

Amita Singh
Editor

International Handbook of Disaster Research

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With 241 Figures and 184 Tables



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Amita Singh

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Preface

Disaster research is relatively a recent subject which has brought together a large number of varied stakeholders such as communities, technology, governance, law, and media in constant discourse on mitigating and preventing disasters. International organizations remain in constant melee for their role in mitigating disasters and their ability in resilience building of vulnerable communities. Business organizations fear an irreparable damage to their supply chains and substantial collapse of micro-small and medium units. Law schools are making attempts to put together new courses which could address key concerns and points of law in a disaster. The terrain of disaster studies appears to be a market place for a variety of disciplines indulging in trade-offs for their dominant status. Notwithstanding a very meaningful research being carried out in every discipline on disasters, a researcher may be at a loss to access it due to deep silos in which disciplines functioned. This provoked a need to break through anachronistic compartmentalization of research and make an effort to explore a fundamental epistemic idea which defines disaster studies. The *International Handbook of Disaster Research* is a single platform which puts together, classifies, and systematizes research on disasters in mainstream disciplines and spawns a transdisciplinary mindset.

The year 2004 has been a turning point in disaster research. A ghost suddenly wakes up from the cracking womb of the ocean as if in a fit of rage turns the world topsy-turvy, washing away 227,898 people and a much larger number of animals. The unforgiving gruesome weaponry of this ghost named Tsunami were the gigantic black waves threateningly rushing toward the land in its clean-up operation like the municipal demolition drives. No one had ever seen or read in history anything about such a macabre event. Humanity sat paralyzed with the jolt of realizations sequentially unfolding before it one by one. First was neglect of earth's carrying capacity, second was irresponsible and corrupt governance, and third was disproportionate political leaning toward vote bank politics rather than synergy for building habitats more resilient and safer places for all species to live and prosper in peace and sustainable abundance. Even if one cannot stop disasters from occurring, one could appreciate and enforce natural laws of seismic activity, forests as green shields, and carrying capacity of land for human habitations to draw reasonable limits to growth and development around earth's fragile regions.

This handbook draws upon social history of technology which has been a great support not only in bringing out authentic data during a disaster, but it also generates open debates against a standard argument of a scheming wolf in the benign state that it is an “Act of God.” Transparency starts from the manner technology and businesses advance since the year 2000. The new Internet technology expanded to social media and subsequently brought a boom in tourism industry with online travel and flight planners. The Trip Advisor and Expedia.com as by-products of the new millennia moved large number of tourists across countries. By 2004, the Facebook social network as introduced by Mark Zuckerberg brought maddening online traffic for sharing photos about travel scenes and sites. These clueless people celebrating Christmas and New Year holidays far away from their homes were suddenly seized by an unrecognizable Tsunami. This Tsunami caused by an earthquake of magnitude 9.1 at the ocean floor of a small island Sumatra in Indonesia was unprecedented and millions of heartrending images were circulated by those who were lucky enough at ground zero to survive or call for help. Time had come that people would not need governments to tell them what it was not, but data were with people to decide what is not an “Act of God.” Transparency, accountability, tortious liability, and performance evaluation had always pricked governance studies, but in disaster studies, they were not seated as sermon monks but as deadly Tsunamis taking Suo Moto action against those who arbitrarily capture riverbed, coasts, and forests and build dream castles over prohibitive fragile land and mountains! Climate change is a treasury alert for disaster managers. Life is in a countdown within a midnight library of equity, fairness, and human rights, and one must be prepared to answer the question “who would live when not everyone can live?”

The handbook has been a team work of some of the best research directors as section experts. This team was not built in a day to undertake this handbook project. We had all been working together for many years, especially since the Himalayan region’s fragility started emerging in repeated eruptions in forms of floods, landslides, and glacial lake outbursts. By virtue of being leaders in their respective disciplinary research, these section experts have been globally acknowledged as trendsetters for many new and refreshing ideas incorporated in this handbook. These experts coming as ground administrators, social scientists, environmental experts, and technologists started converging on the imminent dangers embedded within policy formulation and implementation processes of governments. Media played a phenomenal role when it brought empirical ground surveys faster than the disaster management authorities. All of these scholarly authors and researchers came together to produce this handbook with a three-pronged mission: disaster research should remain transdisciplinary, it should be equitable, and governments should amend laws to facilitate resilience building against disasters. Many lessons taught during the Covid-19 pandemic have been addressed in the handbook.

The handbook starts with a part on Policy Implementation and Best Practices which is treated as a key concern of disaster research and a gateway to many more insights in disaster management policies. In handling this section, the NAPSIPAG (Network of Asia Pacific Schools and Institutes of Public Administration and Governance) experience of cross-cultural best practices simplified a rather complex

implementation research to a sequential response of an understandable inductive logic. The second part on Emerging Technologies and Innovative Applications of AI in DRR is guided by gleaming insights from Dr. Ferda Ofli and Dr. Mohammad Imran from the Qatar Computing Research Institute (QCRI) of Hamad Bin Khalifa University (HBKU). A comparative picture on technology implantations and classification emerges with these experts who brought their enormously deep and discursive South and West Asian experience to the task. The third part on GIS and Geospatial Studies is led by Prof. Chandan Ghosh. A scholar of a very long research experience in this area, he has been a keen editor for getting the right methodologies to serve this section. The fourth part on Institutions and Governance became a mission driven task for a legendary civil servant from India's so called God's own country, the State of Kerala. Since she had been the first Chief Secretary to create country's first disaster management authority in a state, her focus on authentic and balanced analysis without bureaucracy bashing turned a reservoir of knowledge for the handbook. The fifth part on Smart Cities and Technological Innovations for Disaster Management was initiated by Brigitte Lasry, a subject leader from UNESCO led NETEXPLO-International University Network at Paris. With her coordination and co-working with a number of world's best smart city scholars and also editing books on the theme, her vision was wider and more reasonable toward challenges of a smart city. I had to take over at a later stage as Brigitte's tenure at her institution got over. The sixth part on Media and Communication has involved Prof. Jaishri Jethwaney, one of the most vibrant and communicative scholar, on mass media, advertising, and politics. Her task was tough as media people generally do not translate their ground zero experience into scholarly papers. Nonetheless, her communicative skills and online capacity enhancement during many seminars organized by our section editors recharged remote media scholars in writing and sharing their understanding and experience. The seventh part on the Sociology of Disasters is again a gist of a deeply insightful mind of Prof. Siri Hettige from the University of Colombo, Sri Lanka. It was no doubt an ordeal to organize, select, and prioritize a minuscule from heaps of versatile and striking ideas on his table, but his reliance on the art of just elimination made it possible. The eighth part on Disaster Law has been a brainchild of Gabrielle Emery and together we handled this section. She was head of the Disaster Law division at The International Federation of Red Cross and Red Crescent Societies (IFRC). She subsequently moved to UNDRR but continued to guide us through the section and its key focus areas which were in need for more research. The ninth part on International Law and Collaboration received brilliant analytical support from Prof. Mohammad Ekramul Haque from the Law faculty of Dhaka University. His training and experience in international humanitarian and disaster law attracted some meaningful papers of immense value for researchers. The tenth part on Administrative Initiatives and Best Practices has been effectively addressed by Prof. Lalitha S. Fernando from the University of Sri Jayewardenepura, Sri Lanka. Picking up appropriate and application-based methodologies from Public Administration, this part will be of immense value to policy formulators and scholars in the discipline. The eleventh part on Cities and Urban Governance has been led by a very experienced city manager and planner

from Japan, Prof. Kiyoshi Murakami from Tohoku University. As a Chief Executive Officer and strategy advisor at the City of Rikuzentakata, he provided his most practical and application-oriented research support to the authors. The twelfth and the last part on Business During Disasters has been directed and edited by Prof. Huong Ha from the faculty of Business and Law, University of Newcastle, Singapore. As a very keen and dedicated researcher on the subject of business during disasters and especially during the recent pandemic, her holistic and equity-based approach enriched papers in the section. All section experts have tirelessly worked together during the pandemic to give the reader one of the most unmatched and substantially complete experience rarely available elsewhere. The sumptuousness and intelligibility that this handbook offers to those looking for suitable inputs to research and policy making may valiantly fall back on its framework of research for different sections.

The team that produced this handbook also included some of the most brilliant publication managers from Springer Nature, who knew the art and sophistication of managing ideas, time, and content. From the time that Dr. Mokshika Gaur, Senior Editor from Singapore, floated this idea of a handbook at my office room at JNU, the work appeared too ambitious. She politely persevered and subsequently brought together Director Dr. William Achauer, from Singapore Office, and Editor Ms. Nupoor Singh, from Delhi-Mumbai Office, to motivate and discuss the objective and a tentative plan for the handbook. The work still seemed incredible, formidable, and challenging due to my disbelief if there really was enough research on disasters and also authors willing to share it in a handbook. Nupoor and Mokshika were so excited to see the work picking up that its worthy of mention here that they did not disconnect with me even for an hour in the last two years. Gradually, as work expanded, two extremely brilliant and knowledgeable team members pitched in. Dr. Gaurika Chugh, Assistant Professor and an academic researcher with a long experience at JNU, joined in as a Managing Editor, and soon after Ms. S. Shameem Aysha joined in as a Publication Manager. For the last year and a half, the first call and the first beep on my mobile were work reminders from them. This definitely speaks volumes of their dedication and commitment to work. As if it was ordained, two delightful journeys concluded almost together, the handbook and Aysha's final month of pregnancy. The whole team of experts and editorial board share her joy and wish her a very good future.

Three points define this handbook: appropriate algorithm for research framework in technology usage, team spirit in decision making, and finally a convergence of transdisciplinarity in content and methodology of research. It can not only help in the enrichment and evolution of research and policy making in disaster mitigation and resilience building but also suggest the value of team work to those still stagnating in their disciplinary and professional silos. This is a handbook which would live through generations in libraries.

New Delhi, India
September 2023

Amita Singh

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With special thanks to the handbook team of section experts, editorial board, and the authors who have sailed together through the tough times of the pandemic.

Contents

Volume 1

Part I Introduction	1
1 Introduction to the International Handbook of Disaster Research	3
Amita Singh	
Part II Policy Implementation and Best Practices	13
2 Policy Implementation and Best Practices in Disaster Management	15
Amita Singh	
3 Accountability in Disaster Governance	25
Saumya Kumar	
4 Property Rights for Disaster Recovery	39
Harvey M. Jacobs	
5 Man-Made Disaster: A Case of Failed Governance in a Latin American Economy	49
Diego Rodríguez De Marco, Marcela Porporato, and Nirupama Agrawal	
6 Indigenous Knowledge as Early Warning Guide in Disaster Management	71
Thongkhola Haokip	
7 Institutional Preparedness Against Disasters: A Case Study of Odisha	83
Pradeep Harichandan	

8	Building Disaster-Resilient Coastal Cities: An Assessment of Coastal Regulation Laws and Judicial Statements in India	95
	Haaris Moosa and Stellina Jolly	
9	Animal Welfare During Disasters in South Asia	107
	Dulki Seethawaka	
10	Public Sector Continuity Planning: Preparing the Bureaucracy in the Age of the New Normal	125
	Ebenezer R. Florano	
11	Pandemic and Inclusive Governance	139
	Madhushree Sekher and Balbir Singh Aulakh	
12	Sustainable Strategies for Conservation of Water Resources: A Critique	157
	Sanjeev Kumar Mahajan and Anupama Puri Mahajan	
13	Community Resilience and Chronic Flood in Imphal City	167
	Thiyam Bharat Singh Thiyam	
14	Disasters in Sundarbans and Ecological Refugees to Kolkata: A Missing Action Plan	181
	M. P. Chengappa and Arpita Saha	
15	A Study of Animal Behavior and Natural Disasters	197
	Renu Kochhar Sharma	
16	Inter-agency Coordination in Disaster Management	211
	Chetana Kumari	
17	Coastal Resilience and Urbanization Challenges in India	223
	Mamta Sharma and Shadab Khan	
18	E-governance-Based Disaster Mitigation Strategies	239
	Sangita Dhal	
19	Building Resilience Against Nuclear Disaster	257
	Rajesh Kumar	
20	National Disaster Management Authority: Close Encounters with COVID-19	273
	Subhradipta Sarkar	
21	Covid-19 Pandemic and Women's Reproductive and Sexual Health	289
	Debahuti Brahmachari	
22	Disaster Preparedness in the Context of Mt. Apo Natural Park in the Philippines	303
	Franklyn R. Buenaflor	

23 Resilient Cities, Vulnerable Communities: Disaster Governance in the Coastal Cities in Indonesia	311
Andi Luhur Prianto and Abdillah Abdillah	
24 Coastal Settlement Vulnerability on Risk of Abrasion Disaster	323
Andi Annisa Amalia and Khilda Wildana Nur	
25 Land Management and Disasters	343
Gaurika Chugh	
26 Fishers, Community Resilience, and Disaster Management: Learning from the Grassroots of Odisha, India	355
Swarnamayee Tripathy	
27 Migrant Urban Settlements and Disaster Management	369
Gaurika Chugh	
28 How Local Governments in Kerala Play Crucial Roles During Natural Calamities	379
George Mathew	
29 Animals in India's Disaster Management Policies	385
K. M. Singh	
30 Management of the Impact of Extremely Severe Cyclonic Storm "Fani" of 2019 in Odisha	395
Damodar Panda and Maya Devi	
31 Disaster-Induced Vulnerabilities and Institutional Response in Indo-Nepal Tarai Region	413
Smriti Upadhyay and Kavita Arora	
32 Natural Hazard and Disaster Planning in the State of Oregon: Action and Wishful Thinking	433
Edward J. Sullivan	
33 Policy Options for Minimizing Wildfire Damage in the Western USA	453
Richard C. Box	
Part III Emerging Technologies and Innovative Applications of AI in DRR	469
34 Introduction: Emerging Technologies and Innovative Applications of AI in DRR	471
Ferda Ofli and Muhammad Imran	

35 Citizen-Helper System for Human-Centered AI Use in Disaster Management	477
Yasas Senarath, Rahul Pandey, Steve Peterson, and Hemant Purohit	
36 Resilient Heritage Using Aerial and Ground-Based Multi-sensor Imagery	499
Hong-Gyoo Sohn, Yun Jung Yang, and Yoonjo Choi	
37 Ultralight Platforms to Coordinate First Responders and Communications	519
Narayanan Komerath, Adarsh Deepak, and Ravi Deepak	
38 Role of Social Media Imagery in Disaster Informatics	531
Firoj Alam, Kashif Ahmad, Md. Arid Hasan, Ferda Ofli, and Muhammad Imran	
39 Remote Sensing Tools for Crisis Assessment in DRR	553
Fabjan Lashi, Fabrizio Andreuzzi, Sanny Ramos Jegillos, and Gaia Rigodanza	
40 Big Data and Multi-platform Social Media Services in Disaster Management	573
Marc-André Kaufhold, Christian Reuter, and Thomas Ludwig	
41 Role of Microblogs in Relief Operations During Disasters	595
Moumita Basu and Saptarshi Ghosh	
42 Role of Crisis Information Summarization Through Microblogs in Disaster Management	607
Koustav Rudra, Pawan Goyal, Niloy Ganguly, Prasenjit Mitra, and Muhammad Imran	
43 Disaster Rescue Communication Using Mobile Devices, Social Media, and Artificial Intelligence	629
Keri K. Stephens, Nancy H. Carlson, and Yifan Xu	
44 Role of Geolocation Prediction in Disaster Management	647
Reem Suwaileh, Tamer Elsayed, and Muhammad Imran	
45 Remote Sensing for Flood Mapping and Monitoring	679
Rizwan Sadiq, Muhammad Imran, and Ferda Ofli	
Part IV GIS and Geospatial Studies	699
46 GIS and Geospatial Studies in Disaster Management	701
Chandan Ghosh	

47 Numerical Simulation and Modeling of Landslide-Related Hazards Using Geospatial Technology: Selected Case Studies from India and Abroad	709
Shovan L. Chattoraj, P. K. Champati ray , S. Raghavendra, Shefali Aggarwal, Pratima Pandey, Md. Moniruzzaman, Pooja Sharma, Harshita Tiwari, and Kunj Shethiya	
48 Geomagnetic Signal Processing System for Pre-earthquake Anomaly Detection	727
Khairul Adib Yusof, Mardina Abdullah, and Nurul Shazana Abdul Hamid	
49 Risk Mapping in Managing Flood Vulnerability in Disaster Management	743
Zainab Akhtar, Muhammad Sajjad, Muhammad Imran, and Ferda Ofli	
50 Cloudburst Events in the Indian Himalayas: A Historical Geospatial Perspective	777
Hemant Singh, Divyesh Varade, and Prabhash K. Mishra	
51 Space Technology and Disaster Medicine NASA-/Landsat7-Based Retrospective Study of Haiti 2010 Cholera Epidemic	799
A. Choudry and J. Bickelmayer	
52 Multiresilience Indicators Assessment in Seismic Zone V Area in Parts of Uttarakhand, India, Using Geospatial Technology	815
Ankita Padhalni and Balamurugan Guru	

Volume 2

Part V Institutions and Governance	835
53 Introduction: The Importance of Good Governance in Disaster Management	837
Nivedita Haran	
54 Building Resilience and Community-Based Disaster Risk Management (CBDRM): Experiences and Lessons from Communities in the Philippines	845
Maria Corazon J. Tan	
55 Resilience Thinking in Disaster Governance	863
G. Durga Rao and Manik Sharma	
56 Migration and Its Impact on the Rural Economy During Covid-19	875
Pranav Kumar Anand	

57	An Assessment of the Disaster Prevention and Mitigation Tasks of the Barangay (Village) Disaster Risk Reduction and Management Committees of the River Basin Communities in Southern Philippines	885
	Ian Mark Q. Nacaya, Ester L. Raagas, and Astrid L. Sinco	
58	Disaster Risk Reduction with Special Reference to 2018 Kerala Floods and Approaches to Reduce Flood Vulnerability at River Basin	903
	Peerzada Shuaib Amin Parsa and Kaneez Zehra	
59	Evaluation of Reconstruction Practices	927
	Akanchha Singh	
60	Response to Disaster Challenges of Senior Citizens: Trajectories of Building Resilience	951
	Saheli Guha Neogi Ghatak and Santosh Kumar	
61	Local Governance in India During a Pandemic: A Case for Granting Agency to Municipal Governments	967
	M. Ehteshamul Bari and Pritam Dey	
62	Disaster Risk Reduction Through Waterlogging Prevention in (Southwestern) Bangladesh	987
	M. Rafiqul Islam, Sonia Ashrafee, and Nurun Nahar	
63	Disaster Management in Jammu and Kashmir: Tracing the History of Relief and Rehabilitation Amidst Destruction	999
	Mohit Sharma and Neerja Vyas	
64	Role of Local Governments in Disaster Management	1013
	Amarendra Das, Sasmita Behera, and Bibhunandini Das	
65	Training Programs for Police in Disaster Risk Reduction	1035
	Balu I and Nazia Shaik	
66	Kerala Floods 2018: Impacts and Lessons Drawn	1045
	Ajinder Walia, Pallvi Sharma, and Naima Nusrat	
67	Resilience of MSMEs During the Pandemic	1063
	Deepmala Baghel	
68	Studying Disasters Through Complexity Theory	1077
	Hong-Gyoo Sohn, Yong-kyun Kim, and Youngmok Kwon	
69	Systemic Disaster Risk and Response Management	1089
	Yong-kyun Kim, Jean Luc Poncelet, Dong Hoon Lee, and Glenn Dolcemascolo	
70	Policy Change in the Wake of Major Disasters	1105
	Yong-kyun Kim and Dong-kyu Lee	

Part VI Smart Cities and Technological Innovations for Disaster Management	1123
71 Smart Cities and Technological Innovations Towards Disaster Resilience	1125
Amita Singh	
72 Mitigating the Impact of COVID-19 in Tehran via Technologies in Smart Cities	1135
Kiarash Fartash, Parisa Navab Irani, and Ali Asghar Sadabadi	
73 Therapeutic Role of Arts and Crafts in Post-disaster Resilience Building in India	1153
Mitali Gupta and Reena Kumari	
74 Enhancing the Smartness of the “Smart City” Concept: A Critical Review for a Better Conceptualization	1175
R. L. S. Fernando, M. S. Dimuthu Kumari, and M. S. A. Kulatunga	
75 Disaster-Resilient Smart Cities Inclusive and Pro-poor	1191
Renaldo S. Rajkumar and F. X. Lovelina Little Flower	
76 Disaster Governance and Policy for Dhaka: Building a Smarter City	1207
Nasim Banu	
77 Disaster Management Plan for Libraries Located in Cyclone-Prone Areas in India	1221
Anam Jamal Ansari and P. M. Naushad Ali	
78 Reflections of Disasters in Indigenous Arts: The <i>Patuas</i> in India	1235
Aparna Sengupta	
79 An Integrated Approach Toward Smart and Resilient Cities	1245
Vibhas Sukhwani, He Zuquan, Avani Dixit, Eiko Wataya, Ariyaningsih, and Rajib Shaw	
Part VII Media and Communication	1261
80 Introduction: Taking Media and Communication on Board in Disaster Management	1263
Jaishri Jethwaney	
81 Covid-19 Communication Strategies in India: An Analysis Using Social Amplification Risk Framework (SARF)	1277
Md Shahid Akhter and Biswanath Dash	

- 82 Keep Me Safe from Cyclones: Community Radio and Disaster Campaign in the Coastal Areas of Bangladesh** 1295
Mohammad Sahid Ullah
- 83 Interrogating the Role of Environmental Journalists in the Disaster Context** 1315
Dinushika M. Yapa Abeywardhana, P. K. G. I. Lavangi Ranasinghe, and Luxshe Hariharan
- 84 Post-Disaster Suffering: Amphan Cyclone in East Coast on India** 1331
Subrat Kumar Mishra and Akanksha Shukla
- 85 Outreach Strategies Adopted by Corporate Organizations for Flood-Affected Communities in India** 1347
Kulveen Trehan
- 86 An Ethical Code for Disaster Journalism** 1361
Himanshu Shekhar Mishra
- 87 Capacity Building Through Stakeholder Training in Media and Communication for Effective Disaster Management** 1371
Jaishri Jethwaney
- 88 Media and Communication in Disaster Risk Reduction** 1389
Juhi Ramrakhiyani
- 89 Disaster Communication and Trust** 1399
Thi Thuy Hang Nguyen and Truong Gia Bao Tran
- 90 Social Media as a Catalyst in Disaster Risk Governance** 1413
Prachee Majumder, Disha Dwivedi, and Garima Khera
- 91 Pandemic and Brand Communication in India** 1423
Tanu Dang
- 92 Disaster Management and Communication Technology: The Prospect of Social Media** 1435
Jyotirmayee Tudu and Sourav Prakash Shit
- 93 Social Media and Communication for Older Adults During Disasters: A Narrative Study of Aging Population in Kolkata, West Bengal** 1447
Debarati Dhar
- 94 Pandemic Survival Strategy of Hindi Film Studios: The Case Study on Yash Raj Films** 1459
Ipsita Barat

95	Media and Disaster Reporting: An Analysis of Kashmir Floods 2014	1471
	Sabeha Mufti and Irfan Hashim	
96	Role and Impact of Visual Imagery During Crisis	1487
	Seema Goyal	
97	Government Information Dissemination Structures and Processes in Disasters	1495
	Shalini Narayanan	
98	Reinventing Fashion Industry to Sustain Itself During Covid-19	1503
	Meha Jayaswal	
99	Radio for Disaster Management	1517
	Rajeev Kumar Shukla	
Part VIII Sociology of Disasters		1527
100	Introduction: Sociology of Disasters	1529
	Siri Hettige	
101	Disaster Preparedness, Disability Awareness, and Disability Inequality: A Study of Hong Kong's Property Management Sector	1535
	Yung Yau	
102	Indigenous Knowledge and Practices of the Ethnic and Small Island Communities in Disaster Management	1549
	Mahfuzul Haque	
103	Combating Domestic Violence During Lockdown of COVID-19 Pandemic	1559
	Neena Joseph	
104	Food Security in India During the Pandemic: Future Learning for Ensuring Zero Hunger	1575
	Rabindranath Bhattacharyya	
105	Managing Teaching and Learning at Higher Education Institutions During the COVID-19 Pandemic	1587
	R. P. C. K. Jayasinghe and R. P. C. R. Rajapakse	
106	The Role of Traditional Institution of Governance in Disaster Risk Reduction in Eastern Himalayas	1597
	Shailendra Mani Pradhan and Bickey Sharma	

107	Preserving Cultural Heritage and Psychosocial Support After the Great East Japan Earthquake: An Interdisciplinary Approach to Good Practice	1609
	John Morris and Machiko Kamiyama	
108	Community Participation Strategies in Nepal's Disaster Management	1621
	Soumendra Mohan Patnaik	
109	Exploring the Social Effects of Disasters: Causes, Consequences, and Mitigation	1637
	Siri Hettige	
	Part IX Disaster Law	1647
110	Theoretical Foundations of Disaster Law: The Pillars and the Building	1649
	Amita Singh	
111	The Pandemic and Its Effect on the Power Sector in India	1667
	Abha Yadav	
112	Local Community Leaders Operating in Disaster Recovery	1687
	Valerie Ingham, John Hicks, Lucia Wuersch, Mir Rabiul Islam, and Anna Lukasiewicz	
113	Post-Disaster Dispute Resolution: A New Zealand Case Study	1705
	Toni Collins and W. John Hopkins	
114	The Need for Health Emergency Law in India	1715
	Manika Kamthan	
115	Making Those Accountable for Man-Made Natural Disasters: A Critical Appraisal of the Law with Special Reference to Sri Lanka	1725
	Kokila Konasinghe and Akalanka Thilakarathna	
116	The Use of Earth Jurisprudence Against Anthropogenic Marine Environmental Disasters in Sri Lanka	1737
	Asanka Edirisinghe	
117	Disaster Management Laws: International and Indian Perspectives	1755
	Tarun Arora and Nibedita Bhattacharjee	
118	Paradigm Shift in Disaster Management: Bangladesh Experience	1773
	Mahfuzul Haque	

- 119 Comparative Analysis of Legal Framework for Disaster Management in Pakistan, India, and Bangladesh** 1781
Madhuri Parikh and Deba Ranjan Hota

Volume 3

Part X International Law and Collaboration During Disasters ... 1793

- 120 Introduction: International Law and Collaboration During Disasters** 1795
Muhammad Ekramul Haque
- 121 Legal Aid Services for Disaster-Induced Gender-Based Violence in Coastal Bangladesh** 1799
Arpeeta Shams Mizan and Nahid Rezwana
- 122 Doctrine of Executive Immunity in Times of COVID-19: Experience from Indonesia** 1821
Rosa Ristawati, Radian Salman, and John Roberto Sampe
- 123 International Law, Human Rights, and Public Health Emergencies During Disasters: A Developing Country Perspective** 1835
Jobair Alam and Md. Naimul Hasan
- 124 The International Law Commission and International Disaster Law** 1849
Quazi Omar Foysal
- 125 Duty of the State to Protect Internally Displaced Persons in the Event of Disaster** 1863
Sayeed Hossain Sarwar
- 126 Managing Disasters in Bangladesh: Legislative Framework and Judicial Developments** 1879
Muhammad Ekramul Haque and Azhar U. Bhuiyan
- 127 Persons with Disabilities in COVID 19: Bangladesh Perspective** 1891
Nabila Farhin and Rabeya Basri
- 128 International Human Rights Law (IHRL) in Disaster Risk Reduction (DRR) Planning** 1909
Shirin Sultana
- 129 Nuclear Disaster: Assessing the Compliance of Global Nuclear Safety Regime in Bangladesh** 1923
Md. Raisul Islam Sourav

130	COVID-19 Pandemic and Health for All	1935
	S. M. Atia Naznin	
131	Climate Change and Disaster Management in Bangladesh	1953
	Nasrin Akter and Zelina Sultana	
132	Disaster Displacement and International Refugee Law: Locating Legal Protections in the Context of Climate Change Migration	1977
	Nafees Ahmad	
133	Protecting Civilians During Armed Conflicts: An Appraisal of States' Obligations from an International Law Perspective with Special Reference to Sri Lanka	1995
	Wasantha Seneviratne	
134	Corporate Responsibility to Protect Human Rights: Evaluating the Legal Framework of Bangladesh in Light of International and Regional Standards	2011
	Tahseen Lubaba	
135	Humanitarian Relief in the Time of Covid: The Law and the Reality	2023
	Kanchan Yadav	
136	International Humanitarian Law to Address the State Responsibility for the Management of Civilian Casualties in Post-War Situation	2039
	Nakib Muhammad Nasrullah	
Part XI Administrative Initiatives and Best Practices		2053
137	Disaster Management: Administrative Initiatives and Best Practices	2055
	R. L. S. Fernando	
138	Capacity Building at the Level of Community to Reduce the Risk of Natural Disasters: A Study on the Indian Scenario	2061
	Akanksha Shukla and Subrat Kumar Mishra	
139	Drought, Food Insecurity, and Gender Relations in Selected Districts of India	2077
	Basanta Sahu	
140	Good Governance Strategies for Disaster Management and Risk Reduction	2097
	Pallavi Sinha Das	

141 Climate Change Disasters and Impact on Women in South Asia	2113
Garima Sangwan and Debahuti Brahmachari	
142 Women and Domestic Violence During Covid-19 Pandemic in India	2127
Rahila Sikandar	
143 Response of Biological Disaster COVID-19 in Bangladesh	2139
Nasim Banu	
144 Unsung Climate Heroes: Women Protecting Land, Environment, and Livelihood in Odisha	2157
Annapurna Devi Pandey	
145 Creating Robust Infrastructure and Response Mechanism: Odisha Model of Disaster Management	2175
O. P. Mishra	
146 Flood, Livelihood, and Community Resilience: A Study from Barak Valley Region of Assam in Northeast India	2189
Suranjan Das and Tapati Das	
147 Community Vulnerability and Disaster Risk Reduction at Sundarbans	2203
Rabindranath Bhattacharyya	
Part XII Cities and Urban Governance	2219
148 Governance Is Affected by Individual to National Level: The Case of the Great East Japan Earthquake and Tsunami in the City of Rikuzentakata, Japan	2221
Kiyoshi Murakami	
149 Evaluation of Structural Reconstruction Practices: Housing Reconstruction	2237
Akanchha Singh	
150 Vulnerability of Coastal Communities and Livelihoods Through the Experiences of Developmental Organizations: A Case Study of Kachchh, Gujarat, India	2259
Sromona Burman and Suparana Katyaini	
151 Reimagining DRR in Urban Transformation: Confronting the Heterogeneity of Urban and Negotiations in Transforming Urban Landscapes	2281
Niti Mishra and Lavanya Shanbhogue Arvind	

152	Building Rights for Funding Housing Reconstruction: Mexico City's After the 2017 Earthquake	2295
	Claudia Acosta and Julio Fuentes	
153	Cultural Tangibles and Intangibles and Disaster Challenges: Narratives from Varanasi	2315
	Priyanka Jha and Sukhreet Bajwa	
154	Cities and Climate Change: Responding to the Impacts of Water-Related Disasters in Sri Lanka	2331
	Deepthi Wickramasinghe, Lihini Prematilaka, Ayomi Witharana, Devanmini Halwatura, and Thisaru Perera	
	Part XIII Business During Disasters	2355
155	Business Resilience and Disaster Risk Management	2357
	Huong Ha and Joyce Linghua Wang	
156	Indonesia's Legal Complexities in Responding to Natural Disasters and the Business Environment	2377
	Arie Afriansyah	
157	Platform Co-operative Models and the COVID-19 Pandemic in Singapore	2395
	Huong Ha and Carey Lin	
158	Tourism Industry and the COVID-19 Pandemic: A Case Study in Indonesia	2413
	Huong Ha and Timothy Wong	
159	Food Security and the COVID-19 Pandemic in Singapore	2425
	Huong Ha and Renwei Lim	
160	CSR and Sustainable Coexistence with Society During the COVID-19 Pandemic: The Case of Korean Large Enterprises	2437
	Soyeon Kim	
161	The Importance of Restructuring the Local Food System in the Context of Disaster Management: Lessons Learned from the Effect of COVID-19 on Agricultural Business in Japan	2449
	Misa Aoki	
162	Times of Crisis: Women and Leadership	2461
	Teresa Sims Johnson and Stanley Bruce Thomson	
163	Sustaining and Shielding Business from Disasters: Assessing Indian Experiences of COVID-19 Pandemic Disaster Management	2471
	Rajesh Kumar	

164	How Food and Beverage Industry Overcome the Impacts of the COVID-19 Pandemic in Hong Kong?	2485
	Man Chung Wong and Huong Ha	
165	Behavioural Insights, Organizational Resilience, and Disaster Preparedness	2497
	Yuan Zhi Seah and Huong Ha	
166	Leadership and Crisis Management for Businesses Globally: The Role of Leadership in Business Sustainability in a Crisis Environment	2511
	Stanley Bruce Thomson, Darcia Roache, and Richard Muschette	
167	Impact of COVID-19 Pandemic and Natural Disasters on Businesses in the Pacific: Preparing for Unknown Future Disruptions	2519
	Asif Chida, R. D. Pathak, Stephanie Russell, and David Gargett	
	Index	2535

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Part I

Introduction



Introduction to the International Handbook of Disaster Research

1

Amita Singh

Contents

A Guide to Better Research in Disaster Management	4
Provides Space for Non-Western Narratives and Strategies for Disaster Management	5
A Holistic Framework of the Handbook	6
Synchronizing International Framework with National and Local	7
Ideas Highlighted in Sections	8
Conclusion	11
References	11

Abstract

The objective of this International Handbook of Disaster Research is primarily twofold: first to enable Asian perspectives generate a surge of ideas which correlate, diversify, or question a firmly entrenched western determinism or American exceptionalism in disaster studies. Determinism is characteristic of an approach which suggests that one is a captive of a particular way of thinking and their responses to different situations are quite the same as could be anticipated. Seymour Martin Lipset in his work *American Exceptionalism: A Double Edged Sword* (1997) has explained it in detail. One could pick up any work on disaster management prepared in the last decade to see that Asian narratives are rare entries even though their experience with disasters is much more varied, deep, and diversified in social, ecological, and community-centered strategies. Second objective is to formulate some kind of a holistic and all-encompassing transdisciplinarity among multifaceted studies in disaster management which have so far remained confined quite ineffectively yet arrogantly within their exclusive

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silos. Once transdisciplinary interaction or a dialogue begins, disaster management would no more remain a meandering dervish (A Sufi who is always in search of a universal spirit) or an epicurean technological hedonist (a pleasure seeking, money earning glorified scholar). Keeping the two objectives ahead of the plan for this handbook, there are 12 parts led by transdisciplinary expert scholars who have worked together as a team and generated synergy within the sections for an effective disaster management for planet earth like a Noah's Arc for us. The message from this work is that no one can do it alone and decisions in disaster management should follow a democratic, non-hierarchical, and communicative spirit with an understanding about the limitations of planet Earth rushing toward its concluding detonation.

Keywords

Anthropocene · Other-humans · Adaptation · Climate change

A Guide to Better Research in Disaster Management

This International Handbook of Disaster Research is planned with the objective of disseminating information from across the world on varieties of disasters, vulnerabilities of habitats, and governance strategies. Research strengthens decision making and brings clarity on accountability. It is an indispensable requirement for connecting grassroot communities with their municipal authorities, Wards, and Panchayats (grassroot institutions of governance in South Asian region). Writings in this handbook have attempted to cover regions of persistent disasters, which have rarely found a place in Western Euro-centric literature on disasters. This makes the handbook unique as a compilation of voices from the remotest and most ignored areas of the world especially Asian region and may provide a new direction to ongoing global research on disasters. Notwithstanding its volume and outreach to the non-Western world, emphasis has nonetheless been comparative and solution oriented. Decision makers may re-strategize their policies on disaster management with ideas on new technology for disasters, its limitations, databases, information sharing, participatory governance, institutional responsibility, legal compliance, and role of media in a changing world. Currently, planet earth is more vulnerable to vagaries of climate change and increasing devastation that few can control with available tools. Voices from grassroot communities have ensured that this handbook can definitely be a fundamental base book for anyone working or undertaking research studies on disasters.

What are the five elements of disaster research? Fig.1

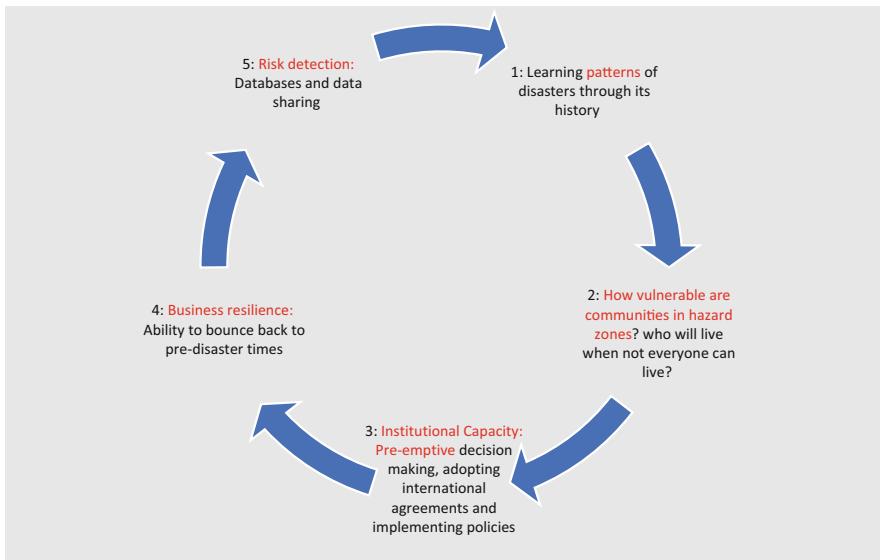


Fig. 1 Five elements of disaster research (source: Author)

Provides Space for Non-Western Narratives and Strategies for Disaster Management

This handbook covers global studies, yet the focus is on Asia-Pacific and specifically the Hindu Kush-Himalayan (HKH) region, which encompasses an area of mountains in eight countries of Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan. A study (Matin & Islam, 2021) assessed the decision-making processes at the institutional level in four countries – Afghanistan, Bangladesh, Nepal, and Pakistan on their institutional capability on a single important ingredient of disaster management, which is usage and sharing of geospatial information. It found an immense lack of data and resources such as hardware, software, human, and institutional. Besides a need for strengthening decision-making processes the study raised an important point on the for partnerships to reduce vulnerabilities and achieve resilience. As it appeared from studies across Asia Pacific that deficient institutional capability notwithstanding improved space research and remote sensing reflected gaps in policy frameworks of most countries. In addressing hydrometeorological and environmental challenges advanced geospatial tools are needed in disaster management. Much of this effort needs governance, which does advance planning, preparedness, land resource mapping, and data sharing tools for dissemination to all agencies equitably.

The handbook becomes extremely important for current times, which are encountering deep ethnic, religious, and national divides combined with climate and

war-led migration. Governance institutions and law stand as a small David before the mighty Goliath. Governance and data sharing may turn out to be one of the most glaring challenges to new regional alliances such as IORA (The organization was first established as Indian Ocean Rim Initiative in Mauritius on March 1995 and formally launched in 1997 by the conclusion of a multilateral treaty known as the Charter of the Indian Ocean Rim Association for Regional Co-operation.), G-20 (The **G20 or Group of 20** is an intergovernmental forum comprising 19 countries and the European Union (EU). It works to address major issues related to the global economy, such as international financial stability, climate change mitigation, and sustainable development.^[3]), BRICS (**BRICS** is an acronym for five leading emerging economies: Brazil, Russia, India, China, and South Africa. The first four were initially grouped as “BRIC” (or “the BRICs”) in 2001 by Goldman Sachs economist Jim O’Neill, who coined the term to describe fast-growing economies that would collectively dominate the global economy by 2050;^[1] South Africa was added in 2010), BIMSTEC (The **Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation(BIMSTEC)** is an international organization of seven South Asian and Southeast Asian nations, housing 1.73 billion people and having a combined gross domestic product of US\$4.4 trillion (2022)), the Mekong-Ganga Cooperation (The Mekong-Ganga Cooperation (MGC) is an initiative by six countries – India and five ASEAN countries, namely, Cambodia, Lao PDR, Myanmar, Thailand, and Vietnam for cooperation in tourism, culture, education, as well as transport and communications. It was launched in 2000 at Vientiane, Lao PDR), etc., which have taken over older regional pacts such as OPEC (Organization of the Petroleum Exporting Countries (OPEC) is an intergovernmental organization of 13 nations, founded in 1960 in Baghdad by the first five members (Iran, Iraq, Kuwait, Saudi Arabia, Venezuela), and headquartered since 1965 in Vienna), SAARC (The South Asian Association for Regional Cooperation (SAARC) is the regional international organization and geopolitical union of nations in South Asia since 2006) and OECD (The Organisation for Economic Co-operation and Development (OECD) is an intergovernmental economic organization with 35 member countries, founded in 1960 to stimulate economic progress and world trade) with their embedded challenges. How far would they work and synchronize country-based efforts and form disaster resilience through healthy and honest partnerships is yet to be seen. Their collective march toward targets set for the Sustainable Development Goals by 2030 has sensitized them to a need for integrating disaster management in developmental planning and programs. Implementation remains a challenge of priorities as brought out in papers.

A Holistic Framework of the Handbook

The handbook covers 12 key sections steered by experts who combine years of experience with their academic leadership and ground research. For the convenience of readers effort has been made to draw some technical boundaries among these sections but considering the nature of disasters there exists sufficient overlapping

and highlighting of common concerns. The section experts have presented frames of their ideas in their introductory chapter, which unfolds into regional and area-based concerns and solutions in contributions by authors. The following parts constitute this handbook;

1. Policy Implementation and Best Practices
 2. Emerging Technologies and Innovative Applications of AI in DR
 3. GIS and Geospatial Studies.
 4. Institutions and Governance
 5. Smart Cities and Technological Innovations for Disaster Management
 6. Media and Communication
 7. Sociology of Disasters
 8. Disaster Law
 9. International Law and Collaboration During Disasters
 10. Administrative Initiatives and Best Practices
 11. Cities and Urban Governance
 12. Business during Disasters
-

Synchronizing International Framework with National and Local

Certain important issues have been flagged in all chapters, which synchronize well with the objectives of three international frameworks and the critical narratives, which follow in national, local, and regional capacity building questions. These three international frameworks are the;

- Hyogo Framework for Action (2005–2015) for identification of risk on a priority and staying prepared to prevent disasters. As a knee jerk instant response to the 2004 Tsunami that shook governments across the world Hyogo gave a skeletal frame over which much had to be designed to obtain a clear national and global strategy for implementation. Hyogo Declaration was nonetheless a clarion call to wake up national governments and they responded with their country-specific disaster management acts. This brought tremendous transformation in perspectives on community research and developmental initiatives.
- Sendai Framework (2015–2030) that goes beyond “risk identification” to a more mature and substantive requirement of governance to manage disasters. It emphasized State responsibility alongside that of local bodies, private sector, and other stakeholders. The key objective of this governance as for any other sectoral area is to “Build Back Better” in recovery, rehabilitation, and reconstruction. So issues of Constitutional democracy, human rights, and participatory decision making became as important as implantation and adoption of technology for disaster management.
- Sustainable Development Goals (SDG 2015–2030), which alerted governments on reiterating Brundtland (Norwegian Prime Minister Gro Harlem Brundtland prepared a report as Chair of World Commission of Environment and

Development in 1987, which is called the **Brundtland Report, Our Common Future**. This report introduced the concept of sustainable development in the midst of environmental degradation and concern for social equity and economic growth) Commission's invocation and incantation of sustainability as a breath of life at its last gasp. Consequently, all developmental initiatives were rendered lifeless in the absence of their evaluation on a scale of damage and losses to environment. SDGs are understood as a shared blueprint on peace and prosperity in the world.

Ideas Highlighted in Sections

Authors have their country-specific disaster management acts as their primary light house as they take it forward to address management issues. A central coordinating authority has come up in every country after the coming of country-specific disaster management acts, yet during pandemic management (2020–2022) a phenomenal lack of coordination was seen. This existed not just within the country that impacted the functioning of national agencies but affected many other cross-border operations such as international rescue, airport-railway-bus passages, visa and custom support, across the border trade, rights of aid-workers, and emergency equipment transportation. For example, South Asian countries which are largely located on a single land mass and could have done much better in coordinating toward cost-effective measures were not even able to coordinate on a minimal scale despite an available framework of action in SAARC Agreement on Rapid Response to Natural Disasters (SARRND 2011).

There is lack of policies, legal frameworks, and mandates to produce, archive, and share data. This is combined with many institutional issues in technology and data sharing leading to replicative production of the same data by different agencies. Geospatial technologies are used in different capacities, intentions, and objectives, which obstruct institutional coordination and understanding on sharing data. Recently, in 2021, Brazil, Russia, India, China, and South Africa (BRICS) initiated cooperation in this direction when it signed an agreement for cooperation in remote sensing satellite data sharing as brought out by Indian Space Research Organisation (ISRO), which had already been sharing data information bilaterally with South Asian countries. Indian Remote Sensing Satellites shared data with Sri Lanka during tsunami and with Bangladesh during the cyclone SIDR. Sharing data has, to an extent, been taking place with Nepal and Maldives too. This sharing is highly inadequate as individual SAARC countries with an exception of India have woefully lacked in utilizing space-based assets. Most regional groups of countries need a much articulated cooperation on meteorology, hydrology, oceanography, seismology, and atmospheric studies yet dedicated regional satellites continue to remain marginal concerns in disaster prevention. The GSAT-09 satellite launch in India is expected to bring greater cooperation and coordination with neighbors in water conservation, weather forecasting, and early warning on disasters.

The handbook recognizes the fact that the world is more turbulent than what it was at the beginning of this millennium. International law is being broken with impunity and nature remains a victim to demands that go beyond earth's carrying capacity. Climate change, agricultural adaptation, medium- and small-scale industries, urban management, smart cities, water bodies, habitat destruction, migration, and human rights are new concerns, which have been addressed in the handbook. The developer led cities had been an acceptable norm since the beginning of globalization in early nineties. However, this trend changed as urbanization became an extended project of smart cities despite the pit holes of governance deficits. So, key issues of governance, such as democracy (Singh, 2021), accountability, transparency, and participatory decision making have been investigated in disaster management initiatives. Repeated incidence of landslides, forest fires, glacial lake outburst, and floods have insisted a thorough environment impact assessment as a precondition to approving any project anywhere but more stringently in coastal and hill areas, which are sentinels against climate-led destruction that is defining contemporary era now being referred to as a metaphor "Anthropocene" (The Greek *Anthropocene* means the "recent age of man.") This term was coined by American biologist Eugene Stoermer in 1980s, but gained global attention when a number of geologic science forums proposed to treat it as a formal geological interval in which human activity have had a substantial negative impact on planet earth). Disasters are by-products of this era.

It is in this Anthropocene era that the processes of law ought to be redesigned with stronger norms of equity, justice, inclusive governance, and unhindered institutional and individual tortious liability. Decisions on environmentally prohibitive activities undertaken in defiance of law demands uncompromising political leadership. The section on disaster law highlights a scenario based on enormous experience of advocates and cause lawyers in courts, legal experts, and international experience in disaster philanthropy of the International Federation of Red Cross and Red Crescent Societies (IFRC). This new area of law is deeply embedded into saving lives in disasters, reducing suffering due to disasters, and upholding human dignity for victims of disasters. Disaster Law resonates these three human demands in the Court of Law.

The section on Media in the handbook indicates a new world, which has jingled into a boundaryless terrain through the World Wide Web. Media shapes public opinion much faster than any other technology or human design today. It is rather difficult to say if the 360 degree and 24/7 news channels and social media (Twitter, Whatsapp, Facebook, Instagram or the new entries like Zoom, Vice, or Buzzfeed) alongside the rather diminishing daily newspapers continue to validate a coherent, reliable information about disasters (Franks, 2013) to render disasters more "observable and knowable" (Cottle, 2009) or does it portray a calamity, which has no precedence, an Act of God, which encourages and deflects government action to silently legitimize deaths and devastations in public imagery. Risk communication is a specialized field today starting with newsroom action to investigate whatever happened, who was affected, and who may be responsible sets a trend for government and peoples' debates (Greenberg & Scanlon, 2016). The role of disaster journalism in an era of global networking, capital flows, and transnational satellite

media creates a logic that influences people profoundly and shapes an understanding about a disaster. This may portray governance deficits, environmental neglect, a multinational project, lifestyle changes, corruption, and climate change.

Animals or the “other humans” are the worst victims of inequitable and unjust disaster management laws (Coll, 2013). Equity is nothing but morality, fairness, and good conscience yet disaster laws ignore the presence of these other humans (animals). As a result, these other humans are left behind to be washed off in floods, be burnt to death in forest fires, and be buried under rocks in landslides. Governments around the world have not adequately delivered equity and justice for animals in their country’s disaster management acts or even in their national disaster management plans if any. A standard legal principle suggests that, “no relief (in torts) could be given if the demand arises in connection with one’s own tortious acts” or in Latin, “Ex turpi causa non oritur actio” (from a dishonorable cause an action does not arise). So, if men are causing most disasters today due to anti-environment developmental policies, generate toxic pollution in water and over land, deforest green areas and release more CFCs (dishonorable act) to cause climate change, does man deserve relief? By this argument, animals are innocent victims of human’s dishonorable acts (Singh, 2022) and should legitimately be given relief. Kashmir floods of 2014 and Kerala floods of 2018 washed away more than 6.5 lac and 4 lac houses, pets, poultry, and livestocks, respectively. The Australian forest fires killed and displaced more than 3 billion animals from June 2019 to February 2020 (Vernick, 2020).

The much televised heartbreaking Snowball incident from Hurricane Katrina in 2005 drew phenomenal public attention. A 9-year old boy refused to leave behind his small dog Snowball, and telecasting of such a tragic episode on television and news media sites generated such a moral outrage that forced American government to revisit their rescue policy on a priority. The US Congress immediately brought the historic Pet Evacuation and Transportation Standards Act (PETSA) 2006. This Act amends the Robert T. Stafford Disaster Relief and Emergency Assistance Act and authorizes the Federal Emergency Management Agency (FEMA), “to ensure that state and local emergency preparedness operational plans address the needs of individuals with household pets and service animals prior to, during, and following a major disaster or emergency” (PETSA, 2006).

This stupendous and much awaited initiative even with its anthropocentric leanings for pets and service animals only (not stray and homeless) was indicative of change in the manner that cities were governed. It pushed badly governed states like Louisiana into an indispensability of sensitive animal management policies such as the Animal Birth Control (ABC) to stay prepared. Ironically, this ABC should have been part of all Smart Cities yet it is missing out in most other countries including India. A few forward steps that have been taken up in the 2016 and 2019 National Disaster Management Plans are still not implemented in India since implementation depends much on efficient and participatory State governance systems. The handbook carries this inclusive sentiment across all sectional themes as an important ingredient of disaster management research and policies.

Conclusion

This handbook on Disaster Research is a mine of ideas from the developed and the developing world on their perceptions, strategies, governance, and legal frameworks that help to create an enabling environment for disaster management. It helps to identify distortions occurring in disaster studies due to technology-centric approaches and suggests solutions to balance them through practitioner's experience with public administration, governance, and policy sciences. International humanitarian law and media studies provide flywheels to the implementation of disaster management toward an inclusive, equitable, just, ethical, and holistic policy framework. This book has interrogated some of the major contemporary narratives in each section and will prove to be a one stop shop for decision makers, researchers, policy makers, academia, and students.

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Part II

Policy Implementation and Best Practices



Policy Implementation and Best Practices in Disaster Management

2

Amita Singh

Contents

Introduction	16
A Few Perceptive Findings Define the Universe of Implementation	16
Essentials of Implementation	18
Implementation Has a Strong Connection to Local Governance	18
Digitization of Disaster Management Policy Implementation	19
Implementation and Political Expediency	20
Conclusion	22
References	23

Abstract

Policy implementation in disaster management is one of the most sensitive displays of the state capacity in governance. Owing to its wider broadcast across media, the success or failure of implementation becomes the face of a particular disaster. For example, Hurricane Katrina carried the reputation of Louisiana State's corrupt government, the Kedarnath disaster (2013 India) apathetic governance, the Kerala Floods (India 2018) ill-coordinated dam management, etc. It brings together on the table deficits of administrative, political, and technological decision making and highlights social vulnerability and access to justice. The legal and governance framework is treated as a causative reference point of implementation. This framework represents official capacity to address citizen's concerns. It also displays structural strength when faced with media trial rooms at a time when disaster strikes and multiple questions arise around government's

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planning processes, early warning technology and access of information to citizens. Despite its crucial indispensability in making policies effective, implementation remains today what it was in the early 1970s, when Erwin Hargrove ([1975](#)) referred to implementation studies as the *missing link* of policy sciences.

Keywords

Communitarian · Digitizations · Expediency · Innovation

Introduction

The “Smart,” “Unsmart,” or “Smart Enough” Cities in Disaster Management

A Few Perceptive Findings Define the Universe of Implementation

First, the end results of all forms of implementation are always unanticipated and unintended. As Margetts et al. ([2010](#)) write on modern organizations as functional embodiments of modern science and business practice, yet they come to produce outcomes that are so far away from what was apparently anticipated or intended ([Potoski, 2001](#)). The Vietnam War (1968) and later the Chernobyl nuclear leak (1986), and even the disintegration of the Soviet Union explain how even the most scientifically and evidence-based planning can go awry and be shockingly different than the original purpose of its policy.

Second, the human capacity to foresee is highly limited. R. K. Merton, the sociologist of the early twentieth century, established this belief quite scientifically in his work, *The Unanticipated Consequences of Purposive Social Action* ([1936](#)) that the social change expected of a policy may not be so. He explained the nature of “conduct,” which comes out of “purposive action.” Conduct, being part of a purpose, can make rational choices between various alternatives, but “behavior,” which an individual carries, is a response to stimulation from one’s environment, one’s group, or a particular species. Therefore, this difference between “conduct” and “behavior” ([Ostrom, 1998](#)) explains most deviations and deflections that occur during the implementation of policies.

Third, there are various interests that influence and carry forward or impede implementation on issues of substantive democracy. Constitutionalism alone, as perceived, may not be a guiding light to implementation. James M. Buchanan and Gordon Tullock, in their epoch-making work *The Calculus of Consent* ([1962](#), p. 361) and Mancur Olson’s *Logic of Collective Action* ([1965](#)), started looking into various interests that control democracy and political economy. There were strong influences on policies related to taxation, program expenditures, budgets, and the political process. From economics to public administration, many cross currents of theories emerged to explain implementation. O’Toole ([2000](#)) argued that there is a

world of viable theoretical constructs (e.g., principal–agent, rational choice, and game theories) upon which implementation can draw during changing times, while encountering a variety of interests. The continuation of disasters in some areas of every country as opposed to quick action in certain others may reveal politics of vote bank, race, caste, and religion.

Fourth, implementation mostly provokes issues of justice, fair distribution, and equity. For example, the Coastal Zone Management Laws in every country have incited local communities, fisherfolks, land and water usage laws arrived as projects, and developmental permits were to be issued by local authorities. Thus, a trade-off between laws and projects may defeat the purpose of laws and force amendments to give relief to the interests of powerful projects. In India, the 1991 Coastal Zone Management Regulations have been amended 25 times to give relief to projects that were approved over fragile coastal zones without adequate clearance and environmental impact assessment (Aggarwal, 2018). The situation is not much different in a highly developed country such as the USA. Schoenbaum and Rosenberg (1976, p. 9) observed that “this lack of enforceability is the Achilles heel of North Carolina’s emerging coastal zone management program.” They suggested that unless it is corrected, this weakness will undermine its effectiveness, not just in North Carolina, which they have studied, but in all other States as well.

Fifth, implementation always fails to reach out to the last mile, i.e., the people most affected by a striking disaster. This last mile therefore becomes a critical stage of humanitarian aid provision to the people suffering most who are trapped in the most unreachable, remotest areas. Although delivering technologies such as drones and artificial intelligence-driven vehicles have greatly transformed the last-mile delivery, a pre-existing lack of support infrastructure, such as transportation road-blocks, lack of medicines and ambulances, limited finance, which is unable to manage delivery costs, and a lack of urban freight combine to leave the last mile largely unattended. On top of this, the same government that neglected the city infrastructure and remained unaccountable and corrupt with impunity multiply difficulties in reaching out to the last mile (Balci et al., 2008).

Last, implementation at all levels and all stages requires immense and intricate coordination between many agencies and departments. In disaster management policies, this coordination requirement is relatively more complex and forceful than in other policies owing to its transdisciplinary nature. During the recent COVID-19 pandemic, most countries realized that managing a disaster is not analogous to managing a ritual policy implementation, but it stands apart because of its continuous coordination between government agencies, nongovernmental organizations, corporates, vulnerable communities, international organizations, aid providers, equipment suppliers, technology, media, and rescue teams. To understand it better, a study of implementation challenges and need for coordination is well documented in a paper by Singh (2020, p. 377). It is for the sake of effective coordination that disaster management in every country requires a brilliant, enlightened, and smart leadership to compensate for many coordination gaps, which are likely to do damage beyond the destruction already caused by a disaster.

Essentials of Implementation

Implementation is one of the earliest problems of policy sciences and remains unresolved today. When Pressman and Wildavsky published their work in 1973, the global recession was at its peak following failures of the UN's first 'Development Decade' of the 1960s. This Development Decade was an outcome of the General Assembly resolution [resolution 1710 (XVI)] on a proposal by the US president which said that problem of newly emerging states was not just hunger but much more. The decolonization process had increased the number of underdeveloped, post-colonial nations in the General Assembly. These new and nascent republics were encountering serious issues of democratic deficits and slippages in implementing their developmental goals. The major drawback of development administration was its implementation, as the "conduct" and "behavior" of both administrators and citizens stood in defiance of the law (de Leon & de Leon, 2001).

In consideration of the above prerequisites of implementing disaster management policies the following requirements stand uncompromised:

1. A legal framework in the form of a statutory Act as its baseline functional necessity.
2. A Central Coordinating Authority such as the National Disaster Management Authority and its subordinate authorities for the States and the District levels.
3. Decentralized governance or decision making related to preparedness against disaster comes the bottom upward.
4. Sustainability as a key attribute of implementation may become a futile policy as disaster managers may not be focused enough to understand or take instructions. Administrative authorities may stop discounting environmental limits set by principles of carrying capacity, inter- and intra-generational equity, and justice.
5. A highly committed and trained regular force such as India's National Disaster Response Force rather than the country's Army, may be deployed to manage disasters.

Implementation Has a Strong Connection to Local Governance

Local governance (Ostrom, 1993, p. 227) is an edifice that brings the first knock to disaster-affected vulnerable communities. It is a repository and a source of knowledge, information, skills and social capital, it balances the "capacity deficits" of government by adding to it cumulative communitarian experience, indigenous skills, and appropriate local science. Owing to the functional visibility of the authorities, local governments also bring greater clarity on issues of accountability, information, damages, and losses brought about by disasters.

The 1990s brought new currents into policy implementation, as new public management approaches and new institutional economics redefined its boundaries. Goggins et al. (1990) reintroduced a study of patterns in behavioral changes across different situations and found modern concepts of game theory or principal-agent

theory meaningful in predicting governments' responses. As this direction of studies advanced, rise of contingency theory could be seen in the works of Richard Matland (1995), Helen Ingram (1990), and Denise Scheberle (1997). Barring Matland, the other two contingency theorists justified more than ever before that no one single centrally directed mega plan can resolve a multifaceted ground contingency. Capacity and trust in local communities are strong and are relatively more readily available. These theorists of the contingency approach find little reason to accept that one shoe fits all situations. The work of de Leon and de Leon (2002) summarized the justification of local governance as the best source of implementing a policy, as it is reflective of communitarian interest rooted in local democracy: "Rather than having a policy imposed by a policy maker who is counselled by select (hardly representative) and narrowly focused interest groups, the potential clientele are proposing a policy that will directly affect them. In short, a bottom-up policy implementation will tend to be more realistic and practical, in that it suggests that the vox populi have a great deal of say about where they are going and how they choose to arrive" (p. 478). The authors further establish that such an approach, which emerges from local communities, will be increasingly democratic and discursive, as opposed to the top-down "command and control" policies. In the final analysis, contextual conditions would dominate an effective implementation of policy. However, the digital era governance, which is rapidly being introduced into the implementation of disaster management policies, is likely to weaken the role of local communities and produce unanticipated consequences of implementation. In the latter part of this chapter, we attempt to analyze this challenge as well, and suggest a few cautious steps in the implementation process.

Digitization of Disaster Management Policy Implementation

Technological implantation and modernization have currently become key drivers for efficiency and speed in implementation. In fact, the Smart City model of disaster management is increasingly designed upon artificial intelligence, machine learning, and the Internet of Things, which tend to define new models of policy implementation in disaster management. In hindsight, this change is simultaneously weakening the important local connection of implementation and returning to the State-centric mega models of implementation. Databases likely to construct the algorithm of disaster management may distort information processing in a manner in which justice and distribution may not be adequately recorded. Subsequently, implementation would again be stuck in the same old unresolved predicament of obtaining unanticipated and unintended outcomes.

The designing of the World Wide Web (www), created by Tim Berners-Lee, has such a phenomenal presence and a hegemonic control of information today that the natural meaning of words and expressions from unstructured natural language is almost lost. One tends to learn the world from text and annotations over the www. Therefore, the internet, which was developed by academics and military computer scientists for military and war management, has become a social innovation

(Margetts et al., 2010, p. 102) for its services to entertainment, governance, banking, transport, and a number of other systems. Therefore, something designed for one purpose is actually working for another purpose bringing unanticipated results. To conclude, the digitization of policy implementation may also not ensure a purposeful achievement of those objectives for which it was originally brought into policy structures.

One would be charmed by the enormity of information available to the user at a single command over the keyboard. Owing to the simplicity of information extraction, the process itself becomes a design embedded in a purposeful act. Coupled with satellite navigation, which fills the universe with various databases of information, the meaning given to a term may depend upon its interpretation. In the end a simple assumption expressed by a local community in one's unadulterated natural language may convey a different meaning at the other end. Therefore, information extraction has become a central point of disaster planning and implementation. Most terms are so highly scientized that only a scientist who knows the real meaning of the terminology or annotation used in the information may know its meaning. Therefore, information processing may discourage community participation because of its complexities. An implementer should first simplify scientific terms, even the ones considered overtly simple such as red, orange, and yellow alerts for floods. A report on the Kerala Floods of 2018 found that most local communities were caught unaware as they did not know what these colored alerts were indicating and the district disaster management authority did not explain these to them in advance. Figure 1 represents the stages of processing information and formulating a program on one's understanding of a problem from the barrage of meanings available on the internet. This complexity of information processing weakens implementation.

Implementation and Political Expediency

Implementation ought to be politically expedient in democracies where governments tend to please their vote banks more often. Defiance of building norms in cities, tree felling over fragile land and hills, construction over water channels, and sand mining of rivers have been repeatedly causing disasters. The Morbi Bridge collapse (India News 2023) in Gujarat, which kill more than 135 people, as was brought out in the five-member SIT Report, or, the illegal construction over a temple stepwell in Indore, the no. 1 smart city of India killing 36 people, were tragedies that could have been averted by timely action by the government.

Implementation is not just getting it done but letting it happen. Although authoritarian governments may believe that "Laws" constitute the strongest whip against noncompliance, in reality it continues to be the weakest stilt in the implementation process. Consistent communication, collaborative drills, and trust building with local communities are basic to implementation as the government benefits. First, the government receives clear first-hand original information from the affected community. Second, participatory approaches make implementation cost effective with the support and collaboration of local communities. Third, a belief is generated to

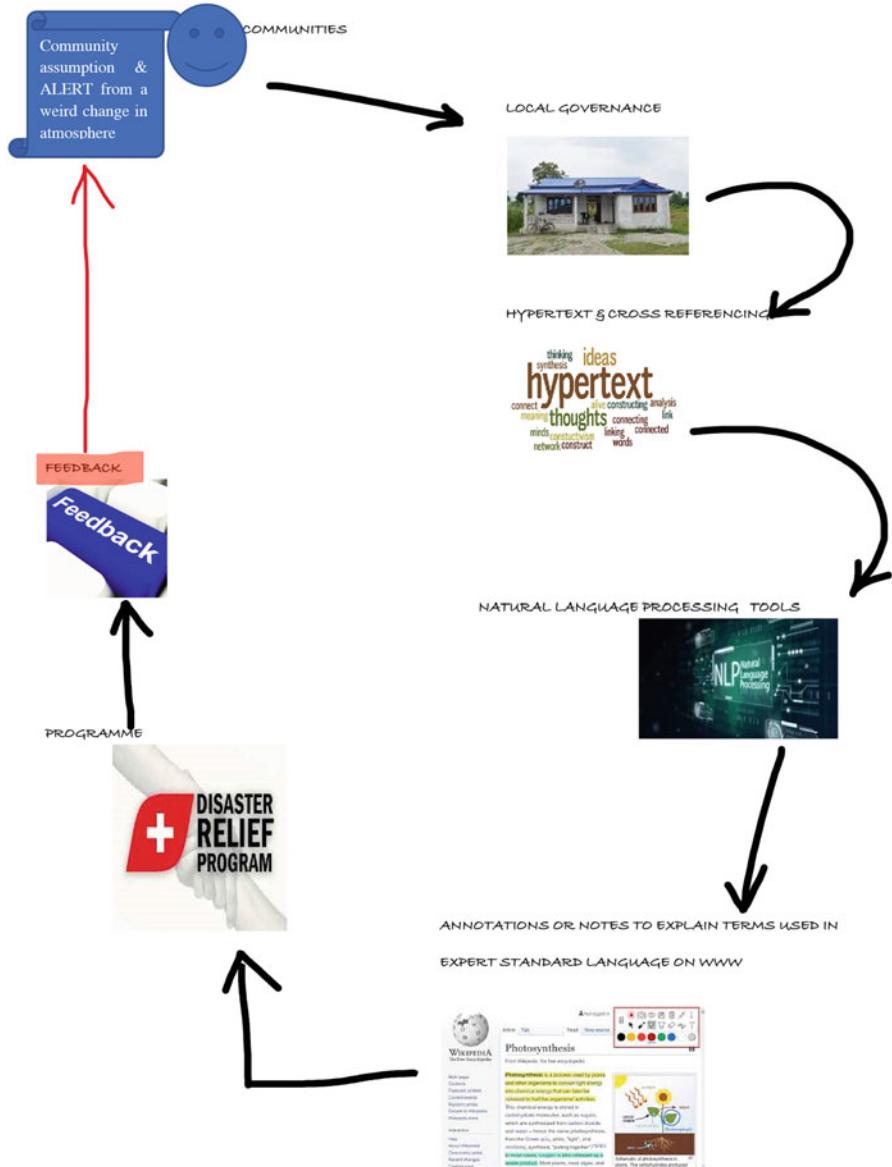


Fig. 1 Stages that process information and formulate a program for implementation in disaster management. (Source: Author)

provide support and trust the success of policy outcomes. Rational choice theorists have warned against political expediencies in implementation processes and have suggested greater dependence on data and logic to achieve rationally sound implementation. Nevertheless, a basic tool kit emerges out of this discussion on

implementation, which may bring greater possibilities of achieving not what often comes about as unanticipated outcomes but anticipated and intended results.

1. **Local communities should be partners** in local decision making on developmental projects in their areas. This includes their role and partnership in environment and social impact assessment-related investigation studies and the protection of whistle blowers on defiance of various laws, corruption that weakens protection against disasters.
2. **Coordination should be strengthened** between the State and local agencies, between rescue forces and evacuation teams, between the State and relief agencies, and various State authorities on the procurement and testing of medical equipment, the essential needs of people.
3. **Pre-emptive planning to avert disasters** affecting the region such as infrastructure, transport, medical support, ambulances, and telecommunication including functional early warning systems. **For other humans (animals) in cities** and rural areas, evacuation routes, food and water storage, and shelters, alongside a continuous and consistent Animal Birth Control program.
4. **International agreements to facilitate relief providers** and aid workers with custom, visa, and movement support. The State should be collaborative and respectful toward vulnerable neighbors trapped in disasters. South Asia's most meaningful agreement on disaster planning and implementation, the South Asian Association for Regional Cooperation Agreement on Rapid Action against Natural Disasters of 2011 is yet to be implemented.
5. **Empowered and trained local governments** to address contingencies of disasters with quick decision making. These local governments should develop and work toward a network of local schools, colleges, universities, and communities to conduct regular drills and training programs in an inclusive manner.

Conclusion

Implementation provides a face to any policy, as not even the best formulated policy can be deemed a success until it is implemented. Disaster prevention policy should be implemented in a manner in which it is able to achieve its intended results. Studies in policy sciences since Pressman and Wildavsky (1972) have suggested ample evidence to demonstrate that policy implementation generally produces unintended and unanticipated results and sometimes serendipity may also explain outcomes of policy implementation as varieties of accidental surprises may emerge unintentionally on many fronts.

Policy implementation demands flawless and well-systematized "coordination" but in disaster management the threshold of coordination is far more intricate and critical than policies in other sectors. Transdisciplinarity is the key to good implementation in disaster management and to obtain this framework, immense preparedness and deep behavioral improvements would not only be required but would also need to be sustained.

Policy implementation in the post-1990s has been analyzed using theoretical tools of new institutional economics such as principal–agent, public choice, and game theory. This has found a larger field of implementation field under the occupation of political expediency instead of logically designed and rationally structured initiatives only to please the vote banks of legislators. Varieties of interests entered policy implementation to deflect and divert policy implementation to produce results quite different than what it was aimed at producing. To insulate policies from various influences and subsequent slippages and failures, a regulatory mechanism with participatory local communities provides an effective answer. Policy science is an ever growing field and it is always the context that defines its implementation. The removal of “time and space” limitations through the digitized basis of technology notwithstanding, even digital modernization gives no insurance against unanticipated outcomes of policy implementation. Pre-emptive planning with paradigms of justice and equity as anchors of implementation would bring the greatest possibility of a success story in disaster management.

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Accountability in Disaster Governance

3

Saumya Kumar

Contents

Introduction	26
Can the King Do <i>Some</i> Wrong?	27
The Restrictive Approach in the USA	27
The Rights-Based Approach of ECtHR	27
A New Shape for Immunity in India	28
Protection Under DM Act	29
Operational Choices	29
Disaster Management Act: Testing the Water with Covid 19	30
Basic Structure	30
Too Many Cooks?	30
District Administration	31
Social Welfare Schemes	32
Covid 19 and Indian Courts	32
Conclusion: Unraveling Accountability in Disaster Governance	34
References	36

Abstract

Government play a very crucial part in responding to disasters. A very pressing concern during the pandemic has been on accountability of governments. Many of the common law countries suffer from the colonial trapping of sovereign immunity, providing legal protection to government actors while working on disasters. In India, we can see that most of the national legislation protects a government actor from judicial scrutiny and failed process rarely sees any repercussion. The European Court of Human Rights, in very few cases, has been able to break away from this limitation under exceptional situations. During the pandemic, some of the legal protection provided was diluted, with courts, civil society, and media demanding accountability when interventions went against the

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scientific evidence available. People in authority worked on creating engagement with communities and civil society, but the power remained with the government. The chapter considers some of these examples to identify key actors and creating space for accountability of government within the ambit of disaster risk reduction.

Keywords

Disaster governance · Accountability · Disaster risk reduction

Introduction

With the introduction of the Hyogo Framework and the Sendai Framework for Disaster Risk Reduction (SFDRR), it is clear that disaster governance is not limited to government as it includes civil society, media, academia, and businesses, among others. At the same time, in India, as in most countries globally, the government is still the critical regulatory authority. Often labeled as bureaucratic, inflexible, and wedded to the theory of command-and-control, the work of government at the time of disaster is always under scrutiny as disasters create a period of uncertainty and the ensuing unplanned nature of the response is generally beyond the control of managers (Quarantelli, 1997). Accountability in disaster management has been referred to as accountability by proxy exercised by entities like the media or NGOs (Ploughman, 1997). Establishing standards, codes, and regulatory frameworks has been helpful to establish standardized structures (IFRC, 1994) to hold different stakeholders accountable. However, the voluntary nature of these agreements has rendered their enforcement a big challenge, especially with the government (John Twigg, 1999). Citizens and civil society holding government's accountable is a key part of reducing risk (United Nations, 2008) by the development of plans and monitoring and evaluation, participatory budgeting, and social audit, among others, at the community level (Newbourne, 2008). This requires citizens' engagement in the decision-making process with a clear understanding of legitimate standards on which the action is to be measured (Polack et al., 2010). Three lines of accountability are well recognized – downward government accountability to the citizens, horizontal accountability – within the administrative structure and upward accountability of local institutions to government at the national level (Transparency Accountability Initiative, 2014).

The chapter provides an overview on the functioning of institutional mechanisms for disaster management in India during Covid19 to identify actors and opportunities which can facilitate accountability. The chapter starts with the examination of the principle of sovereign immunity to ascertain the different ways courts have looked at state and individual accountability in disasters and then specifically during the pandemic. The chapter provides an insight of the development of the principle of sovereign immunity during disasters. The chapter concludes by identifying the key actors and factors which could enhance accountability in disaster governance in India.

Can the King Do Some Wrong?

The Restrictive Approach in the USA

The concept of sovereign immunity is best encapsulated in the term – the *king can do no wrong*. Concerns have been raised over the continued application of this common law legacy in a constitutional democracy where government accountability is a crucial feature of good governance (Vicki, 2003). In Dalehite v. USA (346 U.S. 15, 73 S. Ct. 956 (1953)), the Court protected government officials involved in the storage and maintenance of fertilizers in the port which led to massive explosion. Justice Read in his order excluded the government from any liability for errors in the administration as the policy gave room for the independent discretion.(p. 36). The dissent challenged this application as it would keep the government outside the scope of any liability, even for carelessness (Dalehite, pp. 47–60). In Berkovitz v. the USA (486 U.S. 531 (1988)), Justice Marshall created a two-pronged test – whether the action was a matter of choice for the government employee and whether the decision was based on public policy consideration (p 536). The suit would be dismissed if the decision was covered under either of these two conditions. In re Katrina Canal Breaches (Nos. 10–30249, 10–31054 and 11–30808), the lower courts found that the construction of breaches by the Army led to massive flooding during Katrina. The Army was protected under sovereign immunity for the construction of the breaches, but the same was not extended on its failure to maintain the breaches by the lower courts. In appeal the decision was reversed and became a well-known example of a conservative approach of the court focusing more on the financial burden of the liability on the treasury rather than the issue of accountability (Bruno, 2001).

The Rights-Based Approach of ECtHR

The ECtHR recognizes that natural hazards, to a certain extent, are beyond the control of the government. At the same time, it requires that the governments provide institutional mechanisms and guidelines to deal with well-known, predictable levels of disasters of natural hazards (Kolyadenko, 2012 §§ 157). The court also recognizes that an impossible or disproportionate burden cannot be imposed on the state as there is a need for flexibility to accommodate the *operational choices* (Budayeva, 2008 §§ 134–135). The courts have recognized that the state's obligation depends on the extent to which the risk is foreseeable and susceptible to mitigation (K Cedervall Lauta, J Elo Rytte, 2016). The state must assess all potential risks and exercise due diligence to learn about specific hazards like adopting technical precautionary measures (M. Özel and Others v. Turkey, 2017) and establishing contingency plans and emergencies.

A New Shape for Immunity in India

Sovereign immunity was extended to government officials in India only when the negligent person is executing a sovereign function. Many cases, specifically Shyam Sunder v. Rajasthan (AIR1974 SC 890), dismissed the need for such distinctions, which emerged from the Peninsular & Oriental Scheme Navigation Co. case ((1861) 5 Bom. H.C.R. App. I, p. 1). The scope of sovereign protection has reduced considerably. However, there are many provisions like the Disaster Management Act (DM Act) where provisions like the one on good faith read with Article 300 of the Constitution have been used to avoid litigations.

The CAG Report after the Gujarat Earthquake documented instances of purchase of expensive materials with no justification, payment of excessive compensation in some cases, and delays in the payment. The Public Accounts Committee of the Parliament reported a massive diversion of money allocated for the reconstruction to other sectors after the Indian Ocean Tsunami to other purposes (Viswanathan 2009: 45–48). After the floods in Uttarakhand in 2013, a massive bill was charged under the head of flood relief for the stay, travel, and food of bureaucrats working in the flood-affected region in some cases incurred 6 months before the floods in Uttarakhand. These incidents led to internal enquiries by government leading to some penalties which are generally not available in the public domain, thereby preventing any kind of public accountability.

After the Gujarat Earthquake, 2002, in Bipin Chandra Divan & Others v. State of Gujarat ((2001) 2 GLR 1394) the state argued that disaster response was not within the jurisdiction of the High Court as the court cannot take over the work of the Executive. The court dismissed this argument and located its power under Article 21 and the principle of *parens patriae* (para 13–14). The High Court dismissed the request of the petitioners to replace the existing government machinery and asked the government to involve the citizens in the governance process. The state was expected to hold the money sent by people as donations in a trust. The Court pointed out that complete success by all authorities in disasters is not always possible due to the unpredictability of the impact of different *operational choices*.

In the Swaraj Abhiyaan case (Writ Petition (C) NO. 857 of 2015), the Supreme Court was asked to decide on the delay in declaring droughts by different state governments. The court did not consider the negligence and gap in the data collation process as an issue which could prove the petitioner's claim of a deliberate delay. The Court emphasized on the need for a monitoring agency or ombudsman to ensure proper monitoring of policies in the future (para 24). Therefore, the matter focused more on the challenges of insufficient guidelines which lead to flawed operational decisions thereby justifying the limited *operational choices* of different state government.

The rains in Chennai in 2015 were unprecedented, but the primary cause of flooding was construction in low-lying areas, flood-prone areas encroaching the natural reservoirs as pointed out by the Comptroller and Auditor General of India. A range of actors across departments across governments performed unrelated actions leading up to the unplanned urban space by allowing illegal sale of land, changing

flood zones, etc. This creates a challenge in identifying who is to be held responsible, besides the state, when no direct culpability is possible as decisions are properly justified and approved by multiple authorities. The role of courts in such cases is limited, and reliance is to be placed on measures of administrative control focusing more on horizontal accountability rather than downward accountability.

Protection Under DM Act

The DM Act has identified penalties for any offense by a person obstructing or not complying with the government orders under the Act. Concerning penalty for government officers, no proceedings can be constituted for an action in good faith even if the desired objective is not achieved unless a sanction has been taken from the government. Besides the Supreme Court or High Court, no court can adjudicate on the guidelines and orders under the Act. This indicates that PILs and writ petitions are the primary mode of seeking redressal under the Act. For some of these reasons, the DM Act is said to grant a very high degree of immunity to officials (Sarkar & Sarma, 2006). The NDMA and the SDMA prepare annual reports and present them to the central government and the state government, and the respective legislative bodies. The central government has immense power in the appointment determination of salary and power of the NDMA. Any regulation made in this regard or provisions for the DM Act is tabled before each House of the Parliament and allows the Parliament to engage in the rule-making process.

Operational Choices

The principle of sovereign immunity has been watered down considerably as the legal system has developed thereby increasing government's liability. At the same time, courts are conscious of the separation of power between the executive and judiciary and refrain from deciding on policy decisions and defer to the operational choices of officials. The introduction of frameworks, advisory, and guidelines is useful to refine the operational choices for better clarity on responsibility. The Swaraj Abhiyan and Bipin Chandra decision establishes the need for frameworks but refrains from granting compensation or employing qualifying terms like due diligence used by the ECtHR (M. Ozel). The decision-making process and the factors considered for the decision are not questioned indicating the protection given to the *operation choices* of the administration. The space for holding the government accountable remains under the larger umbrella of PILs. In case of disasters, like the Chennai floods, holding individuals – spread across departments, outside and inside government, and across timelines – responsible for the unplanned expansion of the city is impossible. The inability to establish the causal link to hold one liable would expand the application of sovereign immunity in cases of disasters. An examination of operational choices during Covid19 will help further unravel the way India built upon the idea of accountability.

Disaster Management Act: Testing the Water with Covid 19

Basic Structure

The National Executive Committee (NEC) is the principal executive body, responsible for the coordination and monitoring of disaster response under the guidelines of the National Disaster Management Authority (NDMA). Mask mandate and social distancing were introduced by the NDMA and enforced by Committee's orders (MHA 40–3/2020-DM-I(A), 14th April 2020). During Covid19, the NEC headed by the Home Secretary issued directions for all ministries which were modified multiple times based on the learnings and the feedback from district administration (MHA 40–10/2020-DM-I(A), 23rd April 2020). These orders acknowledged the on-ground challenges created due to the multiple interpretations and allowed the district administration to ascertain the meaning based on local requirements (MHA 40–3/2020-DM-I(A), 3rd April 2020) and the requirements of the migrants (MHA No. 40–3/2020-DM-I(A), 29th March 2020). These orders and guidelines indicate a basic feedback mechanism facilitated by the media, local administration, and state governments contributing.

Too Many Cooks?

The NEC constituted an empowered group of officers for comprehensive and integrated response plan on a range of issues (MHA 40–3/2020-DM-I(A), 29th March 2020). The group, among other things, worked on a supply plan for medical oxygen during the second wave (MHA 40–6/2020-DM-I(A), 16th April 2021) and recommended diversion of oxygen during the rapid increase in demand (MHA 40–6/2020-DM-I(A), 18th April 2020). While subsequently, in 2021, on the order of the Supreme Court, the National Task Force was constituted to recommend a scientific, rational, and equitable distribution pattern of medical oxygen and monitor and audit the supply. Multiple bodies like the National Task Force and Empowered Group working on oxygen supply appear to have similar functions with the final deliverable to ensure adequate oxygen supply. Even with significant overlaps in the work of these two bodies concerning oxygen, the condition during the second wave (World Bank, 2022) indicates that both these bodies failed to achieve the mandate given to them. Even if the condition was not as dire, the duplication of task needs attention.

In some cases, the NEC relied on media reports to identify violations of lockdown and guide the corresponding secretaries to improve the enforcement (MHA 40–10/2020-DM-I(A), 21st May 2020). As per the report submitted to the Supreme Court in Alakh Alok Srivastava, the Prime Minister and a group of ministers and secretaries – Health, Aviation, Shipping, External Affairs, and Home – were working on Covid long before the lockdown. Similarly, the enforcement of the lockdown was to be supervised by Inter-Ministerial Central Team (MHA 40–10/2020-DM-I(A), 19th April 2020) guiding the entire police administration across the country. The engagement of multiple bodies with similar functions creates question on accountability, the hierarchy, and the possible overlap of functions which may prevent an

efficient use of limited resources. The courts in multiple proceedings across the country questioned the district administration or the chief secretaries, while the different specialized bodies were outside the scope of questioning. Some of the bodies mentioned above were expected to do that as per the mandate. While the district collector is, and rightly so, to be held accountable, the position and the accountability of the newly constituted bodies remains unclear.

In the second wave, the test track treatment protocol was used to guide the state and district authorities (MHA 40–3/2020-DM-I(A), 23rd March 2021). This was followed by a range of guidelines issued by the Ministry of Health and Family Welfare for home quarantine, isolation, and medical protocols. Concerning the availability of medicines, monitoring the availability was assigned to the National Pharmaceutical Pricing Authority and the Drug Controller General of India. They worked in consultation with manufacturing companies and state governments (MHA 40–6/2020-DM-I(A), 22nd April 2021). The governance systems concerning disasters are inter-connected and inter-dependent, and therefore accountability cannot be restricted only to the district administration or the NEC alone.

District Administration

The District Disaster Management Authority (DDMA) has the district collector as the chairperson and the elected representative of the local authority as a cochairperson. The role of the DDMA is much broader as it works on enforcing the guidelines issued by multiple entities. In one of the first few orders of the NEC, the District Collector (DC) was required to appoint an executive magistrate as the incident commander to enforce the restrictions before the lockdown (Annexure to Order 40–3/2020-D, 24th March 2020 & PIB 3rd April 2020). The DDMA, headed by the DC with officers from Health Department, Police, and Education, among others, acted as the last mile connection between the people and the institutional governance. During the second wave in 2021, the NEC gave more space to the local administration to employ evidence-based decision-making as they provided the basic parameters allowing the local administration to figure out the restrictions based on positivity rate and the availability of oxygen-supported or ICU beds (MHA 40–3/2020-DM-I(A), 26th April 2021).

In terms of accountability, the DCs were expected to be working under the supervision of the Chief Secretary of the State. Regular meetings between the higher authorities of the state and the DCs were reported in many states, and regular communication via the SDMAs was also observed. The nature of interactions are said to be consultative ((MHA 40–10/2020-DM-I(A), 23rd April 2020), but this remains a matter of research and would require a more immersive engagement. The creation of the DDMA is expected to provide the space for the different departments to work together under the supervision of the DC and in a way create a consultative process holding each other accountable and responsive to the changing needs of the time. In many instances, the Courts have summoned DCs and have demanded responses based on PILs or have questioned them on the compliance of its orders. The courts especially High Courts during Covid19 became very active especially

during the second wave to question the DCs, Chief Secretaries, and Health Secretaries on enforcement of guidelines or drawing attention to an overlooked issue. The upward and horizontal accountability remains within the confinement of administrative structures, but the courts have been able to create an additional level of upward accountability. The downward accountability toward the citizens remains discretionary and is not formally institutionalized.

Social Welfare Schemes

During Covid 19, the utility of this social welfare schemes was evident as the government employed welfare policies like National Food Security Plan, Jan Dhan, and MGNREGA, among others, for extending support to vulnerable groups after the lockdown. The employment of these schemes provided a safety net to people whose livelihood and food were affected by the restriction imposed during the lockdown. Therefore, the study on disaster governance cannot be limited to the DM Act alone and needs to encompass the different social welfare schemes which are crucial in reducing risk.

The enforcement of schemes like MGNREGA are riddled with administrative challenges (Salian & Leelavathi, 2014) like delayed payments, no job cards, fake cards, and low payments. It is important to remember that the beneficiary of the schemes are people with limited means and thereby have limited access to the DC or any court as local power stratification plays an important role in accessing these spaces (Masiero & Maiorano, 2018; Agarwal, 2016). The point of contact for many of these schemes is the Gram Panchayat, ward officer, or the ration shop owner. There are mechanisms created like social audit developed to ensure supervision and accountability, but in many cases the nature of supervision varies (Varghese, 2019). Due to better accessibility and more dependency on these schemes, the engagement of the community is much higher but the redressal process is often limited (S. Dutta, 2015). The accountability is limited to surprise inspection by superior officers or official complaint filed by people. The management and settlement of these complaints is often lost in the myriad of administrative processes in the absence of institutionalized grievance redressal (Agarwal, 2016). Quite often during disasters, the point of contact for many of these schemes is unavailable or inaccessible. The Department of Administrative Reforms and Public Grievances required every department and the central government's Ministry to appoint a nodal officer to deal with public grievances for COVID-19 with details (DARPG, 30th March 2020). The status of complaints before these nodal officers is unclear and is definitely not available on the official websites.

Covid 19 and Indian Courts

The Indian Supreme Court, in mid-2020, looked into matters emerging from the enforcement of the lockdown. In some instances, like the case of the juvenile home, the court took cognizance of reports from the media and passed orders on the nature

of protection required in the juvenile homes. The case of Alakh Alok Srivastava v. Union of India (Writ Petition(s)(Civil) No(s)0.468/2020) was very vital as it elaborated upon the different *operational choices* of the central government. In its submission to the court on different issues raised, the central government was able to provide their justification for key decisions. The government highlighted the impact of fake news and misleading information leading to the migrant crisis.

The High Court of Delhi questioned the DGCA on Covid-appropriate behavior in the period between the first and second wave (Court on its own Motion v. DGCA, Writ Petition (Criminal) N. 3184/2021). Based on the facts presented by the petitioner and the media reports, the court acknowledged that Covid-appropriate behavior was not being followed in many cases. The decision employed the media and citizens to refine the instructions of the DGCA for more effective preventive measures. Specialized bodies like the National Commission for the Protection of Child Rights (NCPCCR) put together data on children orphaned due to Covid, which gave good insight into the gaps in the data assimilation process of the States and highlighted the impact of the lockdown on children. The NHRC, in June 2021, released an advisory for the protection of the rights of children where a wide range of issues was mentioned – education, psychosocial care, nutrition, data management, and adoption, among others (NHRC R-17/8/2020-PRP&P, 2nd June 2021).

The Allahabad High Court questioned the need for holding elections at the time of a pandemic in light of the death of 135 Shiksha Mitras on election duty in April 2021 and also ordered to constitute a Pandemic Public Grievance Committee (In-Re Inhuman Condition At Quarantine Centres v. State of U.P. PIL No. 574 of 2020). The Court was not impressed with the limited facilities provided in rural parts of UP (para 6). The court appointed a judge above the rank of Civil Judge senior division to act as a nodal officer for the High Court in crucial districts to monitor the compliance of its orders and verification of every death reported. Orders were delivered by different High Courts across the country during the second wave especially regarding the availability of hospital beds and oxygen for the patients. Some sweeping statements were given by the Allahabad High Court which were set aside by the Supreme Court as they were difficult to enforce and were therefore considered advisory in nature rather than directive. This is a good example of the High Court negotiating the scope of judicial overview on the grim consequences of the operational choices made in the past which was restricted by the Supreme Court considering the challenge in the practical enforcement of the decision, thereby recognizing the limitation of the executive's operational choice.

In one of a kind judgment, the Allahabad High Court proposed to hold the DC responsible for culpable homicide for the deaths in the second wave. This statement of the High Court brings forth the question on liability to the forefront in the case of a disaster. The DCs and Secretaries in question are not the sole entity responsible for failure of hospitals as it is a part of a systematic failure. Since it was just a statement, the legal position on individual liability of government officials in this issue is unclear.

Multiple media sources reported the disparity between the number of official deaths and the number of people cremated or buried in different parts of the country. The international media also picked up the extensive work done by Newspapers in

Gujarat regarding the disparity in numbers. Further, when asked in the Parliament about the number of deaths due to lack of oxygen, no data was found as the states being responsible for health did not collate this data (Biswas, 2021). This is an excellent example of media, public representatives using their offices to question the government, but this also shows the futility of efforts as the matter is set aside on technical grounds.

Conclusion: Unraveling Accountability in Disaster Governance

For disaster risk reduction, effective accountability requires capacities of citizens and civil society to hold governments accountable, supported by an adequate information and communication system between the government and the citizens (United Nations, 2008). The citizen involvement during Covid was observed in some cases at the district level, with a feedback loop created to ensure compliance of the lockdown. Specific provisions concerning engagement with local leaders were also mentioned in the guidelines. However, the space is primarily consultative and does not translate into a formal grievance redressal channel.

Social accountability can be included in a range of actions like monitoring of public budget, participation in the planning process, among others, to hold the state accountable (McNeil & Malena, 2010). A supportive governance structure is essential to enhance and ensure coping capacities in societies and thus reduce their vulnerability. Governance influences how the stakeholders, i.e., the state, the private sector, and civil society organizations, are willing and able to coordinate their actions to manage and reduce disaster-related risk (UNDP, 2010). There are multiple institutions and actors from different areas of specialization involved in reducing disaster risk like – technical, political-administrative. At the same time, the lines of accountability get blurred when the systems cannot cope with the stress created by disasters (Coskun, 2013). Clarity on these stakeholders' roles and responsibilities is crucial with a transparent chain of command. During Covid, initially the restrictions imposed were very stringent and gradually modified to allow the local administration to work more space. The presence of multiple bodies with overlapping functions and challenge in reaching the last mile indicates the need for more clarity in roles not just within the government but with external actors as well. In some cases, the supervision of the district administration on civil society helped ensure that there was a collaborative association rather than an antagonistic relationship.

Owen Main Podger points out that building and sustaining public trust is critical during and after a crisis caused by a disaster. It becomes more critical because often:

1. Institutions themselves are at times devastated by the disaster.
2. Resource providers for relief and recovery are frequently far removed from the crisis.
3. Political interest disappears before recovery is complete.

The second wave could be considered a complete breakdown of critical support systems, rendering the people helpless as the black market for medicine and oxygen soared. A good part of Covid19 was the availability of government notifications, WHO guidelines in the public forum with regular press briefings on relevant ones by the Health Secretary and by competent authorities at the state level. Even the courts, in some cases, directed authorities to make information public on some issues. The availability of information online from different ministries was fruitful to ensure transparency and clarity on basic ground rules, which is often not the case in other examples of disasters.

For the past two decades, decentralization has been an essential feature of governance structures in South Asia. Factors like income disparity, gender divide, and caste-based differences, among others, are factors that directly have an impact on local-level accountability (Haque, 2008). The DM Act is one example of creating a decentralized system with the NDMA and NEM at the center and the SDMA and then the district level and state-level executive authorities. Decentralization is often justified to bring more people within the governance framework and improve accountability as the power is located closer to the people who are affected by it. In his work, Philip Mawhood (1984) has highlighted that decentralization often leaves the institutions at the lowest level of hierarchy with limited power and resources as the decision-making authority stays with the higher authorities. Therefore, in institutions where power is decentralized to actors who are not accountable to their constituents or are accountable only to their superiors or to themselves – the expected benefit of decentralization in the form of efficiency, equity, and development cannot be achieved. This is a major concern with respect to the challenges in the enforcement of social welfare schemes in India which have a clear impact on disaster governance. The gaps in the enforcement and more focus on upward accountability especially of the DC rather than public accountability create this challenge.

The accountability of expert bodies was limited to the government itself, most of them reporting to the NDMA or NEM. Information on different aspects of significant decisions was relatively unknown, and court cases became a good source of getting information in the public domain. Horizontal accountability has been utilized in some capacity within the administrative system in India. After the reported incidents of financial irregularities in the use of flood relief funds in Uttarakhand, an internal enquiry was constituted, which led to some repercussions for the staff. In the Puttingal temple fire incident, the administration was not penalized. However, the internal mechanisms of the officials led to the transfer of the police officer responsible for preventing this incident. The informality and the ad hoc nature of these mechanisms leave much power in people's hand with no accountability and no grievance redressal for the individual.

Several stakeholders like the media, civil society, and courts, among others, played an essential role during the pandemic. The role of the media has been a matter of debate as some media outlets worked on unraveling the gaps – like the number of deceased in Gujarat or the BBC reporting using RTI to ascertain the

details on different government bodies (Biswas BBC, 2021) while in some cases FIRs were filed on some reports (Vinod Dua, 2020). At the same time, the media was also criticized for diverting attention from the medical emergency to tabloid-type news reporting on unrelated issues.

Civil society was a crucial factor in providing support at the time of lockdown and, in many cases, ended up being the only entity reaching the urban poor or filing PILs for vulnerable communities. The more institutionalized organizations like UNDP or UNICEF worked on collating data and releasing reporting on the impact of the restrictions on vulnerable groups like children and migrants. The support of civil society to the district administration was well appreciated in some places. No reference has been made to considering the civil society organization as a monitoring agency. The space for working with NGOs and humanitarian actors is to be explored with more focus on accountability.

The deference to operational choices in the decision of the courts is obvious especially in the early cases of 2020. In the second wave, the numbers and an absolute helpless situation pushed many High Courts to appoint monitoring bodies and threaten to impose severe penalties on individual officers. Some of the High Courts made attempts to unravel the operational choices by engaging with ideas of due diligence, but the same was superseded with the Supreme Court. It is to be seen whether the positions taken by some High Courts during the second wave will find a space under the sun in the future or as the Supreme Court's order indicates we give way to the operational choices of the executive.

The governance structure for disaster governance has not created many formal mechanisms for accountability. Actors like the media, courts, specialized expert bodies, and civil society have created the space to demand some accountability. Formal mechanisms were created due to Covid19 but restricted to a more consultative manner and need to be more formalized.

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Property Rights for Disaster Recovery

4

Harvey M. Jacobs

Contents

Introduction	40
Private Property in Historical Perspective	40
Private Property Advocacy in the Twenty-First Century	42
What We Know About Property	43
Conclusion	44
References	46

Abstract

Natural and man-made disasters are a regular part of the human experience on the planet, though in this particular era certain natural disasters (e.g., flooding, wildfires, and excessive heat) seem to be more frequent and intense. An often overlooked issue in disaster management and recovery is the property rights regime that underlies human settlement. Whether land is privately, publicly, commonly, tribally, formally, or informally claimed (or “owned” in some other way) makes a tremendous difference in the ability of individuals, NGOs, and governments to manage disaster recovery.

This contribution examines the current global debate over the right to property in the context of an ever-increasing urban population. In particular, claims for increased Western-style private property as a vehicle for increased social stability and increased wealth are scrutinized in the context of their compatibility with sustainable disaster recovery. Research suggests that it is the institutions that support and legitimate property that appear more important than the actual form of property rights itself. The outcome of this examination suggests policy directions for property’s form and civic and public sector action to achieve a form compatible with disaster recovery.

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Introduction

The twenty-first century began with several notable trends, a few of which are particularly relevant to this contribution. One set had to do with land use.

It appeared to many that we have entered a period of increasing ecological fragility. The popular media and scientific literature are replete with stories and investigations of, for example, melting ice caps in the polar regions, receding glaciers, deforestation, increasing forest fires, desertification, water supply disruption, previously unrecorded heat levels, extended drought, unstable weather systems (see, for example, Fountain, 2022; UNEP, 2022; Yaffa, 2022). A consequence of these changes is the potential for and reality of a broad range of natural disasters, such as rising sea levels, floods, wildfires, earthquakes, tsunamis, volcanoes among others.

Coterminous with ecological fragility is the trend of urbanization. Sometime in the early part of this century human settlement became, for the first time in recorded history, more urban than rural. While this has long been the case in the developed world, we are now a planet of cities and city dwellers. In and of itself this need not be a problem. But the problem is that much of the urbanization that is occurring is in the developing world and is designated as “informal.” Informal settlement means that dwellers from rural and minor urban areas migrate to a major city where they settle without a secure sense of place, on spaces that often do not have adequate (if any) physical or social infrastructure, and which may actually be dangerous (e.g., unstable hillsides). The places are often labeled slums (Davis, 2006; Bansal, 2022).

A second trend is institutional and legal. Of concern here is the renewed focus on property rights (von Benda-Beckmann et al., 2006). Largely spurred on by informal urbanization, and the tenuous situation of most informal settlers, an argument emerged for the necessity to formalize informal settlers and settlements through the formulation and granting of private property rights. This argument was most prominently advanced through the work of Hernando De Soto (2000). De Soto contended that if and when settlers were granted secure private property rights both their sense of social security and their opportunity for economic development and advancement would be improved.

This contribution explores the history and current status of the argument for the granting of private property rights. In so doing it poses the question of whether such an institutional solution is the only or even the best way to address natural (and human-made) disasters, and what place there is for other approaches.

Private Property in Historical Perspective

The disasters that get our attention – the ones that we “care about” – are generally the ones that occur in the context of human settlements. And human settlement means that decisions have been made (historically or consciously, culturally or legally) to

allot uses of land with certain privileges and restrictions. We refer to these privileges and restrictions as property rights. And they confer upon the “owner” (controller) of the rights the ability to do things – to use the land, such as building upon it or putting it into production, to transfer it, through market transactions such as sale or lease, to gift it through, for example, inheritance. Rarely, though, are these rights unlimited. Often, especially in modern times, they are subject to privileges and restrictions put forth by society through government, such as through urban zoning regulations. Throughout history, humans have allocated access to land in a wide variety of ways globally. Land can be tribal, common, customary, aristocratic, state (public), patriarchal, matriarchal, and often a mix of all these at the same time. Often these property systems arose to address different ecological conditions, and always varying historical and cultural circumstances. And all of these property systems “worked,” and all were, at the same time, problematic.

In the late 1600s, English philosopher John Locke began a multi-century discussion arguing for the widespread privatization of land (Locke, 1988[1689]). Private property (on the whole) does certain things quite well – it returns to users the effort of the investment of their labor; it provides owners with a sense of security, investment, and equity; it is an asset against which they can borrow for the purpose of improvement or for other economic activity; it can lead to “pride of ownership,” which with residential property can mean care and upkeep, gardens, etc. Locke’s argument has resonated through the centuries (though his caution that it works well when there is “at least . . . enough [land], and as good, left in common for others” (para. 27 of Second Treatise) seems to be less present in the minds of many). Locke’s ideas had great influence on the founders of the United States and their Declaration of Independence from England in 1776. Locke’s ideas on property also influenced Jean-Jacques Rousseau who in turn influenced the activists in the French revolution of 1789 (Rousseau, 1994[1754]). And Locke’s ideas informed Adam Smith and his treatise for the emergence of market economics, which itself argued for the need for clearly articulated and defensible property rights (Smith, 1937[1776]) (these matters are discussed in more detail in Jacobs (2013)).

From the sixteenth century through the mid-twentieth century European powers colonized Africa, North and South America, Asia, and Southeast Asia. Wherever they went Europeans encountered alternate property systems, which they choose to ignore or obliterate, replacing indigenous property systems with Western property systems that enabled extensive resource harvesting and exploitation (see, for example, Cronon, 1983 for a discussion of the property system conflicts that occurred between European settlers and indigenous peoples in northeastern North America in the early European settlement era).

The end of the Second World War began a multi-decade period of decolonization, as the European powers pulled back from their ownership and control of foreign countries. But this period also gave birth to a new focus on property rights. Under the guise of promoting economic development through efficiency in agriculture, Western advisors urged reform of property systems toward the Western model of private property. The overall argument was that private property would lead to higher yields, which could become production surpluses, which would facilitate exports, which

would bring in foreign capital, which would yield funds for investment in social and physical infrastructure. A compelling story.

In this period, Western countries counseled developing countries in Africa, Latin America, Asia, and South Asia to undertake considerable revision to their traditional property rights regimes, primarily in agriculture, though in all natural resource sectors (forestry, grazing, and mining). Bilateral international aid agencies such as the United States Agency for International Development (USAID), Great Britain's Department for International Development (DfID), Germany's Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), and multi-lateral international aid agencies such as the United Nations Food and Agriculture Organization (FAO) all largely offered similar counsel (many of these and related international aid agencies have had subsequent name changes). While the activity of the bilaterals and multilaterals continued on through the decades of the twentieth century, the prominence of a global discourse on property rights faded for a period in the latter decades of the twentieth century.

Private Property Advocacy in the Twenty-First Century

The birth of the twenty-first century brought with it a renewed focus on property rights, especially private property rights.

A major reason for this reemergence was the work of Hernando De Soto ([2000](#)) and the impact of his ideas. De Soto shifted the global property rights conversation from rural to urban areas by focusing on informal settlement in the developing world. Like many others, he pondered how to regularize these settlements, as the conditions for residents and their environs were problematic. In essence he asked: “how can the poverty of informal residents and their need for a comprehensive and effective program of economic development be addressed?”

De Soto’s answer was a simple and compelling one. According to him, the poor needed to acquire rights in property, specifically formal title for the land they occupied. If they did, he reasoned, such acquisition would give them spatial security (they wouldn’t worry about displacement), and they would have an asset which could use for investment (in their place of living) and borrowing for other economic activities.

De Soto’s ideas proved wildly popular with (neo)conservative political leaders in the West including the US Presidents George H. W. Bush and Bill Clinton, and French President Emmanuel Macron. For a period in the first decade of the twenty-first century De Soto was a regular invitee to the World Economic Forum (Davos) where he mixed with economic, political, and cultural “influencers” (to use a contemporary term).

However, De Soto’s ideas have also been subject to deep criticism, even hostility, from scholars and activists (for an early example, see Gilbert, [2002](#)). Some activists see him as an apologist for the right, providing justification for actually making the poor poorer. Where informal settlement upgrading has occurred and has involved the granting of formal titles, it is not clear that it has actually benefitted the poor in

the way De Soto suggested it should. Instead it appears that it is often the middle classes who acquire the titles, and the poor are themselves displaced from their settlements into new settlements. Are they any better off? Many say no. Often these new settlements can be less centrally located, and require more complex (and expensive) transport between home and work (for a lauded review of decades of slum upgrading efforts in sub-Saharan Africa see Gulyani & Bassett, 2007).

In addition, some scholars argue that De Soto's investigative methods and his data do not actually "prove" what he says they do. Attempts to independently verify his study results have not yielded the conclusions he offers forth.

But in most ways these critiques are and have been immaterial. De Soto's ideas appealed to powerful individuals in the public and private sectors. And it was this appeal that in a very real way validated his arguments.

What We Know About Property

People have always developed rules whereby they allotted rights to property. These rules took many forms, and were shaped to the ecological and historical circumstances that human communities found themselves within. And just as there have been many forms of property there has been long-standing and on-going conflict over the best form for property.

As the global environmental movement was emerging in the late 1960s, population biologist Garrett Hardin ignited a debate about property with his article *The Tragedy of the Commons* (1968). To some, he seemed to suggest that for efficient and effective natural resource management – and especially those resources which were "commons" (air, oceans, etc.) – it was necessary to extend the institution of private property. As such, he fit into the centuries-long argument by Locke, Rousseau, and Smith, and pre-dated the argument by De Soto.

But the Nobel Prize winning political economist Ostrom was among the most prominent to take up Hardin's argument and to suggest he was wrong, or that he at least oversimplified what was, in reality, a complex situation (Ostrom, 1990; Cole & Ostrom, 2012). She pointed out that "the commons" could be owned in a variety of ways and that many of these ownership modes could be quite successful – for the owners and for the resource. She and others pointed out that property has always been and continues to exist in a myriad of forms; one scholar has denoted its current status as "polyrational" (Davy, 2016).

How does this impact the form of property for disaster recovery? In many ways the research literature is quite clear about several things. Property (often referred to as land tenure) is a crucial component of disaster management and recovery, and yet an often under-considered and undervalued component (Brown & Crawford, 2006; Caron et al., 2014; Mitchell, 2011; Register & Escaleras, 2007 are among many who make this point). A significant reason why property is important is that when there is a lack of property records, those impacted by disasters (most often among the poor and those living informally) suffer disproportionately in the recovery process (see, for example, Kälin, 2005; Kenny et al., 2006; Mitchell, 2011). So in instances of

disasters, especially in developing countries with large informal settlements and a lack of property records, the disaster recovery process can often result in significant displacement among prior residents and subsequent land grabbing.

However, privatization of land a la De Soto's proposal is not necessarily the only or the best solution to this situation. Privatization itself presents significant challenges and problems. Heller's scholarship (1998, 2010, 2013) presents an extended examination of the challenges and problems of *over* privatization of property. Using examples from the former Soviet Union, among others, he shows what can happen when there is pendulum swing toward private rights without enough concern for the community context within which these rights exist. My own experience working on land and property issues in Albania in the 1990s under the auspices of the US Agency for International Development affirmed this observation. I saw firsthand how privatization (after a multi-decade period of forced social ownership) led owners to have concern only for their apartment units but not the hallways or other common areas in a multiunit building, or only for the precise legal definition of the space around their building, which led to neglect and deterioration of yards that were now "a no man's land." Heller's analysis about the dangers of over-privatization of property has been challenged, but this challenge is largely ideological rather than empirical in nature (Epstein, 2011).

Reale and Handmer (2011) are among the many who point out that in the context of disaster management it is not just or even primarily the form of property that ends up mattering. Rather, it is how property is embedded within a set of strong institutions that then allow a property form to function as it is theorized to function. What are these institutions? Reale and Handmer (2011) identify (a) a strong and enforceable legal system, (b) an up-to-date and functional land records system, and (c) a governmental system with legitimacy and authority. Unfortunately, it is precisely these institutions that are often lacking in developing countries. So other forms of property – tribal, common, customary, aristocratic, state (public), patriarchal, matriarchal, etc. – are often no more or only marginally more effective in disaster management and recovery than private property. In this vein, Raschky (2008) found that countries with stronger, more well-developed, and socially respected institutions had fewer victims and lower economic losses from natural disasters.

Conclusion

So what is the best form of property for disaster management and recovery? Property systems can take many forms. All are both functional and dysfunctional; there is no "perfect" solution, only a solution that works in the moment, for a time, and within an ecological, economic, and social context. And as that context changes, it is likely, even desirable, that the form of and for property changes.

What we know about property is that it has always been a socially contestable and malleable entity.

Private property as promoted by De Soto and others is intended to address issues of intense urban poverty and a lack of economic development in informal

settlements. It has that potential. In theory private property could help to deal with a range of issues and problems that arise in disaster recovery when claims to property are muddied – problems such as displacement and land grabbing. But private property can also contribute to and create its own set of problems, such as securing the rights of women and children when the overriding social structure is one that expects property to be held and managed by a male head of household, or excluding whole classes of people based on race, religion, etc.

Private property has a long and admirable theoretical history, dating at least to the work of Locke, Rousseau, and Smith in modern times. It has been promoted in the latter part of the twentieth century through the work of Coase (1960) and others. Yet it is also a form of property that has long been subject to intense scrutiny and debate. Beginning within a century of the American Revolution and Adam Smith's landmark text in 1776, critiques emerged among a range of scholars and activists who were concerned with what and who were privileged by the social and legal institution of private property (see the discussion in Jacobs, 2018, 2022). And these critiques continued to the present day, including an examination of whether a classical and robust set of rights in private property is the best configuration for long-term environmental sustainability (among many exploring this issue see, for example, Stone, 1972; Steinberg, 1995; Freyfogle, 2003; Jacobs, 2022).

Are there alternatives to De Soto's concept of private property? Yes. There are both more social forms of private property (ones that recognizes and incorporates the needs of the community, the future, and the environment, while also being fundamentally private in form), and alternate forms of property (see, for example, the contributions in Geisler & Daneker, 2000). Many of these alternate forms seek to explicitly address the critiques and shortcomings of classical private property.

Alternative forms of property compatible with disaster recovery can be developed and implemented. But several matters precede this step. First – a broader and overall set of purposes for this alternate form of property must be articulated (disaster management being one of several purposes, but only one of several, which property must address). For example Pellissery and Lødemel (2020) use the frame of promoting social citizenship to examine a proper form for property “beyond the [global] north.” So, property’s purpose – security, stability, social cohesion, economic mobility, economic development, democratic citizenship, . . . – needs to clarified. Second – property’s development and implementation is directly tied to the state of supporting institutions: the legal system, the administrative and policy system, and the land records system. Any property system has to fit with these supporting institutions. If it does not, no matter the “elegance” of its design, it will fail.

So there is no one form of property that is correct for disaster management and recovery. But I believe several design components of such a property system are elemental. A property system should promote democratic citizenship: it should promote and legitimate the rights of the individual as an individual and as a member of a community. In particular, a property system should be designed that clearly denotes who has what (a clear and legitimate land records system); it should promote property access across race, tribe, gender, and religion; it should articulate both individual and social rights and responsibilities in property “ownership”; it should

allow for and promote as appropriate public and private initiatives to reconfigure property boundaries (land consolidation), both post disaster and into the future; it should provide for the relatively easy transfer (through sale, lease, inheritance) of property rights; and it must acknowledge the right of the public to manage (regulate) and expropriate (physically take) property for legitimate public purposes. There are of course additional elements; these are offered forth as a building block.

Disaster management and recovery can be facilitated or inhibited by the property system in place. If there is a functional property system for disasters, it is place-specific. There is no “one size fits all” model to offer forth because property systems reflect many things. History, culture, the bioregional ecology, and law are among the factors that have been noted here, and there are others (religion, the economy, etc.).

What is known is that property matters. In the wake of natural disasters decisions have to be made about who can and should have access to land and for what purpose, and under what conditions. Often these decisions involve the public sector. But the way property is held pre-disaster and the strength and legitimacy of the legal, administrative, and land record systems become what is significant for how the public sector can act.

The global challenge – in all countries of the world – is to generate a substantive discussion about the social and legal institution of property. But this is hard to do. What exists today is largely an evolutionary development. At a certain point in time property was designed to fit existing circumstances. Almost without exception those circumstances no longer exist, yet old forms of property has changed incrementally, pushed along by history, culture etc. Absent an emergency, it is almost impossible to get focus on an institution that many (citizens, policy makers) find amorphous. Perhaps the best that can be done is to be prepared to use the (unfortunate) instance of a disaster to come forth with proposals for redesign. Until then, what is important is to work on the legitimacy and functionality of the legal, administrative, and land records systems so that when redesign can occur it has the possibility of succeeding.

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Man-Made Disaster: A Case of Failed Governance in a Latin American Economy

5

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Contents

Introduction	50
Intersection of Disasters and Corruption	52
Natural Versus Man-Made Disasters	52
Corruption in Procurement	53
The Case of Tucumán's Failed Bridges	54
Collapsed Bridges As a Result of Forces of Nature Aided by Suspected Corruption	54
Corrupt Practices in the Procurement of Bridge Repairs and Construction	58
Power Pursuit and Building of Economic Capital	63
Conclusion	65
References	66

Abstract

Disasters are the aftermath of hazardous events. In other words, events triggered by natural phenomena, such as flooding, extreme weather, or technological/structural failure become disasters when they have the potential to cause damage to people, property, essential services, and the environment. This chapter is based on multiple bridge collapse incidents in Argentina, causing extensive damage and disruption in the region and exposing deep-rooted corruption at administrative and government levels. Heavy rains in January 2007 and March 2015 were said to have caused many bridges to collapse within a few days in Tucumán, Argentina, and announcements of funds for rebuilding followed immediately. The press reported the bridges were constructed with funds flowing from a federal

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government account whose authorities were convicted of corruption and sentenced to prison. The news media suggested that politicians and local businessmen agreed to a 5% kickback in public works contracts. Worldwide, corruption costs USD2 trillion per year or 20% of all government procurements, with bribery and favoritism being common forms of corruption. We contribute to the discussion on how corruption uses the force of nature to perpetuate itself in a context of weak control mechanisms and low transparency. The case illustrates how government officials use natural hazards turned into disasters to maintain an indefinite state of emergency allowing two negative practices to perpetuate: grant contracts without public tender and contractors cut corners to ensure that the construction needs repairs or reconstructions soon. This combination of factors can result in man-made disasters.

Keywords

Man-made disaster · Riverine flood · Argentina · Corruption · Procurement

Introduction

Excessive rainfall can cause disasters affecting the lives and livelihood of many communities. From time to time, the news report catastrophic infrastructure collapses, and nature is blamed for it most of the time. For example, in the province of Tucumán, a subtropical area of Argentina, there are records of rainfall above the average before the years 2007, 2015, and 2018 when several bridges collapsed. Still, the events of 2015 were attributed to never seen before levels of rainfall, although significant levels of rainfall occurred in previous years (1992, 1997, 2000, and 2001) when none of the bridges in the region collapsed. Furthermore, at a granular level, maximum daily rainfall records in one meteorological station show 279 mm on the worst day of March 2015, which is said to be the cause of many bridges' collapse, but rainfall of 308 mm on one day of December 1997, 225 mm on 21 February 2009, or 206 mm on 27 January 2011 caused no bridge to collapse. This observation led us to question why the rainfall in March 2015 caused so many bridges to collapse or be closed in need of urgent repairs.

Riverine floods, caused by heavy rainfall, are recognized as disasters in the region where many bridges collapsed in 2015. There have been only three riverine floods caused by heavy rains in recorded history, namely, years 2000, 2007, and 2015. Consequently, the research question can be refined as to why the heavy rains of 2015 caused many bridges to collapse, but none in 2000 or very few in 2007. The undamaged bridges were not new, so what could be a possible explanation? Perhaps a fast and unplanned development increased the impervious areas, restricting infiltration of the water into the ground and thus, leading to a quicker and greater magnitude of overland flooding. However, demographic trends show an internal migration toward the main city, San Miguel de Tucumán, while most bridge collapses happened in rural areas that are upstream of the capital city or in a different

basin. The last possible explanation to consider points toward human-caused poor construction quality, rooted in negligence or corruption, leading to label the 2015 bridge collapses as man-made disasters.

Reports suggest the perception of corruption increased for most people in Latin America and the Caribbean in recent years (Pring & Vrush, 2019). Multilateral organizations such as the Inter-American Development Bank, World Bank, International Monetary Fund, United Nations Economic Commission for Latin America and the Caribbean, and Transparency International have produced many documents analyzing and criticizing the corrupt practices of governments in Latin America and the Caribbean. For example, it is reported that 85% of citizens believe that government corruption is a big problem (Transparency International, 2017), and all recipes for improvements are based on this premise.

Regardless of its perception, corruption is pervasive in Latin America and the Caribbean, but little is known about specific groups involved and how corruption practices emerge and persist over time. The World Bank Corruption Spotlight report identifies that anti-corruption strategies must be feasible and aligned with the objectives of actors who are recognized as having significant interests in their specific context or field (Khan, 2017). Despite stating it, the report does not provide a detailed level of analysis, nor of actors, much less of the way in which it is carried out. This approach has helped spread the perception of corruption as a matter for governments alone, paying little attention to how government officials are entangled with the private sector in corrupt practices.

To explain the decisions by involved actors, both in the government and private sector, we use Bourdieu's institutional sociology (Bourdieu, 1977, 1990, 1993; Bourdieu & Wacquant, 2005). From this approach, the relationships of social actors are understood based on their relative positions within the field in power disputes (Emirbayer & Johnson, 2008). The position is determined by the capital that the social actors possess and the value the capital has in that field, which allows us to see the constant struggle to accumulate capital (Everett, 2002) and explain how they do it, in addition to putting in the foreground the tensions and power relations that arise (Emirbayer & Johnson, 2008). Many actors have family ties and use conservation strategies such as nepotism to surreptitiously maintain their status quo, which, in turn, solidify their economic capital.

Following the call of Arellano Gault (2017) for empirical works in Latin America, this study focuses on a specific case in Argentina that, on the surface, appears to be a natural disaster (disaster triggered by a natural phenomenon). The empirical evidence collected points to a plausible alternative explanation rooted in the habitus and its influence on government procurement and its links with corruption. The case is developed with publicly available documents from the national agency of climate/weather, judicial system, and news articles.

The remainder of this chapter is organized into four sections as follows. Section two situates the study in the disasters literature and within the corruption studies with a focus on the syndromes of corruption (Johnston, 2005). The third section presents the case used to illustrate the linkages between disasters and corruption, hinting at the role played by different actors, while the fourth section

offers an analysis of the dynamics between actors and the society using the institutional sociological lens of Bourdieu. The chapter closes with a discussion of lessons learned and concluding remarks.

Intersection of Disasters and Corruption

This study explores the reasons behind a set of bridge failures catalogued initially as the result of natural disasters (heavy rains and flooding). It is vital here to differentiate natural disasters from man-made ones; to better understand man-made disasters, a link with corruption literature mainly focused on procurement studies coming from the accounting literature tradition is introduced.

Natural Versus Man-Made Disasters

In disaster literature, there is a differentiation made between disasters and hazards. The term hazard refers to a severe or extreme event such as a flood, storm, cold spell, heat wave, etc., which occurs naturally anywhere in the world (Centre for Research on the Epidemiology of Disasters [CRED], 2021). Hazards only become disasters when losses are incurred in the form of human lives, properties, and the environment. Generally speaking, hazard and disaster are used interchangeably in lay person's language. To that end, natural disasters are caused by events catalogued as meteorological (weather-related), geophysical (earthquake, tsunami, volcanic eruption), climatological (drought, wildfire), biological (epidemic, insect infection), and extraterrestrial (meteorite strike). In the past decade, between 2000 and 2019, the total human cost of natural disasters was 1.2 million lives lost (CRED, 2020).

Disasters can also be triggered by technological failures, accidents, or the accidental release of toxic materials, all of which are due to various causes, including human error. For example, the recent Beirut harbor explosion on 4 August 2020, shocked the world due to its humanitarian, political, social, and economic impact. In 2010, an explosion ripped through the Deep Water Horizon drilling rig in the Gulf of Mexico, unleashing over three million barrels of oil into the Gulf of Mexico and killing 11 people in the worst oil spill in the United States history (Friedman, 2020). The main reasons for the accident were weakening safety and environmental regulations while pushing to expand oil drilling in nearly all American waters.

Disasters triggered by human-induced factors, such as poor construction, a lack of maintenance, negligence, intentional (terrorism), economic, or political, are perceived as criminal in public opinion. Examples of such events include the Flint, Michigan (New York Times, 2016) water crisis that began in 2014 when the city switched its water supply from Detroit's system to the Flint River as a cost-saving measure in a majority-black town. Soon after the switch, the tap water turned brown, bad tasting, odorful, and caused rashes in the population with concerns of bacteria. High levels of lead (from 11 ppb to 104 ppb within months) were reported causing developmental problems in children. Earthquakes around the world have killed

thousands of people as a result of collapsed buildings because the concrete was diluted, steel bars were excised, or otherwise, substandard building practices were employed. Although it is difficult to evaluate the extent to which corruption might have played a role, the convergence of corrupt contractors, building inspectors, and public officials has been demonstrated in studies (Escaleras et al., 2006; National Geophysical Data Center [NGDC], 2021; Ferranti et al., 2017). The 2001 Bhuj, India quake with a 7.7 Richter Scale that led to 20,005 deaths is one such example.

Corruption in Procurement

The field of government procurement is a major site where corruption flourishes (Berrios, 2006; Neu et al., 2015) due in part to the volume of goods and services the government consumes to the tune of USD9.5 trillion per year (Ferguson, 2019) and in part due to the unique features and participants of this site (Neu et al., 2013). Studies focused on government procurement estimated corruption costs as much as USD2 trillion per year or roughly 20% of all government purchases (Ferguson, 2019). Bribery and favoritism are very common forms of corruption in the process, where government procurement is defined as “*the acquisition by a government department or any government-owned institution of goods or services*” (Ferguson, 2019: 942). It is argued that corruption is facilitated when government officers have a greater opportunity to influence decisions, obtain benefits, and are able to get away with the offence (Schultz & Søreide, 2008). Accounting literature suggests limited transparency and control mechanisms increase the chances of government officials approving purchases to companies linked to friends and family or paying prices that are significantly higher than the market independently from the expectation of receiving kickbacks.

Prior research in the accounting field has highlighted the importance of documentation and form-based practices as control mechanisms, inspection practices, the timing of inspections, and internal audit practices as means of enhancing internal controls to prevent corrupt practices (Neu et al., 2015; Ferguson, 2019). When governments do not understand the magnitude of the corruption, their responses are inappropriate (Upadhyaya et al., 2020), and price differentials can be up to 30% of the contract amount in cases of inefficient procurement, but in cases of corruption, they can be higher (Schultz & Søreide, 2008). The supply side of corruption argues that corporations are constantly under pressure for higher profits, and in the face of high competition, some may resort to illicit means of securing government contracts, highlighting the state–business nexus that perpetuates corrupt practices (Siddiqui & Uddin, 2016). Sikka and Lehman (2015) highlight some of the limits to the effectiveness of internal controls in government procurement programs and how best practices that work in one environment might not work in others due to institutional, social, and economic factors.

The literature recognizes two competing views on corruption mitigation in government procurement; one asserts that proper surveillance systems are universal and applicable across all cultures (Neu et al., 2015), while the other argues controls

by themselves do not affect corruption if they are disassociated from social tensions, legitimacy of the state, and networks of power (Sikka & Lehman, 2015). Adopting the second view, we observe prior research on governance mechanisms has drawn on Johnston (2005) categorization of Influence Market corruption where politicians are often the middlemen (Neu et al., 2013, 2015; Sikka & Lehman, 2015), but there has been very little research done in Elite Cartel environments such as Argentina, where powerful professional networks are said to play a significant role in creating and maintaining corruption practices. Corrupt practices in Influence Markets settings are often characterized by strong state institutions where politicians utilize their connections to collect rents in the form of contributions, both legal and otherwise (Johnston, 2005, 2015; Neu et al., 2013). Corrupt activities in Elite Cartels are often set up to enrich and protect networks and higher-level elites that have the prerogative of changing rules and policies to their favor (Johnston, 2005).

The Case of Tucumán's Failed Bridges

The Province of Tucumán is one of the 23 provinces of Argentina with 1.4 million inhabitants and a population density of 64 inhabitants per square km. Its landscapes are characterized by plains, valleys, and mountains, with part of the Andes mountain range to the west complemented by jungles and arid lands to the east. It has diverse microclimates with averages of maximum temperatures of 25 °C and minimums of 13 °C (Gobierno de Tucumán, 2021). The Salí River is the main drainage basin of the province flowing in a north-to-southeast direction with 12 main tributaries and two artificial lakes – C.Gelsi and Río Hondo dams (Tracanna et al., 2014). Figure 1 shows the hydric map of the province in relation to South America and Argentina, locations of some of the failed bridges, and meteorological stations that measure rainfall data. The rainy season runs between October and March; the heavy rains and the collapse of bridges investigated in this study occurred during the southern summer months. Figure 2 shows annual precipitation in millimeters in six meteorological stations in above-average years between 1990 and 2020, with three of them causing floods of significant proportions as recognized in the international database of disasters (CRED, 2021). Table 1 summarizes extreme episodes listing the top 20 days experiencing more than 150 mm of rain, one of them in March 2015 is when most bridges collapsed.

Collapsed Bridges As a Result of Forces of Nature Aided by Suspected Corruption

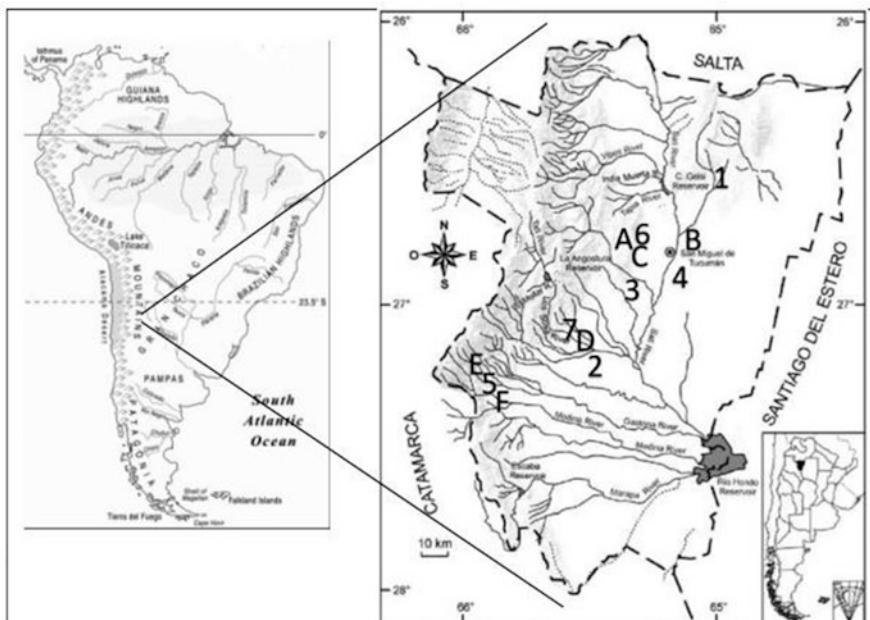
In January 2007, rains exceeded the normal rainfall, causing floods, evacuation of citizens, road damage, and the intervention of provincial and national authorities that declared a state of emergency. As reported in the media, in 3 h, a total of 150 mm rainfall occurred on Wednesday, 10 January, while the monthly average was 196 mm (Pagina 12, 2007) and 11 January had three record measures of rainfall (see Table 1).

Although Greenpeace linked floods to climate change and deforestation practices in native forests (Lipcovich, 2007), historical data suggest 2007 is a record season (see Fig. 2). The consequences included two deaths, over 30,000 affected, and severe damage to infrastructure costing USD192 million (Lipcovich, 2007; Ámbito Financiero, 2007). Among the destroyed infrastructure were National Route 38, Provincial Route 301, and some road bridges.

The Governor of Tucumán, who took office in 2003 and left in 2015, declared in 2007 the state of emergency in the territory by provincial law 7875, and requested help from the National government, whose officials also took office in 2003 and left in 2015 (Pagina 12, 2007; La Gaceta, 2007; Boletín Oficial, 2007a). In a state of emergency, decisions are fast and do not follow prescribed policies, consequently transparency decreases creating a fertile ground for fraud and corruption (Schultz & Søreide, 2008). In the post-disaster phase, complaints of humanitarian assistance being manipulated (Ámbito Financiero, 2007) were quickly dismissed by federal authorities, blaming citizens who “*in these crisis situations [...] bring out their miseries to take advantage*” (El Territorio, 2007; own translation). A recovery plan based on the assessment of the damage was promised by the Governor after a few days of the event. Over 10,000 homes were estimated to be renovated or rebuilt with a plan to prevent Tucumán from flooding, including the systematization of rivers through the Province-Federal government agreement approved by provincial law 7945 (Ámbito Financiero, 2007; Boletín Oficial, 2007b).

In the 2015 rainfall event, many more bridges were damaged, with many located in the northern basin even though the event was not in the top rainfall days for that basin. On the other hand, the southern basin saw record rainfall in March 2015, the second-highest in the province since 1990, recorded by one meteorological station (see Table 1). The 2015 new round of flooding disconnected thousands of people due to damaged bridges (López, 2015; Clarín, 2015; Contexto Tucumano, 2019), several of which had been repaired with federal government funds after the 2007 flood, such as the bridge on Route 301 over Lules river (Costa & López, 2018). The official report for that bridge (see Fig. 1, bridge 3 Lules River), indicated “*The structure collapsed in the early morning of March 11 due to a large amount of water and sedimentary material that collided with the abutments, causing the embankment that connects the bridge to the surface to give way*” (Gobierno de Tucumán, 2016; own translation).

The governments signed a new agreement to repair the damages for a total cost of USD31 million (Costa & López, 2018). A year later, the authorities announced that the repairs were carried out on some of the bridges, while plans for reconstructions were finalized for an estimated amount of USD6.8 million (Gobierno de Tucumán, 2016). Table 2 offers our synopsis of collapsed bridges until 2018 based on publicly available documentation. Comparing the panels of Table 2 suggests that less than half of failed bridges as reported in the press were transparently reported by the provincial government providing accountability for only USD6.8 million or 22% of total funds. These results confirm that a state of emergency reduces transparency and accountability (Schultz & Søreide, 2008).


Map Legend:

Bridge	Bridge Description	Location of Meteorological Stations
1	Salas river, route 305	A #456 Lules, El Nogalito
2	Mandolo and Los Sosa rivers, route 324	B Station Airport Tucumán
3	Lules river, route 301	C #411 Lules, Potrero de las Tablas
4	La Calera river, route 321	D #410 Los Sosa, Ruta Provincial N 307 Km19
5	Jaya river, access to National Park Los Alisos	E #452 Jaya, Casa de Piedra
6	Bridges 1 & 2, San Javier river, route 340	F #453 Jaya, Piedra Grande
7	Zerda river, route 324	

Fig. 1 Hydric map of the study area in Argentina, showing the City of San Miguel de Tucumán, some of the collapsed bridges considered in the study (1–7), and meteorological stations (A–F) in Tucumán province. (Sources: Adapted from Tracanna et al. (2014), lagaceta.com.ar, <https://snih.hidricosargentina.gob.ar/> and <https://ipinimg.com/>)

September 2018 saw the last bridge collapsing amid confirmation of corruption involving federal and provincial officers. The fallen bridge was built in 2015 by a local company using federal funds. Unlike the other bridges, the latest collapse occurred due to structural problems while a cargo truck was passing through it (Costa & López, 2018). The construction company blamed the truck driver and also claimed vandalism during construction. For their part, the provincial authorities related the causes to construction defects (Costa & López, 2018; Merodio, 2018). With a new federal government in power since December 2015, the previous federal government officials were held accountable, and eight officials, including the

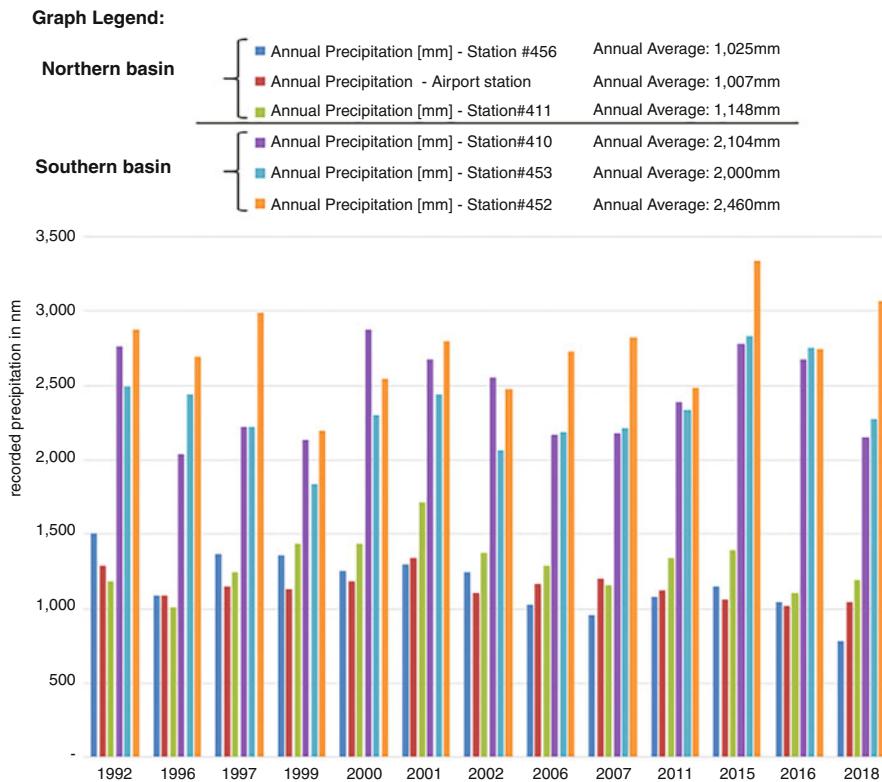


Fig. 2 Years with above-average annual precipitation (in mm) recorded at six meteorological stations from 1990 to 2020. (Source: Prepared with data available at <https://snih.hidricosargentina.gob.ar/>)

national minister of public works, were arrested for bribery and corruption related to other causes, none of them from Tucumán (Costa & López, 2018; Perfil, 2018; Los Primeros, 2018). One of the top officers arrested was the secretary of public works, caught in the act by the police throwing bags of money (USD9 million, expensive watches, and guns) in a nunnery in 2016 (Infobae, 2021b). This secretary had maintained contact with Tucumán provincial authorities during the rainy season of 2007 and 2015, as reflected in multiple news videos and pictures (Contexto Tucumano, 2019); he was responsible for managing the federal funds transferred by the national state to the province of Tucumán for the construction of bridges between the years 2005 and 2015 (Boletín Oficial, 2007b; Costa & López, 2018). Although he cooperated with the justice and exposed collaborators, he was convicted in 2019 by a federal court and released in 2021 on a bond of USD140,000 after his political party returned to power in December 2019 (Infobae, 2021a; Costa & López, 2018; Ámbito Financiero, 2021; Perfil, 2021).

Table 1 Top 20 days with heavy rains recorded in six meteorological stations, from 1990 to 2020

Station	Date	Precipitation in mm	Failed bridges/disaster
#453	1997-12-31	308 ^a	
#452	2015-03-09	279 ^a	Twenty-three in march and one in April or may/riverine flood ^b
#410	2001-02-12	242 ^a	
#410	2000-02-13	235.5	Riverine flood of 2000 ^b
#452	2009-02-21	225	
#453	2000-02-13	218	Riverine flood of 2000 ^b
#452	2007-01-11	210	Six in January/riverine flood of 2007 ^b
#410	2011-01-27	206	
#452	1997-12-31	205	
#410	2007-01-11	202	Six in January/riverine flood of 2007 ^b
#452	2013-01-09	192	
Airport	2018-01-24	191 ^a	One in January, one in may, and one in September
#410	2019-02-12	191	
#452	2000-01-22	187	Riverine flood of 2000 ^b
#410	1990-02-09	186.2	
#453	2007-01-11	186	Six in January/riverine flood of 2007 ^b
#410	2017-04-03	185.5	
#453	2006-10-26	182	
#456	2020-12-29	175 ^a	
#411	2006-10-14	150 ^a	

^aHighest daily rain recorded at this station since 1990

^bSource: International Disaster Database (CRED, 2021 <https://public.emdat.be/>)

Corrupt Practices in the Procurement of Bridge Repairs and Construction

Investigative journalism uncovers the normal practice of bribing to be invited to bid on infrastructure projects. The mechanism works only with direct purchases where businesses bid for one project, and it does not work well with public tenders where several businesses bid for the same project, as explained by the president of the association of SMEs construction companies of Argentina (Montero, 2018). Public tendering is mandatory for all public works projects unless an emergency is declared or it has to be executed immediately; in this context, the heavy rainfall of 2007 and 2015 provided the appropriate context for direct purchases of all construction or repair works in bridges. According to La Gaceta journalist, the emergency situation declared in 2007 was indefinite because further provincial laws extended it until the end of the year 2021 (Boletín Oficial, 2014), allowing the Governor to “use public resources without cumbersome bidding processes or price comparisons or anything” (Sanchez, 2015; own translation). This is compounded by the lack of transparency of budget execution as shown in Table 2 and predicted in the literature on emergency and disasters procurement (Schultz & Søreide, 2008).

Table 2 Bridges with reported failures in Tucumán

Panel A – Officially reported by the Ministry of Economics, Province of Tucumán as of 2016

Nº	Bridge	Date of failure(s)	Cause of failure	Type of work done	Description
1 ^a	Salas river, route 305	Jan.2007 and Mar. 2015	Natural, heavy rains, floods, river floods	Repaired in 2007. Rebuilt in 2015	In 2015 estimated 12 months work with an investment of more than USD2.4 million
2 ^a	Mandolo river, route 324	Jan.2007 and Mar. 2015	Natural, heavy rains, floods, river floods	Repaired in 2007 and 2015	In 2015 construction done in 6 months at the cost of USD527 thousand by Alfa Empresa Constructora SRL
3 ^a	Lules river, route 301	Jan.2007 and Mar. 2015	Natural, heavy rains, floods, river floods	Repaired in 2007. Rebuilt in 2015	In 2015 construction done in 5 months at the cost of more than USD1 million by Empresa Constructora Argentina de Servicios (ECAS)
4 ^a	La Calera river, route 321	March 2015	Natural, heavy rains, floods, river floods	Repaired	Move of the earth in the embankment by the provincial division of roads (DPV)
5 ^a	Jaya river, route 330	March 2015	Natural, heavy rains, floods, river floods	No data	Access to National Park Los Alisos
6 ^a	Bridge 1, San Javier river, route 340	March 2015	Natural, heavy rains, floods, river floods	Rebuilt from scratch	Estimated 4 months work with an investment of USD791 thousands
7 ^a	Bridge 2, San Javier river, route 340 (Nº6 in Fig. 1)	March 2015	Natural, heavy rains, floods, river floods	Rebuilt from scratch	Estimated 6 months of work with an investment of over USD950 thousands
8 ^a	Zerda river, route 324 (Nº7 in Fig. 1)	Jan.2007 and Mar. 2015	Natural, heavy rains, floods, river floods	Repaired in 2007 and 2015	In 2015 construction done in 6 months at the cost of more than USD633 thousands by Mark Construcción SRL
9	Stream Totori-Illas, route 307	Jan.2007 and Mar. 2015	Natural, heavy rains, floods, river floods	Repaired in 2007 and 2015	In 2015 construction done in 4 months at the cost of USD126 thousands by Inca SRL
10	Los Sosa river, route 324	Jan.2007 and Mar. 2015	Natural, heavy rains, floods, river floods	Repaired in 2007 and 2015	In 2015 construction done in 6 months, cost USD369 thousands by Hugo Cerviño Construcciones
11	Acequiones river, route 309	March 2015	Natural, heavy rains, floods, river floods	No data	No data
12	Seco river, route 324	March 2016	Natural, heavy rains, floods, river floods	Preparing the project	No data

Source: adapted from Gobierno de Tucumán (2016)

^aBridge reported in Fig. 1

Table 2 (continued)

Panel B – Reported in news outlets on top of those reported by the Government of Tucumán

Nº	Bridge	Date of failure	Cause of failure and source(s)
13	Caspichango River Bridge, route 324	March 2015	Natural, heavy rains, floods, river floods reported in a local newspaper (La Gaceta, 2015, 2018a)
14	Railroad Bridge on Lules River	March 2015	Natural, heavy rains, floods, river floods reported in newspapers (Ámbito Financiero, 2015; La Gaceta, 2015)
15	Zerda River, route 307	March 2015	Natural, heavy rains, floods, river floods reported in a local newspaper (La Gaceta, 2015, 2018a)
16	San Ignacio, route 334	April/May 2015	Natural, heavy rains, floods, river floods reported in a national newspaper (Costa and Lopez 2018)
17	Tapia River, Route 9	Between 2015 and 2018	Natural, heavy rains, floods, river floods damage detected by the government at sometime between 2015 and 2018 (La Gaceta, 2018a)
18	Los Sosa River, route 307	Between 2015 and 2018	Natural, heavy rains, floods, river floods damage detected by the government at sometime between 2015 and 2018 (La Gaceta, 2018a)
19	Bridge over route 312, Los Gutierrez and route 305	Between 2015 and 2018	Natural, heavy rains, floods, river floods damage detected by the government at sometime between 2015 and 2018 (La Gaceta, 2018a)
20	Acheral Access Bridge, route 307	Between 2015 and 2018	Natural, heavy rains, floods, river floods damage detected by the government at sometime between 2015 and 2018 (La Gaceta, 2018a)
21	Muerto River, route 338	Between 2015 and 2018	Natural, heavy rains, floods, river floods damage detected by the government at sometime between 2015 and 2018 (La Gaceta, 2018a)
22	Sali River, route 323	Between 2015 and 2018	Natural, heavy rains, floods, river floods damage detected by the government at sometime between 2015 and 2018 (La Gaceta, 2018a)
23	Stream Barriente, national route 38	Between 2015 and 2018	Natural, heavy rains, floods, river floods damage detected by the government at sometime between 2015 and 2018 (La Gaceta, 2018a)
24	Stream Matazambi, national route 38	Between 2015 and 2018	Natural, heavy rains, floods, river floods damage detected by the government at sometime between 2015 and 2018 (La Gaceta, 2018a)
25	Constitucion Av., Tafí Viejo	Jan/Feb 2018	Delays in the release of funds by National authorities to channel the water stream and build a new bridge (Infobae, 2018)
26	Chico River, route 38	March 2015 and May 2018	Natural, heavy rains, floods, river floods reported in a local newspaper (La Gaceta, 2015, 2018a). Road cut off due to serious flaws detected on the bridge (Café Prensa, 2018)
27	Colón Av. and Lidoro Quinteros diag.	September 2018	Tensioners gave way. The construction company argued the bridge collapsed because of bad maneuvering of the truck, “skidding,” or that the bridge was vandalized before and after its inauguration (El Ciudadano, 2018)

Bribes range between 5% and 13% for bidding in public projects financed by the federal government, and they included Tucumán bridges (Contexto Tucumán, 2018; Balinotti & Sbrocco, 2011). In the lower end of the bribing requirements were housing project bidders who are asked to pay provincial officials known as “*ratita*” (“little rat” in Spanish) a bribe in the range of 5–6%, a portion of which would be contributed to federal officials by companies (Costa & López, 2018). On the higher end of bribes were infrastructure works with kickbacks ranging between 12% and 13% for provincial officials and another 5% for federal officers (Costa & López, 2018). Friendly companies contributed the required percentages to provincial and federal officials, all construction companies were based in Tucumán, and all officers had strong personal and family ties in the province.

The established practices to secure a share in the construction projects funded by federal money date back to 2003 when a new federal government took office and appointed a native of Tucumán as secretary of public works. The bribing practice has been in place since 2004, wherein an officer working for the secretary of public works traveled to meet businessmen to collect kickbacks on federal government-funded projects (Costa and Lopez, 2018). This official was convicted along with the secretary of public works native from Tucumán and mentioned in court rulings as his figurehead (El Marplatense, 2019). In legal proceedings, the former economy minister of Argentina, who resigned in 2005, declared that already in those years, informally, the World Bank had warned about the cartelization of public works that forced the state to pay surcharges (Santoro, 2021). Although federal officials were arrested and sentenced to prison, there were no corruption cases in the Tucumán provincial justice system related to the issue; out of the 219 complaints of corruption received between 2005 and 2017 in the province, only one was successful in getting a conviction (Benito, 2015). One plausible explanation for such discrepancies in practices and results of the federal and provincial justice system can be related to governing authorities, and while at the federal level they changed in 2015, in the province of Tucumán, the same political coalition remained in power.

The mechanism to negotiate and collect kickbacks for federal officers who were based in the City of Buenos Aires was built around individuals with extensive connections in the province of Tucumán. Exploring personal ties helps to understand the nexus between provincial and federal officials that created and shaped a powerful elite suspected of siphoning funds from public works to support their political and business activities. These relations among diverse types of capital and family ties emerge among the actors linked in the collapsed bridges of Tucumán, as reported in the press (Café Prensa, 2018; Contexto Tucumano, 2018; Los Primeros, 2018; Perfil, 2018). The secretary of public works at the federal level between 2003 and 2015, the same who was convicted in 2019, is from Tucumán. He had political aspirations to become governor in 2015 but settled for a seat in the Mercosur Parliament representing the province of Tucumán. His candidacy was endorsed by many unions (Primera Fuente, 2014) and also by a national senator who was the third in the line of presidential succession of Argentina. This national senator was also the spouse of the then Governor of Tucumán (Contexto Tucumano, 2021) and the fourth wealthiest

Senator in Argentina. Her share in the family businesses predates her political career (Perfil, 2011). Many members of the family of the Governor and his spouse hold positions that might contribute to the lack of transparency and control as shown in Fig. 3.

It is argued that the scheme of bribes, kickbacks, and overpricing was complemented by lax controls and low quality in the construction. According to news articles, the “*ratita*” pressured inspectors to expedite certificates for works that had not yet been completed (Contexto Tucumano, 2018). The alleged mechanism might explain why the opposition party denounced to the provincial justice cases of low construction quality and high costs, particularly in housing (López, 2018). To explore if the argument of poor quality is valid for bridges, an interview reported in the press with a bridge specialist, engineer Tomas del Carril, is considered (Montero, 2018). It was first explained that there are many reasons for a bridge to fail in Argentina, with the main trigger being the “hydraulic action” of floods and rain surges; however, the reasons for such failures are normally rooted in design errors, construction defects, or lack of maintenance (Montero, 2018). Specifically, regarding the last fallen bridge in 2018, he commented that the type of structure used for the bridge was more complex and expensive than needed because the “braced arch” type design executed is used for places where there are no support points, such as mountains, a good example of which is a recently built bridge in the province of Córdoba (La Gaceta, 2018b; Montero, 2018).

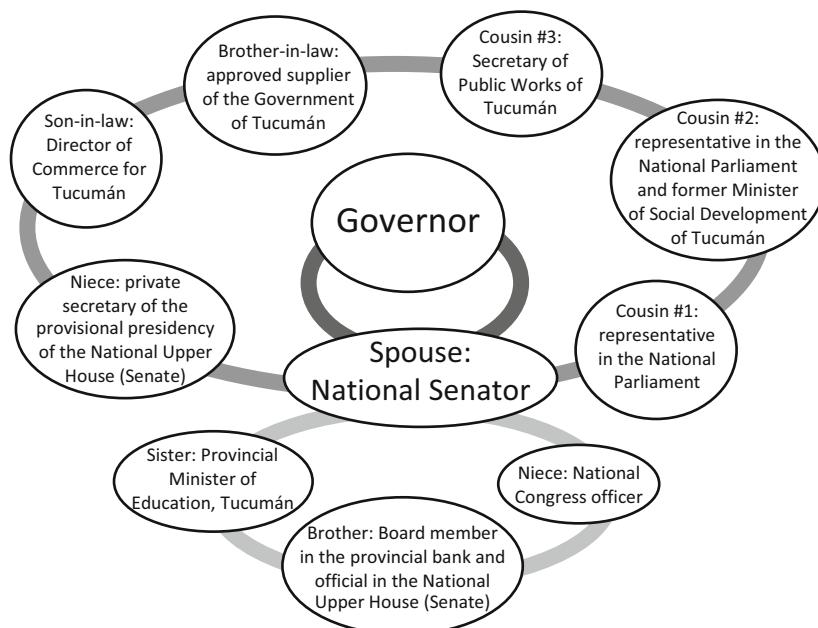


Fig. 3 Network of the Governor’s relatives placed in provincial and national positions of power. (Source: adapted from La Nacion (2012))

Power Pursuit and Building of Economic Capital

Bridge collapses were deemed as disasters resulting from natural hazards, but data reveals a different picture, one that points to deep-rooted corruption at all levels of government aided by natural hazards (Ferguson, 2019). The data suggests bridge repairs and constructions were intended to collapse with above-average rainfall to trigger sequential rounds of financing for reconstruction bypassing public tendering rules. The case recognizes three actors, including officials from the national and provincial governments and construction companies. Each actor participates in the distribution structure of species of power (or capital), whose endowment orders access to specific advantages that are at stake and the possession of one or more types of capital (cultural, economic, social, symbolic, etc.) allows the holders to exercise power or influence (Bourdieu & Wacquant, 2005). Actors are guided by the pursuit of increasing economical capital. Cultural and social capital is a starting point for well-connected families of politicians and business people; for these actors, direct purchases in infrastructure projects present themselves as the best opportunity to siphon wealth from government accounts into their economic capital.

All forms of capital translate into power over other people. Economic capital is recognized as a means to exercise power over resources (appropriation of goods and services) without the need to hide this domination in order for it to be legitimate; it is clearly objectified and with well-defined rights as a means of appropriation. Cultural capital differs from economic capital in both the forms it assumes and in its mode of operation, it can be acquired in the early family environment, and is the one that gives the actor an advantage when it comes to acquiring a position in the field. Although one type of capital facilitates the acquisition of other forms of capital, the accumulation of cultural capital supposes a work of inculcation and assimilation that differentiates it from economic capital and requires a cost of time that must be personally invested by each actor (Bourdieu, 2012).

One mechanism that perpetuates increases in cultural and economic capital is nepotism. Relations among diverse types of capital and family ties emerge among the actors linked in the collapsed bridges of Tucumán, as reported in the press (Café Prensa, 2018; Contexto Tucumano, 2018; Los Primeros, 2018; Perfil, 2018). The secretary of public works at the federal level between 2003 and 2015 is from Tucumán; his political aspirations were endorsed by many unions (Primera Fuente, 2014) and also by the then Governor of Tucumán's spouse (Contexto Tucumano, 2021), who was the fourth wealthiest Senator in Argentina thanks to her share in the family businesses (Perfil, 2011). In 2021 bail was posted for the former secretary of public works by three outside actors based in different provinces (Contexto Tucumano, 2021), although they were all tied to politicians, business people, union leaders, and public officers that were benefited from his disbursements of public funds. Despite being caught in the act of moving money, he claimed to have no money to pay his bail (economic capital), prompting others to help him (cultural capital).

Floods in 2007 saw funds flowing to the province for repair and reconstruction, where an oiled kickback scheme was implemented. To maintain the funds inflow

from infrastructure projects, some actors might have concluded it was less effort to rebuild than propose new projects. The cycle repeated with the heavy rains in 2015 when several bridges collapsed in three days and came the announcement of new funds to rebuild. The coordination of collective action is enacted without the need for explicit structures, systems, rules, and procedures. In other words, the habitus becomes an "*internalized tendency, propensity or inclination*" (Bourdieu, 1977: 214), allowing the actors to act spontaneously in the face of changing circumstances. Social actors use the acquired habitus to express themselves when faced with something new, and in this way, their daily practices help to regenerate and modify certain social orders that have been acquired and whose organizing is emerging.

Heavy rainfall is a constant natural hazard in the province of Tucumán, but human action (or inaction) converts the hazard into a disaster. Researchers affiliated with the Argentinean National Scientific and Technical Research Council (in Spanish: Consejo Nacional de Investigaciones Científicas y Técnicas, CONICET) proposed long-term solutions that involve cultural, ecological, urban, and architectural aspects (Bringas, 2020). Despite political promises after the floods of 2007 that saw the use of federal funds to put together a master plan to prevent flooding, not much was done until 2015 (Ámbito Financiero, 2007). A master plan requires investments in open-air drainage through channels in main cities, underground drainage, garbage management in cities, regulation of building permits for new neighborhoods, reforestation of mountain slopes, and planting trees in cities and towns, among others; however, no systematic action was initiated by the provincial government (Bringas, 2020). If professional networks (families) are invested in protecting sources of economic capital using their cultural and social capital, it is expected they will adopt policies that benefit from the occurrence of natural hazards regardless of the known risk they will turn into disasters. Professional networks in Tucumán can change rules and policies in their favor (Johnston, 2005) to reduce transparency and accountability by declaring the state of emergency.

Corruption practices in themselves are not sustained from a solid entity conception but rather as a process that involves the gradual strengthening of interactions, power relations, norms, and practices that have historically proven to be effective in facing situations that reach those who act in it. The *habitus* makes the relations between actors what it is, and its modus operandi defines how things are done in it (Nayak et al., 2020). This becomes the product of a complex history of accumulated practices that comprise a refined empirical sensitivity toward what is happening and a set of predispositions and tendencies associated with it. In this sense, the presence of past experiences is actively incorporated into decisions that seem eminently sensible or reasonable for a particular group, without the need to resort to explicit rules, routines, or norms (Bourdieu, 1990). Consequently, when complaints of favoritism in humanitarian assistance emerged (Ámbito Financiero, 2007), government officers who quickly dismissed them blaming citizens for being opportunistic and exposing their miseries (El Territorio, 2007) were the truly opportunistic actors. Therefore, what unifies a professional network involved in corrupt practices such as bribery and favoritism is that habitus that is exclusive to it; that way of dealing with things that are idiosyncratic and preparing the actors for the future (Dreyfus, 2014).

Once the social practices settle and incorporate into their habitus, it simultaneously enables and restricts the response action toward the next situations.

Conclusion

Heavy rainfall is a natural hazard that becomes a disaster when corruption enters into the equation of government procurement for critical infrastructures. Corruption takes many forms, and it uses natural hazards to perpetuate itself. The mechanism described of bribes and kickbacks only works if the government procurement system does not use transparent and controlled systems within public tendering. Natural hazards and the disasters they cause force governments to act rapidly to protect the people, but public tendering is slow; consequently, after a disaster, government officials make extensive use of direct purchases, which are less transparent and more prone to irregularities (Schultz & Søreide, 2008).

Powerful elites that control the executive and legislative branches of government, as well as businesses, can perpetuate the cycle of rain-destruction-[new]funds-rebuild where they extract bribes in each round. An important enabler is the nepotism elites exercise, where extended families act as a cartel (Johnston, 2005). “*Those who dominate a field are those who are in a position to make it work for their convenience, which does not imply that they should stop facing resistance, pretensions, ‘political’ or other discrepancies, of the dominated*” (Bourdieu & Wacquant, 2005: 156). Corruption can be curtailed by the judiciary system, backed by an engaged civil society and free press. Despite numerous man-made disasters and legal actions regarding suspected corruption, some dating back to 2008, only a few federal officers (none at the provincial level) were prosecuted and found guilty; at the moment of writing this chapter, only the former minister of public works remains in jail.

The bridge failures in Tucumán suggest that Argentina is a reforming democratic society where political competition is either emerging or going through a significant change where nepotism plays a central role. When unstable political conditions are combined with relatively prosperous economies, many opportunities for corrupt practices transpire (Johnston, 2005). Institutional frameworks in Argentina seem to be moderately strong, but due to intense political competition, contracts are difficult to enforce, and property rights are harder to protect, as shown by the judiciary system’s stiffness and sluggishness. Argentina, like other emerging economies, has strong anti-corruption barriers and internal controls; however, corrupt activities are often set up to enrich and protect networks and higher-level elites (families) that have the prerogative of changing rules and policies to their advantage (Johnston, 2005).

To conclude, we have attempted to advance the knowledge of how corruption uses the force of nature to perpetuate itself in a context of weak control mechanisms and low transparency. The case of bridges’ collapse following specific rainfall events, illustrates how government officials abuse their power to grant contracts and how contractors cut corners to ensure the construction will have to be reconstructed after a short while. The concept of *habitus* (Bourdieu & Wacquant, 2005) allows us to understand corruption as an accepted social practice that naturally

emerges in instances of low transparency and high nepotism. This combination of factors results in man-made disasters.

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Indigenous Knowledge as Early Warning Guide in Disaster Management

6

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Contents

Introduction	72
Indigenous Knowledge and International Agencies	73
Indigenous Knowledge on Early Warnings	74
1970 Bhola Cyclone	74
Floods and Draughts in Malawi	75
Smong in Simeulue Island, Aceh, Indonesia	77
Halo in Kuki Indigenous Knowledge	78
Conclusion	80
References	81

Abstract

The experience and knowledge of older generation on disaster are rich with local warning indicators from birds, animals, and other natural phenomena. Stories about natural disasters in the past are found in oral literatures, songs, poems, and even lullabies. Such past knowledge can not only reduce disaster risk but also prevent human casualties in the face of disasters. However, indigenous knowledge is often discarded as “unscientific.” Such local knowledge needs to be integrated with the scientific early warning system and could help in disaster risk reduction and increase the resilience of vulnerable communities.

Keywords

Indigenous Knowledge · Traditional Knowledge · Early Warning Systems · Disaster Risk Reduction

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Introduction

Indigenous or traditional knowledge has increasingly gained attention among policy makers, development practitioners, academic, and other scientific communities in recent decades. Today, as Mistry (2009: 371) pointed out, the “discourses on development and environment extol the benefits of incorporating indigenous knowledge into policy development, as well as on the ground interventions.” This development is largely seen as the outcome of the inadequacy, and some even consider as a failure, of the modern technologies, institutions, and western knowledge to solve problems so prevalent in remote areas in Asia and Africa. It has come a long way from being considered as an “obstacle to development” to the phase of romanticization and, in the last decade, as an important component in disaster management (Agrawal, 1995; Troglić & van den Homberg, 2018). In the field of disaster research, the potential of indigenous knowledge for effective disaster risk reduction is fully acknowledged now.

However, indigenous knowledge was earlier considered to be unscientific and looked-down for decades by the vast majority of people. They were largely regarded as superstitious belief of socially backward societies. It was seen “as inefficient” and “inferior” (Agrawal, 1995: 413). (For instance, during colonial rule the British considered small settlements of indigenous people with certain agricultural practices such as shifting cultivation as environmentally destructive, and attempts were made to impose a settled agriculture. For more details see Haokip (2020).) Particularly when such traditional or local knowledge help indigenous peoples in maintaining their autonomy from state control, they are decried as unscientific and superstitious and such practices were outrightly rejected. Indigenous knowledge is defined by Mercer and others (2010: 218) as “a body of knowledge existing within or acquired by local people over a period of time through accumulation of experiences, society-nature relationships, community practices and institutions, and by passing it down through generations.” Hence, such knowledge are understood and applied easily by the next generation and subsequently passed on to the succeeding generations through folk stories and songs, dances, paintings, and carvings. However, as it is duly stressed in permanent forum on indigenous issues, “global histories of colonialism, exploitation and dispossession continue to undermine and undervalue these aspects” (“Indigenous People’s Traditional Knowledge Must Be Preserved, Valued Globally, Speakers Stress as Permanent Forum Opens Annual Session,” UN Permanent Forum On Indigenous Issues, 22 APRIL 2019, accessed on 23 February 2022 at: <https://www.un.org/press/en/2019/hr5431.doc.htm>).

There is a realization that indigenous knowledge can make important contribution “to contemporary natural resource management issues, researchers and development workers have been documenting and recording indigenous knowledge with the aim to produce a bank of knowledge which could be incorporated into development projects” (Mistry, 2009: 373). In recent decades indigenous knowledge on the environment and ecology as a whole are found to be sustainable and thus ignited interest in such knowledge system. The potential for effective disaster risk reduction is now well recognized worldwide. Indigenous knowledge “is increasingly being

seen as one of the critical components in reducing disaster risks at local levels, building resilient communities and sustainable livelihoods” (Trogrić & van den Homberg, 2018: 13). The indigenous early warning systems are essential for disaster risk reduction in rural areas as there is a growing literature that shows lack of uptake of official warning information about impending disasters. Ever since the emergence of vulnerability perspective in disasters, which “assumes that a real disaster occurs when it strikes an underprivileged population” (Donner & Rodríguez, 2011), the potential of integration between indigenous and scientific knowledge and the participation of stakeholders has increasingly been promoted by academia and international development and donor agencies (Dekens, 2007).

Indigenous Knowledge and International Agencies

Despite the increasing recognition and rapidly growing studies of indigenous knowledge in recent years and the emphasis on early warning systems to reduce disaster risks, there are not only inadequate studies on indigenous early warning systems, but they are also largely not integrated with the scientific knowledge and official early warning systems. The climate change community recognized the importance of indigenous knowledge on early warning system, and efforts are made to not only include but also integrate such knowledge for an effective disaster risk reduction system, particularly in rural areas.

The United Nations Office for Disaster Risk Reduction defines an early warning system as “An integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities systems and processes that enables individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of hazardous events” and recommended “people-centered” early warning systems (“Early warning system,” accessed on 11 March 2022 at: <https://www.unisdr.org/terminology/early-warning-system>). The Paris Agreement on climate change not only recognized the importance of early warning systems, but it urged upon parties to the United Nations Framework Convention on Climate Change to “strengthen their cooperation on enhancing action on adaptation, taking into account the Cancun Adaptation Framework.” The Agreement recommended that “adaptation action should follow a country-driven” approach “taking into consideration vulnerable groups, communities and ecosystems, and should be based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems, with a view to integrating adaptation into relevant socio-economic and environmental policies and actions, where appropriate” (UNFCCC 2015).

The Sendai Framework for disaster risk reduction of 2015 emphasizes, among others in priorities for action, the understanding of disaster risk reduction and the role of indigenous or traditional knowledge and highlighted the importance of involving indigenous people (UNISDR, 2015). The Framework recognizes the role “indigenous peoples” can play, “through their experience and traditional knowledge,” and “provide an important contribution to the development and implementation of plans and

mechanisms, including for early warning.” It recommended “a broader and a more people-centred preventive approach to disaster risk,” in which “governments should engage with relevant stakeholders,” including indigenous peoples “in the design and implementation of policies, plans and standards.” It recognizes the complementary role traditional or indigenous knowledge can play in the approach and decision in disaster risk reduction and observes that “Indigenous peoples, through their experience and traditional knowledge, provide an important contribution to the development and implementation of plans and mechanisms, including for early warning.” The Sendai Framework recommended thus: “To ensure the use of traditional, indigenous and local knowledge and practices, as appropriate, to complement scientific knowledge in disaster risk assessment and the development and implementation of policies, strategies, plans and programmes of specific sectors, with a cross-sectoral approach, which should be tailored to localities and to the context.”

Indigenous Knowledge on Early Warnings

There is no dearth of indigenous knowledge in different spheres of human life among indigenous and other communities. Their knowledge on early warnings is learned through “phenomenological experience.” There are various stories emerging in different parts of the world where indigenous communities utilize their local knowledge on early warning signs and escape major disasters. Here four cases or incidents of disasters are examined to explain how indigenous knowledge on early warning systems is in fact saving the community from disaster.

1970 Bhola Cyclone

The 1970 cyclone in the then East Pakistan, and now Bangladesh since 1971, is so far the deadliest tropical cyclone on record with 300,000 deaths and some estimated to as many as 500,000 lives lost. Since then huge resources were geared toward the establishment of national warning systems and to build cyclone shelters. For instance, the Red Crescent Cyclone Preparedness Programme played an important role in the installation of radio networks and trained volunteers. However, a study shows that “household preparedness and survival potential appear to be very much dictated by economic and social circumstance. Cyclone shelters and other protective/enabling infrastructure are still scarce on the chars and in the most rural coastal districts... which are extremely vulnerable to cyclones and tidal surges,” despite huge investment for building cyclone shelters and setting up of national warning systems (Howell, 2003: 4).

In her study of the “indigenous early warning indicators of cyclones” in Bangladesh during the 1970 cyclone, which were mostly derived from animal behaviors and weather patterns, Philippa Howell (2003: 2) observed that in such areas the “poor people are more likely to live in marginal, low-lying areas most prone to flooding” and “the poorest are least likely to hear radio warnings or understand the meaning of different warning signals.” Howell reported that the uneducated people are most likely

to feel alienated from a scientific system, and more so are the women “due to the purdah system.” In such condition indigenous early warnings are essential for early action. Muhammad Nurul Islam narrated: “I know there are Disaster Signals ranging from Signal No. 1 to 10, but I have no idea what they mean. I can predict any disaster coming when the sky turns gloomy, bees move around in clusters, the cattle become restless and the wind blows from the south” (Howell, 2003: 4).

In the case of the 1970 cyclone, the natural disaster occurred at the middle of the night, and some local indicators such as weather and sea or river patterns would not be visible few hours beforehand. However, other indicators particularly from the behaviors of animals occurred about a week before the disaster struck. For instance, a septuagenarian Muhammad Abdul Ali Majhi said: “We take notice of continuous crying of the dogs, increase of flies and mosquitoes, movement of ants, crying of kurpals, hot and humid weather and so on. These signs occur about 5-7 days earlier.” An octogenarian Bibi Sahera Khatun also confirmed this when she said: “The dogs had been howling for four days before the flood hit in 1970.” Despite the deadliest tropical cyclone on record with 300,000 deaths, those giving the information of the local indicators survived despite their marginality and vulnerability. Howell’s study found out that older people have “knowledge of local warning indicators based on animal behaviour or natural phenomena” and largely not transmitted to younger generations and regarded as unscientific.

Floods and Draughts in Malawi

Malawi, in the Sub-Saharan Africa, is one of the least-developed countries in the world with an economy heavily dependent on agriculture. With a largely rural and rapidly growing population, the landlocked nation is highly prone to natural disasters. In recent decades there is an increase in frequency, intensity, and magnitude of these calamities, especially floods and droughts, “and have adversely impacted on food and water security, water quality, energy and sustainable livelihoods of most rural communities” (DoDMA, 2015: viii). Malawi is also frequented with heat waves, strong winds, dry and cold spells, hailstorms, thunderstorms, landslides, mudslides, earthquakes, pest infestations, disease outbreaks, and fires.

Earlier Malawi had relied totally on indigenous early warning systems in preventing disasters or reducing disaster risks. These systems were developed by communities predicting upcoming disasters through various signs and indicators locally observed. In recent decades there are scientific early warning systems at the national level, as well as a number of community-based early warning systems which are implemented across the country by nongovernmental organizations, often in cooperation with local governments. However, the early warning systems operating in Malawi are inadequate. Despite recent efforts by different stakeholders in improving the existing early warning systems in Malawi, there are still a number of gaps. Studies indicated that “the existing early warning systems for floods, dry-spells and droughts are not providing an accurate warning information in a timely manner. In addition, the existing EWS in the country does not take into account the rich indigenous knowledge held by community members” (Troglić &

van den Homberg, 2018: 7). The National Disaster Risk Management Policy of Malawi in 2015 included the “development and strengthening of people-centred early warning system” in its policy priority areas (Government of Malawi, 2015: 5).

There are two main categories of ecological indicators which could be used as early warning signs: the changes in the behavior of animals and plants. In Malawi the most common early warning sign of heavy rain, which eventually leads to flood, is the behavior of ants. Before heavy rain the ants become very active and move around in large numbers in farms and even disturbing villagers in their homes. The same behavior is also observed among insects such as spiders and mosquitoes. Likewise various birds are also “found in increased numbers of producing a specific, loud sound are seen as indicators of heavy rainfall.” Heavy rainfall is also indicated by movements of pythons, grasshoppers, rats, cats, and other animals. The behavior of hippopotamus is an interesting indicator of not only heavy rains but also the extent of the upcoming floods. In their study Trogrlić and van den Homberg (2018: 34) indicated: “The hippo will move away from the water and walk for more than a kilometer on dry lands. These animals also give us an understanding on how the floods will behave. Every place where the hippo passes through, it is exactly the place where the floods will reach. Where the hippo did not go, the floods will not reach those lands.” Trees were also seen as an important indicator of heavy rainfall among various communities in Malawi. The bountiful flowering and bumper fruits borne by trees are the two ecological indicators.

There are also various early warning signs that communities draw from meteorology, particularly on forecasting floods, by sensing the temperatures, the pattern of wind blow, and intensity of rainfall. Very hot temperatures are indicative of higher amount of rainfall, while the wind direction is also believed to be indicator of heavy rain and flood. Local communities were aware of the impending flood by monitoring and reading the intensity of rain. For instance, a person from Khungubwe said: “For floods we do not focus on the cloud or wind but on the intensity of the rain” (Trogrlić & van den Homberg, 2018: 35). The communities are aware that flood will occur after several days of rain and monitoring the intensity of rain can predict upcoming flood and prepare in advance to minimize the impacts.

In the case of draught and dry spell too, there are several ecological indicators embedded in the local knowledge of communities. The indicators are broadly the changes in plant behaviors, such as cassava giving lower yield than normal, certain trees shed all their leaves, and bush grass dries. Several studies identify the gaps in the early warning systems and suggested integration of indigenous knowledge with scientific knowledge (Chiota et al., 2017; Trogrlić & van den Homberg, 2018). People-centered early warning systems are crucial for disaster risk reduction in countries such as Malawi.

In similar developing areas like Majuli river island in the Indian state of Assam, residents “are living in consonance with nature” and not only have several traditional adaptation practices to cope with frequent floods and riverbanks erosions of the Brahmaputra river, but “their traditional wisdom helps them to detect and identify the possible hazards or disasters.” They have the indigenous knowledge of early warning system predicting heavy rain and flood “which they observed through some signals from nature before any major event is about to happen which assists them to

prepare from disaster and reduce its impacts and the communities have mastered these over the years.” They also have the “coping mechanism developed by communities” such as storage of food grains and housing structure which “were based on their folklore or stories which are passed from one generation to another that were useful in understanding nature and the causes of disasters.” A village leader from Jengrai Gaon responded to Chetry (2020: 21):

We have our own flood predictions techniques and we observe sets of early warning sign which help us to predict the intensity of flood. Like the soil sediments coming downstream from which we get an idea of how heavy the rains would be. If soil sediments are flowing in the river before the onset of monsoon, it signals that flood will come and the rain would be heavy leading to floods.

Smong in Simeulue Island, Aceh, Indonesia

The Indian Ocean earthquake and tsunami on 26 December 2004 killed more than 200,000 people. The intensity of earthquake was the third-largest ever recorded magnitude with its epicenter between Simeulue and mainland Sumatra, about 40 km from the northernmost tip of the Simeulue island. The earthquake created a series of massive tsunami waves surging vertically up to 30 m (100 feet) high and caused huge damages to life and property in the surrounding coasts of the Indian Ocean affecting about a dozen countries. However, in Simeulue island in Aceh, there were only 7 deaths from a population of 78,128 people (The population figure is as per the official recorded in 2000 census). Studies show that people escape such a massive tsunami through the local knowledge of early warning system called *s mong*. The term is derived from “Devayan language word of ‘Kemong’ or ‘Seumongan’ which means ‘splash of water’ or ‘tidal wave or tsunami’,” and it “is used for tsunami warning when big earthquakes occur in Simeulue Island” (Syafwina, 2014: 573). In simple words it refers to “the ocean coming onto the land” (McAdoo et al., 2006: S665) and warns everyone of the incoming high tidal waves or tsunami and instructs them to run for higher grounds.

The story of *s mong* went back to more than a hundred years ago when a 7.8 magnitude earthquake hit the Indian Ocean on 4 January 1907 causing a tsunami that wreaked havoc killing about 70% of the total population in the island. Survivors of this tragic disaster passed on their experiences orally “to the next generation through buai-buai (lullaby) in family daily lives, nafi-nafi (advices) from old generation to the youth and through traditional poems and songs called Nandong that are performed in communal events in Simeulue.” One of the popular Simeuluean songs on smong is reproduced below (Syafwina, 2014: 576):

*Enggelmonsaocurito
Inangmasosemonan
Manoknopsaofano
Uwilah da sesewan
Unen ne aleklinon
Fesangbakat ne mali
Manoknopsaohampong
Tibo-tibomawi*

*Angalinon ne mali
Uweksuruiksahuli
Maheyamihawali
Fano me singatenggi*

Please listen to this story
One day in the past
A village was sinking
That what have been told
Starting with earthquakes
Following by giant wave
Whole the country was sinking
Immediately
If the strong earthquake
Followed by the lowering of sea water
Please find in hurry
A higher place

Smong has become a “part of the Simeulue indigenous culture, transmitted through songs, short poems, lullabies, and stories” and is “a key word understood by the entire population of Simeulue that describe the occurrence of giant waves after a major earthquake.” During the 26 December 2004 tsunami, the indigenous knowledge of *smong* was to a great extent successful in giving early warning leading to “a massive evacuation of the entire Simeulue beach area within a few minutes after the earthquake” (Suciani et al., 2018: 1).

Halo in Kuki Indigenous Knowledge

The Kukis are indigenous transborder community settling in the Indo-Myanmar and Indo-Bangladesh borderlands. They are endowed with rich cultural heritage including traditional knowledge on environment and ecology, meteorology, forestry, traditional agriculture practices, medicinal plants and herbs, and distinct social values and a “democratic check and balances” system in their traditional governance. (Kukis are indigenous people settling in the Indo-Myanmar borderlands. To know more about them, read Haokip (ed.). The Kukis of Northeast India (2013); and a further reading on their chieftainship form of governance and its democratic elements can be found in Haokip (2022: 10–11).) They have indigenous knowledge of early warning systems and make predictions, and such indigenous knowledge were handled down from generation to generation. The traditional meteorological knowledge has been useful for predicting weather and climate, and, like other indigenous communities around the world, such forecasting is used “as a guide in making important decisions that enable them cope and adapt to climate change-induced extreme weather variation” (Balehgn et al., 2019). Combined with such knowledge is the utilization of societal values in community-based resilience building. In this process people of the same community are brought together, and they collectively manage a disaster by discovering “their culturally resilient values, stories, memories and connections in their life for the purpose of understanding their identity and

becoming resilient. The activities also promote self-discovery and reflection, understand their own identity, manage change and transition, and build the skills necessary to become resilient.” The Kukis have the cultural value systems called *Khankho* and *Tomngaina*, which “instruct the youth and their social institutions to act in times of disaster, conflict, war and other calamities” (Haokip, 2018: 282–283). These social values help them to not only cope with disaster but also build a strong indigenous post-disaster recovery system.

On 20 June 2020, a halo was observed in the Indian state of Manipur. Social media were flooded with the picture of the 22° halo which has a colored ring. According to the Kuki traditional knowledge, it is a sign that there will be heavy rains and floods in the near future. In some other societies, there is a saying that “ring around the moon means rain soon.” Halo is an atmospheric optical phenomenon which is the result of either the sun or moon shining through thin clouds which contain millions of tiny ice crystals. The phenomenon is “due to the refraction of light that passes through the crystals, or the reflection of light from crystal faces, or a combination of both effects. Refraction effects give rise to colour separation because of the slightly different bending of the different colours composing the incident light as it passes through the crystals” (Fig. 1) (Britannica, “Halo,” accessed on 29 March 2022: <https://www.britannica.com/science/halo-atmospheric-phenomenon>).

Halo basically occurs due to high moisture content in the atmosphere. There is truth in such prediction by indigenous peoples “because high cirrus clouds often come before a storm” (What causes halos? EarthSky, Accessed on 31 March 2022 at: <https://earthsky.org/nature/what-causes-halos>)



Fig. 1 A picture of halo on 20 June 2020 in Manipur, India



Fig. 2 A picture of flood in Jildung or the Irl river in Saikul subdivision in Manipur

earthsky.org/space/what-makes-a-halo-around-the-moon/). Storm is normally followed by heavy rain, and incessant rain leads to flood. Within a month since the occurrence of halo in the state of Manipur, there was incessant rain in some parts of the state, and on 14 July 2020, the river Jildung, or the Irl river, overflowed the banks, and several acres of paddy fields were flooded and destroyed. These two incidents, of a halo and flood, not only prove that indigenous knowledge on early warning systems are reliable today, but they are best suited to rural masses who fail to read and understand modern systems or a far-flung area where modern communication systems could not reach them easily. A news report on 16 Jul 2020 also informed about mudslide at Moulding village, near Leimakhong bazaar under Kangpokpi district in Manipur due to incessant rain (Fig. 2) (Imphal Free Press, “Villagers living under fear of landslide in Manipur,” 16 Jul 2020, accessed on 23 February 2022 at: <https://www.ifp.co.in/1279/villagers-living-under-fear-of-landslide-in-manipur>).

Conclusion

Early warning systems are important component for disaster risk reduction. In recent years the importance of indigenous early warning systems is increasingly recognized, and integration of such knowledge with the scientific early warning systems is emphasized. Studies in recent decades have shown the existence of a largely ignored

but huge body of indigenous knowledge on early warning systems which were preserved for generations. Such local knowledge came to light only after their successful utilization in saving lives in major disasters around the world. Today international agencies recognize the indigenous early warning systems and encourage the integration of the indigenous early warning systems with the scientific systems for a more effective early detection of disasters and thereby to reduce the impacts of disasters. Earlier I argued that “Such integration would help the indigenous communities in understanding scientific knowledge better and develop an integrated approach to community based disaster risk reduction and resilience building” (Haokip, 2018: 296). Despite such recognition, efforts by climate change community to integrate the traditional knowledge and scientific knowledge on early warning systems for an effective disaster risk reduction system are slow and tardy. For an affective early warning system, the focus should go beyond a mere integration of indigenous and scientific early warning systems; it should be people-centered, which is crucial for reducing disaster risk.

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Institutional Preparedness Against Disasters: A Case Study of Odisha

7

Pradeep Harichandan

Contents

Introduction	84
Odisha: a Disaster Vulnerable State	84
Incorporating Lessons Learnt from Super Cyclone 1999	86
Intricacies of Institutional Preparedness	86
Odisha State Disaster Management Authority (OSDMA)	87
Odisha Disaster Rapid Action Force (ODRAF)	88
Odisha Fire Services	89
Keeping “Community” at the Core	90
Disaster Resilient Infrastructure	91
Inclusive Strategy	92
Integrated Approach	92
Conclusion	94
References	94

Abstract

The success of institutional preparedness against disasters lies in minimum casualty, which is largely dependent on the resilience of a community and the ability of its government to work synchronously. Odisha, a relatively small and economically weaker state on the east coast of India exemplifies how institutionalization, inclusive strategy, and its prudent implementation can make the turnaround. In the year 1999, the Super Cyclone left about 20,000 people dead in Odisha! After a decade in 2013 when cyclone *Phailin* struck Odisha, the state carried out India’s biggest-ever evacuation with about 5 lakh people moved up to safe cyclone shelters within a span of 48 h, resulting in “zero human casualty”!

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More than a decade of meticulous planning, institution building, and community engagement helped manage every successive disaster with more professionalism, precision, and faster response. In 2020, when cyclone *Amphan* battered West Bengal amid the Covid-19 pandemic, Odisha played a major role in the rescue and restoration operations in Kolkata and adjoining areas. Not only managing calamities but also Odisha recorded a spectacular performance in managing the Covid-19 pandemic. Starting with a low resource base and relatively weak infrastructure, the state could build up a massive health infrastructure, trained manpower, and effective response system within a record time! It could supply oxygen to save lives in far-off Delhi and Mumbai!

This chapter showcases Odisha's success in building a strong disaster-resilient ecosystem and suggests how achieving next-level disaster preparedness requires a change in approach; concerted effort for institutionalization, inclusive strategy, and community engagement.

Keywords

Inclusive · Resilience · Zero-casualty · Bounce-back · Skill-matrix · Eco-system

Introduction

As the world struggled to overcome a deadly disaster in recent human history in the form of COVID-19 and its variants, the discourses and practices on disaster preparedness also needed to be more inclusive, strategic, and institutional. The keys to a robust disaster management plan are inclusive strategy and institutionalization that work on the built-in mechanisms of decentralization, community empowerment, and ownership. The success of disaster preparedness lies in the resilience of a community and the ability of the government to forge strong bonds institutionally for overcoming varieties and volumes of disasters – cyclones, floods, drought, earthquakes, tsunamis, heat waves, or even a pandemic, in a planned and prudent manner.

Odisha: a Disaster Vulnerable State

The topography of Odisha makes it a disaster-prone state. The state has a long history of disasters – cyclones, floods, and droughts. Between the years 1891 and 2021, more than 100 tropical cyclones have lashed Odisha, which happens to be the highest number among the coastal states of India. The state has 30 administrative Districts, which can be classified into the coastal strip, the western region, and the central plateau. Frequent floods and cyclones ravage the coastal districts that lie along the Bay of Bengal with 485 km. long coastline while recurring droughts haunt the western and central parts. Over the Bay of Bengal, tropical cyclones travel upward in the northwest direction.

Because of the physical shape of the subcontinent, storms mostly spin in the anti-clockwise direction. Odisha, located at a critical curve of the Indian subcontinent gets frequently exposed to pre- and post-monsoon cyclones (Ramesh, 2019).

Propelled by a severe drought in the year 1865, the “Orissa Famine” of 1866 continues to be remembered as a mass tragedy for the people of Odisha over generations. Though it affected the entire east coast of India from “Madras” to “Calcutta,” the impact was most severe in “Orissa.” About one third of the population got wiped out during and in the aftermath of the famine (Imperial Gazetteer of India vol. III, 1907). The response of the British government officials to tackle this massive human tragedy was marred by carelessness, indifference, absolute lack of empathy, and miscalculation. The British bureaucratic apparatus made an incorrect and fictitious assessment of the situation. As a result, by the time the imported rice could reach the affected region in September 1866, lakhs of people had already died of starvation. Many more were killed by cholera during the monsoon and by malaria afterward. At least one million people, about one third of the population died by the end of the year. Many more died over the next 2 years (Patel, 2016). The British Raj blamed it on delayed shipments of rice owing to adverse weather conditions in the sea, weak surface transport network, and distribution system. However, lack of community “connect” and “misgovernance” by the colonial government was clearly the prime reasons for this mass tragedy.

After more than a century, in the year 1999, Super Cyclone devastated the entire coastal Odisha with about 1.6 million homes razed, 20,000 people dead, thousands of animals killed, plants uprooted, and property damaged to the tune of US\$ 4.44 billion! No doubt, the Super Cyclone was unprecedented and unparalleled in the cyclone history of the country with the state capital Bhubaneswar itself (from where the rescue and relief operations were to be carried out) being ravaged and remained cut off in darkness for more than a week. Almost every house, including that of the Chief Minister’s official residence was blocked by fallen trees, broken electricity poles, and razed boundary walls, and it was not humanly possible to get out of the homes. It took months and years for an economically weak state like Odisha to recover from the socioeconomic impact of the catastrophe. But, the major reason for failure to prevent such massive loss of lives and properties and inadequate post-cyclone relief and rehabilitation works were more systemic than eventual. Lack of institutional preparedness, political rivalry, and bureaucratic failure led to an inadequate and delayed response to the catastrophe. Neighboring Andhra Pradesh Government was the first to come to the rescue of the people of Odisha by restoring the communication system. International aid agencies contributed immensely to the relief and rehabilitation work. Besides, it was a time when the scope of disaster preparedness was limited to the “Orissa Relief Code” framed after the 1977 cyclone and finalized in March 1980. The concept of disaster management was not prevalent in the country at that time and it served only as an operational guide for post-calamity relief operations.

Incorporating Lessons Learnt from Super Cyclone 1999

After the Super Cyclone of 1999, there has been a clear and decisive change in the approach of the authorities regarding their scope of work from only post-disaster response to regular and continuous pre-disaster preparedness, rescue, and restoration through dedicated agencies and specialized forces. In fact, there was a lot to learn from the massive loss of lives and properties, and the catastrophic socioeconomic impact of the 1999 Super Cyclone that led to a serious rethinking of the way a disaster should be approached and managed. As a result, 14 years later in the year 2013, when cyclone *Phailin* struck Odisha, it was a different, much stronger, rapid, and institutionalized response with “zero casualty” outcome. In 2013, Odisha carried out India’s biggest-ever evacuation with about 5 lakh people being moved up to safe cyclone shelters within a span of 48 h! From here, the state has been trying relentlessly to reach the next level of disaster preparedness. While tackling cyclone *Yaas*, Odisha became the first state in India to evacuate about 4500 pregnant women to safe places for emergency medical assistance who gave birth to 750 babies safely under medical supervision during the cyclone on 26 and 27 May 2021. This could be possible for identifying and relocating such huge numbers of mothers to safe places, mostly hospitals or health centers. On 25 May 2021, when the evacuation process was still on, a heart touching visual came in the media from Odisha’s *Kendrapada* District. Without waiting for the rescue team, a school teacher, Mr. Durjay Moharana, at *Rangani* village in *Rajnagar* Block of the District, helped to carry an octogenarian lady to a safe place on his shoulder, though it was not part of his allotted duty. Many such stories of proactive community action keep coming from the state in the collective fight against disasters. Community pro-activeness and participation are a solid backbone for successful disaster management anywhere. Covid appropriate behavior was followed by all concerned and in spite of the massive evacuation of about 7 lakh people to safe places, there was no exponential rise of positive cases in the cyclone-affected Districts of Odisha. This was yet another feat of modern disaster management amid a pandemic.

Thus, the successive high floods and cyclones [*Hudhud* (2014), *Fani* (2019), *Amphan* (2020), *Yaas* (2021)] have been managed with greater success. The success story is not limited to rapid response with rescue and restoration operations in Odisha alone. The Special Forces from Odisha played a crucial role in immediate rescue operations, clearance of roads, and restoration of power and water supply in the city of Kolkata and adjoining areas devastated by the cyclone *Amphan* (2020).

Intricacies of Institutional Preparedness

The decade between the Super Cyclone and the *Phailin* was a decade of meticulous, long-term planning, institution building, and community empowerment that helped manage every successive disaster with more professionalism, precision, and less “bounce back” time. The creation of Odisha State Disaster Management Authority (OSDMA), Odisha Disaster Rapid Action Force (ODRAF), and the advent of high

accuracy cyclone warning technology contributed to the institutional preparedness against disasters (Mohanty, 2021).

Odisha State Disaster Management Authority (OSDMA)

Odisha became the first state in India to come up with a systemic and institutional response by constituting an autonomous body for disaster management on 29 December 1999, just within 2 months' time of the Super Cyclone! On 29 December 1999, Odisha State Disaster Mitigation Authority (later renamed as Odisha State Disaster Management Authority - OSDMA) was set up as an autonomous organization registered under the Societies Registration Act, 1860.

Unlike typical government departments, OSDMA has been built to function as a techno-managerial and professional front organization. The decision-making and approval processes, which would otherwise go through multiple layers of the hierarchy thereby delaying implementation, have been done on a fast-track channel with support from technology and modern management practices.

The broad objectives of OSDMA have been to build up a robust disaster risk management system, coordinate disaster response and recovery operations and develop strong climate change adaptation capabilities to ensure a disaster resilient state. The specific objectives of OSDMA have been to:

- (a) Promote disaster preparedness at all levels in the state.
- (b) Act as the nodal agency for disaster reconstruction works.
- (c) Coordinate with the line departments involved in reconstruction.
- (d) Coordinate with bilateral and multilateral aid agencies.
- (e) Coordinate with UN agencies, international, national, and state-level NGOs.
- (f) Network with similar and relevant organizations for disaster management.

The first and foremost challenge during and in the immediate aftermath of the Super Cyclone of 1999 was a total failure of the communication system at all levels for which rescue, restoration, and relief works could not be coordinated for about a week. Therefore, learning from the past, developing a robust communication system became imperative. By the year 2004, OSDMA had set up a very high frequency (VHF) network all over the state, linking 401 locations covering all District headquarters, tehsils, Blocks, and vulnerable Gram Panchayats of the coastal belt. Satellite phones were deployed at strategic locations to keep the channel open in the event of total failure of the communication network. The UNDP provided initial technical support for use of the Geographical Information System (GIS) in disaster management. A dedicated GIS Cell became operational in collaboration with the Odisha Space Applications Centre (ORSAC) to be used for rescue, restoration, and reconstruction work.

District Disaster Management Centres (later merged with the District Disaster Management Authority) were established as the district level nodal agencies to drive all disaster preparedness, rescue, and restoration operations in an affected District. It

was well equipped with trained personnel, a state-of-the-art communication system, and a strong logistic support base. OSDMA has a Disaster Management Training Cell (DMTC) set up at Revenue Officers' Training Institute (ROTI) in Bhubaneswar for imparting special refresher training to the ODRAF and Fire Services personnel.

Odisha Disaster Rapid Action Force (ODRAF)

Though OSDMA and the District Disaster Management Authorities became the nodal agencies for disaster management planning, preparedness, rescue, restoration works, and the interface points for collaboration with other national and international entities, raising a special ground force was imperative. A high-skilled force equipped with state-of-the-art technology to assist the civil administration in rescue, restoration, and relief operations on ground zero was felt necessary. In this context, the Odisha Disaster Rapid Action Force (ODRAF) was raised on 7 June 2001 drawn from the Orissa Special Armed Police, Armed Police Reserve, India Reserved Battalion, and Specialized India Reserve Battalions.

ODRAF is structured as a lean force having 20 units stationed at strategic locations with only 50 personnel per unit. The proficiency and agility of ODRAF units in responding to crisis situations have made it a formidable and pre-disaster preparedness post-disaster response force. Multi-skilling and extra-agility of the ODRAF have come through its operational interface with the Indian Army, Indian Navy, Indian Air Force (IAF), Indian Coast Guard, National Disaster Response Force (NDRF), and Odisha Fire Services.

The ODRAF units are deployed on the ground as per the requisition from the Special Relief Commissioner (SRC), OSDMA, or the District Collector concerned. It has been a normal practice for the Special Relief Commissioner/Managing Director of OSDMA to request the Inspector General of Police (Law & Order), who is in charge of the movement of the ODRAF, for deployment of ODRAF, which is nonnegotiable. Telephonic calls are also taken by the State Emergency Operation Centre/identified Nodal Officer in the OSDMA to mobilize the ODRAF teams at the earliest.

There is a Standard Operating Procedure (SOP) for movement, deployment, camp arrangement, equipment, logistics, etc. Effective interorganizational coordination with civil administration and line departments for managing high-intensity or large-scale disasters is ensured by the Head of each unit. Seamless interagency coordination has produced a very high level of operational efficiency of the force in all kinds of crisis situations.

Military type of training is imparted to the personnel of ODRAF with additional skilling on search, evacuation, rescue, relief, and restoration in the face of any type of disaster. The cost of specialized training is borne by the OSDMA. A full-fledged specialized Disaster Response Training Guidelines has been developed on the basis of input from all levels. An annual training calendar is prepared every year taking into consideration the types of training, availability of training slots in State and National level training institutions, and non-disaster lean period. The modules are

based on the roles and responsibilities of different categories of personnel. After completing the first two levels of training internally, ODRAF personnel are sent to the reputed training institutions in the country for specialized training and *Training of Trainers* (TOT) courses. The entire training program is curated into the following levels of courses:

- (a) Basic/Induction level Training Course (internal);
- (b) Advanced/ Specialized Course (internal);
- (c) Specialized and Training of Trainer's Courses (external).

A skill matrix has been developed for identification and enhancement of the skillsets and efficiency levels of the ODRAF personnel in disaster response activities, which has been ISO 9001-2000 certified. The entire disaster response activities are divided into a number of skill groups depending on their possible application in different disaster situations such as water rescue, search and rescue from collapsed structures, relief line clearance, transportation line clearance, communication restoration, power restoration, casualty management, and miscellaneous responses. The skill matrix is initially prepared with the self-assessment of the personnel on their knowledge on the use of different categories of equipment. The proficiency of individual personnel in using each piece of equipment is measured on a numeric scale.

Skill-group-wise joint mock drills are carried out at regular intervals to enhance the proficiency of a particular group of ODRAF personnel in emergency operations and for cross-learning. These joint mock drills are conducted also for giving exposure to the ODRAF personnel with the personnel drawn from other specialized agencies such as the National Disaster Response Force (NDRF), State Fire Service, Civil Defense, St. John Ambulance, Red Cross, East Coast Railway, Airport Authority of India, and other stakeholders.

Odisha Fire Services

Odisha is also an example of how a pre-independent state fire services force can be re-equipped and re-skilled for the additional job of rescue and restoration operations in times of disasters in and outside the state. Odisha Fire Service has got the dual mandate of firefighting as well as disaster response. After the Super Cyclone of 1999, each Fire Station in the State was redeveloped as a multi-hazard disaster response unit to respond in case of any type of disaster, in addition to its original firefighting and rescue operations. It took about a decade to re-equip and re-skill the 5000 odd personnel of 338 fire stations in the State.

Odisha Fire and Disaster Response Academy (OFDRA), Bhubaneswar

The training of Odisha Fire Services personnel began in the year 1943 with Mr. Hetch Blue, the then Deputy Fire Officer, Odisha Fire Service taking charge of the training establishment. In the year 2003, the Government of India recognized

Odisha Fire Services Training Institute (OFSTI), Bhubaneswar as the Regional Training Centre (RTC). In the year 2015, Govt. of Odisha upgraded the OFSTI into Odisha Fire and Disaster Response Academy (OFDRA). Till September 2020 more than 26,000 personnel were trained from OFDRA.

Odisha Fire and Disaster Response Institute (OFDRI), Naraj, Cuttack

Odisha Fire and Disaster Response Institute (OFDRI) was established at Naraj, Cuttack in the year 2015 for the training of the auxiliary fire force of Odisha Fire Service consisting of Firemen, Leading Firemen, Drivers, and Havildars, thereby decongesting the OFDRA and specializing both OFDRA and OFDRI. However, the training modules of both OFDRA and OFDRI are curated to equip the personnel as a multi-disaster response force with the ability to approach and face any emergency.

Keeping “Community” at the Core

A disaster-resilient community is understood to be less vulnerable and more prepared to manage sudden catastrophes such as fire, flood, cyclone, earthquake, landslides, bomb blasts, nuclear accidents, epidemics, and pandemics. Although disaster resilience at the community level is somewhat missing from the public discourse and there has been no direct mention of it in disaster management planning at any level, it is indeed a determining factor for the success or failure of any disaster management operation. Only an empowered community can be a disaster-resilient community that would make the governments prepared to manage disasters more effectively.

An empowered community constitutes a solid foundation for a disaster-resilient state or country. Governments become capable of managing disasters more effectively when the community takes ownership in creating, operating, and maintaining community infrastructures like toilets, cyclone shelters, *anganwadi* centers, shelter for the homeless, rental houses, hostels for working men and women, and water ATMs, which play a crucial role during and after the occurrence of a disaster. It becomes much easier for the city government to manage a disaster with ground-level support from an empowered and proactive community. Odisha has shown the way in empowering the community by involving them in all the above initiatives. Many such initiatives are taken to empower the community and if practiced elsewhere would be certainly helpful for building a strong community force to manage disasters.

Recognizing the indispensability of community engagement in disaster preparedness, the Community-Based Disaster Preparedness (CBDP) program was initiated in the year 2001. Disaster Management Committees at the District, Block, and Gram Panchayat levels were set up during the UNDP-supported Disaster Risk Management Programme (2002–2009) as a stepping stone to community participation and decentralized planning. District Disaster Management Plans are prepared and updated every year by adopting a bottom-up approach, with input from the Block and Gram Panchayat levels. The *Sarpanch* heads the GP Disaster Management

Committee with members from the local NGOs and CBOs and other stakeholders. Similarly, the Block Disaster Management Committees and District Disaster Management Committees were set up headed by people's representatives. Later, as per the National Disaster Management Act, 2005, the District Disaster Management Committee was restructured as District Disaster Management Authority.

Odisha's long journey to disaster preparedness has been entirely community-driven. The practice of disaster preparedness at the panchayat level aimed to ensure the community's preparedness as the first line of defense during the crucial few hours before and after the disaster had struck, focusing on zero casualty and community participation in the restoration operation. It facilitated building up a strong and sustainable grassroots institutional mechanism for preparing multilevel inclusive strategies as part of the institutional preparedness against disasters.

Disaster Resilient Infrastructure

The new multipurpose cyclone shelters built up in the coastal stretches of the state under the National Cyclone Risk Mitigation Project (supported by the World bank) not only have space for the needy people to take shelter but also for their animals to be kept in the basement; as the latter is the source of livelihood for many. So, "zero casualty" not only of humans but also of animals become the next-level disaster management target for the state. During the non-disaster time, these multipurpose cyclone shelters are used as informal education centers; and the space is utilized for social benefits like holding awareness camps, health camps, etc. Hundreds of evacuation roads and bridges are constructed in strategic places to make evacuation and rescue operations easier. The commissioning of the community-level early warning dissemination system with last-mile connectivity has been the key to the rapid dissemination of information about the impending dangers of a disaster.

As part of a strategic plan, the state government has initiated land acquisition for the construction of the 382 km long proposed coastal highway along the Bay of Bengal (Bisoyi, 2021). Besides movement of relief and supplies during disasters, the coastal highway will serve as an economic corridor for the transport of agricultural and in-land fishery produces to the Paradip and Dhamra ports. The project is taken up under the Government of India's *Bharatmala Pariyojana*. The highway will bypass the Chilika lagoon and culminate at Digha touching Brahmagiri, Puri, Konark, Astaranga, Naugaon, Paradip Port, Ratanpur, Satabhaya, Dhamra, Basudevpur, Talapada, Chandipur, and Chandaneswar. In the first phase, land acquisition for approximately 177 km length of the proposed Tangi-Ratanpur stretch has been started, which will provide cyclone resilient connectivity to nearly 100 villages in Puri, Khurda, Jagatsinghpur, and Kendrapara districts.

As the Government of Odisha asks the Union Government to consider sanctioning Rs 25,000 crore for disaster-resilient power infrastructure in cyclone-prone coastal areas of the state, it becomes evident how the state has been approaching the creation of disaster-resilient infrastructure in the state in a planned manner.

Inclusive Strategy

Today, Odisha has become a lighthouse for others on how inclusive strategy and its prudent implementation can make the turnaround. Odisha exemplifies how a small and economically not so strong Indian state could develop a robust institutional capacity to manage disasters of any kind; whereas many others with a much larger resource base and government machinery have failed. The answer lies in strategic long-term planning and a prudent two-pronged approach (i) to nourish and involve the community in disaster preparedness on the one hand; and (ii) to establish and strengthen institutions for techno-managerial operations, ground-level infrastructure creation, and logistic support on the other.

However, framing of a high-voltage so-called “inclusive strategy” to be executed by a typical government bureaucratic setup has never succeeded anywhere. The road to the next level of disaster preparedness begins with a citizen-centric participatory government. The space for government–community interface must be real and wide enough to have rooms available for each citizen to participate in some or the other activity of local governance, directly or indirectly that would ultimately contribute to a disaster-resilient state or country.

Integrated Approach

The learnings from the COVID-19 management combined with Odisha’s experience in managing calamities also showcase an integrated approach and overarching operational framework with ample rule and role clarity for each stakeholder down to the level of an *Anganwadi* or *Asha* worker; and adherence to the SOPs by them without waiting for the official orders, which has made the response and bounce back times incredibly faster. The message is loud and clear – governments become capable of managing disasters more effectively when the community takes ownership in creating, operating, and maintaining community infrastructures like cyclone shelters, *anganwadis*, schools, community centers, and toilets which play a crucial role during and after the occurrence of a disaster. For instance, the key of a cyclone shelter is kept with the local *Sarpanch*, instead of any government official to respond instantly to an emergency need. It becomes much easier for the govt. to manage a disaster with ground-level support from an empowered and proactive community. Achieving the next-level preparedness in managing disasters with “zero casualty” and strong “bounce back” capacity requires concerted efforts for making disaster preparedness more inclusive and institutional with an empowered community and participatory government.

Odisha has recorded a spectacular performance not only in managing calamities but also in managing a widespread highly infectious pandemic with a very low death rate and high recovery rate in the entire country. Starting with a low resource base and relatively weak health infrastructure, the state could build up an effective response system within a short span of time, with high-impact IEC, community awareness, high test rate, efficient contact tracing, proper treatment, massive

infrastructure built-up, and trained manpower in terms of COVID hospitals and quarantine centers. The decision to delegate the power of the District Magistrate to all *Sarapanchs* in managing COVID 19 is historic indeed!

In fact, the rapid response mechanisms adopted by Odisha to deal with about 10 lakh migrant laborers who came back to their homes from different parts of the country post lockdown have been quite impressive. Registering and testing them in temporary camps after their arrival was meticulously planned and implemented to keep the domestic population insulated from the virus. These temporary camps, set up mostly in government and private educational institutions for each district, had a cumulative capacity of 800,000 beds. Besides, financial incentives were also declared for these people. To tackle the livelihood problems of the migrants and local urban poor, the Government of Odisha in the Housing and Urban Development Department implemented a tailor-made wage employment program called “Urban Wage Employment Initiative (UWEI)” in April 2020 at a cost of Rs. 100 crore for 6 months, which has been extended and continued further with more fund and dedicated UWEI Cells in all Urban Local Bodies.

By the time the first wave of Covid was over, Odisha had already built up a massive Covid response health infrastructure and team within a record time. The state was the first to establish one of the country’s biggest 1000-bedded dedicated COVID hospitals in a record time of just 1 week. Since then, Odisha has built up more than 50 dedicated Covid hospitals, which included both public and private medical institutions. The entire medical expenses of Covid patients are borne by the state government. There has been a successful fund-raising initiative as well to meet Capex and Opex and other medical expenses from individual and corporate entities like Odisha Hydro Power Corporation, Odisha Mining Corporation, Mahanadi Coal Field, and Indian Oil as part of their CSR initiative. The state government has decided to spend about Rs 2000 crore for vaccinating those between 18 and 45 years of age free of cost. Covid testing capacity of the state increased from just 01 functional lab to 19 labs within a short span of time. The biggest initiative came up in setting up a vaccine production facility near Bhubaneswar in collaboration with Bharat Biotech to meet future vaccine requirement of the state on priority. When many hospitals in Delhi and Mumbai ran out of oxygen and relatives of patients ran from pillar to post for managing an oxygen cylinder, Odisha responded by supplying oxygen to different cities of the country to save lives and ensured unhindered transportation.

Effective monitoring and surveillance, testing, and contact tracing have been the key to successful pandemic management anywhere. To leverage technology, the state IT Dept. linked all Covid hospitals, testing facilities, quarantine centers, and cases with GIS-based information system. The Covid expert team prepared a 15-point SOP that included daily state-level public briefing by officials and experts keeping people regularly briefed, control room meetings, supervision, risk assessment, identification of high-risk areas, containment zone microplanning, etc. Daily and weekly reports are collected to track the trend for the next strategic decisions. The challenging task to train and build capacity of thousands of doctors, nurses, paramedics, AYUSH staff, police, frontline health and sanitation workers, volunteers

of ICU management, psychosocial training, etc., during the lockdown was supported by state government officials, WHO, and the UN agencies. Even though complaints of negligence have been reported from some places, which are unfortunate but natural in such a huge pandemic management, reports of human touch given by the medical staff to the patients like counseling, shaving their beard, combing their hair, and entertaining them by dancing to the tune of music are some good news heard nowhere else in the country.

The state government introduced bike ambulances with oxygen support for Covid patients in the inaccessible *Bonda Ghati* of *Malkangiri* District; and prepared itself for the subsequent waves by identifying and making dedicated Covid hospitals with specially trained staff ready to take care of children who are expected to be affected more severely. This is yet another instance of the next level of disaster preparedness.

Conclusion

As hurricanes, typhoons, and floods become more frequent than ever before with climate change, Odisha continues to strive for the next level of disaster preparedness. It sets precedence, for how institutional preparedness is the key to success, and institution building, inclusive strategy, integrated approach, and community empowerment can help the government to build up a robust and effective disaster management eco-system. True, governance, infrastructure, technology, logistics, and operational professionalism are also crucial factors in effectively managing disasters. But achieving the highest level of disaster resilience essentially depends on the extent of institutional preparedness and the ability of the government of the day to work synchronously with the community in a planned and prudent manner.

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Building Disaster-Resilient Coastal Cities: An Assessment of Coastal Regulation Laws and Judicial Statements in India

8

Haaris Moosa and Stellina Jolly

Contents

Introduction	96
<i>Maradu:</i> Facts and History	97
Legislative Framework on Coastal Regulation	99
Major Judicial Trends	101
Balancing the Permissible Activities	101
Adoption of Environmental Principles	101
Institutional Authority	102
<i>Maradu</i> Case Impact on Environmental Jurisprudence	102
Conclusion	104
References	105

Abstract

The Supreme Court in the *Kerala State Coastal Zone Management Authority v. The State of Kerala Maradu Municipality* (2019), while directing the demolition of waterfront apartment complexes built in the coastal zone of Kerala's Maradu, observed that the devastating floods in Uttarakhand and Tamil Nadu are the direct results of construction sprees on river banks and the resultant emaciation of the natural path of backwaters. Recent experience testifies to the fact that coastal regions have become increasingly vulnerable to the depredations of

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environmental disasters and climate change. Considering the acute threats faced by the coastal areas, the Ministry of Environment and Forest (MOEFCC), Government of India, gazetted the first Coastal Regulation Zone (CRZ) Notification in 1991 using the powers conferred under the Environmental Protection Act, 1986. The CRZ Notification of 1991 was superseded by the CRZ Notification of 2011, which was in turn superseded by the CRZ Notification of 2019. The chapter explores the role of the judiciary in administering and evolving an efficacious coastal regulation regime in India by analyzing judicial statements. In the Indian context, the judiciary has played a significant role in developing and incorporating legal principles based on international legal developments. The chapter evaluates the impact of judicial statements in building disaster-resilient coastal cities in India.

Keywords

Maradu · Coastal regulation · Environmental protection · Judicial statements

Introduction

India's extensive stretch of coast has been at the receiving end of unregulated developmental and human activities. (Sudha Rani et al., 2015). The threat is compounded by the indiscriminate developmental activities undertaken along the coasts challenging the attainment of sustainable development. The Supreme Court in the *Kerala State Coastal Zone Management Authority v. The State of Kerala Maradu Municipality*, popularly known as the *Maradu* case (Kerala State Coastal Zone Management Authority v. The State of Kerala Maradu Municipality, 2019), while directing the demolition of waterfront apartment complexes built on the coastal zone of Kerala's Maradu, observed that the devastating floods faced by Uttarakhand and Tamil Nadu are the direct results of construction sprees on river banks and the resultant emaciation of the natural path of backwaters. The judgment has been hailed as momentous for coastal regulation and has set a new stickler standard in environmental adjudication in India. At the same time, an analysis of the rationale employed by the court in ordering the demolition raises certain legal concerns. Mapping through the judicial statements, the chapter explores the role of the judiciary in administering and evolving an efficacious coastal regulation regime in India. The chapter evaluates the impact of judicial statements in building disaster-resilient coastal cities in India. Section "[Maradu – Facts, and History](#)" elaborates the facts, procedural history, and the decision rendered in the *Maradu* case. Section "[Legislative Framework on Coastal Regulation](#)" briefly discusses the legislative framework on coastal regulation to contextualize the *Maradu* case and map the major thread of judicial decisions to regulate coastal zone. Section "[Maradu Case Impact on Environmental Jurisprudence](#)" looks into the specific implications of the *Maradu* decision on environmental jurisprudence.

Maradu: Facts and History

Rarely is the conclusion of an environmental case broadcasted on live TV (NDTV, 2020). Rarely do environmental cases lead to the making of a movie (Shibu, 2020). The *Maradu* case is peculiar in both facts and law. The *Maradu* case has its origins in a letter dated May 18, 2007, by the Secretary of the Local Administration Department, Government of Kerala, directing the Secretary Maradu Grama Panchayat, to cancel the building permits of five apartment complexes that were allegedly in the violation of Rule 16 of the Kerala Municipality Building Rules. The secretary, Maradu Grama Panchayat, issued a show-cause notice for the revocation of the building permits that were granted to the five builders. In response, the builders moved five different writ petitions before the High Court of Kerala (Alfa Ventures Pvt. Ltd. v. Government of Kerala & Others, 2007) (M/s Holy Faith Builders and Developers Pvt. Ltd. v. Government of Kerala and Ors, 2007) (M/s. Jain Housing & Construction Ltd. v. Maradu Grama Panchayat, 2007) (K.V. Jose v. Government of Kerala, 2007) (M/s. Holiday Heritage (P) Ltd v. Government of Kerala, 2007). Even though the cases were filed, admitted, and the injunction orders passed in 2007, the final judgment was passed only on September 10, 2012, i.e., it took five long years for the High Court of Kerala to dispose of these cases, and the corollary being that the interim injunction on the cancellation of building permits continued for five long years. In this interregnum, apartment complexes were fully constructed and sold to unsuspecting buyers. While things were so, the Maradu Panchayat was made the Maradu Municipal Corporation in November 2010 (Kerala State Coastal Zone Management Authority v. The State of Kerala Maradu Municipality, 2019).

It is relevant to note that in the final judgment dated September 10, 2012, the single bench of the High Court of Kerala adjudicated the entire issue on the administrative law prohibition of statutory authorities from acting under dictation and did not even find it relevant to refer to any principle of environmental law let alone the Coastal Regulation Zone (CRZ) Notification. It is also relevant to note that the Kerala Coastal Zone Management Authority (KCZMA), which was to later move the Supreme Court of India and secure the order of demolition, impleaded itself in just one (Alfa Ventures Pvt. Ltd. v. Government of Kerala & Others, 2007) of the five cases brought by the builders before the single bench. The single bench decided the matter based on the administrative law prescription of a governmental authority acting under dictation and a lenient view taken by an earlier judgment (Baiju. K. v. Government of India, 2011) of the High Court of Kerala in regularizing errant constructions.

Maradu Municipality appealed this order of the single bench before a division bench of the Kerala High Court, and the KCZMA was made the Second Respondent (Maradu Municipality v. State of Kerala and Others, 2013). The judgment delivered by the division bench specifically records the arguments made by the KCZMA to the effect that Rule 23(4) of the Kerala Municipality Building Rules, 1999 (hereafter KMBR, 1999) requires all constructions to comply with Coastal Regulation Zone notifications (hereafter CRZ Notifications) and that all building permits and plans require the clearance from the KCZMA. The court rejected both these arguments by

stating that the Coastal Zone Management Plans (CZMPs) remain unusable and that the delinquency of the municipality in not forwarding the building permit/plan to the KCZMA cannot be used for penalizing the builders. The division bench ends the judgment with the following lines:

Before parting with these cases, we must record our anguish about the manner in which the appellants have conducted themselves. They were merrily issuing permits and allowed the builders to proceed with the constructions. After substantial progress was made, the Municipality suddenly became wiser on receipt of the letter from the GovernmentGovernment. (*Maradu Municipality v. State of Kerala and Others, 2013*)

At the heart of this controversy is the interpretation of Rules 16 and 23(4) of the Kerala Municipality Building Rules, 1999 (Government of Kerala, 1999). The division bench essentially held that the revocation of the building permit for the alleged violation of CRZ norms could not be brought under Rule 16 of the Kerala Municipality Building Rules, 1999, because such a violation is not covered by any of the four instances envisaged in the provision, namely, “the permit was issued by mistake,” “a patent error has crept in it,” “issued on misrepresentation of fact or law,” or it will amount to a “threat to life or property.” This particular division bench judgment brings home the tragedy that is wrecked when ultra-positivist interpretive techniques are trained on environmental cases. Against this judgment of the division bench, the KCZMA preferred a review petition before the High Court of Kerala; however, it was dismissed (2015).

The KCZMA took the case in appeal before the Supreme Court of India through a Special Leave Petition Order dated 27/11/2018 in SLP(C) No. 004227 - 004228 / 2016 making the State of Kerala the first respondent and the Maradu Municipality the second respondent. During the course of the hearing, the Supreme Court categorically found that there is no discussion or pronouncement from either benches of the High Court of Kerala as to the exact Coastal Regulation zoning (CRZ Category III, Category I, or Category II) of the impugned apartment complexes. The Supreme Court appointed a committee consisting of three bureaucrats to hear the objections and was asked to report in 2 months as to the precise coastal zoning and the legality of the impugned constructions in terms of CRZ Notification 1991. (*Kerala State Coastal Zone Management Authority v. The State of Kerala Maradu Municipality, 2019*) Upon receipt of this report and hearing both the parties, the Supreme Court of India went on to overturn the judgments of both the single bench and the division bench of the Kerala High Court and held the constructions to be illegal (*Kerala State Coastal Zone Management Authority v. The State of Kerala Maradu Municipality, 2019*).

The single bench and the division bench of the High Court of Kerala adjudicated the matter entirely on the point of infraction of administrative law and not on environmental law. On the other hand, the Supreme Court was not concerned with administrative law infraction at all. The apex court decided the entire matter on

environmental law and the violation of the CRZ Notification. The specific factual finding in the judgment is to the effect that the constructions are in violation of the CRZ norms and that such constructions would affect the natural water flow and would lead to calamitous results. The court used the floods in Kerala, Uttarakhand, and Tamil Nadu in 2019 to substantiate its conclusions. It finds fault with the High Court for not taking into account the approved CZMP of 1996. In fact, it relies on the same CZMP of 1996, which the High Court's division bench found unusable, to order the demolition of the apartment complexes. The apartment complexes were brought down using controlled explosions on January 11 and 12, 2020. By ordering the demolition of these apartment complexes in *Maradu*, the Court has set a new stickler standard in environmental adjudication. In order to properly assess the context of the *Maradu* case and its implications, it is essential to understand the legislative framework relating to coastal regulations in India and the role played by the judiciary.

Legislative Framework on Coastal Regulation

The CRZ Notification 1991 was promulgated by the Ministry of Environment and Forest (MOEFCC) under the Environment (Protection) Act, 1986 (Ministry of Environment Forests and Climate Change, 1991). The notification defined the coastal stretches of areas consisting of seas, bays, creeks, rivers, and backwaters, which are influenced by tides up to 500 m from the high tide line (HTL) and the land between the low tide line (LTL) and the HTL as coastal regulation zone and prescribed permissible activities (Ministry of Environment Forests and Climate Change, 1991). The 1991 CRZ Notification classifies the areas into four categories depending on their ecological vulnerability and stage of development:

CRZ I: This category includes the ecologically vulnerable coastal areas. Absolute prohibitions have been prescribed for construction within reach of 500 m of HTL or between LTL and HTL (Ministry of Environment Forests and Climate Change, 1991).

CRZ II: This category includes developed areas that are close to the shoreline. Buildings are only allowed only on specified areas in accordance with the existing local town and country planning regulations, including the existing norms of Floorspace Index (FSI) or Floor Area Ratio (FAR) (Sundar, 2014).

CRZ III: This category includes undisturbed areas that are not designated in CRZ I/II. An area up to 200 m from the HTL is earmarked as No Development Zone (NDZ) and no new constructions are allowed (Ministry of Environment Forests and Climate Change , 1991).

CRZ IV: The category constitutes small islands like Andaman and Nicobar, and Lakshadweep. Subsequently, changes were made to the notification from 1991 to 2009, and all these changes were consolidated through a notification in 2011

(Ministry of Environment Forests and Climate Change, 2011). While retaining the basic categorization of CRZ 1991, it brought certain features (Puthucherril, 2011):

1. New additions were made to the category of CRZ by identifying critically vulnerable coastal areas such as the Sundarbans (Panigrahi & Mohanty, 2012).
2. Time-bound clearance and post-clearance monitoring of projects have been introduced along with enforcement mechanisms.
3. Water areas up to 12 nautical miles in the sea and the entire water area of a tidal water body such as the creek, river, and estuary are included in the CRZ areas, without imposing any restrictions on fishing activities.
4. The notification brings in the idea of “hazard line” without defining it. The mapping and demarcation of the same will be undertaken by the MoEF (Purohit & Markus, 2013).
5. For implementing the notification at the ground level, the responsibility of developing the CZMPs is assigned to the state governments, and this has to be done with the involvement of the local communities (Gupta, 2013).

The 2011 Notification was superseded through CRZ Notification 2019 (Ministry of Environment Forests and Climate Change, 2019). The salient features of the notification include the following:

1. Encouraging tourism infrastructure for public use in coastal areas like shacks, toilet backs, and drinking water facilities on beaches.
2. The procedure for CRZ clearances has been streamlined.
3. Considering the unique characteristics of islands, it is prescribed that CRZ of 20 meters from the HTL on the landward side shall be applicable to islands.
4. The Critically Vulnerable Coastal Areas (CVCA) will be managed by the participation of coastal habitats, including fisher folks (Ministry of Environment Forests and Climate Change, 2019).

It is important to note that for the CRZ notifications to be operational a CZMP needs to be prepared and notified. It is at the stage of preparation of the CZMP public consultations, and the participation of stakeholders is involved. The CZMP is significant in determining the contours of HTDL and LTDL. There has always been a time lag between CRZ Notification and the adoption of the CZMP. The CZMP for the 1991 CRZ was notified only in 1996. Similarly, the CZMP for the 2011 CRZ Notification was adopted only in 2019. Hence, practically speaking, even after the CRZ Notification in 2019, till the time CZMP is modified and adopted, the CZMP of the CRZ Notification of 2011 will hold the field. India's tryst with coastal management did not, however, remain confined to legislative enactments. Judicial pronouncements continue to shape the way in which the state implements coastal regulation and promotes sustainable development. The following section will elaborate on some of the major threads of judicial statements.

Major Judicial Trends

Balancing the Permissible Activities

Judicial statements have clarified the contours of permissible activities in the coastal zone. For example, in *S. Jagannath v. Union of India* (1997), popularly known as the shrimp case, the Supreme Court opposed further conversion of agricultural land into aquaculture farms. It held that the shrimp industries functioning within the coastal regulation zone and within 1000 m from Chilka and Puliket Lakes are liable to compensate the affected persons on the basis of the “polluter pays” principle. The apex court also directed the union government to constitute an authority under Sec 8(3) of the EPA 1986. It was pursuant to this direction that the National Coastal Zone Authority (NCZMA) and State Coastal Zone Authorities (SCZMA) were set up in order to operationalize the CRZ Notification (Purohit & Markus, 2013). In *Union of India v. Chennai Metropolitan Development Authority*, it was held that the prohibition of construction under the coastal regulation laws applies not just to industrial activities but also to residential buildings as well (Union of India v. Chennai Metropolitan Development Authority, 2006). The National Green Tribunal (NGT), while examining the clearance granted to the Vizhinjam International Seaport Ltd, directed its promoters to retain the fisheries harbor near the proposed seaport considering the livelihood of the local fishermen (Wilfred J. Anr v. MOEFCC & Ors, 2016).

Adoption of Environmental Principles

The adoption of international environmental principles has been one of the major strands of environmental jurisprudence in India. In *the Goa Foundation case* (Goa Foundation v. Goa State Coastal Zone Management, 2001), the construction of the “Sunset Dunes” resort at Baga beach was challenged as violating the CRZ Notification 1991. Though the court could not find any violation of CRZ norms, it emphasized the significance of environmental principles. It observed that “there cannot be any doubt that there should be a sustainable development and there should be a (sic) and harmonious co-existence of nature's bounty and mankind's development.” In *Worli Koliwada Nakhwa & Others v. Municipal Corporation of Greater Mumbai & Others* regarding construction of a coastal road on the western coast of Mumbai, the Bombay High Court relied on the precautionary principle and stressed the need for a comprehensive EIA. It is important to mention that though the judicial statements have attempted to incorporate environmental principles, the CRZ Notifications have not incorporated any of the core environmental principles like sustainable development, public trust, and intergenerational equity under its explicit provisions (Puthucherril 2018). However, the 2019 CRZ Notification makes references to the idea of sustainable development.

Institutional Authority

In the landmark case of *ICELA v. Union of India*, the Supreme Court obligated the state governments to create their CZMPs (Indian Council for Enviro-legal Action v. Union of India, 1996). In *Fazal Gafoor*, the applicant challenged the Panchayat order for the demolition of a residential building for the alleged violation of the CRZ norms. The Supreme Court diverted the onus of decision-making to the Coastal Management Authority and held that Panchayat is not the legal body for ordering any demolition (P.A. Fazal Gafoor v. State of Kerala, 2003). Similarly, in *Alexio Arnolfo Pereira*, the petitioner contended that the Directorate of Tourism, State of Goa, has usurped the powers of the Goa Coastal Zone Management Authority (GCZMA) and managed the construction of temporary shacks and huts in Mazorda and Utorda. The court held that the GCZMA is only entitled to permit the erection of purely temporary structures between September and May months in CRZ III subject to compliance with the coastal regulations. However, in this case, the court held that the permission of GCZMA was taken (Alexio Arnolfo Pereira v. State of Goa, 2014).

Maradu Case Impact on Environmental Jurisprudence

The *Maradu* judgment needs to be seen in the larger background of numerous measures and principles articulated by the judiciary in protecting the vulnerable coast of the country. It should be noted that *Maradu* is not the first case where the court has ordered the demolition of constructions in violation of coastal regulations. However, *Maradu* is the first time when demolition of such a massive scale has been undertaken. The judgment highlights the never-ending debate between environmental protection and development pursuits and offers a compelling message for environmental protection. The *Maradu* judgment tries to debunk the traditional judicial bias against the displacement of the upper sections of societies in comparison to the frequent displacement orders against tribals and other marginalized sections of the society. The immediate impact of the *Maradu* case can be seen in the case of *Kapico Resorts*. Before the start of demolition of apartment complexes in *Maradu*, the Supreme Court upheld the demolition order passed by the High Court of Kerala for the razing of a luxury resort in the Vembanad Lake built in violation of CRZ Norms (*Kapico Kerala Resorts Pvt. Ltd v. State of Kerala*, 2020) While the judgment provided a strong precedent for the enforcement of environmental protection laws, the rationale employed by the court in *Maradu* has left open some fundamental questions.

The Supreme Court in *Maradu* reasoned that the 1991 CRZ Notification is applicable to the impugned constructions. This brought the impugned constructions in CRZ III, wherein the area of 200 meters from the HTL is considered an NDZ. It is relevant to acknowledge that a CRZ Notification can only be operationalized using a CZMP. In reality, the CZMP is approved only many years after the CRZ Notification. For instance, even though the First CRZ Notification was issued in 1991, its CZMP was approved only in 1996 (Geevan, 2021) (Kapoor, 2017). Thereafter, even though

the second CRZ Notification came in 2011, its CZMP came to be approved only in February 2019 (Geevan, 2021).

In *Maradu*, it is a fact that constructions happened during the currency of the 1991 CRZ Notification along with its CZMP (approved in 1996). Both came into being when *Maradu* was a Panchayat, squarely making it a CRZ III area. It is to be noted that *Maradu* was converted into a municipality in November 2010, and this is why the draft CZMP to the 2011 CRZ Notification marks it as a CRZ II area. However, it was only in February 2019 that the CZMP to the 2011 CRZ Notification recognizing *Maradu* as falling under CRZ II came to be approved. This meant that before the Supreme Court judgment was pronounced on May 8, 2019, the impugned constructions became part of CRZ II. It also meant that the buildings in violation of CRZ III might not violate CRZ II. The Supreme Court should have taken note of this factual history and addressed the question as to whether, in respect of the impugned buildings that were constructed under the earlier notification, the rules applicable should be the ones that are in force at the date of judgment or on the dates of construction.

This case thus raises certain questions about the retrospectivity of CRZ regulations. The Supreme Court in *Goan Real Estate and Construction Ltd. and Ors. v. Union of India (UOI)* went on to say that the landmark decision in *Indian Council for Enviro-Legal Action Action* (Indian Council for Enviro-legal Action v. Union of India, 1996) relating to CRZ regulations is only prospective. It has also been held in many decisions that environmental regulations are not retrospective (Narmada Bachao Andolan v. Union of India, 2000) (Rajendra Shankar Shukla v. State of Chhattisgarh, 2015) (Common Cause v. Union of India, 2017). In the instant case, the 2019 CZMP marks *Maradu* as CRZ II, wherein restricted constructions are allowed on the landward side of existing authorized structures. However, the protection of the 2019 CZMP is not available for these constructions because of the prospective nature of environmental regulations. Even though environmental laws are characterized by non-retrospectivity, in the instant case it can create a complex precedent. However, overlooking the fact that the impugned constructions on the date of judgment fall under CRZ II the Supreme Court denied a beneficial interpretation of the law. Theoretically, it is even possible that constructions may come up in consonance with CRZ II norms on the same site where the apartment complexes were demolished (Nedumpara, 2021).

In an interesting twist, the Supreme Court of India asked the Kerala government to furnish the list of all CRZ violations in the state (*Kerala State Coastal Zone Management Authority v. The State of Kerala Maradu Municipality*, 2019). Pursuant to this order, the Government of Kerala created Coastal District Committees in its 10 coastal districts for ascertaining the number of buildings violating the CRZ norms. In October 2020, the Government of Kerala filed an affidavit in the Supreme Court admitting the total number of CRZ violations in Kerala to be 27,765 (Narayanan, 2020). It will be both cathartic and cataclysmic if the court applies the same principle of non-retrospectivity to all the CRZ violations in the state (Kumar, 2019). If it does, then *Maradu* will become a *T N Godavarman* (by which the Supreme Court of India took over the management of the forests of the country) (Rosencranz & Lélé, 2008)

(Chowdhury, 2014). The apex court also went on to appoint a judicial commission for compensating the apartment owners who lost their homes and asked the state government to pay each of the apartment owners an interim compensation of Rs.25,00,000/- each, and this amount was to be recovered from the builders (Kerala State Coastal Zone Management Authority v. The State of Kerala Maradu Municipality, 2019). It is also important to note that the second leg of the *Maradu* case is still continuing in the form of a *suo moto* case before the Southern Bench of the National Green Tribunal. In addition, a crime branch investigation of the builders and officials is underway (SIT Opens Criminal Investigation Against Builders, 2019). It is also argued that the fact that the apartment complexes were demolished without undertaking an environmental impact assessment on the possible environmental impact on the fragile wetlands, waste debris, and air pollution challenges the very object, legitimacy, and efficacy of the demolition (Kurien, 2019).

The case highlights the lack of coordination between administrative bodies, courts, and environmental protection agencies. The fact that the Grama Panchayat permitted the construction and an injunction against the stay order was passed by the High Court is pertinent here. Even though the constructions were allowed to be continued by the High Court, the brunt of the judgment was borne by the bona fide purchasers. Thus while celebrating the *Maradu* judgment, it is also important to keep in mind the need for consistent and coherent decision-making.

Conclusion

The vulnerability of India's vast coastal area is well documented. Categorizing coastal zones and prescribing the list of prohibited and permissible activities through CRZ regulations, the government has attempted to protect the country's coastal zones. The legislative initiatives were supplemented and complemented by an active judiciary that has attempted to balance the economic and environmental imperatives. By ordering the demolition of high-rise apartment complexes in *Maradu*, the court is believed to have set a stickler standard for environmental adjudication in India. However, the detailed analysis of facts and the law involved in the case raises staid questions about the retrospective application of environmental regulations and especially with regard to the narrative on environmental rule of law as laid down by the Supreme Court in *Hanuman Laxman Aroskar and Ors. v. Union of India*. It will be interesting to see how the Supreme Court of India reacts to the cases of CRZ violations in the state provided by the Government of Kerala as it raises the possibility for *Maradu* tracing the trajectory of *T N Godavarman* and its attendant judicial overreach. This suggests that, while celebrating the *Maradu* judgment, it is important to consider the need for coordinated decision-making among various environmental agencies.

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Animal Welfare During Disasters in South Asia

9

Dulki Seethawaka

Contents

Introduction	108
Welfare Concerns of Pets and Homeless Animals During the COVID-19 Pandemic	110
Inflicting Harm to Pets and Strays by Committing an Act	111
Inflicting Harm to Pets and Strays by Omitting an Act	112
Abandoning of Pets	113
Recommendations	115
Mitigation Steps to Protect Pets and Homeless Animals During a Pandemic	115
Preparedness to Protect Pets and Homeless Animals During a Pandemic	117
Response Steps to Protect Pets and Homeless Animals During a Pandemic	119
Conclusion	120
References	120

Abstract

With many variants being discovered every day, COVID-19 pandemic is still raging around the globe. It has been a traumatic experience not only for humans but also for pets and homeless animals, the closest and the most dependent types of animals living in the vicinity of people. Many pets were abandoned and mistreated due to various reasons, and homeless animals continuously struggled to find food and water during the pandemic lockdown and other restrictions. Mistreatment and negligence toward pets and homeless animals are considered as crimes since they are protected within the national legislative framework in most of the countries. However, compared to the scope and rapid development on the legal measures for pets and homeless animals in developed countries, the South Asian nations are struggling to enforce the existing frameworks and adapt measures against new challenges such as the COVID-19 pandemic. This research intends to explore the welfare issues encountered by pets and homeless animals in the South Asian region during the COVID-19 pandemic and the legal protection

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granted to them against such issues. Furthermore, it will investigate the mitigation, preparedness, and response steps that must be adapted in order to resolve any existing gaps and ambiguities by comparing such measures which are implemented in developed countries, with variables such as economic, social, and development progresses in mind. The suitable solutions will then be analyzed as to their applicability to the South Asian countries, and further recommendations for the future will be suggested.

Keywords

Pets and homeless animals · Animal welfare · Animal cruelty · Pet grief · COVID-19 pandemic

Introduction

The COVID-19 pandemic has been the most unanticipated global emergency in the twenty-first century causing more than six million deaths by March 2022 (World Health Organization, 2022). Humans are not the only victims of the pandemic, since the living conditions of animals all around the world were subject to various welfare, cruelty, and socioeconomic challenges (Grant, 2020, para 2). Almost every type of animal including wild, farm, research, companion, and livestock suffered because of the pandemic. For instance, due to lack of visitors and guards in the national parks and reservoirs, the wild animals in Asia and Africa were threatened with poaching (Grant, 2020). The fur animals were culled in millions after detecting SARS-CoV-2 outbreaks in farms in countries such as the Netherlands, Denmark, the USA, etc. (Grant, 2020). Since people refrained from meat consumption, many livestock farms which got overcrowded with poultry and meat animals opted to kill them in the cruelest methods (Grant, 2020). The animals used in research facilities had to suffer because the COVID-19 vaccine research were carried out on them (Grant, 2020). Pets were abandoned due to the fear of being exposed to the virus and other economic difficulties (Grant, 2020).

The South Asian nations also experienced similar scenarios relating to the well-being of animals during the pandemic irrespective of whether they are pets, strays, captivated animals, livestock, laboratory animals, or wildlife (Choudhary et al., 2020). Even though there are rules and regulations in South Asian countries to ensure that animals do not undergo physical or emotional pain and suffering, the COVID-19 pandemic proved that the reality is different from the legislature. Therefore, it is necessary to conduct research to clearly identify and analyze the imminent threats and available legal protection to animals during a pandemic for several reasons.

One such reason is that it is not certain when the COVID-19 pandemic would be completely eradicated (Charumilind et al., 2022). The citizens of South Asian nations have had a close association with animals and are compassionate toward their well-being. However, during the pandemic it was observed that when people

are confronted with unforeseen difficulties, they tend to make the selection based on their priorities and convenience. Therefore, it must be ensured that pandemic restrictions are not provided as justifications or excuses for not fulfilling the duties as compassionate human beings.

At the same time, many of the ongoing researches predict that in the future, zoonotic disease outbreaks which would be as dangerous as the COVID-19 can occur. One cause of such outbreaks is the illegal wildlife trade which is also considered as the source of SARS-CoV-2 (United Nations Office on Drugs and Crimes, n.d., p 2). It is also reported that previous zoonotic disease outbreaks, such as avian influenza and swine flu, have originated from livestock operations (Grant, 2020). Therefore, it is essential that the South Asian countries are well-prepared for any similar pandemic that might occur in the future and ensure that the safety and well-being of animals are not compromised.

Developed nations are constantly encouraged to find fast-track solutions for the protection of animals, particularly because if cruelties against animals are not prevented in the initial stages, they might create bigger issues in the long term. Similarly, developing nations must also focus on the broad perspective and thereby address the concerns without further delay. Even though there are ample research articles that discuss the mistreatment toward animals during the pandemic in the South Asian context, there is a research gap relating to the analysis of domestic legal protection granted to animals and measures and mechanisms that can be adapted in order to ensure their safety in any similar future occurrences.

However, due to time and word limitations and other restrictions, this chapter only focuses on caring for pets and homeless animals during a pandemic. Thereby, in the context of this chapter, “pets” are defined as the domesticated animals which are kept as companions, and “homeless animals” are those who were once companion animals, but then abandoned by their owners and are now considered as stray animals. One of the main reasons for selecting these two types is because they are completely dependent on human beings and cannot survive unless they are provided sufficient food, water, and care (Waxman, 2021, para 2). Hence, companion and domesticated animals were one of the most vulnerable groups during the pandemic (Applebaum et al., 2020; Berry, 2020).

This research explores how pets and homeless animals can be protected during a pandemic, with specific reference to South Asia, and will be carried out using the black letter approach of research. The research question is how the South Asian nations can develop their legislative frameworks and include mitigation, preparedness, and response measures to safeguard the pets and homeless animals during a pandemic.

The chapter first investigates the welfare concerns of pets and homeless animals which arose due to the COVID-19 pandemic, with examples limited to India and Sri Lanka. These examples would be analyzed in the context of the existing legislative frameworks of the selected nations, i.e., the Prevention of Cruelty to Animals Act 1960 of India and the Prevention of Cruelty to Animals Ordinance of 1907 in Sri Lanka, which would be helpful to identify the gaps and ambiguities. In order to suggest the improvements which can be introduced to South Asia, the

chapter will refer to applicable legal provisions and other mechanisms from developed nations which can be used to inspire the South Asian nations. Accordingly, mitigation, preparedness, and responsive measures on safeguarding pets and homeless animals during a pandemic will be considered in recommendations.

Welfare Concerns of Pets and Homeless Animals During the COVID-19 Pandemic

This section discusses the pandemic-induced concerns which affected the welfare of pets and homeless animals in India and Sri Lanka, followed by analyzing the legal provisions and thereby attempting to identify the legal gaps and ambiguities. Prior to the discussion on specific issues and pertinent legal framework, it is necessary to consider the constitutional provisions which protect pets and homeless animals in the selected nations. The Fundamental Duties of the citizens of India enshrined in Article 51A (Part IV-A) of the Constitution of India provides that “It shall be the duty of every citizen in India: . . .(g) to protect and improve the natural environment including forests, lakes, rivers and wildlife, and to have compassion for living creatures . . .” (Constitution of India, 1950). Hence, it is the duty of every Indian citizen to ensure that any creature including pets and homeless animals is not subject to suffering and pain.

The landmark judgment given by the Supreme Court of India in the case of *Animal Welfare Board of India v. A. Nagaraja & Ors.* provides several significant interpretations on constitutional provisions which validate the safety of animals in India. The term “compassion for all living creatures” as per Article 51A of the Constitution was interpreted to include concern for suffering and well-being of animals. Furthermore, it declared that Fundamental Right in Article 21 on right to life includes the right to life of animals. Accordingly, any animal in India is guaranteed constitutional protection against any form of cruelty, suffering, and mistreatment which would affect its honor and dignity by any person under any circumstance. This interpretation is essential to determine that pets and homeless animals in India not only have a right to life but also to lead a life with honor and dignity.

However, the Constitution of Sri Lanka does not provide for such definite provisions on animal protection, and hence, it can be construed that the Constitution of Sri Lanka, the supreme legal entity of the nation, fails to establish animal protection within its provisions.

Next step is to investigate specific concerns which affected the welfare of pets and homeless animals in India and Sri Lanka during the pandemic, thereby amounting to actions of animal cruelty. Animal cruelty can be considered as purposeful actions or failure to act which causes pain and suffering for the pets or homeless animals (Hussain, 2021, para 2). This chapter considers three main methods of animal cruelty, namely, inflicting harm to animals, neglecting the duties toward animals, and abandoning animals. These were selected based on the availability of actual

incidents suffered by the pets and homeless animals during the pandemic in the context of India and Sri Lanka.

Inflicting Harm to Pets and Strays by Committing an Act

A person can inflict harm to a pet or a stray by kicking, burning, stabbing, beating, shooting, raping, etc. (Animal Welfare Institute, n.d., para 1). The tendency of inflicting harm to animals is considered as a well-established early indicator of future assault, serial killing, rape, and partner and child abuse (Futterman, 2021; Hodges, 2008). Research indicate that 25% of aggressive prisoners, 45% of school shooters, and 21% of serial killers had committed animal abuse and cruelty as children (Futterman, 2021). Therefore, inflicting harm to pets and strays cannot be taken lightly.

There were many incidents of pets and homeless animals being tortured in India during the pandemic. Experts have warned that animal abuse cases in India have increased at an alarming rate since April 2020 lockdown (Sood, 2021; Behl, 2020). Some of these incidents were reported, some were disregarded even though they were duly reported, and many were not even reported (Sood, 2021). In 2020, 886 cases were registered only from Mumbai on animal abuse, and in some days daily count spiked up to 8 cases (Sood, 2021).

A few instances include a female dog in Nagpur being stabbed on the forehead using a sharp object (Behl, 2020). There was also a dog whose eyes were brutally pulled out using a sharp object in Naik Nagar (Behl, 2020). There were several reports on raping and killing of female dogs (Sood, 2021). One accused even argued that female dogs did not object since he was feeding them, and hence it does not amount to a crime (OpIndia, 2021, para 9). There were also reports on torturing animals to increase the followers in social media (Singh, 2020a).

There are several contributory factors to the increase in such incidents in India. Police and welfare activists share the view that some people consider animal abuse as a sport which has intensified during the pandemic since people were stuck indoors with their pets or due to lack of people in roads and common spaces (Sood, 2021). Hence, it can be considered that pandemic lockdowns triggered such actions and the threat still prevails. The frustration of losing jobs and inflation are also considered as reasons for the alarming increase in animal abuse during 2021, compared to 2018 and 2019 (Sood, 2021; Behl, 2020). Welfare activists and experts also argue that lenient legal provisions, lack of public awareness, and insensitivity toward animals also caused animal abuse (Sood, 2021).

The existing legal framework on this regard in India is found in the Prevention of Cruelty to Animals Act 1960 (hereinafter PCA Act) which provides comprehensive guidelines to protect pets and homeless animals against infliction of any harm by any person. Section 2(a) of the Act defines an animal as any living creature other than a human being. This means any pet or homeless animal falls within the definition of an animal in the context of this Act.

Section 3 of PCA Act establishes a duty on every person who is in charge or care of animals to ensure the well-being and to prevent inflicting unnecessary pain or suffering on the animal. Accordingly, the owner or a custodian of a pet is entitled to care for an animal. Also, if any person has inflicted any harm to an animal by committing an act which is specified in section 11(1)(a) including beating, kicking, torturing, or any other act of causing unnecessary pain or suffering to the animal, it amounts to an offence of treating animals cruelly.

Hence, all the acts which were discussed in the aforementioned examples are crimes according to the PCA Act, which protects all pets and strays against any person including the owner and custodian. However, the fine which is specified for such an offence is a maximum of 100 Indian rupees or 3-month imprisonment. This clarifies as to the reason why people are not scared to inflict harm to animals and not hesitant to repeat crimes.

Furthermore, as per Sections 428 and 429 of the Indian Penal Code (hereinafter IPC), killing or maiming any animal is considered as a punishable offence. If the value of any animal is more than 50 rupees, the punishment includes a fine, 5-year imprisonment, or both. If the value is more than 10 rupees, then 2-year imprisonment, a fine, or both. Thereby, pets and homeless animals are protected by Sections 428 and 429 of the IPC.

Compared to India, hardly any incidents were reported on cruel treatment to pets or homeless animals in Sri Lanka. However, it does not completely mitigate the fact that none of the pets and homeless animals have suffered any abuse by frustrated people during the pandemic. Therefore, it is appropriate to consider the probability of such actions taking place in Sri Lanka and thereby take preventive actions. The applicable legal instrument is the Prevention of Cruelty to Animals Ordinance, No.13 of 1907 (hereinafter PCAO).

Sections 2(1)(a) and (b) of the PCAO state that any person who cruelly beats, ill-treats, abuses, or tortures any animal or does any act or omission which causes unnecessary pain or suffering to any animal is punishable with a fine of 100 rupees, 3-month imprisonment, or both. Killing any animal in an unnecessarily cruel manner is also prohibited by section 4 of the PCAO. However, the concern is that the Ordinance is not applicable to homeless animals in Sri Lanka, because as per section 14 the definition of an “animal” only includes domestic, captured, and animals in captivity. Therefore, homeless animals in Sri Lanka are not protected within any legislative framework against any cruelty.

Inflicting Harm to Pets and Strays by Omitting an Act

In this regard, omitting an act means during the pandemic a person has failed to provide food, water, shelter, medical care, and adequate exercises to the animals they are in charge of and thereby caused pain for pets and homeless animals. The instances of such infliction of harm were common in both India and Sri Lanka. When lockdown and travel restrictions were announced in countries, there was confusion regarding interstate distribution of animal food and accessing veterinary

care facilities (Tiwari, 2020). Furthermore, due to the fear of dogs contracting the virus, many owners avoided outdoor activities, which caused stress and hyperactivity in pets (Palisetty, 2021). If a pet dog is confined to a cage or a limited space, such an animal requires daily exercises and other physical activities, which were unavailable during the pandemic (Palisetty, 2021).

Also, owners and homeless dog feeders were struggling to provide food for the animals they care for due to staggering financial conditions (Prasad, 2021, para 1). The homeless animals were among the most affected during the pandemic because they were unable to find food and water (Tissaaratchy & Fernando, 2021; Rozais, 2020; Tiwari, 2020; Choudhary et al., 2020). There were also reports of negligent drivers who would drive at a higher speed due to lack of traffic and did not bother to help or call for help if an animal met with an accident (Rana, 2021). Hence, the sick and injured strays were left to die without medical treatment (Rana, 2021; Bhatnager, 2020). There were also incidents where individuals and Resident's Welfare Association (RWAs) in India had opposed feeding stray dogs and prevented pets from using common amenities in communities (Kadidal, 2020, para 3).

If any owner has deliberately or negligently allowed any pet or homeless animal to suffer by failing to provide sufficient food and water, shelter, and reasonable exercises, as per Sections 3 and 11(1)(f), (g), and (h) of the PCA Act of India, he has committed an offence and is liable for a fine of 100 rupees, 3-month imprisonment, or both. In Sri Lanka, such an offence is punishable under Sect. 2(1)(b) of the PCAO by failing to act and section 3 of the PCAO if any animal is found suffering due to starvation or any other ill-treatment. Applicable punishment is 100 rupees fine, 3-month imprisonment, or both. However, as it was already discussed, this provision in PCAO is only available for pets.

Abandoning of Pets

A major concern during the pandemic which was unanimously confronted by all nations is abandoning of pets (Wollaston, 2021; Davies, 2021; Prasad, 2021; Morris, 2021; Grunebaum, 2020). It is now observed that pets have been abandoned during the initial stages of the pandemic, as well as in the recent stages of the pandemic. Reports suggest that many pets were abandoned during the first and second waves of the pandemic due to the fear that they might be a vector of transmission (Das, 2021, para 6; Sharma, 2020).

Yet another reason for abandoning pets is loss of employment, which causes the owners to either give up their pets due to economic difficulties or return to their rural hometowns leaving the pets in the cities (Mavad, 2021; Singh, 2020b). There were also incidents when sick pets were abandoned when the owners could not get timely medical treatment (Das, 2021) and owners dying from the virus which left the pets alone and unattended of which only some were rescued (Mavad, 2021; Kalra, 2021).

Recent reports further indicate that people are abandoning pets that were adopted during the lockdown (Das, 2021). Pandemic pet adoption became a resolution to help people who were emotionally distressed due to lockdown restrictions and social

distancing (Das, 2021, para 1; Maneckshaw, 2020). This resulted in a rapid increase for pet adoption which was considered as a positive approach (Das, 2021, para 1; Maneckshaw, 2020). However, when the lockdown restrictions were slowly removed and people had to return to work, they opted to either return their pandemic pets to shelters or simply abandon them in the streets (Kalra, 2021). Some other reasons for abandoning pets include lack of knowledge on dietary and medical treatment, heavy expenses to care for pets, and lack of food items.

Abandoned family pets cannot survive in the streets because they do not have the skills to fend for themselves and often struggle due to unavailability of food, water, and medical care, navigating road traffic, conflicts with feral dogs, harassment from humans, etc. (Rozais, 2020). Furthermore, they undergo emotional trauma and anxiety due to separation from their owners (Rozais, 2020). In this process, if they try to seek out human company from strangers, people might use cruel methods to chase them, which might inflict injuries to the animals. Hence, many pets which were abandoned died of starvation, dehydration, fatal injuries, or illnesses (Rozais, 2020).

If abandoned pets are not rescued and somehow manage to survive in the streets, they become a part of the strays. It is reported that nearly 79.9 million homeless dogs and cats are found in India (The Economic Times, 2021). Increasing population of such homeless animals can intensify the spread of various diseases including rabies. The state is responsible for conducting animal birth control (hereinafter ABC) programs and vaccination programs against rabies which would require considerable resources. Many nongovernmental organizations also organize ABC and vaccination programs due to the rising number of homeless animals. However, most of such programs were temporarily stopped due to the pandemic further increasing the population of homeless animals (American pets alive, 2020).

Abandoning pets is forbidden by Sections 3 and 11(1)(i) of the PCA of India. Section 11(1)(i) states that no person can abandon any animal causing it to suffer by starvation or thirst without a reasonable cause. The penalty is the same as was mentioned in other sections. Homeless animals are further protected from killing, dislocation, or relocation as per Animal Birth Control (Dogs) Rules, 2001. Sections 428 and 429 of the IPC prescribe severe punishment to any person who dislocates, abducts, or commits an act of cruelty toward pets or community dogs (Sood, 2021). However, a survey revealed that among nine countries, India recorded the highest pet abandonment with a score of 2.4 out of 10 (Das, 2021).

In Sri Lanka, Section 7 of the PCAO prohibits any owner from abandoning any diseased or disabled animal in any street without reasonable excuse and imposes a fine of 100 rupees or 3-month imprisonment. The weakness of this provision is that it only protects sick or disabled pets to some extent and exposes healthy pets who were abandoned due to various reasons during the pandemic. This reaffirms the necessity of revising 115-year-old prevalent laws in Sri Lanka with timely provisions and reasonable penalties.

After the comprehensive discussion on the specific circumstances which caused pain and suffering to pets and homeless animals in India and Sri Lanka during the pandemic, the causes which instigated such incidents and the scope of legal protection granted to such animals, it is necessary to investigate what recommendations can be introduced to ensure humane treatment and proper care toward such animals.

Recommendations

The recommendations are discussed in three categories, namely, mitigation, preparedness, and response steps with appropriate suggestions from developed nations. It was also observed that India had executed several significant measures to safeguard pets and strays during COVID-19 pandemic. These will also be considered as appropriate suggestions for other South Asian countries given the common economic, political, and social grounds.

Mitigation Steps to Protect Pets and Homeless Animals During a Pandemic

In disaster management, mitigation is the process which reduces or eliminates the impacts of a disaster on people and property (Newbedford, n.d.). In relation to this study, it stands for eliminating and reducing the risks encountered by pets and homeless animals by people due to pandemic-induced reasons. The most appropriate method which can eliminate and reduce such risks to any animal including the pets and homeless animals is implementing strong and timely animal protection and welfare legislation.

Constitutionalizing animals is the highest level of protection that can be granted to any animal in a country against any cruelty by any person (Eisen, 2018). Constitutional protection for animals mandates all government authorities to ensure that animal welfare is duly recognized within the national legal and value systems and empowers further political, institutional, and legislative developments (Bolliger, 2007). Furthermore, it guarantees that other basic rights and privileges of a person including the freedom to follow a religion, choose a profession, and engage in scientific and artistic endeavors do not have priority over suffering of animals (Bolliger, 2007).

Several developed nations including Switzerland, Germany, Luxembourg, and Austria have enacted constitutional provisions to protect the interests of animals (Eisen, 2018). India is the only nation in South Asia which has duly secured animal protection in the Constitution. If a multiethnic, multireligious, and diverse nation such as India can safeguard animals in the constitution, other South Asian nations which have not enshrined animal protection in their respective constitutions must also be encouraged to give due recognition to animals in the constitution.

Uplifting national legislative protection for animals is also essential. It was clearly evident that punishments specified in both PCA in India and PCAO in Sri Lanka are not adequate. The proposed Animal Welfare Act in Sri Lanka provides penalties of a fine of 25,000 rupees and a 2-year imprisonment for any act which can cause unnecessary pain to an animal (Animal Welfare Bill, 2022, Sec. 3(2)). This is a significant development compared to the prevalent provisions in the PCAO.

Similarly, all South Asian nations must ensure that their national legislative framework to protect animals including pets and homeless animals are duly updated to address any form of cruelty which can cause unnecessary pain and suffering to any animals. Furthermore, they must prescribe reasonable penalties which can instigate fear in the minds of people who are likely to cause harm to animals and prevent them from repeating such acts.

Duly enforcing prevalent laws is also important in mitigation, which can be carried out by personnel who are well-trained and competent in identifying animal cruelties and taking necessary actions to prevent such cruelties. The officers in police stations must be encouraged to duly report and carry out investigations when complaints on animal cruelties are made by citizens (Sood, 2021). There are instances in South Asian nations where police officers disregard animal cruelties stating that there are no adequate laws to take actions, and they cannot protect animals when they are occupied with other work. Therefore, it is important to organize workshops, training programs, and conferences which can educate all state personnel who are empowered to take actions against the people who hurt animals.

Yet another group which requires education on the legal provisions concerning animal protection is the general public. Even though there is adequate protection and stringent penalties, if the public is not aware of the law, then there is no guarantee that people will fulfil their responsibilities as compassionate human beings during a frustrating time period. It is a common observation in South Asia that people specially living in rural areas do not know that their certain actions or ignorance can amount to an offence punishable in law. Therefore, mass media platforms such as television, radio, newspaper, social media, etc. can be used to educate the general public, and sufficient funding must be allocated to such awareness programs.

It is also essential to appoint a group of dedicated animal welfare policy advisors to collect data and feedback, analyze emergency situations, conduct research, execute proper action plans and law, and make appropriate recommendations during the times of disasters including an ongoing pandemic (Department of Primary Industries and Regional development, 2018). Since the COVID-19 pandemic was an unforeseen emergency, private organizations and individuals took undue advantage of the panic and fear among people which often caused despair to pets and homeless animals (Mason, 2021; Woodyard, 2020). The expert policy advisors can prevent such situations and take precautions to address them. These are some of the steps that can be useful to mitigate causing harm to pets and homeless animals during the pandemic.

Preparedness to Protect Pets and Homeless Animals During a Pandemic

Disaster preparedness includes a set of actions commenced primarily by governments, authorities, organizations, communities, or individuals to better respond and cope with the immediate aftermath of a disaster (European Commission, [n.d.](#)). The main objective of initiating such preparation methods is to minimize loss of lives, in this instance the lives of pets and homeless animals. Hence, this relates to providing adequate food, medical care, shelter, and other essentials to pets and homeless animals which are required to maintain their physical and mental well-being during the pandemic.

Lack of pet food supplies was also identified as a cause of pet abandoning and starvation of homeless animals, and nations sought different solutions. For instance, in India the Ministry of Home Affairs declared pet food as an “essential item” and exempted interstate supply chains of animal feed and fodder from lockdown (Tiwari, [2020](#)). In the UK the pet owners were encouraged to maintain hygiene and healthy diets and engage in socially distanced exercises and indoor activities to the pets (Bakir, [2020](#)). In Turkey, the interior ministry ordered all local councils to provide food and water to all other places where animals are found (Karlidag, [2020](#)). Some organizations established food banks which helped pet owners to get free pet food (Four Paws International, [2020b](#)). Other nations can also be inspired to follow such methods and ensure that lack of pet food will not be a hindrance during the pandemic.

Creating animal welfare charities is yet another method which can assist in providing monetary aid to pet owners facing economic difficulties and animal welfare charitable organizations struggling with lack of donations. In the UK, animal charities started a petition to request the government to include animal charities in emergency funding, and accordingly, many welfare charities were able to take advantage of the Coronavirus Job Retention Scheme (Petitions, [2020](#)). The government also took the initiatives to raise funds and launched several emergency grant schemes (Petitions, [2020](#)).

Not restricting pet travel during the pandemic is also essential, and several preparedness steps can be considered in this regard. Creating transport methods for owners to carry their pets, establishing emergency transport methods for sick pets or homeless animals, providing special permits across state borders for owners to get medical treatment for their pets, and arranging mobile pet care and veterinary services are some of the recommendations (Animal Emergency & Referral Center of Minnesota, [n.d.](#)). It is recommended that necessary permits and licenses are prepared for such situations. Instead of onsite veterinary care, in the USA and France, veterinarians were allowed to practice telemedicine (MSD Animal Health, [n.d.](#)). Furthermore, US veterinarians received regular guidance from organizations such as the American Veterinary Medical Association on how to operate during a

crisis (Vincent et al., 2020). These initiatives could be useful to South Asian nations given the safety precautions, health guidelines, and resource limitations.

The government can also establish state transport services for animals or duly regulate private companies who would engage in pet transport services. It is mandatory that they are duly registered companies with trained staff to handle animals who would be stressed due to separation anxiety from owners or bad health (Mason, 2021). It was also observed that many airlines either restricted or charged unusually high charges for pet flights during the pandemic causing pet owners to abandon their pets (Mason, 2021; Woodyard, 2020). Hence, it is necessary to pre-plan how the charges will be regulated in all pet transport facilities which is the responsibility of the government.

In some countries the owners were encouraged to prepare a pet action plan, which would be helpful in caring for the pet if the owner becomes sick or hospitalized or passes away (Chaves, 2020; SPCA, n.d.). The pet action plan would include a person to take care of the pet in an emergency, provide adequate food stock, vaccine records, special care or medical necessities, and the pet would be collared with an ID tag (Chaves, 2020). This would be helpful in rescue operations and save resources and time. The veterinary officers and media campaigns can promote such initiatives in South Asian nations.

Despite mitigating and preparedness efforts, there is the possibility that people would tend to mistreat animals. Therefore, having fully equipped animal shelters to house abandoned animals and continuing animal birth control and vaccination programs also amount to preparedness steps. Due to lack of funding, shelters faced difficulties in finding manpower to carry out day-to-day chores. In such situations, they can encourage people to volunteer in shelters while adhering to safety protocols, and such volunteers can be provided with necessary travel permits during lockdowns. However, precautions must be taken to ensure that such permits would not be misused.

The shelters should not only prepare to house the abandoned animals but also ensure that adopted animals will not be returned. For this purpose, pandemic preparedness plans were initiated in France which encouraged the shelters to take all steps to inform the responsibility that lies with adopting or fostering a pet (Lerat et al., 2021). Similarly, dog breeders and sellers must ensure that they inform all the necessary care needed for the animals they sell, so that the owners can respond to emergency situations and challenges of raising a pet during an ongoing pandemic.

These preparedness steps show that the government, state and non-state organizations, and individuals are equally responsible in taking necessary steps to protect pets and homeless animals during a pandemic. However, it is difficult to enforce major decisions and carry out such comprehensive rescue and protection operations when animal welfare is categorized with another Ministry, as the general practice followed in South Asian nations. Therefore, the existing governments must pay attention to form a separate ministry for animal welfare which only specializes in decision-making relating to animal welfare and protection.

Response Steps to Protect Pets and Homeless Animals During a Pandemic

Response in disaster management is the assistance and intervention steps taken during or immediately after an emergency and focuses on saving lives and protecting community assets usually measured in hours, days, or weeks (Resilient Community Organisations, n.d.). In this instance, response steps amount to those actions which can be taken immediately to address certain concerns which would threaten the well-being of pets and homeless animals during the pandemic.

One of the immediate aftermaths which harmed pets and homeless animals is pandemic-induced stress and frustration among the owners, custodians, and other people. This can be avoided by organizing online counselling sessions to help pet owners and other people to manage stress and frustration and not to engage in any activities that might cause harm to animals. Furthermore, mass media can also be a helpful medium to reach and promote public awareness on the necessity of caring for animals who depend on people (Hooper et al., 2021).

It is important to navigate such media campaigns to promote accurate information that would help animals during the pandemic. Posters, posts, and advertisements can be circulated in social media and communities (Onlinefirstaid.com, 2020). Other than creating awareness, mass media can be a platform where experts and influential personnel can encourage people to care for animals without neglecting their duties. For instance, in the UK several charities and experts joined forces to offer advice and guidance and correct conflicting and misleading information during the pandemic (Onlinefirstaid.com, 2020). Such activities can be helpful and easily adopted in South Asian nations.

Yet another significant response step which was highly beneficial for the homeless dogs in India was the New Delhi High Court judgment in the case of *Dr. Maya D. Chablani v. Radha Mittal and Others* which declared that stray dogs have the right to food and the citizens have the right to feed while ensuring that such feeding does not cause nuisance or harassment. This allowed individual and welfare organizations to feed homeless dogs during pandemic restrictions and help the animals to survive. Such landmark judgments can influence other nations on the importance and extent to which animals can be protected.

In response to the pandemic, the government of India ensured that veterinary services continue during the pandemic, and hence they were declared as essential services (Dhingra, 2020). In the state of Minnesota, US veterinary clinics were categorized as “essential businesses” provided that services should be given to urgent and emergency cases (Animal Emergency & Referral Center of Minnesota, n.d.). It was already discussed how animal feed and fodder were also categorized as “essential items” which also amounts to a response step.

It is also necessary to encourage people to report any circumstances of mistreating, neglecting, and causing domestic violence on pets and homeless animals (Four Paws International, 2020a). Since pets and homeless animals are among the most vulnerable animals during the pandemic, the people must safeguard such animals and be empathetic toward their pain and suffering. The animals are unable

to communicate the mistreatments they face, and hence people can be alert to the sudden changes in the behaviors of animals in their vicinity. These are some of the recommendations which can protect pets and homeless animals during the pandemic.

Conclusion

It is evident that pets and homeless animals were subject to immense pain and suffering during the COVID-19 pandemic despite having a substantial scope of legal protection to them. Even though this study did not refer to examples from other South Asian nations, they also faced similar situations. Mahatma Gandhi has stated that “the GREATNESS of a nation can be judged by the way its animals are treated” (Richards, 2014). The COVID-19 pandemic shows the need of treating all living beings with care and kindness, and instilling compassion toward pets and homeless animals can be the starting point for treating all animals with empathy. Hence, it is necessary that South Asian nations implement adequate legal, policy-related, and other measures to safeguard pets and homeless animals during pandemics. However, given the developing status of South Asian nations, it would be a challenge to find necessary resources to facilitate the recommendations. The beginning of this process may seem rather multifaceted, but the long-term outcomes would prove to be beneficial specially, considering the vulnerability of the region for future pandemics and other disasters.

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Public Sector Continuity Planning: Preparing the Bureaucracy in the Age of the New Normal

10

Ebinez R. Florano

Contents

Introduction: The Challenges to Governments in the “Age of the New Normal”	126
Bureaucracy for Emergencies	127
Rigidity in Bureaucracy: The Limitations of the Bureaucratic Model During Disasters/Emergencies	127
Public Service Continuity Planning: Helping the Government Provide Continuous Services in Disaster/Emergency Situations	129
Public Service Continuity in the Eye of the Storm	130
The Case of the Eastern Visayas Regional Medical Centre ⁴	132
Institutionalizing Public Service Continuity Planning in the Philippines	136
Conclusions	137
References	137

Abstract

This chapter is both a theoretical and empirical discourse on the responsiveness of the bureaucratic norms of governmental response systems in the aftermath of disasters. It starts by discussing the contemporary context, i.e., the “Age of the New Normal” where unexpected catastrophic disasters increase in frequency and become more intensified, also seen to become an everyday staple of life that mankind must learn to deal with. It then argues that to become responsive and be able to restore normalcy immediately after a disaster has struck, bureaucracies must innovate. The challenge becomes complicated, however, when the bureaucracy itself becomes a victim. The chapter summarizes existing knowledge based on current literature on the challenges and problems that the “Age of the New Normal” pose to Public Administration and how the latter respond to them. Second, it discusses how the bureaucracy, idealized by Weber, serves either as facilitating or hindering factor during disaster/crisis situations. Empirical

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evidence is provided by showcasing four government agencies that prepared for the onslaught of Super Typhoon Yolanda/Haiyan on November 8, 2013, in Tacloban City, Philippines. Lastly, the chapter presents public service continuity planning as a tool that government agencies could use to provide continuous service in the aftermath of disasters.

Keywords

Continuity planning · Public service · New normal · Disaster recovery

Introduction: The Challenges to Governments in the “Age of the New Normal”

“The abnormal is now the new normal,” is how UN Secretary-General Ban Ki-moon ([2012](#)) sums up the global situation nowadays.

The *IPCC Special Report* warns that climate and weather extremes are getting more frequent and powerful in the twenty-first century even though only 0.5 °C increase in temperature had been detected in the past decades since 1950 (IPCC, [2018](#), 6). Thus, the “New Normal” is about “unexpected” frequencies and intensity of hazards. According to the same report, “the worst is yet to come” (IPCC, [2018](#)). Referring to the case of the totally unexpected power of Super Typhoon Yolanda/Haiyan (for brevity, this chapter uses “Yolanda”) which struck the Philippines on November 8, 2013, experts warned that people have the tendency to relax in the face of unprecedented disasters because they rely on historical experiences of past disasters, which, luckily for them, they survived ([Myrén, 2015](#)). However, such complacency, in itself, may aggravate the disaster. This happened to the people in the affected areas of Yolanda, who did not know the meaning of “storm surge” and stayed in their houses believing that just as they survived the past storms, they would just breeze through it. As history tells us, around 7,000 in the Visayas Region died, the worst in the region’s history.

The challenge nowadays to Public Administration in general, and the bureaucracy in particular, is to deal with the unexpected challenges of the “Age of the New Normal,” i.e., disasters brought by climate change. The challenge is formidable because the bureaucracy – the offices and the people that manned them – are just as vulnerable to hazards as mankind. It behooves us to ask: Are bureaucracies, as idealized in the Weberian model, responsive to the challenges of the “New Normal”? What are its strengths and weaknesses? What mechanisms can be instituted to “prepare” for these challenges?

To answer these questions, this article briefly reviews literature on how the challenges of the “Age of the New Normal” affect the bureaucracy. Second, it dissects the strengths and weaknesses of the Weberian model of bureaucracy in the face of disasters. A full case study on a government hospital is presented in the third part. The hospital was chosen for a fuller discussion because, paradoxically, even

though it was given a national award in 2013 as one of the best government agencies in disaster response, it fell victim to the super typhoon in spite of all of its preparations and years of experience in disaster/emergency situations. Lastly, the chapter briefly presents the “Public Sector Continuity Planning” of the Philippine government in response to the need to prepare its bureaucracy to survive disaster after disaster so that it could recover immediately and render post-disaster services to victims.

Bureaucracy for Emergencies

Rigidity in Bureaucracy: The Limitations of the Bureaucratic Model During Disasters/Emergencies

In times of disasters, governments respond through what is sometimes pejoratively called “bureaucracy.” Max Weber’s ideal-type of bureaucracy is the model which most of the countries in the modern time have adopted. To Weber and other authors, the bureaucracy is “a general way of organizing human activity so that complex tasks can be carried out in a coordinated, routine, and efficient manner” (Schneider, 2011, 47). The five most common characteristics of it are: (1) clearly defined objectives, (2) a division of labor, (3) a formal structure underlying the process and tying together the various component organizations, (4) a set of policies and procedures guiding organizational activity, and (5) specialized training, expertise, and experience (Schneider, 2011, 47). These constitute what is known as “bureaucratic norms.” These bureaucratic norms work best in stable conditions. The bureaucracy will function as long as these are followed. However, Schneider argues that these norms will have to contend with “emergent norms” which come out during disaster periods. They are norms that structure human behavior among the affected population that enable them to cope with the chaos brought by disasters (Schneider, 2011, 60). Its four basic components are: (1) milling, (2) rumor circulation, (3) keynoting, and (4) emergent norms. During disasters, people go to safe places to “mill” around with fellow survivors to search for meaning and appropriate standards of behavior. Rumors, then, begin to circulate which could be malicious accounts of ongoing situations. Those ideas and features that are repeated, while others are discarded, are said to be the keynotes, which transform into emergent norms once they dominate discussions and adopted as new set of behavior (Schneider, 2011, 55–57).

Gaps between the bureaucratic norms and emergent norms develop when there is a difference between governmental plans and the needs of affected population or disaster victims. The rigid, impartial, hierarchical, and rule-bound bureaucracy may not be able to respond to their needs. First, the goals and objectives of the bureaucracy are defined by laws, policies, and procedures imposed by the government. Any deviation from them to meet victims’ expectations will be treated as unlawful

actions, e.g., emergency purchases that violate the procurement law. Second, in times of emergency, government offices are not flexible enough to attend to people's needs. The division of labor among agencies have to be respected and their expertise has to be trusted to avoid duplication of services and wastage of government resources. Third, the organizational hierarchy, from top to bottom, has to be observed in authorizing actions and implementing them. In times of emergencies, this could spell a difference in evacuating residents or letting them become potential disaster victims.

The gaps may continue to widen because of five factors. These are: (1) magnitude of the disaster, (2) degree of administrative preparedness, (3) level of communication and coordination, (4) goals of governmental response system, and (5) prevailing orientation and behavior patterns of the affected populations (Schneider, 2011, 61). The bigger the catastrophe, the more the government may not be able to meet victims' expectations for speedy rescue, relief, recovery, and rehabilitation. The disaster preparedness of the government, guided by sets of procedures and protocols, may either not be followed during emergency situations or may not be congruent with the needs of the victims. Owing to the rigid hierarchies of government agencies, failure in communication and coordination is inevitable. Thus, government officials and employees may not be able to receive information and instructions both from the top and the bottom of the hierarchy. The changing or shifting goals of governmental response systems may obscure effective disaster response. If burdened with so many tasks through time, e.g., adding non-essential or unrelated tasks, disaster management agencies may find it difficult to pinpoint their objectives and priorities in times of disaster. Finally, the community or society's values, culture, or thinking may either support government's disaster management activities if the former is closely-knitted or make things complicated if people are uncooperative (Schneider, 2011, 61–67).

Other literature supports the contentions of Schneider. Learning from the dismal Hurricane Katrina post-disaster management, Takeda and Helms (2006) enumerate three failures of the bureaucratic approach towards disaster management. These are: (1) decentralized knowledge and centralized decision making, (2) ignoring outside information, and (3) commitment to failing courses of action. According to the authors, the sharing of codified knowledge built within an organization whose staff became "experts" in their own right takes some time to be passed to frontline local governments. Moreover, actions which require approval from the central office of a hierarchical organization cause delay in disaster response. And, due to the inbreeding of knowledge within agencies, there is a tendency among personnel to ignore relevant outside information, which is defined as "as any information, individual or activity which is not currently part of a system, but relevant to the task(s) faced by the system" (Takeda & Helms, 2006). This usually happens when scientific data contrary to those the government agency generated challenge those of the latter. Instead of reconciling, government agencies might defensively refute alternative data without assessing its validity. The result may be that the agencies fail to take appropriate actions, to the detriment of disaster victims.

Public Service Continuity Planning: Helping the Government Provide Continuous Services in Disaster/Emergency Situations

Disaster planning has been largely adapted and widely practiced for a long period of time. Whether there are natural, technological, contextual, or human-induced hazards (Wasley, 2013) that pose risks to the social, economic, and natural capital of a community, region, or country (Wasley, 2013), disaster planners have come up with counter measures to mitigate their effects. They have created emergency, preparedness, recovery and rehabilitation plans in the pre- and post-conditions of governments, business enterprises, communities, and other social entities. It is only in recent years that they have popularized continuity planning in the public and private sector, following the September 11 terrorist attack (Savage, 2002; Schneider, 2011) and other real-world events that increase the awareness to prepare and take action (FEMA, 2011).

The U.S. Department of Homeland Security describes continuity planning as “simply the good business practice of ensuring the execution of essential functions through all circumstances, and [it is] a fundamental responsibility of public and private entities responsible to their stakeholders,” (USHSC, 2007). In the context of business operations, continuity planning serves as a proactive measure to ensure that critical products and/or services are delivered during a disruption. These products and/or services must be rendered for the survival of the business enterprise, prevention of injury, and meeting of legal and other. On the other hand, continuity planning in the context of public service is a political safeguard to ensure an uninterrupted succession of the constitutional form of government in the face of any hazard that could pose threats to its constituents. It is integrated into the daily operations, functions, plans, and mission areas of government departments and agencies, and simultaneously occurs with the development of their programs (USHSC, 2007).

In the wake of the disastrous events that struck the USA, President George W. Bush’s administration pushed for extensive policies to counter terrorism and enhance national preparedness for disasters. In 2007, they issued a National Continuity Policy (NCP), which is an updated, integrated public continuity plan that aims to maintain a comprehensive and effective continuity capability for the preservation of their government and continuing performance of their functions broken down as follows: Mission Essential Functions (MEFs), Primary Mission Essential Functions (PMEFs), and National Essential Functions (NEFs). The MEFs are the government functions that must be continued after a disruption of normal activities in the department and agency-level. The PMEFs, on the other hand, are the specific MEFs that support the NEFs before, during and after a disruption. They must be continuously performed or must be restored within 12 hours after an emergency, and maintained for up to 30 days or until normal operations are resumed. Lastly, the NEFs are the overarching responsibilities of the Federal Government to lead and sustain the nation in the aftermath of an emergency (USHSC, 2007).

The four key pillars of continuity are leadership, staff, communications and facilities (see Fig. 1). All these components are significant during day-to-day operations but become critical in times of crisis (USHSC, 2007).

Fig. 1 The continuity policy framework. (Source: USHSC, 2007)



Leadership refers to the senior decision-makers that are in command of an organization (e.g., President, Cabinet Secretary, Governor, Chief Executive Officer, or manager). As supervisors to the continuity of operations, they are given physical protection (e.g., sheltering in a secured place or relocation away from the threat) in the imminence of danger. A prioritized list of designated successors is also accomplished in advance to ensure the survival of leadership. The successor serves as the “person to act for and exercise the powers of the principal in the event of death, incapacity, or resignation” (USHSC, 2007).

Staff are the “personnel that provide [the] leadership advice, recommendations and [the] functional support necessary to continue essential operations” (USHSC, 2007). Like the leaders, they are also cross and vertically trained to continually perform their duties with their peers and with the person above and below in times of disruption.

Communications refer to the “voice, video and data capabilities that enable leadership and staff to conduct their essential functions” (USHSC, 2007). It must be durable and reliable substantially in times of crisis. It must also be interoperable so that public and private organizations are linked, and can receive and transmit important information.

Facilities are the locations where leaders and staff perform their essential functions. There must be a designated facility intended for daily operations and alternate facilities for relocation. They must be sturdy and resilient, and must provide protection for the continuity operations. The leaders and staff may physically work in one facility or distribute in various sites (USHSC, 2007).

Public Service Continuity in the Eye of the Storm

When Super Typhoon Yolanda, one of the strongest typhoons ever recorded in the Philippines with its wind speed up to 300 km/h, made its landfall on November 8, 9 out of the 17 administrative regions in the Philippines were affected by its strong

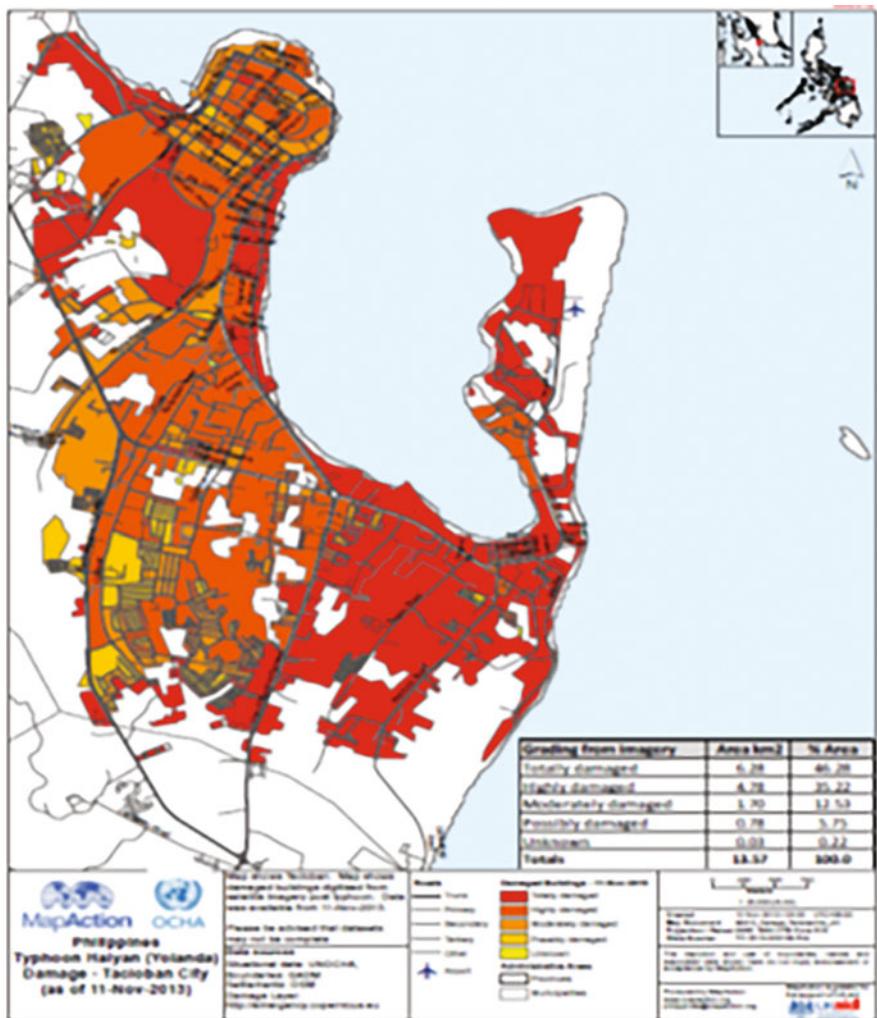


Fig. 2 Areas in Tacloban City affected by the storm surge. (Source: UN-OCHA, 2014)

winds and the storm surge that came with it. This includes Tacloban City, which is considered as the regional hub of the Central Visayas region. The province's eastern part was heavily damaged by the storm surge, which rose up to 6 m high (see Fig. 2). The fatalities were estimated at 7,000 and the number of missing persons at 1800. Moreover, the number of damaged houses reached up to 28,734. Out of this number, 90% were along the coastline. Partially-damaged houses totaled to 17,643. Major damages were also sustained by all of Tacloban's seven hospitals and clinics.

The Case of the Eastern Visayas Regional Medical Centre⁴

Background

One of the hospitals which was heavily damaged was the Eastern Visayas Regional Medical Centre (EVRMC). EVRMC is a regional, tertiary, teaching-training health care facility established in 1966 with 275 bed capacity. In 2013, it had 389 health manpower complement consisting mainly of doctors (27%) and nurses (40%). It is an “apex” hospital or the “end-referral” hospital where all the lower health facilities, patient transport services and volunteer emergency responders bring their patients for definitive management, especially patients during emergencies and disasters.

EVRMC has proven that it is capable of living up to its functions in times of disasters. Prior to the November 2013 disaster, the hospital responded to 12 emergency/disaster-related cases, ranging from man-made (fire, collision, car falling off from cliff or to canal, landslide, flooding, typhoid fever outbreak, search and rescue mission) to natural disasters (earthquake and typhoons).

For outstanding medical contributions to emergency/disaster responses in other areas, EVRMC was awarded on October 25, 2013 by the Office of the Civil Defense (OCD) the 2013 *Gawad Kalasag* (Shield) National Award: Best Hospital (Regional and Training Hospital Category). It was barely a month before the super typhoon brought the hospital down.

Preparations

Having been accustomed to disasters, EVRMC took immediate actions as early as November 6 in anticipation of the visit of the super typhoon. The chief of hospital raised the “Code White” alert (the first level among the 3-level Code Alert System) through the issuance of Hospital Memorandum (HM) No. 189, s. 2013, which instructed the following personnel to be present and man their stations during the entire duration of the latter:

Senior house officer	Nurse supervisor residents on duty –
Residents on duty –	
Orthopedic	Operating room staff and personnel
Internal medicine	Institutional workers
Family medicine	Radiologic technologies.
Ob-Gyn	Pharmacist
Surgery	Medical technologist
Eyes, ear, nose, throat	Admitting unit
Psychiatry	Ambulance driver
On-scene response team (EMTs) – Composed of 14 doctors and staff	Maintenance crew
	Security guards

In addition, all concerned departments/sections/units were instructed to prepare in accordance with the alert level, and send flash report of any untoward incidents to the operations center of the hospital.

On November 7, 2013, the chief of hospital issued HM No. 192, s. 2013 suspending work starting the afternoon of that day until the next day when the super typhoon has made landfall in Tacloban City. However, the following units

were requested to keep skeletal forces during the entire duration of the typhoon visit: admitting, pharmacy, billing and PHC claims unit, cash section, laboratory, radiology, and facility and maintenance.

The staff of the Clinical Department was ordered to maintain its working force in support of the “Code White” alert or higher level codes. On the day of the visit of the super typhoon, the hospital had a total ward census of 331, and around 66 personnel on duty.

Loss and Damage

However, in spite of all the preparations and its experiences in responding to disasters, the hospital became one of the victims of the super typhoon. After the wrath subsided, 5–90% of the hospital’s buildings/infrastructure were damaged. Its desalination plant and water treatment plant suffered the most. Except for three places, all of the offices got flooded and their equipment were either partially or completely destroyed (refer to Table 1).

Table 1 Damage sustained by various EVRMC structures

Building/Infrastructure	% Damage	Flooded	Equipment damage
Desalination plant	90%	Yes	100%
Waste water treatment plant	80%	Yes	100%
Tropical & Infectious Diseases Building	30%	Yes	100%
SARS (severe acute respiratory syndrome) building	50%	Yes	100%
SAO & CN quarters (housing the offices of the supervising administrative officer and chief nurse)	30%	Yes	100%
Chief of hospital quarters	30%	Yes	100%
Supply office	25%	Yes	100%
Laundry & Linen Building	40%	Yes	50%
Engineering & Maintenance	15%	Yes	50%
Powerhouse & Generator	15%	Yes	100%
Morgue	50%	Yes	NA
Incinerator	50%	Yes	NA
Dietary	10%	Yes	None
Out-patient department	90%	Yes	Yes
Administration building, including Pharmacy & Emergency Complex	10%		Partial
Main building (patients’ wards)			
Internal medicine Ward/intensive care unit	15%	Yes	Partial
Internal medicine Ward/Ob-Gyn Ward	10%	Yes	Partial
Pediatrics/Ob-Gyn Ward	50%	Yes	Partial
Operating room complex/labor room/delivery room	25%	Yes	Yes
Laboratory	5%	Yes	Yes
Philippine health insurance corporation I/orthopedic	50%	Yes	Yes
Philippine health insurance corporation II/general surgery	15%	Yes	Yes

Source: Ruetas (2014)

Table 2 Inventory of EVRMC staff after the Typhoon

Service	Number of staff	Reported alive	Dead	Did not report
Medical	93	59	0	34
Nursing	120	66	1	53
Administrative	93	53	1	39
Ancillary	37	21	0	16
STD (sexually transmitted disease) unit	13	6	0	7
Casuals	4	2	0	2
RN heals (registered nurses for health enhancement and local service)	169	78	1	91
Job orders	135	76	0	59
Security guards	15	14	1	0
Total	664	361	4	301

Source: Ruetas ([2014](#))

The hospital's personnel were also hit hard by the super typhoon. When an unnumbered Hospital Memo was issued on November 20 requesting all personnel to report to duty starting November 25, many failed to show up. Out of the 680 staff, 44% or 301 of them were not able to immediately report. Unfortunately, two medical staff and two administrative personnel (1%) died during the typhoon's onslaught. Luckily, 375 personnel (or 54%) went back to duty immediately (see Table 2). Those who reported struggled to do their jobs in spite of the damages sustained by the hospital and its equipment, the shortage of medical supplies, and the bleak conditions in the city.

Recovery Efforts

In spite of the damages it sustained and loss of lives of its personnel, the hospital continued to provide its services as a critical community facility during and after the visit of the super typhoon. In fact, EVRMC was the last hospital standing in the aftermath of the disaster despite the depleted manpower and logistics (Ruetas, [2015](#)). The table below shows the dedication of its staff to its oath to serve people in dire need of medical assistance even in times of disasters. From 7 to 22 of November, on the average, the hospital admitted 42 patients, adding to its in-patients averaging 220 each day. As quickly as it admitted patients, the hospital discharged 47 on the average each day. Unfortunately, among those admitted during the said period, 49 of them died (see Table 3).

EVRMC was assisted by many to continuously give medical services immediately after the disaster, and to recover immediately from the devastation. These include local governments, local hospitals, national government agencies, UN organizations, local and international private corporations/foundations and foreign countries (Ruetas, [2015](#)).

Continuity Planning for the Future

In reflection, the hospital learned that even though it was a national awardee on disaster response that very same year and had lots of experience in responding to disasters in other provinces, it lacked plans, effective communication system,

Table 3 Hospital census, November 7–22, 2013

Date	Admissions	Discharges	Mortality	In-patients
Nov. 7	56	64	5	331
Nov. 8	29	3	1	346
Nov. 9	28	30	4	340
Nov. 10	51	54	3	334
Nov. 11	46	62	6	312
Nov. 12	52	77	2	285
Nov. 13	37	75	0	247
Nov. 14	40	106	3	168
Nov. 15	45	58	4	154
Nov. 16	29	34	3	146
Nov. 17	25	4	4	135
Nov. 18	35	25	1	125
Nov. 19	55	30	0	131
Nov. 20	47	47	3	169
Nov. 21	49	40	3	164
Nov. 22	46	48	3	144
Total	664	757	49	N/A

Source: Ruetas ([2014](#))

transportation system and units, logistics, and lifelines. Moreover, it realized the problem of their staff as victim-responders, i.e., they are also susceptible to the hazards, hence, may not be able to report immediately to the hospital to perform their duties. To address these gaps, EVRMC drafted its *Hospital Emergency Preparedness, Response, and Recovery Plan (HEPRRP) 2014–2015: Contingency Plan, Business Continuity Plan* in 2014. The manual “defines the direction of the hospital in preparing for effective and efficient response and recovery in any event of emergency or disaster within its facilities and/or its catchment area” (EVRMC, [2014](#)). The over-all goal of the new systems put in place is to decrease mortality and morbidity in times of disasters. Four plans have been drawn up in details. These are the:

- **Preparedness Plans** – contain strategies and activities that the hospital shall carry out, all geared toward the building and enhancing of the hospital capacity to address all types of emergencies and on disasters.
- **Response Plans** – include the established strategies and activities defining the utilization of the hospital resources for an effective and efficient response during emergencies and or disasters. This includes specific policies, protocols, guidelines and procedures pertaining to various emergency management systems for a more efficient and calculated response.
- **Hospital Recovery or Rehabilitation Plans** – include any and all strategies and activities which will bring back the hospital to its status quo condition antecedent to the occurrence of the emergency and/or calamity in order to prepare the same for any other forthcoming eventuality.

- **Contingency Plans** – systems and standard operating procedures in establishing and sustaining surge capacity of the hospital. Its objective is to maintain continuous hospital operation during disaster.
- **Business Continuity Plan** – includes systems and standard operating procedures on how to continue critical functions of the hospital without interruptions. It contains logistical plans with strategies, mechanisms, arrangements, systems and procedures on how to continue operations. Includes support to operation in terms of resources such as manpower, logistics, finances, information, lifelines and accommodation, among others.

Systems and procedures were also drawn up for to verify reports of impending hazards/disasters, management of victims in the “tent emergency room,” standard operating procedures on the conversion of the hospital’s parking lot into triage, collection and treatment area, and mechanism for the activation of the plan for external disasters.

The hospital created its EVRM Planning Committee with the Chief of the Medical Centre, as the chairman (alternative is the HEMS Coordinator) with members composed of the heads of the various clinical departments or their representatives, i.e., the administrative officer, the chief nurse, the security officer, head of the maintenance division or their representatives.

Analysis: The case study above has shown that EVRMC’s bureaucracy is well-experienced in dealing with emergency situations. However, its high level of preparedness, and long years of experience in dealing with emergency situations, as fully narrated above, were of no match to the power of the super typhoon. Still, it persevered to serve the people of the Eastern Visayas region even though the hospital itself was handicapped by the damage to its building, equipment, and facilities, and casualties and injuries to its personnel. It lived up to expectations when it continued its operations during and immediately the disaster has struck.

Institutionalizing Public Service Continuity Planning in the Philippines

On 10 April 2018, the NDRMC, through its Memorandum No. 33, s. 2018, called on all government member-agencies of the council at all levels and other government departments, offices, bureaus, services, units, and instrumentalities to develop their own Public Service Continuity Plans (PSCPs). This was after a decision was made at the fourth Meeting of the Cabinet Cluster on Climate Change Adaptation, Mitigation, and Disaster Risk Reduction “to guarantee the continuity of operations amidst disruptions.” The concept of the PSCP was developed through the joint-collaboration of the OCD, NDRRMC TWG, and Philippine Disaster Resilience Foundation (PDRF).

A PSCP is officially defined as “a document containing strategies and mechanisms of a government agency/ organization to ensure continuous delivery of services to the public amidst any disruption” (NDRRMC-PDRF, 2018). Specifically, PSCPs are drawn to:

- Ensure continued performance of essential functions – essential functions are those services that must be delivered amidst any disruption.
- Minimize damage and loss to critical processes – critical processes are all internal to your organization.
- Ensure succession if agency leadership is disrupted – such will allow continuity of leadership roles by having backup leadership positions.
- Reduce or mitigate disruptions to operations – your government agency can still perform your mandated roles.
- Ensure facilities for performance of essential functions – the infrastructure and facility requirements will be in place so that you can perform your essential functions.
- Protect essential facilities and resources – aside from essential functions, the facilities and resources that support the performance of your essential functions are also secured from the threats.
- Achieve a timely and orderly recovery.
- Resume full service to customers.
- Maintain a test, training, and exercise program (NDRRMC-PDRF, 2018).

Conclusions

Theoretically speaking, the literature points out that the strengths of the Weberian model of ideal-type of bureaucracy is also its weakness during times of emergencies. The Weber-inspired bureaucracy assumes a stable condition such that it creates its bureaucratic norms which makes it inflexible to respond immediately to emergent norms of disaster victims who need help to cope with their personal losses and the destruction in their environment. Hence, gaps between the government's bureaucratic norm and the victims' emergent norms develop. These gaps may still widen depending on the nature and power of the disasters, the preparedness of the governmental response systems, and people's orientation and behavior towards disasters and their government. The case of EVRMC has shown that years of experience in disaster/emergency response may not be enough to withstand powerful hazards in the "Age of the New Normal." Hence, continuity planning for various disaster scenarios may still prove to be useful to lessen, if not eliminate damage, losses, and casualties.

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Pandemic and Inclusive Governance

11

Madhushree Sekher and Balbir Singh Aulakh

Contents

Introduction	140
Building the Context	141
Key Policy Principles	142
Information and Communication	142
Community-Driven Solutions	142
Structural Integration	143
COVID-19: Conceptualizing Inclusive Governance	143
Assessment of Domains: Challenges and Measures	144
Rural	144
Urban	148
Access to Welfare: Institutional Restructuring	151
Concluding Remarks: Empowering Individuals and Capacity-Building to Address Exclusion and Pandemic-Induced Challenges	154
References	155

Abstract

The welfare provisioning and distributive justice in a pandemic, as seen in the context of the current worldwide COVID impact, assume particular importance for achieving the goals of inclusive development. The world has, undoubtedly, witnessed in recent times average gains in material prosperity with gross domestic product per capita doubling in low- and middle-income countries. But, even with the world becoming richer, poverty and destitution continue to be experienced by a large population living on the margins of this growth story. It is a pandemic and a disaster that is axiomatic in the development policy context for structuring policies and institutions for inclusive governance. It is in this context that this

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chapter looks at the policies and interventions made by the government in India, for the incorporation of productive capacities of the poor and marginalized post the COVID pandemic impact through the numerous welfare policy initiatives. The focus of this chapter is on the policy interventions pertaining to agriculture services, food security, livelihood and employment, public health, and WASH (water, sanitation, and hygiene) programs. The chapter attempts to provide an understanding of, and a mapping of, the operational issues that underlie challenges and opportunities for inclusive governance across rural areas and urban areas (in urban areas, the focus being on slums). In the rural context, the chapter looks at the policy provisions for agriculture, food security, and employment; and in the slum settlements in urban areas, issues of health and WASH are covered along with food security policy for the urban poor. These domains are critical to addressing the immediate challenges of distributive justice and well-being in a pandemic, as they are central to concerns of livelihood and affordable living. In the same context, these domains are significant to develop a framework of inclusive governance and build an understanding of the institutions for inclusive development. The chapter makes important policy inputs for structural interventions, involving public administration/government, private sector, and civil society, for governance in a pandemic. The chapter draws on government notifications and guidelines, projects, and initiatives conducted through corporate social responsibility initiatives by the private sector and civil society groups in slums and recommends how convergence between these groups and initiatives can be met going to support efficient capital and human resource.

Keywords

Inclusive governance · Institutions · Distributive justice · Pandemic

Introduction

Since the SARS-CoV-2 outbreak in India, there is an increasing attention paid toward the role of “essential goods” and what does it constitute. This has been made clear in the response of the India government presented in terms of the economic and structural reforms package introduced in mid-May 2020 (Press Information Bureau, 2020) (see Table 1). It is within the scope of this response package and in particular the structural reforms introduced by the central government that this policy brief attempts to answer the policy question of how challenges concerning local governance structures be addressed in order to direct and devolve resource for people’s well-being in the urban and rural context. The immediate or essential domains, as evident from the central government’s recent announcements, have been areas of agriculture, food security, employment, and health. In keeping this as the focus of this policy brief, the study discusses the macro-level challenges of federalism and outlines a contextual understanding of local governance and institutional capacity to operationalize such structural reforms.

Table 1 Allocation of funds as part of the stimulus package by the Government of India

S. no.	Major heads	Amount (in Cr.)
1	RBI fiscal stimulus	801,603
2	Liquidity infusion	245,000
3	Linked to farmers	247,400
4	Agriculture	150,000
5	Collateral loans to small businesses	391,000
6	Welfare related	260,435
7	Total package	2,095,438

Source: Accountability Initiative (URL: <https://public.flourish.studio/visualisation/2443098/>)

In India, the quasi-federal structure gives space for governance at three levels: central, state, and local. The 73rd and 74th Constitution Amendments Acts (CAAs) provided constitutional status to local bodies in India, and laid down the importance of “local” governance, in the period that saw the introduction of the structural adjustment programs. In line with this, focus has been toward understanding the devolution of funds, functions, and functionaries, in policy and practice.

The following section (Section “Building the Context”) presents the context for this discussion. Section “Key Policy Principles” highlights the challenges concerning the role of local governance, issues of inclusion, and well-being during COVID-19. Following this, section “COVID-19: Conceptualising Inclusive Governance” presents a critical discussion on contextualizing inclusive governance in handling a disaster like the COVID-19 pandemic. Section “Access to Welfare: Institutional Restructuring” highlights the institutional restructuring needed to strengthen governance and distributive justice. The concluding remarks are presented in the final section.

Building the Context

The emergence of SARS-CoV-2 had brought far-reaching impact and transformative changes in the social, economic, and political sense. The impact and transformation in terms of social life and livelihoods has brought underlying structural and distribution challenges to the forefront again. This is primarily due to the global nature of this virus, and the way in which the SARS-CoV-2 has infected urban areas, especially in India. In this context, the urban areas have highlighted immediate issues in terms of physical health and WASH infrastructure at the local body level as well as access and affordability of food and housing. The second part of this, food and housing, has brought major burden on the daily wage workers residing in cities and migrant populations to migrate back to rural areas amidst the national-wide lockdown. This in turn has brought upon additional burden on rural employment and food security along with distribution of agriculture produce from the preceding season and rabi season in India.

In urban areas, a large focus has been in areas of high population density and informal settlements; studies indicate they are more vulnerable to the outbreak (Corburn et al., 2020; Patranabis et al., 2020). These types of urban settlements are extremely vulnerable to SARS-CoV-2 due to the lack or no availability of basic health and WASH facilities. The instable and inadequate economic condition of these families makes them doubly vulnerable to such outbreaks. As literature points, the role of communities and community leaders within these informal settlements becomes fundamental to containing the spread and for authorities and support groups to help them. These community-driven solutions are the first step that local bodies need to actualize for access to food and affordability of essential services. These issues question the sustainability of metropolitan cities.

Key Policy Principles

Information and Communication

The domain of information and communication is crucial to addressing issues of asymmetry and inadequacy in a governance process. In providing a system of transparent and account system of information, the highlighted issues can be addressed, beginning at the community level. In understanding the role of information in governance process, especially at the local and community level, studies indicate how asymmetrical flows of information can lead to market failures.

The role of information is important to each stakeholder for an inclusive feedback loop. In this case, the role of community radio and campaigns at the grassroots are discussed and proposed, especially for its benefits and targeted nature for the beneficiaries. At a community level, and in the process of governance, these channels act as important means through which asymmetries are tackled and mitigated. Therefore, an effective information and communication strategy is crucial to address challenges in the abovementioned areas and act as a key principle for exploring, understanding, and examining measures undertaken.

Community-Driven Solutions

This principle of community-driven solution has become crucial to identifying and addressing the level at which governance can be possible. In the particular context of urban areas, informal settlements are seen as extremely vulnerable spaces in India and across the Global South, raising questions about the challenges to health and WASH conditions therein.

The informal nature of these settlements makes it difficult to navigate and organize programs, and where the role of “slum leaders” (Auerbach, 2020) becomes an important feature. They are central in availing resources and act as the link

between any form of social and economic intervention in the community. Such “durable and active forms of informal leadership” are a feature of these leaders, and where aspects of trust and fear (Corburn et al., 2020) play an important role in access to health and other essential services in the governance process; any governance process needs to understand the strong presence of resistance and violence within these communities toward government authorities and “outsiders” as the basis for governance planning and process.

Structural Integration

In identifying local government agencies, corporate social responsibility, or CSR foundations and civil society, it is important to highlight integration and emphasize on the processes at the grassroots. While there is a broader aspect of federalism at play, in terms of the center-state-local cooperation during the SARS-CoV-2, as this policy brief has highlighted, the role of bottom-up approaches is crucial to achieving inclusive governance and addressing challenges of institution capacity through such integration at a community level across India.

While central and state governments have mapped important areas, when it comes to local interventions, authorities will provide economic and logistical room and flexibility in governance. The total expenditure by CSR foundation in India was Rs. 8691 (KPMG, 2020) for 2018–2019. India’s CSR Survey for 2019 indicates that 80 percent companies have a preference to spend locally:

88 per cent companies have implemented projects in the locality of their presence (neighbourhood). This truly indicates India Inc. willingness to contribute for wellbeing of stakeholders (largely communities) around its operations, which indirectly may also result in enhanced brand recall among such stakeholder groups. (KPMG, 2020)

There has been a reported trend of a growing partnership with implementing agencies within the CSR space. Therefore, collaborations and partnerships can facilitate cooperation and create transparency and accountability in the governance process through regular reporting, monitoring, and assessment of activities.

COVID-19: Conceptualizing Inclusive Governance

In using inclusive governance to develop response in terms of addressing structural and systemic challenges at the local self-government amidst the pandemic outbreak, three key tenets are important. These are to explore and understand responses on the part of government, private organisation, and civil society and examine these responses in light of the existing structural and systemic gaps.

For example, research focusing on “factors that can strengthen implementation and accountability and empower individuals to claim their entitlements” has

provided evidence to support where the central government has failed to mandate such necessary reforms. For example, to make the PDS functional across India, individual states and territories will have to take the initiative to fill the gaps (Sekher et al., 2017). Similarly, in urban areas, issues of health and WASH are to focus upon with urgency and sustainability in their response to address the existing fractures. This requires “community-led committees” to be “empowered to lead on the public health and disease messaging, including avoiding xenophobic and racist falsities, and help decide the appropriate use of technologies in communication to those who may be illiterate or have minimal health or science education” (Corburn et al., 2020). Likewise, the role of CSR in the social security space needs to be contextualized within the decentralization argument, because of its focus on community and local areas (KPMG, 2020). The distribution of CSR funds at state-level across sectors, decentralization, and impact of COVID-19 need to be problematized together for understanding each area and plan a course of action.

Assessment of Domains: Challenges and Measures

There is a wide range of literature indicating the structural constraints rooted in the reforms proposed, and why these as fractures in the welfare system require urgent attention. The role of local governance and decentralization are central to the type of micromanagement needed to address challenges and implement these reforms for effect and efficient targeting and implementation. The role of civil society, CSR, and an inclusive local planning on the part of local bodies, to leverage support, can guide measures to ensure well-being in policy and practice terms.

Rural

In the rural economy, the changes in agriculture brought as part of the emergency economic package and how far do they go to address the needy and vulnerable groups remain a critical question. In addition, the emphasis on creation of physical infrastructure capacity and giving farmers greater freedom to sell their produce calls for addressing scarce income resource in the hands of the rural population, data and information on coverage of schemes, and gaps within the regulatory framework.

The agriculture sector in India was entering the rabi crop harvest stage when the impact of COVID-19 gradually increased and the national lockdown was imposed. In addition to the structural problems existing in the agriculture sector, the Indian Council of Agricultural Research (ICAR) on behalf of the agriculture ministry and the Government of India laid down state guidelines too. Regarding provisioning of schemes and funds toward agriculture, farm sectors such as coconut extraction, tea, etc. have received attention across the frame by India Inc., but a large sector of them still rely on government schemes and informal credit system.

Challenges

- Lack of access to collection agents for forest produce in tribal areas due to the lockdown.
- Borrowing of informal loans by farmers at higher rates further escalates the socioeconomic vulnerability of small-scale farmers and other rural groups.
- The agriculture sector was exempted from the lockdown only in mid-April with the immediate challenge being observed as “dissemination of the guidelines and implementation on the ground” (Bhavani, 2020).
- The distress farmers found themselves in “the first few weeks, with no clarity about exemption to agricultural work, and local police kept disrupting the work” (Rawal & Kumar, 2020):
 - The issue of fall in demand for perishable items such as “vegetables, fruits, milk, eggs, and poultry” (Rawal & Kumar, 2020).
 - There is an impact on the cultivation of interim crops sown between rabi and kharif seasons (Anju, 2020) due to delay in the cultivation and selling of rabi crop.
- The issue increased with shutting down of mandis in the first phase of the lockdown and with certain mandis being identified as ‘superspreaders of coronavirus’ (Rawal & Kumar, 2020) that led to their closing down.
- Agriculture inputs, public procurement, etc. (Rawal & Kumar, 2020).

Measures

- As part of the aid package announced by the central government, a total of rupees 150,000 has been allocated to agriculture directly (see Table 2).

Table 2 Agriculture: Atmanirbhar Bharat economic package

S. no.	Heads	Amount in Cr.
1	Agriculture and infrastructure funds	100,000
2	PM Matsya Sampada Yojana	20,000
3	Cultivation of herbal plants	4000
4	Animal husbandry and development	15,000
5	Micro food enterprises (MFES)	10,000
6	Operation green	500
7	Beekeeping initiative	500

Source: Accountability Initiative, <https://public.flourish.studio/visualisation/2443098/>

Table 3 Linked to farmers: Atmanirbhar Bharat economic package

S. no.	Heads	Amount in Cr.
1	Credit through kisan cards	200,000
2	Working capital for farmers	30,000
3	PMKISAN (PM-GKY)	17,400

Source: Accountability Initiative, <https://public.flourish.studio/visualisation/2443098/>

- In terms of initiatives linked to farmers (see Table 3), the package provides for Rs. 247,000. This includes funds toward credit through kisan cards (Rs. 200,000), working capital for farmer (Rs. 30,000), and PM-KISAN (PM-GKY) (Rs. 17,400).
- In addition to the aid package, guidelines through Indian Council of Agricultural Research include national- and state-specific guidelines to be followed in the light of the ongoing and upcoming agriculture season (Pothan et al., 2020).
- Addressing issues at the local level to the food system and “crop-specific safety measures regarding harvesting, post-harvest operations” (Pothan et al., 2020).
- Accordingly, “responsibilities were given to local field agencies to ensure hassle-free movement of agricultural produce and related machinery to reinstate farming activities” (Pothan et al., 2020).
- Providing market understanding to farmers through conferences, giving them information and expert perspective, and linking farmers to local government officials and policy experts.
- Similarly, corporates are investing in formal, commercial agriculture sectors such as tea and coconut cultivation among others in different parts of the country, giving them agriculture support and creating awareness and health and WASH equipment.
- Providing access to storage and help in terms of supply chain challenges during the lockdown.
- To a similar extent, CSOs are also working on similar lines as CSR, as both partners and individuals in providing:
 - Logistical support through collaboration.
 - Technology: use of mobile applications in addressing supply side gaps.
 - Connecting with farmers in remote areas and identifying them through special programs.

Food Security: can be ensured in terms of availability, access, utilization, and stability (FAO, IFAD, UNICEF, WFP and WHO, 2021) of food and nutrition.

Challenges

- There is heavy reliance on PDS systems for rural populations to get food. This brings a lot of structural burden on governance structure, leading to delays and poor service delivery.
- Besides making food grains available through PDS, the FCI also has to sell the surplus grain through the Open Market Sales Scheme (OMSS), often at a loss (Rawal & Kumar, 2020).
- State governments also need to buy these grains at full economic cost (Rawal & Kumar, 2020) under the OMSS for food security schemes beyond the NFSA.
- Similarly, the urban migrants are excluded from the targeted schemes, as benefits are linked to their residence address in their villages, as listed in their aadhar cards, and, due to this, during the COVID lockdown, many stranded migrants remained vulnerable and faced food insecurity.
- Reports suggest rural India households reduced the number of meals they took during the COVID lockdown, and also there was a reduction in their food

(68 percent), as they reduced the total number of items taken in their meal (PTI, 2020).

Measures

- As part of the aid package announced by the central government, Rs. 3500 crore has been allocated toward free distribution of food grains for 2 months (April and May) “to about 8 crore migrant labor who are not covered under NFSR or state scheme PDS cards” (see Table 4).
- Rs. 40,800 allocated toward food grains under Pradhan Mantri Garib Kalyan Yojana.
- CSR Foundations have used the existing community projects to work with and provide for food rations in these pockets.
- Due to the breakdown of supply chain and lack of volunteers, CSR finds it difficult to implement such programs outside of geographies where they have strong ground presence.
- While partnership with NGOs has been explored, there is little progress to this end.
- Similar attempts have been made on the part of NGOs in terms of providing food security in rural areas through ration distribution.
- These interventions also include facilitating COVID-19 test kits and other health support in inaccessible rural areas.

Employment: Amidst lockdowns and partial running of economy throughout the country, availability and access of livelihood opportunities were critical as migration at scale put a burden of existing capacity on schemes such as the Employment Guarantee Act. This can be observed in terms of the varied challenges to labor demand and supply over time and specific measures adopted to cope with these shocks (Mohapatra, & Hussain, 2021).

Challenges

- The labor work under MGNREGS was stopped as the national lockdown was imposed that severely impacted the laborers in terms of their livelihoods.
- Due to delay in the rabi season’s completion, and lockdown in place, the process was delayed – and farmers had to rely on the local or any available labor force.
- Due to the lockdown, machinery used in the processing of rabi crops was delayed along with challenges in transportation of the machinery:
 - These delays impacted other crop cycles and demand-supply dynamics, putting constraints on farmers.

Table 4 Food security:
Atmanirbhar Bharat
economic package

S. no.	Heads	Amount in Cr.
1	Food grains to migrants	3500
2	Food grains (PM-GKY)	40,800

Source: Accountability Initiative, <https://public.flourish.studio/visualisation/2443098/>

Measures

- As part of the emergency package, the central government has allocated (see Table 5):
 - MGNREGS additional funds amounting to rupees 40,000
 - MGNREGS (PM-GKY) amounting to rupees 37,825
- Support small business and self-employed individuals.
- Creating employment through making medical equipment as well as converting businesses that have hospitality wings to temporary quarantine facilities
- Supporting creation of job cards for in-migrants, proposing revisions to the Gram Panchayat Development Plan, and working directly with elected representatives
- Helping small businesses by manufacturing medical equipment for frontline workers in rural areas
- Supporting awareness drives and activities among women groups

Urban

Cities have been exposed to planning processes that have created inequality across various sectors, i.e., housing, health, water, etc. It has been earlier noted that India went into a nationwide lockdown with a 4-hour notice, and this left a large number of migrant population that had little or no financing capacity to economic survive in these cities. These groups, especially those living in informal settlements across cities, found themselves more vulnerable with their livelihoods lost and no resources to return home, in this case to their home state. The combined issue of access to health and food in these communities combined with the outbreak itself and ensuring social distancing and lockdown norms stretched the institutional capacity of these urban local bodies to its maximum. Corburn et al. (2020) note:

Immediate measures to protect residents of urban informal settlements, the homeless, those living in precarious settlements, and the entire population from COVID-19 include the following: (1) institute informal settlements/slum emergency planning committees in every urban informal settlement; (2) apply an immediate moratorium on evictions; (3) provide an immediate guarantee of payments to the poor; (4) immediately train and deploy community health workers; (5) immediately meet Sphere Humanitarian standards for water, sanitation, and hygiene; (6) provide immediate food assistance; (7) develop and implement a solid waste collection strategy; and (8) implement immediately a plan for mobility and health care.

These urban areas in India provide important lessons, especially when we combine issues of decentralization and top-down planning in cities with COVID-19

Table 5 MGNREGS:

Atmanirbhar Bharat
economic package

S. no.	Heads	Amount in Cr.
1	MGNREGS additional funds	40,000
2	MGNREGS (PM-GKY)	37,825

Source: Accountability Initiative, <https://public.flourish.studio/visualisation/2443098/>

outbreak. These informal settlements are extremely vulnerable socioeconomic sections and rely on extremely low-paying jobs and are excluded physically in terms of space and economically from the core of the urbanization process to the peripheries.

The Social Science in Humanitarian Action explaining the epidemiological vulnerability related to COVID-19 makes a case for population density, households and social structures, water, toilets and sanitation, and access to food:

In poor settlements, households have no capacity to store food for several days and source most of their food from informal markets and street food vendors. If movement is restricted, people's ability to access food will be severely reduced. Furthermore, if markets or food vendors are closed, this will mean people are not able to buy food they need. (Social Science in Humanitarian Action, 2020)

A key component in urban areas and especially among vulnerable groups is the issue of misinformation (https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/15178/SSHAP_Brief_Online_Information_COVID-19.pdf?sequence=1&isAllowed=y) Key considerations: COVID-19 in informal urban settlements. 2020. Social Science in Humanitarian Action), an important area needing swift and timely intervention at the community level to tackle and address any problem of mistrust. There are other aspects of population density, congestion, and access to open spaces that come into consideration (when the lockdown opens). A recent study indicates:

Slums constitute 17% of urban households in India... analysis reveals that several of the existing Containment Zones in Mumbai are within or very close to slums. The reason for this phenomenon is likely to be difficulties in maintaining social distancing or hygiene standards and shared communal facilities including toilets. There are clear policy implications for this. One hypothesis is that the lack of secure property rights given to slum dwellers holds them back from getting better access to amenities and housing, which reduces their ability to safeguard themselves against rapidly spreading infections. (Patranabis et al., 2020)

In addition, eviction of slum population is an important question during the post-lockdown period that will essentially help understand the sustainability of livelihoods in these urban spaces. As noted, discussing issues of health and WASH as well as access to food within these communities in cities remains the primary focus of local areas and which this brief addressed as well.

Health and WASH: As cities emerge as nation and global hotspots of COVID-19, there are major issues around health and WASH to be considered, and how measures to this end have tackled and help mitigate the dangers, and similarly, what are the measures being adopted as cities open up to businesses – formal and informal – and how far do these measures cover operations at the community level for decentralized governance. In the abovementioned summary of concerns, as a background, these issues are central to challenges around health and WASH in cities. These challenges have been the focus of government, CSR, and NGOs to a large extent.

Challenges

- Lack of social security in terms of food and shelter for laborers working on daily basis in industries such as real estate, contractual workers in waste management, etc.
- High population density in cities, especially in informal settlements, increases difficulty for implementation of social distancing norms, isolation, and quarantine.
- Likewise, the issue of poor and no access to water is central to individual practices of hygiene such as washing hands.
- Unaffordable and inaccessible healthcare is another major concern for the weaker socioeconomic section, especially women and children:
 - The gender-based issues are another important factor to be considered while exploring health.
 - Similarly, health-related risk from water and its poor quality is another major issue.
- Communication and awareness about COVID-19 and the associated health risks these community may face are important parts of the social interventions.

Measures

- Increasing testing and creating capacity of hospital beds, including quarantine facilities.
- Implementation of central government orders in terms of health capacity creation, contact tracing, reporting of cases, etc.
- State government and local authorities: operationalizing process of migrants returning home via special trains.
- There are certain corporate foundations that have made special COVID-19 funds in addition to the related contribution to national- and state-level government funds working against challenges posed.
- The support of CSR in health and WASH has largely been in terms of providing:
 - Screening for symptomatic patients
 - Masks and sanitizers
 - Washing and cleaning soaps, sanitary napkins, and toilet cleaners
 - Medical equipment
- Such initiatives are both at the level of frontline staff working on COVID-19 and vulnerable populations residing or in the process of migration, migrants working in real estate sector, etc.:
 - Certain CSR initiatives also focus on working directly with hospitals as well as creating the physical quarantine facilities for local bodies.
- Organizing awareness drives through on-ground and online campaigns.
- Community-level partnership through CSR and local body support.
- A large number of activities include supporting and operationalizing their own programs in:

- Identifying critical and vulnerable masses in cities
- Awareness campaigns and sharing information on health safety and precaution measures concerning COVID-19
- Health support in informal areas and among migrants
- Distribution of WASH essentials
- CSOs worked both with CSR foundations and collaborated with local bodies to help map these groups.

Access to Food: In terms of collaboration and cooperation, providing access to food saw the most inter-participation among government agencies, private organizations, and civil society groups. These collaborated at various levels to identify and provide for access to food among different populations round the clock and on a daily basis. The collaboration between state and private or NGO was seen to be a major positive in the delivery of food.

Challenges

- Adequate access to food became a problem with economically vulnerable population saving money to return home with no work in hand.
- The cloud of uncertainty about going back to their home state made the issue of food an essential part of various social drives across the country and in every community at the local level.

Measures

- Food support through existing state government schemes for urban poor.
- Municipalities worked through the elected representatives at ward level (corporators) to distribute food supplies.
- Food supply to migrant grounds stranded at homes and between commutes.
- Contribution toward ration kits that included rice, dal, food powders, potatoes, etc.
- These kits were targeted in vulnerable populations and groups that were identified through existing CSR projects or communities that were part of the corporate's working base.
- Identification of population and collaborating with local support groups to engage in mass four-time meals.
- Supporting municipalities and CSR in implementation of their food distribution schemes and helping government and private sector to identify these socially vulnerable areas to further expand outreach and increase accessibility of food.

Access to Welfare: Institutional Restructuring

There are critical aspects in relation to agriculture and farm economy in the rural areas in order to understand the structural issues. In this, two areas, Minimum Support Price and Public Distribution System, are central to the agriculture and

food security challenges addressed above which in the past have been at the center to propose important recommendations for access to welfare. They are:

- Informal asymmetries at the micro-level of the governance process.
- Diversification in Minimum Support Price (Mahendra Dev, 2018, p. 23).
- Emphasis on cereals such as rice and wheat (Mahendra Dev, 2018, p. 24) creates issues of diversification within the Minimum Support Price policy.
- Need to understand micro-level systems and process to expand the scope of relevancy and reliance on PDS (Mahendra Dev, 2018, p. 23).
- Similarly, the role of direct cash transfers as compared to the PDS network of food.
- Ensuring stable export policies and mitigating the impact of fiscal and financial policies on structural reforms (Mahendra Dev, 2018, p. 24).
- These reforms include: “(a) price policy, (b) subsidies and investments, (c) land issues, (d) irrigation and water management, (e) research and extension, (f) credit, and (g) domestic market reforms and diversification” (Mahendra Dev, n.d.).
- Increase and growth in the role of private sector in agriculture; aligning agriculture sector with “new emerging agri-system” including rural businesses hubs (Mahendra Dev, 2018, p. 23).
- Impact of reforms on small and marginal farm groups and participation of these groups to access welfare.
- Gulati (2009) notes structural changes have happened at three levels: “diversification within agriculture sector, diversification from agriculture to allied activities like livestock and fisheries, and structural change from agriculture and allied to rural non-farm sector.”
- Development of WASH infrastructure in urban areas, especially in vulnerable and informal areas – and ensuring availability and access to essential WASH services such as water, soap for handwash, etc.
- Creation of community networks and mapping process for better availability, access, and distribution of essential commodities during health emergencies and distress situations.
- Connecting these reform areas and creating an inclusive and sustainable development framework.

These issues are interrelated to the inclusive governance practices and processes needed to avoid any overlapping or duplication of efforts and measures by stakeholders and be discussed through a common framework comprising of information and communication; community-led initiatives and structural integration are central features of an inclusive growth model. In the following table (Table 6), using this as the framework, the nature of work among government, private, and civil society is highlighted in each of the sectors.

Table 6 Nature of work among government, private, and civil society

Sector	Stakeholder	Intervention type	Nature of work
<i>Agriculture</i>	Government	ICT, structural	<p>Special aid package in terms of loans liquidity, reforms, expansion of funds in existing and new schemes</p> <p>Guidelines and recommendations for businesses, farmers, etc. toward processing and distribution of crops</p> <p>Guidelines and recommendations for upcoming agriculture season, and provide credit support for the same</p>
	Private (CSR)	ICT, community	<p>Information, technology, and market access to farmers for their produce</p> <p>Small credits and support to farm businesses</p> <p>Ongoing CSR projects in agriculture</p>
	NGO/CSO	ICT, community	<p>Help small farmers and out of job farm laborers in connecting with work sites</p> <p>Support physical connectivity measures in terms of access to markets, etc.</p> <p>Bridge information gaps, connecting demand-supply issues</p>
<i>Food security (rural)</i>	Government	Structural, community	<p>Special scheme for migrants ensuring them supply of food grains</p> <p>Support through PDS and other state government schemes</p>
	Private (CSR)	Community	Support through targeted food safety programs
	NGO/CSO	Community	Direct and collaboration with local authorities to ensure efficiency in food delivery system
<i>Employment</i>	Government	Structural	<p>Support through employment guarantee scheme Agriculture sector and essential services, etc.</p>
	Private (CSR)	Community	Provide livelihood support in communities where CSR is ongoing
	NGO/CSO	Structural, community	<p>Supporting GP representatives to process job cards for NREGS</p> <p>Support for GP representative in work related to GPDP</p>
<i>Health and WASH</i>	Government	Structural	<p>Policy planning and implementation</p> <p>Testing for new cases</p> <p>Operating and maintaining health and quarantine facilities</p>
	Private (CSR)	Community	<p>Supply of health, sanitation, and hygiene equipment to frontline workers across essential services and public</p> <p>Provide mobile testing machines</p>
	NGO/CSO	ICT, community	Supporting and getting directly involved in frontline work to provide essential health and sanitization items to vulnerable populations

(continued)

Table 6 (continued)

Sector	Stakeholder	Intervention type	Nature of work
<i>Food security (urban)</i>	Government	Structural	Direct support setting up food banks
	Private (CSR)	Community	Provide for kits in communities where corporate is active or associated with
	NGO/CSO	ICT, structural, community	Operate as food banks as well as supply essential services among vulnerable and weak socioeconomic populations

Source: Authors

Concluding Remarks: Empowering Individuals and Capacity-Building to Address Exclusion and Pandemic-Induced Challenges

In India, empowerment and capacity-building strategy represent a multi-level approach to knowledge systems, spatial realities, and human capital while addressing poverty, livelihood needs, and employability. The nature of exclusion, defined by these conditions, push reforms and agendas linked to poverty alleviation and employment. These methods and steps are connected, broadly, to three interrelated conditions: (i) poverty alleviations and their links to vulnerabilities and deprivations such as hunger, malnutrition (SDG-2), and health and well-being (SDG-3); (ii) efforts to understand and capture socioeconomic vulnerabilities and poverty, and the relation of public policies for economic transformation and transparent reporting; and (iii) skilling and entrepreneurship initiatives created in cooperation with local bodies and in sync with the community needs (SDG-10).

Therefore, there arises a need to create tools to examine local challenges and to map the same at the district and state level. In order to do so, a response must have the following:

- Support from industry/corporate houses (through corporate social responsibility).
- Help strengthen start-ups and nongovernment initiatives.
- Create links with the local government system (functions and functionaries) to address community-level livelihood needs and employability concerns.

As immediate concerns, support, guidance, and information to local elected representatives in panchayats is the key challenge. This includes quickening the process of creating job cards under the employment guarantee scheme, and for doing this, NGOs and CSR programs can provide hand-holding better than government structures.

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Sustainable Strategies for Conservation of Water Resources: A Critique

12

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Contents

Per Capita Water Availability in India	160
Goals of the National Water Mission	161
No Water Management in Smart City Features	161
Steps Toward Water Smart Cities	162
Success Stories	164
A Water-Secure Village	164
Saving India's Lifeline: Why Rivers Need Trees	164
Conclusion	164
References	165

Abstract

The importance of water in our lives and for our sustenance cannot be stressed enough. It is a proven fact that the freshwater on our planet earth is only 2.5% of the total available water resources. Two thousand nineteen statistics on water scarcity state that 25% of the world population is facing water scarcity, making it one out of every five people. Grave and current issues like climate change, population explosion, urbanization blowing out of proportion in comparison to the services provided, and finally rapidly growing industrialization have made water into a scarce and valuable commodity. Growing demands on the use of water have resulted in a drop in its quality and capacity to self-cleanse.

Water is one of the most crucial and significant components of national development planning in the twenty-first century. Realizing the importance of water, the United Nations declared that safe water must be inexpensive and easy

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to get for everyone by 2030. It has made this goal a part of the 17 sustainable development goals that must be achieved by 2030 by 193 member nations of the United Nations per their pledge (Population by Country, <https://www.worldometers.info/world-population/population-by-country/>, 2020). This is possible when every nation focuses on the legitimate and appropriate management of the limited water resource because it is crucial to ensure food security and resolve growing conflicts due to water scarcity. Hence, the water policy of any nation should recognize and adequately address the challenges faced by the world in the present and the future.

This challenge is getting tough day by day as the world population has touched the 7.7 billion people mark recently, and India's population has increased to 1.36 billion (Population by Country-2020). India has a 54% urban population of the total population in the world. There was a drastic increase in the international urban population, which went up to 54% from 30% (1950) in 2015. As per the estimates, it is expected to increase to 68% of the total world population's urban population by 2050. The issues mentioned earlier have been established to be the major cause in predicting an increase of 2.5 billion in urban population by 2050. Asia and Africa would be the leaders in the major problem of population crisis by 90% approximately (<https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html>. Retrieved 27 April 2020).

India has 4% share of the earth's land area which is highly disproportionate to its 17.71 population. The United Nations has reported that it is on the edge of an urban revolution based on the statistical prediction of its population to reach six billion by 2031. So, India will have about 40% of the urban population by 2031 (First Post) (Firstpost, Sunday December 1, 2019. Retrieved February 1, 2020, 2019).

The increase in urban population has created numerous problems for the Government and private organizations in dealing with the provisions of essential services to the people. The most severe challenge for urban planners is to tackle the impact of disasters. They have to increase and ultimately optimize disaster risk resilience.

Keywords

Smart water · Water policy · Management · Sustainable strategies

The smart cities concept has originated in the background of the increasing population and Disaster Risk Resilience. The term "Smart Cities" is trending around the globe. It is expected that smart cities should include smart energy, integration, public services, mobility, buildings, and water. This will lead to a high quality of life for the residents living in the cities. This has become the key focus area of the Government and the private sector because it is crucial for sustainable global growth.

Cities in India are made smart to keep up with the global changes and make them disaster resilient. The components of disaster resilience are (Jha et al., 2013):

1. **Infrastructure:** It refers to the vulnerability of buildings to hazards, critical infrastructure, including roads, health care facilities, etc. Its role is to develop the capacity of the community for response and recovery.
2. **Institutional Resilience:** The government and nongovernment organizations need to strengthen to adapt to the rapid changes happening in the environment.
3. **Economic Resilience** relates to the economic activities being carried out by the communities and their ability to function after a disaster.
4. **Social Resilience:** The demographic profile of the community, including sex, age, education, etc., can affect the role of the community's ability to deal with the effects of a disaster.

The components, as mentioned earlier, of disaster resilience, must precede risk mitigation to enhance capacity building. It has gained momentum, especially after the novel Corona Virus Disease (COVID 19) outbreak across the world. This pandemic has been recognized as a "notified disaster" by the Indian Government and led to invoking of the Disaster Management Act for the first time. The new Coronavirus has made the world rethink its strategies to upgrade the components of disaster resilience. Every nation, region, and city needs to identify and prioritize the most imperative needs like water, food, transport, healthcare services, etc.

The components will determine to what extent a city is a disaster resilience smart city. This study concentrates on the particular needs which are the most essential for survival after the disaster. For example, water is the most critical physiological need of disaster-stricken victims. Therefore, the water system in any city is considered a vital infrastructure.

Smart water refers to water and wastewater infrastructure with the help of effective management. Smart water is essentially filtered tap water as this process helps remove metals and contaminants. Smart water systems are more popularly known as intelligent water systems, but the water being produced by water distributors is called *smart water*. Whatever the nomenclature, one cannot deny its importance. The distributor of water adds minerals and additional vitamins to provide more nutritional value, which is usually not available from the tap water. According to the Nat Geographic Society, 1.2% of the 3% of the earth's water can be utilized as drinking water because the remaining is inaccessible, being trapped in the ground, glaciers, or ice caps.

Only about three percent of Earth's water is freshwater. Of that, only about 1.2% can be used as drinking water; the rest is locked up in glaciers, ice caps, and permafrost, or buried deep in the ground. Hence, it is crucial that the limited resources are not wasted, rather they must be efficiently utilized by implementing smart technologies like sensors to detect leakage, fortifying the water supply with necessary minerals so that there is mitigation in water borne diseases, especially, the vulnerable sections of the society.

Intelligent water systems through the use of new and innovative technologies have emerged as a valid solution to deal with the issue of providing affordable and safe drinking water to all as reported by The Water Environment Federation (WEF) along with the Water Environment and Reuse Foundation (WE&RF). Water-borne diseases are a major cause for the death of approximately 3.4 million people in least

developed economies. The death count due to this serious issue of unsafe drinking water was 1.16 million in 2020 ([The World Count, 2020](#)). The rate of death per time was one life every ten seconds which is a shocking statistics to comprehend.

India's average annual water availability has been estimated to be 1869 billion cubic meters (BCM). However, due to hydrological characteristics and topographical constraints, only 1123BCM (690 BCM is a form of surface water and about 433 BCM through replenishing able) for human consumption is available.

Per Capita Water Availability in India

Groundwater) can be utilized. It is evident from Table 1 that per capita water availability in India is shrinking at a rapid rate. The data available for per capita water availability relates to 2012, but one can imagine what a decade must have turned into ([Government of India, 2012](#)). Some issues highlighted by the Government of India are:

1. Huge areas of India are burdened with the availability of water. Population growth, urbanization, and changing lifestyles have resulted in water scarcity.
2. Water resources are not being managed efficiently or judiciously leading to a critical standpoint in many parts of India.
3. India has a high differential in water availability. Climate change has deepened the water crisis and water-related disasters.
4. Salinity intrusion because of the increase in sea level due to climate change is another concern.
5. Skewed water availability and unreliable water supply system lead to social unrest in some parts of the country.
6. Natural water bodies and drainage channels are being infringed upon, leading to the groundwater recharge zone blockage.

Apart from these concerns, there are other areas in which public agencies need to take charge of the water-related issues. In the end, there is a massive gap between a holistic and inter-disciplinary approach to this problem. First, though, International agencies (UNICEF, WHO, UNESCO, UNEO, etc.) focus their attention on the issues. The National agencies have also started showing the urgency to tackle the concerns.

Table 1 Per Capita Water Availability in India

Year	Population (in millions)	Per capita water availability(mm ³)
1951	361	5177
2001	1027	1820
2025	1394	1341
2050	1640	1140

Source: Government of India (2011), *Strategic Plan for Ministry of Water Resources*, Ministry of Water Resources, New Delhi, p. 5

For example, National Water Mission has developed new initiatives, which are state-specific plans (<http://nwm.gov.in/?q=new-initiatives>). The new initiatives carried out by the Ministry of Jal Shakti under the National Water Mission are:

1. State-Specific Action Plan

- (a) The National Water Mission has developed *State-Specific Action Plan* for the water sector covering the following aspects:
- All states in India must be evaluated individually regarding the status of water resources, institutional framework, inter-state issues, and the like.
 - Identify critical issues/problem areas and suggest probable solutions under the given circumstances.
 - Preparation of detailed project reports for problem areas identified by the National Water Mission and carried by the states/union territories.
- (b) Determination of a possible way out of the current crisis by analyzing the pros and cons.
- (c) Formulation of an action plan in detail for each activity decided upon in the NWM to be executed by the state/union territory.

2. Improving Water Use Efficiency (WUE) in Irrigation Sector Base Line Studies

Baseline studies are in progress to assess the present position. Five major projects have been initiated in different parts of the country.

Goals of the National Water Mission

The following goals have been determined based on the initiatives:

Source: Retrieved on 29-10-2022 at <http://nwm.gov.in>, National Water Mission, Department of Water Resources, RD and GR.

It can be observed that an unusual increase in the urban population has seen enormous pressure on the existing infrastructure. This has forced the Government to rethink its strategies to develop infrastructural facilities to improve living standards for the people, including the migrants living in the urban areas.

This is possible only by comprehensive physical and institutional infrastructure development. Therefore, the Government of India introduced the concept of Smart Cities in the recent past. The Smart Cities Mission emphasized improving the quality of life of people by accrediting local area development. The aim is to provide equitable opportunities and access to basic infrastructure for its residents.

No Water Management in Smart City Features

It is difficult to understand the reason for the exclusion of “water” from the features of smart cities.

The features of comprehensive development in Smart Cities are (Smart Cities Mission <http://smartcities.gov.in/content/innerpage/smart-city-features.php>):

1. Promotion of mixed land use in the development of unplanned areas to achieve efficiency in land use
2. Expansion of housing projects
3. Building walkable residential areas
4. Preservation and development of open areas, for example, parks and playgrounds;
5. Promotion of transport options like public transport
6. Promoting efficient and easy digital services to make governance more citizen-friendly
7. Encourage local culture
8. Implementation of smart solutions in areas of infrastructure and services

The latest report by the Bureau of Indian standards (November 19, 2020) shows that Delhi is at the bottom, with 11 out 11 samples failing on 19 parameters laid down by it. All major cities did not comply with the requirements of the standards. However, the Ministry of Water Resources, Government of India, issued the revised guidelines for water quality in 2015, but there have been no substantial or practical solutions.

This chapter is about the status of Disaster Resilience Smart Cities with particular reference to water. Still, in the features of smart cities prescribed by the Government of India, there is no reference to water or disaster resilience. Nongovernmental organizations and citizens need to pressurize the Government of India through legal proceedings and proactive awareness campaigns or protests to add these two features to its prescribed plan for smart cities to bring sustainable development to the nation at present as well as our future generations.

The Smart water City should integrate urban planning and water management to increase climate resilience. Smart water Cities are a crucial component to enhance the quality of urban life. Improvement in the quality of life has been receiving attention from the Government, private sector, and academicians, but there has been no result. Thus, providing opportunities for the considerable investment to develop and recreate urban infrastructure by agencies is involved in this mission.

Steps toward creating water Smart Cities have been explained below:

Steps Toward Water Smart Cities

1. Identify Challenges and Opportunities

The first challenge toward building water Smart Cities is to identify the livability needs of the people and the existing water system prevalent in the city. Then these opportunities can be related to the needs of goals of the area.

2. Define Water Smart City Vision

Every city needs to set up a vision of “when to become a Smart water City” – keeping in mind the challenges and opportunities available in the city. The vision needs to be shared with the stakeholders, and the timeline to achieve online.

3. Explore Cocreation Opportunities

Every city has its natural water system and living conditions peculiar to it. Therefore, all plans and actions need to focus on the requirements to make the city water smart. An infrastructure project in water management also needs to be initiated by linking it to climate adaptation goals.

4. Codesign Solutions

It refers to identifying possible optimal measures to reach the “cities” aspiration, especially water. This can be done by integrating the stakeholders (Government, citizens, research organizations, and investors).

5. Define Business Case

Each possible measure has its advantages and disadvantages. These should be weighed, keeping in mind the break even of possible actions. So a balanced approach needs to be identified before executing the potential measure.

6. Implement and Evaluate

These are the continuous measures for the Smart water Cities. Periodic evaluation of the measurements should be carried out according to the needs and requirements of the cities by monitoring the database (Fig. 1).

Summing up, it can be observed that the steps toward the water Smart Cities should also include:

- Water distribution network
- Maintenance and reliability of distribution network
- Recycle and reuse water

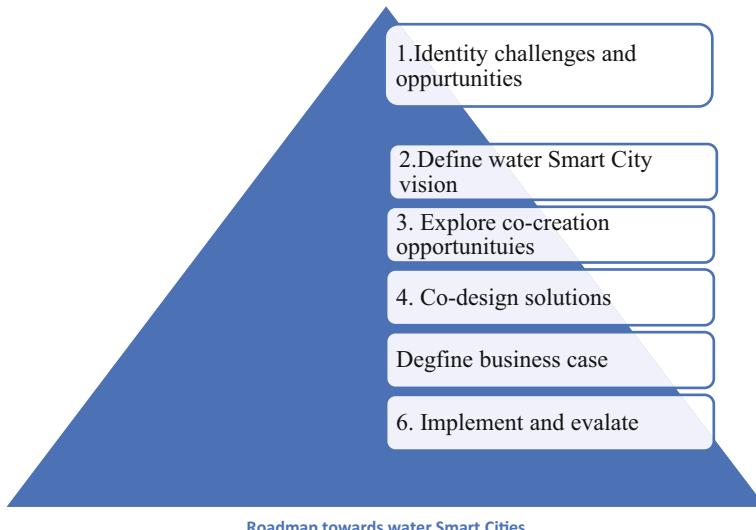


Fig. 1 Roadmap toward water Smart Cities. (Source: Tim Van Henthin et al. (2016), Towards water Smart Cities, Wageningen Environmental Research, Alterra, P.5)

- Developing management information system and database to take care of demand-side management
-

Success Stories

A Water-Secure Village

Mewat includes the Mewat district of Haryana and parts of Alwar, Bharatpur, and Dholpur districts of Rajasthan. Groundwater is the primary source of water, which is saline, making it unfit for human consumption.

With the help of SM Foundation, an NGO of Gurgaon, the villagers of Patkhori village practiced conservation to resolve the problem of water shortage.

Saving India's Lifeline: Why Rivers Need Trees

According to Sadhguru, “We are destroying the soil and water resources at such a rate that in another fifteen to twenty years time, we will not be able to feed these people and quench their thirst”. This can be done through more tree planting through the Project Green Hands. Individuals should be encouraged to plant trees along the banks of rivers and water bodies.

Conclusion

Water is included as a subject in the state List (List2) of the seventh Schedule of the Constitution of India. States have been entrusted with all water-related activities: water supplies, irrigation and canals, drainage and embankments, water storage, and water power subject to the provisions of entry 56 List 1. The Indian Constitution lays down the laws regarding development of inter-state and river valleys by the Union Government. However, it has been observed that water disputes between the states have been on the rise in the recent past.

In India, most policies, plans, and projects have immense readability but lack governance, i.e., their execution, implementation, and monitoring. The national water Resources Council (as suggested by M.M. Punchi Commission on Centre-State Relations). National Water Policy should evolve the consensus on water-related issues through the National Water Resources Council. In the end, it is prudent to say that all is not gloomy. India has a few success stories that explain that we all can collectively fight the battle against water scarcity in the years to come.

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Community Resilience and Chronic Flood in Imphal City

13

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Contents

Introduction	168
History of Flood	168
Seasonal Flood and Risk	170
Imphal City	171
Socioeconomic Indicators	171
Community Resilience	172
Flood in Imphal City	174
Resilience and Community Response	176
Conclusion	178
References	178

Abstract

Manipur is highly vulnerable to natural disasters such as earthquakes, landslides, floods, and drought. Manipur faces vulnerability to earthquakes as the state falls in zone V. Ima Market or Nupi Keithel, a unique women's market in Asia, was severely hit by the earthquake in 2016, causing extensive damage and displacing thousands of women vendors. This study examines community resilience in the context of the chronic flood in Imphal city. Data revealed Manipur has a history of floods which began in 1916 and continued in the following years, i.e., 1929, 1941, 1953, 1965, 1966, 1989, 1992, 1997, 1998, 1999, 2001, 2015, 2017, 2019, and 2020. Imphal city is the most flood-affected area and is connected to the incessant heavy rainfall in the upper catchment areas, constituting about 70% of the total catchment areas. The poor urban drainage system, encroachment of river banks, and numerous vulnerable points of the embankment of major rivers are causing floods in Imphal city. Improving roads in Imphal city without improving the urban drainage system worsens the situation. A vital community resilience needs to increase the roles of states, local communities, and stakeholders in

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rescuing, evacuating, distributing relief materials, and preventing the epidemic outbreak.

Keywords

Resilience · Breach · Water · Drainage · Flood · Catchment

Introduction

Manipur is located in the northeastern part of the country bordering Myanmar in the south, Nagaland in the north, Mizoram in the south-west, and Assam in the west. It has a geographical area of 22,327 sq. km, constituting 0.7% of the total land surface of India. Manipur exhibits unity in diversity, as several ethnic communities have coexisted, exhibiting their customary laws, religions, identities, and cultures. There are 16 districts. viz., (i) Imphal East, (ii) Imphal West, (iii) Bishnupur, (iv) Jiribam, (v) Thoubal, (vi) Kakching, (vii) Senapati, (viii) Kangpokpi, (ix) Tamenglong, (x) Noney, (xi) Churachandpur, (xii) Pherzawl, (xiii) Chandel, (xiv) Tengnoupal, (xv) Utkhrul, and (xvi) Kamjong. Imphal city is situated in the heart of the Imphal West district. Report (Government of Manipur, 2021) pointed out that the proportion of the urban population to its district population was highest in Imphal West, with 62.33 percent among valley districts. Imphal valley is drained by two rivers, (i) Imphal river and its tributaries and (ii) Nambul river. Imphal river rises in the highlands to the western part of Kangpokpi hills which lie in the northern part of Imphal valley. The river is joined by many tributaries like the Sekmai river, the Thoubal river, the Kongba river, and the Iril river. The Imphal river does not fall in the Loktak; it flows in the eastern part of the lake. The Nambul is another vital river of Manipur that drains the Imphal valley. It rises in the Kangchup hills in the western part of the valley. The river passes through the heart of Imphal city and follows a course in the west of Imphal river till it falls into the Loktak. Breach of embankment on Imphal river and the Nambul river causes chronic flood in Imphal city during the rainy season.

History of Flood

Over the last few years, the floods in Manipur have caused extensive damage to properties and essential infrastructures (such as bridges, communication, and power). There was a flood in 1916 that affected significant areas in the Imphal East district on the east side of the Imphal river (such as Wangkhei, Khurai, Kongba, Porompat, Bamon Leikai, and Soibam Leikai). After this, Manipur experienced a flood in 1929 that lasted 3 days, mainly in the valley areas. The state also recorded a flood in 1941 affecting some areas on the western side of the Imphal river, particularly the Yaiskul area, due to a breach of the Imphal river embankment at

Moirangkhom. Flood again struck the valley areas of Manipur in October 1953. Manipur experienced a moderate type of flood in 1965. Following this, a severe flood hit the state twice in 1966 (June–July and October), affecting places like Hiyanglam, Sugnu, Arong, Nongmaikhong, Wangoo, and Tanjeng. Breach of embankment took place at 60 places. Manipur witnessed a flood from July to August in 1989 where the flood severely affected Imphal valley. Altogether 361 localities were inundated due to a breach of embankment in 40 places. The flood had affected 7 lakh people, and 97,500 hectares of paddy fields were damaged. More than 40,000 houses and 41,000 domestic animals were damaged. Incessant rainfall in the upper catchment area of important rivers in Manipur valley caused a flood in October 1992. Manipur awoke to find its valley flooded in September 1997. All the rivers flowing through the Manipur valley increased their water flow rapidly and breached embankments at four different places of Nambul river, two places of Wangjing river, one place of Merakhong river, two places of Imphal river, two places of Thongaorok river, one place of Khujairok river, and one place of Khabi river. More than 4000 houses were damaged. Heavy and incessant rainfall breached many embankments and caused inundation in several parts of Imphal, such as Iroisemba, Lamding, Nashikhong, and Lamding Laishram Leikai adjoining areas, in 1998. Manipur saw severe floods in September 1999 due to incessant rainfall from August 24 till September 3, 1999. The flood damaged more than 7000 houses and 15,000 hectares of paddy fields. It was followed by a severe flood in 2000, causing inundation in many parts of valley areas in Manipur. The flood damaged 2400 houses and 7800 hectares of paddy fields. Incessant rainfall breached the river embankment, and water overflowed through (the embankment), inundating several parts of Imphal city in June and July 2001. Breaching of the embankment also caused a flood in Kongkham, Sabal Leikai, Maibam, and Naorem. Chandranadi river, a tributary of the Nambul river, overflowed to the southern part and inundated cultivated lands of Chajing, Haoreibi, and Karam. Another flood had hit Manipur in August 2002. Besides this, Manipur experienced a flood in 2017, inundating several parts of the valley areas. Districts affected by this flood were Imphal East, Imphal West, Thoubal, Bishnupur, and Kakching. Flood hit Manipur in 2018, claiming six lives in the districts of Kakching, Thoubal, Bishnupur, Imphal West, and Imphal East. Manipur recorded a severe flood in 2019, affecting schools, houses, community halls, temples, playgrounds, clubs, and crematoriums along Imphal river banks. Extensive agricultural lands in many valley areas such as Yumnam Khunou, Sambei, Tangkham, Khundrakpam, and Pangei, with some villages located on the western side of Sajiva Central Jail, were flooded. A flood occurred in 2019, displacing more than 70 families in the Jiribam district of Manipur. Jiri river, which runs along the border with Assam state, breached its embankment on October 27, 2019, and inundated several areas. Manipur witnessed a flood in 2020 due to incessant rainfall for a few days triggering landslides in several parts of Manipur and losing connectivity with some areas of the state. Noney and Tamenglong districts were severely affected by the landslides. The intensity of floods in Manipur ranged between moderate and severe magnitude.

Seasonal Flood and Risk

Statistical data on seasonal hazards and risk assessments are presented in Tables 1 and 2. As shown in Table 1, flash floods and heavy rainfall tend to occur from June to August, while hailstorms and thunderstorms tend to occur from March to May. From Table 2, it can be seen that vulnerable areas include infrastructure, crops, houses, public property, livestock, socioeconomic life, health, education, old age, children under 5 years, and sick people.

Table 1 Seasonal hazard analysis

Name of Disaster	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flash Flood								↔				
Heavy Rainfall							↔	↔				
Earthquake	↔	↔										
Hailstorm/Thunderstorm			↔	↔								
Epidemics	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Drought	↔										↔	↔
Fire Accident		↔	↔									

Source: District Disaster Management Plan (2019)–2020

Table 2 Risk assessment

Potential impact	Vulnerable areas
(i) Infrastructure	Communication network, telephone connections, road network, irrigation system, drinking water systems, electrical installations, etc.
(ii) Crop	Agriculture/horticulture crops
(iii) House	Private dwelling houses both Kutcha and Pucca houses
(iv) Public property	Community halls and market sheds
(v) Livestock	Cows, buffalos, goats, sheep, poultry
(vi) Social and economic life	Livelihood
(vii) Health and education	PHC, PHSC, and schools
(viii) Vulnerable person	Handicapped, pregnant women, old aged, children under the age of 5, sick and ailing, etc.

Source: District Disaster Management Plan (2019)–2020

Imphal City

Khwairamband Bazar is located in the center of Imphal city and is popularly known for its unique women's market. There are three Ima Keithels (Ima means mother and Keithel means market) or Nupi Keithel (Nupi means Woman). They are (i) Leimarel Sidabi Ima Keithel (1300 Women), (ii) Emoinu Ema Keithel (700 Women), and (iii) Phouoibi Ima Keithel (1000). They sell religious goods, vegetables, fruits, fish, spices, utensils, handloom, and handicraft items. These markets have become tourist hotspots in Manipur. Imphal city has been expanding fast, converting many wetlands and water bodies into dwelling units (Zutshi & Verma, 2017). In this process of expansion, even the flood spill channels have been encroached upon, and residential colonies have come up closer to water bodies. These areas were the worst affected during the floods of July–August 2015. Floodwaters followed the natural path and inundated whatever came in their way. The present study selected Imphal city and concentrated on a few selected sites such as (i) Yaiskul, (ii) Sagolband, (iii) Uripok, (iv) Nongmeibung, (v) Kakwa, (vi) Kwakeithel, (vii) Tera, (viii) Wangkhei, (ix) Kongba, (x) Khuman Lampak Sports Complex or Namdunlong Village, and (xi) Naoremthong. A map of Imphal city is shown in Fig. 1. It may be particularly mentioned here that the Nambul river, which passes through the center of Imphal city, serves as drainage discharging water drained from its tributaries and surrounding areas. During the incessant rainfall, the river cannot contain the speedy flow of water draining from its tributaries and urban drainage, causing frequent floods in the city. Apart from that, the distributaries of the Nambul river are not functioning properly.

Socioeconomic Indicators

Table 3 presents data on the socioeconomic indicators of Manipur. It may be observed from the table that GSDP of Manipur state at constant prices in (2019–2020) accounted for 20,743 crores. Per capita income of Manipur at constant (2011–2012) was estimated at Rs. 54,119 in 2019–2020. As per Census India (2011), the population of Manipur was estimated at 28.56 lakhs with a decadal growth of 25%.

Data also shows that the work participation rate was estimated at 45.6%. While the literacy rate accounted for 77%, the sex ratio recorded for 985 per 1000 males. There are 2582 villages; out of these 2205 villages have been electrified. While state beneficiaries under AAY accounted for 2,00,500, state beneficiaries under PHH recorded 21,38,935. The communication network of any state is identified by examining its establishment of post offices, radio stations, TV networks, and provision of Internet services. It may also be seen from the table that there are 50 post offices, including branch offices in Manipur state, 3 radio channels, and 1 TV station. Apart from All India Radio and TV (Doordashan, DD Imphal), various services of local television networks are mushrooming in the state. It may be said that the local television network is growing fast, and it helps disseminate knowledge and

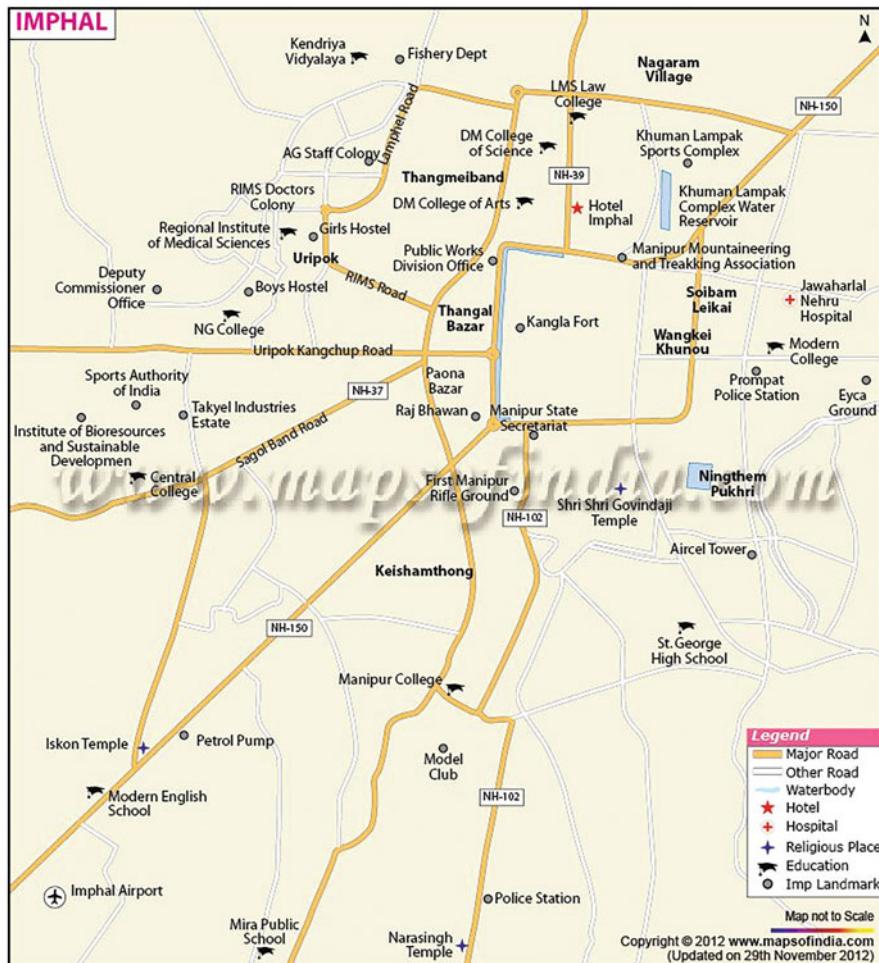


Fig. 1 Map of Imphal city. Source: <https://www.mapsofindia.com/maps/manipur/imphal.htm>

information to the public. As regards to government's healthcare facilities, there are 553 hospitals/dispensaries.

Community Resilience

Community resilience is the ability of countries, communities, and households to manage change by maintaining or transforming living standards in the face of shocks or stresses – such as earthquakes, drought, or violent conflict – without compromising their long-term prospects (DFID, 2011). According to OECD (2013), disaster resilience is part of the broader concept of *resilience* – “the ability of individuals,

Table 3 Socioeconomic indicators of Manipur

Sl. no	Indicators	Manipur
1	GSDP at constant prices in (2019–2020)	20,743 crores
2	Per capita income at constant (2011–2012)	Rs.54,119
3	Population	28.56 lakhs
4	Growth rate of population (2001–2011)	24.5%
5	Population density	128 per sq.km
6	Work participation rate	45.6
7	Literacy rate	76.94%
8	Sex ratio	985 per 1000 males
9	Districts	16
10	Towns	51
11	Rural population (in percent)	70.79%
12	Villages	2582
13	Forest cover	17,418 km ²
14	Electrified villages	2,205
15	National Food Security Act (NFS) beneficiaries Antyodaya Anna Yojana (AAY)	2,00,500
16	NFS beneficiaries like priority households (PHH)	21,38,935
17	Healthcare facilities (government)	553 Hospitals/ dispensaries
18	Livestock Census 2019	7.72 lakhs
19	All India Radio (Kangla, Sangai, and Akashvani)	3
20	Television (Doordashan, DD Imphal)	1
21	Cable TV network (ISTV, Impact, Tomtv, MamiTV, Image, IS Com, Elite TV, TV Kakching, and Manipur TV)	6
22	Post offices including branches	50
23	Telecommunications	Vodafone, Airtel, BSNL, JIO, &Tata

Source: Economic Survey Manipur 2020–2021

communities and states and their institutions to absorb and recover from shocks, whilst positively adapting and transforming their structures and means for living in the face of long-term changes and uncertainty.” Through the Global Facility for Disaster Reduction and Recovery (GFDRR), the World Bank highlighted five core areas for building disaster resilience. They are (1) risk assessments and risk communication; (2) structural and nonstructural measures, e.g., infrastructure, land-use planning, policies, and regulation; (3) preparedness (early warning systems; support of emergency measures; contingency planning); (4) financial protection (assessing and reducing contingent liabilities; budget appropriation and execution; ex ante and ex post financing instruments); and (5) resilient reconstruction (resilient recovery and reconstruction policies; ex ante design of institutional structures). The concept of resilience is highly relevant and applicable in the context of chronic flood in the

Imphal city. Building disaster resilience in terms of structural and nonstructural measures, financial protection, risk assessment, and emergency support system is strongly needed in Manipur.

Flood in Imphal City

Manipur drains its water from the northern sides toward the southern direction of its boundary. However, there has been a significant change in the natural setting of Manipur's river system over the past decades resulting in a frequent flood in Imphal city. For instance, tributaries such as streams and rivulets that feed the Nambul river have been significantly narrowed down and shallowed down due to human encroachment. The major outlet or distributary channel of the Nambul river called Waishel Maril has also been significantly contracted and shallow. Therefore, this channel cannot carry its water flow properly toward its destination, i.e., Loktak lake. The study also observes one phenomenon that the water level of rivers flowing through the Imphal valley significantly increases when there is incessant rainfall in the upper catchment areas. This level will flow higher than the streams that feed the river. During this peak level of river water, the normal flow of water that is being drained through the streams cannot enter the river flow. Instead, the water flows back and inundates a large part of Imphal areas. Once the water level drops in the river, the water will drain and enter the river. Then, the flood will recede automatically.

Flood in Manipur valley is primarily due to heavy rainfall in the upper catchment areas ([Manipur State Disaster Management Plan, 2018](#)). The intensity of rainfalls is higher in the hilly region than in the plain. While the hills surrounding the valley constituted 70% of the total catchment area, the valley area contributed 30% only. Thus, the valley in Manipur has a large upper catchment area where rainfall usually is high. These reasonable amounts of rainfall feed many streams and rivers, which finally drain through the valley. In the hills, steep slopes occupy the central portion. Besides, degraded land areas, which occupy 1545 km, constituted 24% of the total catchment area and 35% of the hilly region, enhancing more erosion and runoff. There are many vulnerable points along the riverbanks of the major rivers of Manipur valley. In these areas, erosion, sliding, and slumping of the banks are common, causing a breach of riverbanks to these points during the rainy season. Proper maintenance of these riverbanks is necessary, and retaining walls are to be constructed. The plantation of trees will help to some extent. A study by Singh, S. ([2015](#)) found that the causes of floods in Imphal valley include poor urban drainage, deforestation, and other factors including breaching of river banks, improper damming, sediment pollution, siltation, shallowing of river beds and lakes, heavy precipitation in the catchment area, changing land-use pattern, and vanishing of traditional recharging structures and water bodies. Earlier, the various lakes of Manipur, mostly located in the southern part of the valley, served as effective reservoirs of excess runoff. Most of the lakes are severely degraded in

quality to the extent of complete disappearance resulting in severe curtailment of their water-holding capacities. The magnitude of a natural flood produced by rain is related to the intensity and duration of rain over the catchment area, the rate at which water flows across the land surface toward the river channel, and the flow of water through the ground to drainage systems. Flash floods can occur in urban areas due to poor drainage facilities. The rate at which water enters river channels depends particularly on vegetation cover. Large floods occur where there is little vegetation and many soils and paved surface areas are impervious to water. Such floods are called downstream floods because the effect of flooding increases progressively downstream.

Low-lying areas in various localities of Imphal were flooded as the Nambul river overflowed, and several farmlands were also inundated (*Hindustan Times*, 2017). A portion of the Imphal riverbank collapsed in the Imphal East district, creating panic among the people. With more than 300 households affected, many fled their homes to seek refuge at voluntary and government-provided temporary relief camps. Several low-lying areas in the capital, such as Kwakeithel, Wangkhei, Sagolband, and Kakwa, had been flooded due to a blocked drainage system (*The Times of India*, 2018). The water level of the Imphal and Kongba rivers that flow in the districts of Imphal West and East was increasing gradually. The water level of the Nambul river overflowed in some parts of Uriopok in Imphal West district due to heavy rain in the catchment areas, and it receded (*The Times of India*, 2017). The Manipur government declared a holiday for all government offices and educational institutions, including private sectors under the government, as the flood hit most parts of Imphal city (*The Sangai Express*, 2019). The sustained rains had overflowed most of the major rivers that run through Imphal city, particularly the Imphal and Nambul rivers. The Imphal river overflowed and breached its bank, submerging large residential areas, including VIP colonies housing the chief secretary of Manipur, DGP Manipur, and other top bureaucrats, under the Imphal East district. The district came to a grinding halt with overflowing water flooding the streets of its commercial hub. The power supply in most parts of the districts affected by the flood was cut off as safety measures. The radio service of All India Radio (AIR) Imphal was also suspended as a flood hit the office complex. The nonstop downpour had raised the water levels at Imphal and Nambul rivers and reached flood levels. The strong current of the water washed away significant parts of the bridge under construction over the Irl river at Sawombung. In some Khurai areas, the water had even breached the river banks and flooded the surrounding homes. Water from the Imphal river overflowed at Thumbothong and Checkon sides (*The Sangai Express*, 2019). Flooding in the cities and towns is caused by increasing incidence of heavy rainfall in a short period of time, indiscriminate encroachment of waterways, inadequate capacity of drains, and lack of maintenance of the drainage infrastructure (Government of India, 2008).

In sum, a number of factors contribute to frequent flooding in Imphal city, including the vulnerability of river banks (often breached), lack of vegetation, encroachment, deteriorating drainage systems, and deforestation in the upper catchments. The state needs to be prepared for disasters in advance.

Resilience and Community Response

There is a lack of community awareness on responsiveness, preparedness, mitigation, and recovery during a disaster in Manipur (Singh, 2018). The local community lacked training about their shelter, rehabilitation, relief entitlements, schemes, and legal access in times of disaster. The main factors causing floods in specific places of Imphal cities like Sagolband, Uriopok, and Nongmeibung are lack of proper drainage system, deforestation in catchment areas, breach of the river embankment, improper damming, changing land-use pattern, and vanishing of traditional recharging structure and water bodies like ponds and tanks due to urbanization. There are also some effects of floods in Imphal city. People are facing many problems during and after the flood. Flood damages houses and properties, creating transportation problems, electricity problems, disturbance in education, reduction in the economy, and spreading waterborne diseases. During a flood, local club volunteers arranged and opened a relief camp at a community hall or school for the safety of affected people and distributed food.

Furthermore, their MLA, social workers visited the affected areas and extended their hands, providing essential commodities like drinking water, PDS items, and relief materials. In Uriopok, Yaiskul, and Tera, flood is mainly due to the failure of the drainage system in that area. When there is heavy rainfall, flood condition worsens due to the overflowing of river water. The bad condition of drainage worsens floods caused by river overflow. Local clubs initiated cleaning up of drainage, and now flash flood condition has improved. Due to the construction of the embankment of Nambul river, a breach of the embankment has not occurred. Concerned departments have taken specific measures like constructing river embankments and retaining walls. When there is a breaching of an embankment, local clubs and government agencies work together for restoration work. During a flood, local clubs help in the evacuation and mitigation process. The government has started renovating the drains, which will reduce the severity of floods in the locality. Local clubs help people in evacuating the affected people to a safer zone.

The main rivers draining Imphal West plain are the Imphal river, Nambul river, and their tributaries (District Disaster Management Plan, 2019–2020). Nambul river is made up of a number of small streams on its upper course. This river passes through the Imphal municipality area dividing its area into almost two halves. This river serves as the main discharging drainage of the Imphal Bazar area and its surroundings. During the rainy season, swift flowing of water directed to it from its tributaries cannot be contained in it. As a result, the breaking of its river bunds causing waterlogging in the low-lying area is a regular feature. In Manipur, various lakes located in the southern part of the valley act as effective excess runoff reservoirs. However, due to the degrading quality of the lakes, their water-holding capacities have been reduced to a great extent. It has led to the flooding of the low-lying areas, which causes various problems such as destruction of houses and properties, loss of lives, water and electricity problems, spreading of waterborne diseases, damage to farms and pisciculture, a severe reduction in the economy, and many more. In Nongmeibung, people have experienced floods every year, and the

worst affected year was 2017, when it was flooded for around 2 months. During that period, people faced many problems, such as food shortages and drinking water. Affected people from the locality even had to leave their homes and stay in the community relief centers as their houses were all flooded, while some people also went to stay at their relatives' place till the water level came down. As the water became stagnant for a long period, it caused many diseases. The locality club played a vital role in tackling the problems being faced by the locality. They helped distribute relief items supplied by the government, such as food and drinking water. They arranged a relief center for those people whose houses were all flooded and who had no place to stay. As the water levels had not gone down for a long period, the people of the locality tried to pump out the water from the flooded area to help dry out the water faster. In Kongba, people have experienced floods every year during the monsoon season. The main reason for the flood in this area is the overflow of the Kongba river. They faced many challenges during that period. For instance, due to a shortage of food supply, they had to use small boats to go out of their house to buy essential commodities. People of the locality had to make new drains so that the water would not be stagnant in a particular area and help dry out the water faster. The councilor of that area also helped people of the flooded area by distributing food items and other dry materials. They also organized medical relief camps for the affected people after the flood, as the disaster had both acute and chronic effects on the physical and mental health of the affected population. In the Wangkhei area, several low-lying areas are flooded annually due to improper drainage systems. After constructing the sericulture office at Sangaipat, the nearby areas are constantly flooded as there is no proper channel for the drainage system. As a result, many families suffered from floods every year at which they had to leave their houses and stay at the community hall. Several families in Wangkhei suffer from floods every year due to an overflow of ponds and drains. Before constructing the sericulture office at Sangaipat, the water flowed through Sangaipat and went off to the Bamon Leikai area through a proper drainage channel. However, after the construction of the sericulture office, the water from ponds and drains was stuck in low-lying areas. So, people have to pump out water by themselves as there is no proper drainage system. The primary causes of floods in Manipur valley are heavy runoff and a lack of a proper drainage system. In the past few years, Manipur faced multiple events of the flood, where it had occurred five times in the year 2017. It has dramatically affected the socioeconomic condition of the state to a great extent. The mitigation and management of flood events are essential to reduce the impacts of floods. Severe flood around the Khuman Lampak Stadium Road occurred in 1989. People lost so much livestock as they were drowned and carried away by the water toward Kangla and the bazaar area. People set up a big relief camp on the main road near the Stadium Road during the flood because of a higher ground level just next to the flood area. The neighboring localities were unable to provide relief and support except for helping in simple tasks like shifting heavy objects for houses and families living closest to them or those related to them. Church leaders play a significant role during flood disasters. The Chingmeirong Catholic Church was the first to provide relief in the form of food. Even after people got rehabilitated back to their homes, they went

to the Manipur Baptist Convention (MBC) church campus to get a vaccination, and people got vegetables and rice as a relief. During the flood, the army also helped in relief works.

Conclusion

Imphal city is the most flood-affected area and is connected to the incessant heavy rainfall in the upper catchment areas, constituting about 70% of the total catchment areas. It is also linked with the poor urban drainage system, encroachment of river banks violating the Manipur Flood Plain Zoning Act 1978, and numerous vulnerable points of the embankment of major rivers. Deforestation in the surrounding hills that leads to denudation in upper catchment areas with a continuous shrinking of traditional water bodies and lakes exacerbated the flood in the Imphal valley. Particular mention may be made of the drainage network system in the Imphal city, which has not been doing its proper work and instead created stinking spots in the Khwairamband market. Continuous improvement of roads in Imphal city is not accompanied by improving the urban drainage system. The National Policy on Flood Control (1954) is ineffective in dealing with flood embankments, drainage channels, and town protection works. A vital community resilience needs to increase the roles of local communities, NGOs, urban local bodies, Panchayati Raj Institutions, autonomous district councils, civil society organizations, religious leaders, and stakeholders in checking floods, rescuing, evacuating, distributing relief materials, and preventing the epidemic outbreak. Training has been found to be the most effective tool for reducing vulnerabilities (Zutshi & Verma, 2017). Plantation of fast-growing trees in the upper catchment areas to reduce soil loss and encouraging terrace cultivation on the slope of the hill are also recommended. Finally, it would be very helpful if proper action could be taken up for the deepening of these lake beds.

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Disasters in Sundarbans and Ecological Refugees to Kolkata: A Missing Action Plan

14

M. P. Chengappa and Arpita Saha

Contents

Introduction	182
Climate Refugees, Disaster Migration: Where Are We Headed?	183
Sundarbans: A Unique Ecosystem	185
Kolkata: The Precariously Placed State Capital	187
The Present Framework or Is There One?	189
The Glasgow Conference 2021 (COP-26) and Its Takeaways	190
Harnessing the Indian Legal Framework	191
Conclusion: Management and Mitigation	192
References	194

Abstract

The frequency and severity of natural disasters have risen worldwide in recent times, causing loss of lives and property and migration of vulnerable populations. In 2019, India recorded the highest disaster displacements in South Asia. Kolkata, the capital of West Bengal, a city situated in the Indo-Gangetic plain, is ranked the fourth most vulnerable among 11 major coastal cities in Asia threatened by rising sea levels. To add to its woes, the world's largest mangrove forest, the Sundarbans, which has historically been its cyclone shield, faces submergence due to rapidly rising sea levels, with acres of crops being destroyed by saline water. The effects of the depletion of the mangrove forest have been manifested from the disastrous consequences of Cyclone Amphan (May 2020) and Cyclone Yaas (May 2021) in southern West Bengal. The island of Ghoramara has been reduced to half its size. Following Cyclone Yaas, islands of Ghoramara and Mousuni have been evacuated by the government. Climate refugees systematically displaced from the outer islands of Sundarbans have relocated to Sagar Island and are gradually pouring into Kolkata, looking for alternative

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accommodation. The lack of national or state policy and a general apathy of the government regarding strategic rehabilitation of climate migrants are proving to be burdensome for Kolkata, a city already bursting at its seams. This paper will evaluate the factors behind the disaster displacement that Kolkata is expected to face soon and propose strategies to mitigate the issues arising from such unchecked migration from the Sundarbans.

Keywords

Climate change · Disaster · Kolkata · Sundarbans · Migration

Introduction

Displacement and migration of population because of climate change and natural disasters are major challenges humanity faces today. Various factors have contributed to worldwide climate change, which may be broadly divided into two categories: slow global warming over a period resulting from natural causes and the other being acceleration thereof because of various factors triggered by humankind and its activities. The 2022 Intergovernmental Panel on Climate Change has warned that the earth will hit the critical warming of 1.5°C within two decades (IPCC, 2022), human activities being the unequivocal contributor to such irreversible changes, and that extreme climatic events shall become more frequent. Whatever be the root cause, global warming has manifested itself in the meltdown of polar ice belts and rising sea levels, one of the disastrous effects thereof being the submergence of islands and coastal belts, which are typically low-lying in nature.

The incidents of submergence have translated into forced or compelled migration of the local population of such islands and coastal areas, such displacement being either temporary or permanent. Such migrations have been either in response to extreme weather events like cyclones, floods, etc. or climate variations resulting from longer-term changes, like rising sea levels, etc. This apart, migrations may also stem from the scarcity of resources or increased conflict among the population because of factors directly attributable to climate change.

Climate migration is not new or endemic to the Sundarbans, the deltaic region in the southern part of West Bengal and Bangladesh. A study by Norman Myers, a British environmentalist, suggests that going by the current trends, there may be as many as 250 million climate refugees worldwide by 2050 (Myers, 1993). Lack of adequate water has compelled the government in China to mandate a series of relocations since 1983 in Xihaiyu, Ningxia. The mass migration in Minqin, Gansu, has seen the coinage of a new term, *shengtai yimin*, or ecological migrants (Muscolino, 2011). The increasingly alarming fear of flooding caused by a rise of temperature to 3.4° has caused four Alaskan villages to require immediate evacuation (USGAO, 2009). Louisiana has seen the loss of more than 2000 square miles of its coast, translating into the first migration of an entire community of the Biloxi-Chitimacha-Choctaw First Nation due to saltwater intrusion (Davenport &

Robertson, 2016). The Balkan flooding has caused considerable migration of people from Bosnia and Herzegovina to other countries in Europe (Monella & Carbone, 2020). In India too, eminent environmentalist Ramachandra Guha coined the term “ecological refugee” to describe the class of people displaced by reason of environmental factors, playing their role in the cauldron of conflicts that developmental policies after 1948 engendered (Gadgil & Guha, 1995). While certain developed countries have continued to deny the factum of climate change till very recently, its reality is being perceived every day and in every corner of the earth.

The United Nations Office for Disaster Risk Reduction defines “disaster” as “a serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability, and capacity, leading to one or more of the following: human, material, economic and environmental losses, and impacts” (UNISDR, 2009). The overarching effect of climate change has brought increasingly numerous and severe localized instances of disaster such as floods, inundation, cyclones, sandstorms, sea-level rise, blizzards, snowstorms, etc. Still, it has also emerged as the single most pervasive disaster incident. The migration of masses as a direct consequence of the cumulative effect of localized disaster and climate change is no less a disaster that humankind will have to grapple with within the coming days (Sherbinin, 2020).

Climate Refugees, Disaster Migration: Where Are We Headed?

The issue of equity is crucial; Climate affects us all but does not equally affect us. (Ban Ki-moon, UN Secretary-General)

“Climate refugees” refer to the large-scale cross-border migration of people wholly or partly caused by weather-related adverse conditions in their homelands (UNGA, 2018). A 2019 report by Internal Displacement Monitoring Centre shockingly reveals that India topped the list of countries with the newest displacements because of climate change disasters in 2019, ahead of the Philippines, Bangladesh, China, and the United States (IDMC, 2019).

Disaster-driven migration may be internal, that is, within the boundaries of a country, or external, that is, to other countries. While there is scope for internal migration to be governed by the laws of a particular territory, a larger framework is provided by the United Nations Guiding Principles on Internal Displacement (“UNGPID”). By recognizing “natural or human-made disasters” as one of the reasons forcing or obligating persons or groups of persons to leave their habitual residences within the definition of “internally displaced persons,” the UNGPID brings climate-induced migrants within its sweep. Principle 3 recognizes the nation’s responsibility and duty toward the persons internally displaced within its jurisdiction to provide them with protection and humanitarian assistance. When it comes to persons having particular attachment with and dependency on their lands, Principle 9 bestows a special obligation on the nation to protect such persons from displacement. Principle 15 clothes internally displaced persons with the right, *among other*

things, to seek refuge in a different part of the country and be protected against forceful return or resettlement at places where risk may be posed to their life, liberty, safety, and health (UNOCHA, 2001).

In the international arena, there has been felt a lack of a global framework to address the issue of climate change-induced displacement. The United Nations Framework Convention on Climate Change (UNFCCC) bears only a passing remark to displacement. The Convention Relating to the Status of Refugees 1951 has failed to aid climatic disaster-induced migrants. The most basic requirement for a person to be covered under the Refugee Convention is “fear of being persecuted” on racial, religious, or other grounds (UNRA, 1951). In the case of a climate migrant, there is no question of fear of persecution; on the contrary, it is the primal fear of loss of life and property due to causes not under anyone’s immediate control. Such migrants are traditionally not entitled to the benefits under the Refugee Convention. In 2015, the New Zealand Supreme Court, while denying refugee status to a Kiribati citizen because of non-satisfaction with the definition of “refugee” due to no “fear of being persecuted,” recognized the need for protecting persons displaced because of environmental degradation attributable to climate change or other disasters (*Ioane Teitiota*, 2015). The application made before the Human Rights Committee under the Optional Protocol to the International Covenant on Civil and Political Rights was unsuccessful. However, the HRC recognized the obligation of the states to refrain from returning a climate migrant forcibly to places where there is a clear risk to their right to life (Sinclair-Blakemore, 2020). In turn, this judgment also acts as a guideline to states to objectively consider and weigh the far-reaching effects of climate change while adjudicating the issues of the grant of asylum and the rights of refugees.

While an easy way out may seem to enlarge the definition of the term “refugees” in the Refugee Convention to include the migrant victims of climate change, there is a lurking fear that bringing such a definition would dilute and devalue the victims of persecution and overwhelm the rehabilitation mechanism already stretched to its limit. Even if such a definition is expanded, it will cover only cross-border migrants, not those internally displaced.

Lester Brown was the first to propose the term “environmental refugee” for a person displaced by environmental causes (Brown et al., 1976). The International Organization for Migration (“IOM”) has proposed a progressive and inclusive definition for environmental migrants who were described as “persons or groups of persons who, for compelling reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad” (IOM, 2017).

The Institute for Economics and Peace has released a study revealing that at least 1.26 billion people would be victims of climate change displacement by 2050 (IEP, 2021). In 2018, the United Nations adopted the Global Compact for Safe, Orderly, and Regular Migration, which provides that governments should endeavor to protect climate migrants in countries of arrival by providing planned relocation and

rehabilitation and visa options if it is not possible to return such migrants to their countries where they were faced with disasters.

According to the United Nations High Commissioner for Refugees (UNHCR), each year since 2008, more than 21.5 million people had faced migration the world over because of climate change-related disasters (UNRA, 2016). The report further reminds us that it is not only the stray incidents of disasters themselves but also shortages in food and water and increased difficulties in access to natural resources that lead to such migration. Climate migrants are typically impoverished people. Migration is perhaps their very last response to adapt to the impacts of climate change, availed only by people who have permanently lost their homes, hearth, and livelihood to the far-reaching impacts of climate change. In the circumstances, climate change refugees find themselves in a precarious and unregulated position.

Sundarbans: A Unique Ecosystem

The Sundarbans (“Sundar” in Hindi language means beautiful and “Bans” mean forests) means “beautiful forests” or variably “forest of the Sundari trees or mangroves.” It is the deltaic forest region in the southern parts of West Bengal and Bangladesh formed by the deposition of silt from the mighty Hooghly, Padma, Brahmaputra, and Meghana rivers and their numerous distributaries before flowing into the Bay of Bengal. The forest is about 10,000 km², out of which about 4260 km² lies in India (Pani et al., 2012). Affected by outward current from the numerous rivers and inward current from the sea, this area has seen simultaneous land erosion on the one hand and land formation on the other for thousands of years. The rivers’ frequent watercourse changes and their numerous distributaries have also affected the newer land formation and washing away of older lands. The low-lying land in this area is thus in a state of relentless flux (Ghosh, 2017), being constantly affected by several external factors such as silt deposition, river currents, tidal currents, change of river courses, etc.

The unique ecosystem of the Sundarbans area has permitted the development of unique varieties of flora and fauna. The sweet water from the rivers and the saline tidal water from the Bay of Bengal have led to a widespread transition ecosystem of mangrove forests, locally known as “Sundari” trees, to develop. The pneumatophores or breathing roots of these trees rise upward from the anaerobic muddy soil to breathe in oxygen. The unique ecosystem created by these trees serves as the habitat for varieties of aqua flora and aqua fauna. This apart, the dense forests of the Sundarbans create a natural carbon sink and a natural cyclone barrier for the rest of West Bengal, particularly the low-lying Indo-Gangetic plains and the capital city of Kolkata (Chowdhury et al., 2021). Since time immemorial, the Sundarbans have protected West Bengal from devastating cyclones originating in the Bay of Bengal. More than 3.5 million of the populace are dependent on the Sundarbans for their livelihood (Mukul et al., 2020).

Over the years, the melting of the polar ice caps has contributed to an average global rise of sea level at about 2 mm per year. However, the heavy volume of

suspended sediment load in the Hooghly, Padma, Brahmaputra, and Meghana waters has escalated the rise of sea level in the Sundarbans region to about 3.14 mm per year (Jumde & Kumar, 2018). The elevation of the Sundarbans is between 0.9 and 2.11 m. The islands, being eco-sensitive regions, are also experiencing subsidence between 2 and 4 mm per year (Krien et al., 2019), mainly attributable to the natural compaction process because of deposits of silt brought in by the rivers.

Out of 102 islands in the Sundarbans delta region in West Bengal, about 54 are inhabited. Recurrent pre- and post-monsoon cyclones in the area have made the inhabitants of these islands vulnerable to loss of life and property. The 2007 Intergovernmental Panel on Climate Change identified climate change to be the biggest threat to the ecology of the Sundarbans, particularly to its mangrove forests (IPCC, 2007). Lohachara was the first inhabited island in the world to vanish under the rising sea level, creating the first climate refugees, whom the government moved into the largest island of Sagar. Other islands like Kabasgadi, Suparibhangha, Talpatti, and New Moore have gradually disappeared underwater (Hazra et al., 2004). The island of Ghoramara has reduced to half its size, while Mousuni island has shrunk by 20% (Danda & Mukhopadhyay, 2019). The frequent inundation of these islands and the severe land erosion in their peripheral regions have adversely affected the plant, animal, and aquatic lives therein and have negatively impacted the life, livelihood, and property of the region's inhabitants. Due to recurrent flooding, fishing, the primary source of livelihood for the area's populace, has severely suffered. The rise in sea levels has also majorly affected the fertile northern tracts of agricultural land, where standing water has been a menace resulting in the rotting of crops. The high school at Rangabelia has lost half of its playground to the rising water levels. The apocalyptic landscape left behind by Cyclone Sidr (November 2007), Cyclone Aila (May 2009), Cyclone Phailin (October 2013), Cyclone Hudhud (October 2014), Cyclone Fani (May 2019), Cyclone Bulbul (November 2019), Cyclone Amphan (May 2020), and Cyclone Yaas (May 2021) is hard to imagine. The recurrent cyclones in the Sundarbans with increased ferocity and frequency have been directly attributed to the rise in greenhouse gases resulting in further climate change. The Category 5 Cyclone Amphan, in the middle of the raging first wave of the Covid-19 pandemic, caused irreparable damage to life in the Sundarbans, inundating huts, cattle, trees, embankments, and paddy fields. About 28% of the mangrove forests were apprehended to have faced severe destruction (Sen, 2020). Inundation of fields and ponds with saline water killed fishes and left the fields unfit for agriculture for long times to come.

Due to adverse living situations, people from Sundarbans have been forced to migrate inward to higher lands. Some people have moved so temporarily, returning to their homes every time the water recedes, and they are in a position to earn some livelihood through agriculture or fishing. Some people have been forced to move permanently to larger islands like Sagar or even more inward to Kolkata and its adjacent areas, because of having lost their home and hearth to the frequent flooding in the region or the rising sea levels. However, the way of life in the bigger towns and cities and its costs have forced some of these migrants to return to ill-abled bodies bearing burdens of substantial medical expenses. While experiences with migration

have been manifold, it is primarily the elderly and the children who have stayed back in the southernmost islands. The inhabitants of the peripheral regions of these islands have to move in the pre- and post-monsoon phases every year, which contributes to the social and economic instability in their lives. Like the vulnerable ecosystem of the Sundarbans itself, its poor inhabitants also live in constant flux, their lives adversely affected by land erosion, island subsidence, rising water levels, cyclones, floods, loss of mangroves, etc.

It has somehow been the accepted notion that the only two states in India taking proactive measures to prevent floods and reduction of mortality rates resulting therefrom are Odisha and Andhra Pradesh (Jolly & Ahmad, 2019). However, by reason of the increasingly severe soil erosion in coastal regions, the outermost islands of the Sundarbans have systematically moved the residents thereof to Sagar Island, resulting in a further drain of resources and infrastructure problems for these larger islands (Samuel, 2021). Sagar Island in southwest Sundarbans stands, already reeling under the pressure of increasing population, exposed to the wrath of the Bay of Bengal (Medhi, 2021), fearing further cyclonic storms, subsidence, sea-level rise, and saltwater intrusion. In fact, since the 1990s, Sagar Island itself has been experiencing devastating effects of climate change, along with gradual incoming sea because of erosion of its peripheral areas. A 2014 strategy report by the World Bank suggests that embankments in the region are themselves a liability, providing a false sense of security to the inhabitants in the area while themselves being susceptible to erosion (World Bank, 2014). However, the devastation caused by the latest series of cyclones in the area has set the government into motion. Under the Mahatma Gandhi National Rural Employment Guarantee Act 2005, 5 crore mangrove is being planted in the Sundarbans Biosphere Reserve by adopting a community-based ecological mangrove restoration process in the area (Ahuja, 2022).

The climate change in the Sundarbans area has triggered numerous destructive effects on the land and its people. The rising sea level has led to increasing salinization of soil and water, which has further reduced the productivity of the land primarily dependent on agriculture. The soil erosion and the capsizing of embankments have led to a lack of availability of safe drinking water, decreased food security, and inadequate water, sanitation, and hygiene facilities. This has led to poor health, increased illness, and high diarrhea-related mortality, particularly among children (Sengupta, 2020). Ironically, only about 3% of the migrants from the Sundarbans attribute their displacement directly to environmental factors (Ghosh, 2018).

Kolkata: The Precariously Placed State Capital

The capital city of the state of West Bengal, Kolkata, is located along the eastern bank of the Hooghly river in the lower Ganges Delta. Reclamation of wetlands in and around Kolkata has been done gradually to accommodate the enormous population bursting at the seams (Chatterjee, 2008). Consequently, Kolkata has had to

reinvent itself and presently sits mostly on alluvial soil and within a zone considerably prone to earthquakes. According to the 2011 census, Kolkata is the seventh most populated city in India. In 2021, the Kolkata Metropolitan Area recorded more than 15 million registered voters.

It is apprehended that the sea level will rise by 1.4 meters in Kolkata by the turn of the century. As part of the low-lying Bengal basin, Kolkata lies between 1.5 to 9.0 m above sea level. Using the data from the 2021 report of the Intergovernmental Panel on Climate Change, Climate Central has created a map depicting the cities that may be underwater by 2030, and the six cities under a warning are Amsterdam (Netherlands), Basra (Iraq), New Orleans (United States), Venice (Italy), Ho Chi Minh City (Vietnam), and Kolkata (Sharma, 2021).

Such fear of inundation is real in Kolkata because of its low elevation. The increased risk of floods has been further driven by urbanization and global climate change. The urban poor in Kolkata typically resides in clustered settlements in low-elevation areas that see an increased danger of flooding (Revi, 2008). If climate change is not arrested, it is feared that more than 50% of the residents of Kolkata and its suburbs shall become victims of climate change and shall be driven out of their homes (Mukherjee, 2015).

According to a 2009 study by WWF International, Kolkata ranks third in Asia so far as climate vulnerability ranking is concerned. It is the fourth most exposed in terms of exposure to climate impacts and sensitivity of people, assets, and GDP. It has the second-lowest adaptive capacity to climate change (WWF, 2009).

Climate change affects not only the migrants but also the ecological balance of the area they are migrating to. Given the inadequacy of living opportunities to set up homes and hearths in the core areas of the destination, settlements are generally set up in peripheral areas, sometimes at the cost of massive deforestation. The living condition in such areas leaves a lot to be desired, leading the climate migrants to resort to unsustainable means to manage the natural resources in such places. Thus one instance of mass migration often leads to another vicious cycle of the beginning of climate change in the destination area. It is apprehended that Kolkata will face one of the biggest climate migration challenges as inundation in the Sundarbans area of both India, and Bangladesh will force millions to enter Kolkata in search of shelter and livelihood. The quality of life for these migrants decreases manifold. From living in areas with vast open fields, ponds, etc., they are pushed into living in cramped, dirty, and unhygienic slums in Kolkata's poor neighborhoods and its adjoining areas. This may further lead to the rapid urbanization of such adjoining regions, thereby creating challenges for local bodies to improve health, sanitation, roads, and infrastructure on a war footing, resulting in a significant ecological disturbance.

However, not much option is left to the impoverished people, who have left their original habitats because of the sinking of those islands and have further experienced the loss of life, property, and livelihood on the island of Sagar, where they had once been relocated. The last resort for them is to enter inward toward Kolkata, settle at the city's outer limits with their meager belongings, and toil hard at poorly waged, unskilled jobs to make ends meet. Mostly they build houses in violation of the municipal building rules and sometimes even in the floodplains, thereby accelerating

soil erosion, deforestation, and choking of available drainage facilities, leading to the deterioration of public health. Kolkata being located in the coastal plains, this precarious situation can further contribute to a rise in sea level.

The migration of people from Sundarbans to Kolkata has become a routine affair. According to a report by DECCMA (Deltas, Vulnerability, and Climate Change: Migration and Adaptation), about 70% of households in the Sundarbans have at least one member settled for work outside the area. Thirty percent of these migrants move outside West Bengal, and a small percentage move to the Middle East. The rest migrate closer to home to Kolkata and its adjoining areas (DECCMA, 2018). This is facilitated by the South Eastern Railways network and road network from Kolkata to the interiors of the Sundarbans and some middlemen. Many of the islanders commute daily to work in Kolkata; some stay and work in Kolkata during the weekdays and return to their villages during the weekends. Over time, some of such migrations have ended up in permanent settlements. Places like Basanti and Mollakhali in South 24 Parganas derive their names from islands in the Sundarbans, indicating the high presence and settlement of climate refugees in such areas. The DECCMA Project also reveals that around 83% of men migrate compared to 17% of women who leave the Sundarbans following their marriage (Basu, 2021). However, this trend has been changing. The number of female migrants has been increasing, particularly in the city of Kolkata and the peri-urban areas, where they are working as domestic helpers (Ghosh, 2018).

The Present Framework or Is There One?

India does not have any law addressing the issues of the climate migrants who have been forced to move internally. The National Action Plan on Climate Change 2008 focuses on broader issues like utilizing solar energy, properly managing water resources, increasing energy efficiency, developing a sustainable agricultural framework, and sustainable urban habitats as responses to the looming climate change issue (GOI, 2008). However, no policy has yet been formulated to categorically deal with the problems faced by climate migrants and provide long-term solutions. This situation is not typical to India alone. Most South Asian countries recognize displacement attributable to climate change but can undertake little to address the same in a significant, impactful manner (Kugelman, 2020). Though providing separate policies for coastal zone management, India's action plan falls woefully short when it comes to focusing on climate-induced displacements. There is no policy for strategic rehabilitation and relocation of climate refugees. Instead, the focus is on short-term measures like temporary relocation, reconstruction, etc. There is hardly any available reliable data regarding the number and situation of climate migrants. The national action plan calls for climate adaptation but fails to provide a concrete resettlement plan for victims of climate change. There has been some degree of public participation in the matter through NGOs. However, the Indian government has failed to get itself directly involved in addressing the grim issues staring at

it. Merely providing a flood warning system or a targeted public distribution system or SOPs for flood victims does not absolve the national government of its liability.

The West Bengal State Action Plan on Climate Change has also failed to provide any policy for the relocation and rehabilitation of climate migrants (GOWB, 2017). The policy does not even recognize the concept of climate migration or climate refugees. None of the adaptation strategies prescribed by the action plan cater to the needs of climate refugees.

The Glasgow Conference 2021 (COP-26) and Its Takeaways

The 26th United Nations Climate Change Conference was held between October 31, 2021, and November 12, 2021, in Glasgow, Scotland. The Glasgow Climate Pact recognizes the problems of climate-related migration and displacement (GCP, 2021). An important takeaway from the conference is that rich countries have collectively pledged to double the funding for climate adaptation projects by 2025. Once realized and appropriately channelized, this will enlarge the window to adapt to climate change, further pushing back and preventing the need to opt for migration as a last resort. The Adaptation Fund has raised more than triple the budget for the previous year, with the United States pledging to the fund for the first time. Better funding would enable the local adaptation efforts to reach fruitful results and prevent the occurrence of migration.

While the Glasgow Climate Pact reaffirmed the desire of all participating countries to arrest global warming to 1.5 °C, the pledges undertaken, however, set the goal at 1.8 °C. Previous experience shows that commitments mean little so far as these negotiations are concerned. If the current situation is allowed to remain, global warming will be on course to reach 2.7 °C. The difference of 1.2 °C would translate into hundreds and thousands of further displacements.

Rich countries have failed to honor their pledges of 100 billion USD per year to help devise a mechanism for poorer countries to mitigate the damages resulting from climate change, suitably adapt to it, and push further migration requirements. As far as the issue of loss and damages due to climate change is concerned, COP26 realizes that adaptation can be stretched only to a limit, and when it comes to permanent and irreversible losses, such as displacement, the countries that have historically contributed more to greenhouse emissions have a responsibility to provide funds to other countries to address the harmful effects of their mistakes. Poorer countries are rooted in establishing Glasgow Loss and Damage Finance Facility to mobilize money specific for redressal of loss and damages. Though Scotland and a group of philanthropic organizations agreed to lead the way by pledging grants, the same did not materialize. Instead, a less ambitious Glasgow Dialogue was adopted to convene between 2022 and 2024. Countries also agreed to commit to Santiago Network, a body aimed at building technical expertise in dealing with loss and damage, including migration and displacements relating to climate change.

Harnessing the Indian Legal Framework

The Constitution of India is not static but a living and organic document that evolves with the changing times and the populace's needs. Article 21 of the Constitution of India applies to both citizens and noncitizens alike. It guarantees the right to life and personal liberty to every individual. The right to live in a healthy and pollution-free environment has been recognized as an essential limb of the fundamental right to life (M. C. Mehta, 1987). The apex court has further construed "environment" to be of broad spectrum and to contain within its ambit "hygienic atmosphere and ecological balance" (Virender Gaur, 1995). Article 48A imposes a duty on the state to protect and improve the environment. Article 51A(g) imposes a similar duty on the citizens of India as well. Also, the Indian jurisprudence on the environment has recognized the environmental rule of law as a facet of the concept of the rule of law. In enumerating the role of all stakeholders in formulating strategies to deal with the challenges posed in implementing the environmental rule of law, the Supreme Court of India has recently recognized the destruction of habitats caused by environmental degradation and climate change (Himachal Pradesh Bus-stand Management and Development Authority, 2021).

However, mere recognition is not enough. It is high time that the preservation and protection of Article 21 rights of the victims of climate change be taken up in right earnest. The hapless homeless victims of climate change cannot be expected to approach the constitutional courts in a bid to enforce their rights by seeking appropriate writs. The gravity of the situation is enough to demand *suo moto* action from the courts. The central and state governments ought to be directed to frame policies under the national and state action plans, respectively, for relocation and rehabilitation of the climate migrants and their synthesis into the mainstream society at the place of migration. Infrastructure and capacity building in Kolkata and its suburban areas need immediate attention. For this purpose, the National Disaster Management Act 2005 may be invoked not only at the site of climate change but also at the site of migration. The minimum standards of relief as contemplated under the act should be made available to climate migrants. Under Section 2(d) of the 2005 Act, the definition of "disaster" is wide enough to cover the migrants affected by climate change-related disasters. Accordingly, the authorities established under the act at the national, state, and district levels may be called upon to address the woes of climate migrants on an urgent basis. The central and the state governments may further be called upon to allocate funds for the purpose and to take further mitigating steps to make the migration, rehabilitation, and resettlement process smoother for the climate refugees after speedy and adequate capacity building at the place of relocation.

The National Institute of Disaster Management and the National Disaster Response Force established under the 2005 Act ought to be sensitized to the uniqueness and special needs of climate migrants, and they ought to be dealt with empathy. The National Policy on Disaster Management fosters a strategy of prevention, mitigation, preparedness, and response. However, the continuing nature of climate change disasters would require a collaborative and symbiotic harnessing of

pre-disaster prevention, mitigation, and preparedness in sites brutally affected by climate change and simultaneous post-disaster response, rehabilitation, reconstruction, and recovery in sites of consequent migration.

Conclusion: Management and Mitigation

The scathing effects of climate change on the Sundarbans are real and visible. The apocalyptic landscape is presented by acres after acres of inundated land with washed away huts, properties, as well as the future of the inhabitants of the Sundarbans after each extreme weather condition triggered by cyclones and erosion, and subsidence is for all to see. While migration to Kolkata and its adjoining areas may provide some short-term relief to some of such unfortunate people, not everyone has the wherewithal or the desire to leave their home and hearth and settle in a foreign land. In these circumstances, it is crucial to devise a mechanism for proper management of such migration and adaptation-focused mitigation of climate change factors so that the phenomenon of migration can be slowly put an end to.

The first step in such mitigation is to realize and recognize that the regions that contribute the least to global climate change are the ones most severely affected by it. The unique ecosystem of the Sundarbans has become an unwitting victim to the rampant exploitation of world resources by developed and developing countries the world over. Accordingly, the primary focus should be on reducing carbon emissions to limit global warming to between 1 to 1.5 °C in keeping with the Glasgow Climate Pact.

The importance of the Sundarbans as a cyclone shield for Kolkata cannot be overemphasized. The depletion of mangrove forests in the Sundarbans had already left its mark during the frequent cyclones in southern Bengal when Kolkata was devastated by the accompanying storms. In recent years, both the frequency and intensity of tropical storms have increased manifold. As such, restoration of mangrove forests is a viable low-cost-high-benefit action that can be implemented to meaningfully protect the coastal areas of West Bengal, which would, in turn, protect Kolkata from direct fallouts of further instances of cyclones.

There is further a need to effectively implement various social schemes like the Kendriya Awas Yojana, Geetanjali, Kanyashree, Rupashree, MNREGA, etc., in the Sundarbans. However, the extent and benefits of the schemes should be amplified to provide not enough for just mere sustenance but for the development of the vulnerable people of the area. The development of medium and small industries in areas of relocation can also help in providing better adaptability and mitigation options to the displaced population. Crop insurance can also be critical in empowering small farmers of the area. There is a requirement for the intervention of the government by assisting local people of the Sundarbans in building cyclone-resistant houses and cultivating saline-tolerant variants of paddy instead of the high-yield varieties that cannot survive saline waters at all. There is a further need to provide access to the Sundarbans' people to fresh water by implementing processes for rainwater harvesting and watershed management (Basu, 2021).

Migration from the Sundarbans can be avoided in the long run only if people manage to live and flourish in smaller tracts of land. A shift to high-value sustainable agricultural practice, improved pisciculture, and a dedicated focus on the development of tourism with emphasis on the typical and unique ecology of the area can address the economic crisis of the inhabitants of the Sundarbans to a great extent. The state and the central governments should collaborate in developing an action plan to provide for the same and assist the people in building cyclone-resistant houses on raised land. For the people who have migrated or are desirous of doing so, the government should take steps to maintain proper records of such inhabitants, along with their skill sets, and take steps to ensure their livelihood and security in the areas they move to.

Australia, Alaska, and other countries have made planned mass migration successful ventures through effective governmental intervention and investment. If seen as an adaptation mechanism and not merely as a helpless last resort, migration of skill sets can take advantage of opportunities in other places. Presently, the migration from Sundarbans is one of negative connotation and primarily of human labor. If the inhabitants in the area can be sufficiently trained in particular skill sets, their migration will be more of an asset than a liability and can be looked at as a livelihood option.

The role of the media in addressing issues of this magnitude cannot be over-emphasized. Presently, the Indian media provides very little coverage of the issue of climate change. If at all, such coverage is restricted to environmental issues like air pollution, noise pollution, etc. There is very little coverage on localized matters typical to Kolkata, like the sea-level rise or the plight of the climate migrants. The media needs to assume a manifold proactive role, preferably with the use of vernacular language, to convey to the general public the clear and present dangers manifested by climate change and the plight of the climate migrants. While presently intermittently covering the issue of migration from the Sundarbans to Kolkata, the media is doing so in the socioeconomic context, while ignoring the climate-related displacement aspect of it altogether. Considering the tremendous impact of climate change and climate change migration, the media must play an agenda-setting role, thereby influencing the discourse and deliberation toward climate change, building public opinion on the issue, and driving every single person to realize and recognize the threats relating to climate change and take proactive steps at an individual level to address the issue. Instead of treating them as isolated events, the media should clearly link major and extreme weather events to climate change.

Only coordinated and collaborative efforts at channelizing all of the above-suggested measures and implementing the same at war footing can deliver a long-term sustainable solution to the dangers the Sundarbans and Kolkata are facing shortly. The central and state governments, along with active and informed public participation, can emerge as the major players in this race, while effectively roping in the private sector in infrastructure and capacity-building programs. With these suggested measures being implemented and firmly put in place, along with the world sincerely attempting to tackle climate change, one can hope for better days to dawn on the Sundarbans and Kolkata.

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A Study of Animal Behavior and Natural Disasters

15

Renu Kochhar Sharma

Contents

Background	198
Introduction	198
Definition of Animal (<i>paśu</i>)	198
Types of Animals	199
Forecast of Natural Disasters by Animals	200
For Services They Rendered Inadvertently, Animals Were Protected	201
Animals and Birds Found in Ancient Literature	203
Name of Animals as an Epithet to Deities	206
Conclusion	209
References	209

Abstract

The present paper aims at expounding the role and importance of animals in the forecast of natural disasters.

Undoubtedly, animals are not just friendly to human beings, but indeed human life is inevitably indebted to animals in many ways. In fact, animals are those speechless creatures, who cannot express themselves through words yet their anxieties, behavioral changes, and responses suggest strong and accurate instinct to identify coming of a disaster.

This chapter will be an attempt to highlight the importance of animals in natural disasters.

Keywords

Calamity (*āpadā*) · Animal (*paśu*) · Village (*grāmya*) · Forest (*āranya*) · Air (*vāyavya*)

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Background

Human, animals, and trees are considered animate creatures. All these are interlinked with each other in many ways for their existence. The importance and position of animals are rooted in the fact that human life is indebted to animals in many ways. Like human beings, animals also react toward situations both adverse and favorable ones.

Since ancient period human life is continuously adapting and protecting oneself from natural disasters. In contemporary times, forecast of natural disasters can be made with the help of scientific devices, use of artificial intelligence, and a variety of sophisticated early warning systems, yet most reports have suggested their failures when disasters actually struck any region. In Kedarnath disaster of 2013 in which 4000 people died or again in the Rishi Ganga glacier burst of 2021 (Bhatnagar, 2021) as well as in the massive 2018 floods (Singh et al. 2018) in the country's most developed and educated state, Kerala, these human machines failed repeatedly. In ancient Indian literature, animal behavior plays an important role in the forecast of natural disasters.

Introduction

On the basis of ancient Indian literature, we may say that animals are full of intellect; they are used as symbols to certain noble acts as well as reflection of human behavior where the narratives on animals are extraordinary. Indian treasure tales in Sanskrit texts propound the importance of animals which will be clear from the following pages and also the references wherever relevant.

Definition of Animal (*paśu*)

It is amazing that ancient Indian texts which weaved morality, ethics, and spirituality laws for human beings have written extensively on animals and the virtues which they exhibit for human learning. Basically, the word *paśu* means all the beings who could see with their eyes. Yāska in *Nirukta*¹ states that all the creatures using their eyes to see the world are known as *paśu*. *Śatapatha Brāhmaṇa*² of Śukla Yajurveda mentions that all the animals are the subjects of the deities.

¹ *Paśuh paśyateh. -Nighaṇṭu and The Nirukta.* Lakshman Sarup. 2002, Reprint, Delhi: Motilal Banarsiidas Publishers, 3.16

² *Daivyo viśo yatpaśavah. - Śatapatha Brāhmaṇa,* 1.8.1.36

- *Aviśeṣeṇa sarvam pasyatītī.*³
- Any animal or brute or beast (also applied contemptuously to a man).⁴

Types of Animals

Animals are considered as valuable treasure in ancient Sanskrit literature. *Śatapatha Brāhmaṇa* propounds that animals are wealth.⁵ Animals are worshipped as divine powers and have inevitable place in human life, so they are called *mahī*⁶ (powerful).

Since Vedic period animals are worshipped and adored. *Rigveda*⁷ mentions three categories of animals:

- Reside in village (*grāmya*)
- Live in forest (*āranya*)
- Fly in the air (*vāyavya*)

God created animals like birds, goats, sheep, cows, horses, donkeys, beasts, camels, etc.⁸

Atharvaveda states that wild animals like tiger, etc. dwell in the forest and they are called wild animals⁹ and also rural animals stay far from forest animals.¹⁰ Rudra has categorized animals in five species, viz., cows, horses, men, sheep, and goats.¹¹

Caraka¹² explains eight types of animals:

(a) *Prasaha*

Suddenness and force with which they seize their food and eat

³ *Uṇādi-Koṣa*, 1.28

⁴ *Paśu, A Sanskrit-English Dictionary*, Monier Williams. 1986, Reprint, Delhi: Motilal Banarsi Dass Publishers, p.611

⁵ (i) *Śrīhi paśavah.- Śatapatha Brāhmaṇa*, 1.8.1.36

(ii) *Paśavo vasuh. - Śatapatha Brāhmaṇa*, 1.8.1.36

⁶ *Paśavo vai mah.- Śatapatha Brāhmaṇa*, 11.8.1.3

⁷ *Paśūn tāniś cakre vāyavyān āranyān grāmyāś ca ye. - Rgveda*, 10.90.8

⁸ *Tasmād aśvā ajāyanta ye ke cobhayādataḥ.*

gāvō ha jājñire tasmāt tasmāj jātā ajāvayāh.- Rgveda, 10. 90.10

⁹ *Ye ta āranyāḥ paśavo mrgā vāne hitāḥ. -Atharvaveda*, 12.1.49

¹⁰ *Vi grāmyāḥ paśava āranyairvi. - Atharvaveda*, 3.31.3

¹¹ *Tatharvavedaeme pañca paśatharvavedao vibhaktā gāvō aśvāḥ pūruṣā ajāvayah.*
- *Atharvaveda*, 11.2.9

¹² *Prasahya bhakṣayantītī prasahāstena samjñitāḥ.*

Bhūśayā bilavāsityād ānūpānūpasamīśrayāt.

Jale nivāsājjalajā jalecaryāj jalecarāḥ.

Sthalajā jāngalāḥ proktā mrgā jāngalacāriṇāḥ.

Vikīrya viśkirāśceti pratudya pratudāḥ smṛtāḥ. -Caraka Saṁhitā, Sūtra-sthāna, 27.52–54

- (b) *Bhūśaya*
Living in holes
- (c) *Ānūpa*
Living in marshy tracts
- (d) *Jalaja*
Living in water
- (e) *Jalecara*
Living on the surface of water
- (f) *Jaṅgāla*
Living and moving on the land
- (g) *Viskira*
Scatter on earth and hills, etc. and use their claws or hoofs or mouth to find their food
- (h) *Pratuda*
Peck at their food

Another classification of animals is available in *Suśruta Saṃhitā*, which is as follows: firstly, there are six types of animals and later they are divided in to two major categories.¹³

Forecast of Natural Disasters by Animals

Ancient Sanskrit literature illustrates that ants, elephants, horses, and other animals warn about the forthcoming of natural disasters. Accordingly, sudden changes in the behavior of animals can be a signal of natural calamities. So, the main focus of the chapter will be the study of behavioral changes of animals as an alarm for natural disasters. References from ancient literature are as follows:

- If a horse while eating dry grass or wood starts making sounds, it means a natural disaster associated with fire may occur shortly.¹⁴
- If a horse makes sound putting his mouth down in a pond, etc. where water is full of moss, this situation creates the fear of fire disaster.¹⁵

¹³ *Jaleśaya ānūpāḥ grāmyāḥ kravyabhujaḥ ekasaphāḥ jāṅgalāśceti ṣaṇmāṇsavargābhavanti. . . . te Punarvidhā jāṅgalā ānūāśceti.* -*Suśruta Saṃhitā*, Sūtra-sthāna, 46.1

¹⁴ *Śuṣkam kāṣṭham tṛṇam vā'pi yadā saindanīśate hyāḥ.*

Heṣante sūryamudvīksya tadā'gnibhayamādiśet. -*Bhadrabāhu Saṃhitā*, 14.167

¹⁵ *Yada śaivālajale vā'pi magnam krutvā mukham hyāḥ.*

Heṣante vikṛtā yatra tadāpyagnibhayam bhavet. -*Bhadrabāhu Saṃhitā*, 14.168

- If ants make their holes nearby human habitat and also move toward forests from town, it is an alarm of major disaster for a nation.¹⁶
- Where ants move fast in their groups, this situation should be understood as demolition of a nation.¹⁷
- When groups of ant tremble and die on their own, a calamity may be expected.¹⁸
- When ants go upward with feathers, this condition brings a lot of rain.¹⁹
- When bull sounds loudly and activates its hump, it causes hazards.²⁰
- While riding an elephant, if its ivory breaks out, it causes the death of the king.²¹
- Breaking of teeth of cat, mongoose, owl, crow, and herons causes hazards.²²
- When horses make loud sounds and look at one another, it will create a harmful situation for the people of the country.²³
- Sudden hairfall of horses indicates upcoming calamities.²⁴
- Loud and awful sound of a deer warns about the destruction of a village, and also if it makes sound facing the sun, it is harmful for the military of a country.²⁵

For Services They Rendered Inadvertently, Animals Were Protected

The role and importance of animals are unavoidably accepted in the literature. Each animal has its own significant position. It should be an important duty of human beings to protect, save, and care for animals as that is where the welfare of entire world is indicated. In Vedic literature a number of prayers for protection of animals are found, which proves that the life of animals is as important as any other living being. A list of few instances is as follows:

¹⁶ *Valamīkasyāśu janane manujasya niveśane.*

Araṇyam viṣataścaiva tatra vindyānmahadbhayam.- Bhadrabāhu Saṁhitā, 14.51

¹⁷ *Mahāpipīlikāvrundam sandrakāviluptam.*

Tatra tatra ca sarvam tadrāṣṭrabhaṅgasya cādiśet.- Bhadrabāhu Saṁhitā, 14.52

¹⁸ *Mahāpipīlikārāśirvisphurantī vipadyate.*

Uhyānuttishate yatra yatra vindyānmahadbhayam -Bhadrabāhu Saṁhitā, 14.53

¹⁹ *Śvaśvapipīlikāvrundam nimnamūrdhvam visarpati.*

Varṣam tatra vijāṇyādbhadrabāhuvaco yathā.- Bhadrabāhu Saṁhitā, 14.54

²⁰ *Urdhvam vruṣo yadā nardet tadā syācca bhayankarah.*

Kakudam calate vāpi tadā'pi sa bhayankarah.- Bhadrabāhu Saṁhitā, 14.139

²¹ *Kṣīyate vā mriyate vā pañcamāsāt param nrupāḥ.*

Gajasyārohaṇe yasya yadā dantah prabhidyate.- Bhadrabāhu Saṁhitā, 14.147

²² *Vidāla-nakuloulūka-kāka-kaṁsamaprabhaḥ.- Bhadrabāhu Saṁhitā*, 14.149

²³ *Pārśve tadā bhayam brūyāt prajānāṁśubhīkaram.*

Anyonyam samudīkṣante heṣyasthānagatā hayāḥ.- Bhadrabāhu Saṁhitā, 14.152

²⁴ *Yadā bālā prakṣarāt vindyānmahadbhayam.- Bhadrabāhu Saṁhitā*, 14.165

²⁵ *Bṛhatsaṁhitā*, Varāmihira with English Translation, Subrahmanya Sastri, 1946, Bangalore: V.B. Soobbiah & Sons, 30.1

- A prayer to God *Pūṣan* is: May the God *Pūṣan* follow our cows, may he keep our horses safe and sound, let none of the cattle be lost, none injured, none sink in a pit and break a limb, may the God return our cattle safely.²⁶
- O Lord *Agni*! by moving everywhere protect the animals.²⁷
- A verse in third book of Yajurveda states: may praiseworthy *Agni*! protect my cattle.²⁸
- Wild animals are protected by God Rudra.²⁹

Killing or hunting of animals for food and entertainment is completely prohibited. Any living being should not be harmed for any purpose:

- Animal killing, liquor, and meat should be avoided.³⁰
- Feeding oneself with animal flesh is considered as the greatest sin.³¹
- *Manusmṛti* mentions seven types of animal killers such as the proposer, cutter, seller, buyer, cook, distributor, and eater.³²
- A person who kills animals for entertainment never gets happiness in his life, and he suffers even after death.³³
- Non-killing of animals leads to joy.³⁴
- A person who never kills and troubles the animals gets greatest happiness in his life.³⁵
- Killing of animals does not lead toward heavenly pleasure.³⁶

A lot of references regarding care of animals state that animals should be treated specially like other animate creatures:

²⁶ *Pūṣā gā̄ anv etu nah pūṣā rakṣatvarvataḥ.*

Pūṣā vājāṁ sanotu nah. - *Rgveda*, 6.54.5

Mākir neśān mākīn riśān mākīn śāmī sāri kevaṭe.

Athāriṣṭābhīr ā gahi. - *Rgveda*, 6.54.7

²⁷ *Bhuwanā vy akhyāḥ paśūn na gopā̄ iryāḥ parijmā.* - *Rgveda*, 7.13.3

²⁸ *Śāṁsyā paśūn me pāhi.* - *Yajurveda*, 3.37

²⁹ *Tubhyamāranyāḥ paśavo mrugā vane hitāḥ.* - *Atharvaveda*, 11.2.24

³⁰ *Varjayen madhu māīnsaiṁ prāṇināṁ caiva hiṁsanam.*

- *Manusmṛti* or *Manatharvavedadharmaśāstra*. Pandit Girija Prasad Dwivedi.1917. Lucknow: Naval Kishore Vidyalaya., 2.177

³¹ *Svamāīnsai paramāīnsena yo vardhayitum icchati.*

..... tato 'nyo nāsty apunyakṛt. - *Manusmṛti*, 5.52

³² *Anumantā viśasitā nihantā krayavikrayī.*

Sainskartā copahartā ca khādakaś ceti ghātakāḥ. - *Manusmṛti*, 5.51

³³ *Yo 'himśakāni bhūtāni hinasty ātmasukhecchayā.*

Sa jīvāṁś ca mrtas caiva na kva cit sukham edhate. - *Manusmṛti*, 5.45

³⁴ *Ahiṁsayaiva bhūtānām kāryam śreyo 'nuśāsanam.* - *Manusmṛti*, 2.177

³⁵ *Yo bandhanavadhakleśān prāṇīnaṁ na cikīrṣati*

Sa sarvasya hitaprepsuḥ sukhām atyantam aśnute. - *Manusmṛti*, 5.46

³⁶ *Na ca prāṇivadhaḥ svargyastasmān māīnsaiṁ vivarjayet.* - *Manusmṛti*, 5.48

- Animals should be protected from cowherd thieves, wild beasts and foes, etc.; also animals should be taken to the forest for grazing according to the season.³⁷
- Animals should be given clean and dirt- and fungus-free water to drink.³⁸
- Same color animals should be kept in a group of tens to protect them.³⁹
- Animals should be served with sufficient grass and water.⁴⁰
- To frighten snakes and other beasts, etc., a bell should be tied in the neck of animals.⁴¹
- One sixth part of living birds and animals should be freed to live in protected safe forests known as *abhyāranya*.⁴²

Also a prayer for the well-being of animals proves that animals were protected and worshipped with prayers, “Kindly keep my cattle content.”⁴³ *Atharvaveda* mentions that one should serve the cows as they will take everyone toward heaven after death.⁴⁴

Animals and Birds Found in Ancient Literature

Vedic literature presents a long list of all kinds of animals and also elaborates their inevitable place in the life of human beings. Role and importance of select animals are as follows:

(a) Cow (*Gau/Dhenu*)

Cow is the most revered animal in Vedic literature. *Yajurveda* states that cow cannot be compared with any object.⁴⁵ *Atharvaveda* mentions that cow is the source of all kinds of prosperity.⁴⁶ Cow brings fortune to mankind:

³⁷ *Lubdhaka śvaganibhir apāstas tena'vyāla.parābādha.bhayam rtu.vibhaktam aranyam cārayeyuh.*

-The Kauṭilya Arthaśāstra, R.P. Kangle, 1969, Bombay: University of Bombay, 2.29.21

³⁸ *Sama vyūdha.īrtham akardama grāham udakam avatārayeyuh pālayeyuś ca.*

-The Kauṭilya Arthaśāstra, 2.29.23

³⁹ *Varṇāvarodhena daśatīrakṣā.* - The Kauṭilya Arthaśāstra, 2.29.39

⁴⁰ *Sarveśām tṛṇodakaprākāmyam.* - The Kauṭilya Arthaśāstra, 2.29.46

⁴¹ *Sarpa-vyāla-trāsana-arthaīn gocara anupāta jñānārthaīn ca trasnūnām ghanṭā. Tūryām ca badhnīyuḥ.* - The Kauṭilya Arthaśāstra, 2.29.22

⁴² *Pakṣimrgānām jīvataśdbhāgamabhayavaneṣu pramuñcet.*

- The Kauṭilya Arthaśāstra, 2.26.4

⁴³ *Pasiūn me tarapayata.*-Yajurveda, 6.31

⁴⁴ *Ayam te mopatistvam juṣatharvavedaa svargam lokamadhirohyainam.*-Atharvaveda, 18.3.4

⁴⁵ *Gostu mātrā na vidyate.*-Yajurveda, 23.48

⁴⁶ *Gávo bhago gáva indro ma ichād gáva somasya prathamásya bhaksah.*

Imā yā gāvah sā janāsa indra ichāmi hydā manasā cid indram.- Atharvaveda, 4.21.5

May cows come and bring us good fortune; let them stay in our cowsheds and enjoy in our company. May many coloured cows bring here prolific milk for offerings to the resplendent Lord at many dawns.⁴⁷

Vedic seer asserts that a cow should not be killed:

Let not the cows fall a victim to the arrogant, dust spurning, war - horse. Let them not fall in the hands of a butcher or his shop. Let the cattle of the man, the householder, move about free and graze out of fear.⁴⁸

Cow is compared with ultimate divinity, and desire for her blessing can be seen:

May the cows be our affluence; may the resplendent Lord grant us cattle; may the cows yield food (milk and butter) of the first libation. These cows, O men, are sacred as the Lord resplendent

Himself, -the Lord whose blessings we crave for, with head and heart.⁴⁹

A cow fulfills all the desires of human beings.⁵⁰ In fact cow is great in all aspects.⁵¹

(b) Horse (*Aśva*)

Undoubtedly, in Vedic literature, horse is a foremost animal. In first maṇḍala of *Rgveda*, Vedic seer has cited many verses regarding care and food of a royal horse:

- Care:

Due care is taken of this royal horse, who should be cleaned and decorated with rich trappings, and whilst it fights bravely against the enemies, it gets laudations and favours from the king and commanders.⁵²

A charming novice horse, representing the commander, moves in the frontline, and it is followed by the royal horse. The novice horse is put under the care of a skilled trainer, and provided with all facilities for receiving honours and glory in future.⁵³

⁴⁷ Ā gāvo agmann̄ uta bhadram akran sīdantu goṣṭhe ranayantvasme.

Prajāvatīḥ pururūpā iha syur īndrāya pūrvīr uṣaso duhānāḥ. - *Rgveda*, 6,28.1

⁴⁸ Na tā arvā reṇukakātō aśnute na saṁskrtatram upa yanti tā abhi.

Urugāyam abhayam tasya tā anu gāvo martasya vi caranti yajvanāḥ. - *Rgveda*, 6,28.4

⁴⁹ Gāvo bhago gāva indro me acchān gāvah somasya prathamasya bhaksah.

Imā yā gāvah sa janāsa indra icchāmīd dhṛdā manasā cid indram. - *Rgveda*, 6,28.5

⁵⁰ Dhenurdakṣinā dhenuriva vā iyam manuṣyebhyah sarvākāmāndhuhe mātādhenurmātēva vā iyam manuṣyānbibharti tasmāddhenurdakṣinā. - *Śatapatha Brāhmaṇa*, 5.3.1.4

⁵¹ Mahāinstveva gormahim. - *Śatapatha Brāhmaṇa*, 3.3.3.1

⁵² Yannirñijā rekñasā prāvṛtasya rātiṁ grbhītām mukhato nayanti.

Suprāñajo memyadviśvarūpa īndrāpūṣṇoh priyam apyeti pāthah. - *Rgveda*, 1.162.2

⁵³ Eṣa cchāgah puro aśvena vājinā pūṣṇo bhāgo nīyate viśvadevyah.

Abhipriyāṁ yat purolāśam arvatā tvaṣṭed enāṁ sauśravasāya jīnvati. *Rgveda*, 1.162.3

- Food:

The horse is fed with a well - cooked meal of cereals of several kinds giving out such odours, so fragrant, that even the passers - by are tempted to say, “It is fragrant, therefore give us some.”⁵⁴

Horse is one of the most powerful among all the animals.⁵⁵ It is considered as the best animal.⁵⁶

(c) Sheep (*Avi*)

Sheep is referred as an important animal. *Rgveda* compared the creator, who “weaves the cloth of creation like the raiment of the sheep”:⁵⁷

He is the Lord of the self-sustained effulgent Mother Nature, as well as of the effulgent soul. He weaves the cloth of creation like the raiment of the sheep and cleanses the vestment.

Śatapatha Brāhmaṇa referred *avi* as earth, who protects everyone.⁵⁸ Here symbolic use of animal *avi* presents its vital place in the literature.

Apart from above mentioned animals, a long list of animals is available in the literature, which proves the unconditional worth of animals: *vyāghra*⁵⁹ (lion) is considered as the king of wild animals,⁶⁰ *śaśa* (rabbit),⁶¹ *mayūra* (peacock),⁶² *ahi* (snake),⁶³

⁵⁴ Ye vājinam paripaśyanti pakvam ya īm āhuḥ surabhīr nir haretī.

Ye cārvato māṁsabhiṣṭām upāsata uto teṣām abhigūrtir na invatu.-*Rgveda*, 1.162.12

⁵⁵ • Aśvaḥ paśūnām vīryavattamaḥ.-*Śatapatha Brāhmaṇa*, 13.1.2.5

• Aśvaḥ paśūnāmāśīṣṭah.- *Śatapatha Brāhmaṇa*, 13.1.2.7

⁵⁶ Tasmādaśvaḥ sarveṣām paśūnām śraiṣṭhayam gacchati.

- *Taittirīya Brāhmaṇa*, 3.8.9.1

⁵⁷ Ādhīṣamāṇāyāḥ patiḥ śucāyāś ca śucasya ca.

Vāsovāyo'vīnāmā vāsāṁsi marmijat.- Rgveda, 10.26.6

⁵⁸ Iyāni (pr̥thivī) vā aviriyāni hīmāḥ sarvāḥ praṭāvati.-*Śatapatha Brāhmaṇa*, 6.1.2.33

⁵⁹ *vyāghra* (lion) - AV, 4.31; 4.36.6; 6.40.1; 8.5.11; *Taittirīya Saṁhitā*; *Maitrāyaṇī Saṁhitā*, 2.1.9; *Aitareya Brāhmaṇa*, 37.2

⁶⁰ *Vyāghro 'bhavadāranyānām paśūnām rājā*. - *Śatapatha Brāhmaṇa*, 12.7.1.8

⁶¹ *śaśa* (rabbit) - *Rgveda*, 10.28.9; *Taittirīya Saṁhitā*, 5.5.18; *Maitrāyaṇī Saṁhitā*, 3.14.19

⁶² *mayūra* (peacock) - *Rgveda*, 1.191.14; *Maitrāyaṇī Saṁhitā*, 3.14.4.18

⁶³ *ahi* (snake) - *Rgveda*, 6.75.14, 7.104.9

VS, 2.4.31, SB, 1.6.3.9

ākhu (mouse),⁶⁴ *rksa* (bear),⁶⁵ *kapi* (monkey),⁶⁶ *vṛka* (wolf),⁶⁷ *varāha* (boar),⁶⁸ *mahiṣa* (buffalo),⁶⁹ *matsya* (fish),⁷⁰ *nakula* (mongoose),⁷¹ *maṇḍuka* (frog),⁷² *Kūrma* (tortoise),⁷³ *gardabha* (donkey),⁷⁴ etc.

Name of Animals as an Epithet to Deities

Not convinced that the greed and conceit of humans can spare these animals, scriptures gave animal names to the gods themselves. This is explained below:

(i) Boar (*Varāha*)

The term *varāha* is denoted as synonym of *megha* in *Nighantu*,⁷⁵ the Vedic lexicon. God *Maruts* has been referred to as bearer of *varāha*.⁷⁶

Śatapatha Brāhmaṇa states *Prajapati* as *varāha*, who was raised in the form of a bear.⁷⁷

(ii) Bull (*Vṛṣabha*)

In Vedic literature, the term *vṛṣabha* is commonly used for deities such as *Indra*, *Agni*, *Rudra*, *Parjanya*, *Soma*, etc. The term signifies to pour.⁷⁸ It is used many times for *Indra*:

⁶⁴ *ākhu* (mouse) *Atharvaveda*, 4.50.1; *Taittirīya Saṁhitā*, 5.5.14.1; *Maitrāyaṇī Saṁhitā*, 3.14.7; *Śatapatha Brāhmaṇa*, 2.6.2.10

⁶⁵ *rksa* (bear) *Rgveda*, 8.68.15, *Śatapatha Brāhmaṇa*, 2.1.2.4

⁶⁶ *kapi* (monkey) *Rgveda*, 10.68.15, The synonym of word monkey is *markaṭa* is also found. - *Taittirīya Saṁhitā*, 5.5.11.1; *Maitrāyaṇī Saṁhitā*, 3.14.11

⁶⁷ *vṛka* (wolf) - *Rgveda*, 1.116.14; *Atharvaveda*, 12.1.49; *Maitrāyaṇī Saṁhitā*, 3.11.2; *Taittirīya Brāhmaṇa*, 2.6.1.5

⁶⁸ *varāha* (boar) - *Rgveda*, 10.28.4; *Atharvaveda*, 8.7.23; *Maitrāyaṇī Saṁhitā*, 3.8.3

⁶⁹ *mahiṣa* (buffalo) - *Rgveda*, 5.29.7, 10.87.7; *Maitrāyaṇī Saṁhitā*, 2.1.9; *Śatapatha Brāhmaṇa*, 7.3.1.23

⁷⁰ *matsya* (fish) - *Rgveda*, 10.68.8; *Maitrāyaṇī Saṁhitā*, 3.14.2.15

⁷¹ *nakula* (mongoose) - *Atharvaveda*, 8.7.23; *Maitrāyaṇī Saṁhitā*, 3.14.7.13

⁷² *maṇḍuka* (frog) - *Rgveda*, 7.103; *Atharvaveda*, 4.15.12

⁷³ *kūrma* (tortoise) - *Atharvaveda*, 9.4.16; TS, 2.6.3.3; *Maitrāyaṇī Saṁhitā*, 3.14.15, 3.15.3; *Śatapatha Brāhmaṇa*, 1.6.2.3

⁷⁴ *gardabha* (donkey) - *Rgveda*, 3.53.23; *Atharvaveda*, 5.31.3; *Taittirīya Saṁhitā*, 5.1.2.1, 5.1.5.7; *Śatapatha Brāhmaṇa*, 4.5.1.9

⁷⁵ *Nighantu*, I.10

⁷⁶ *Etat tyan na yojanam aceti sasvar ha yan maruto gotamo vah.*

Paśyan hiranyakārān ayodamṣṭrān vidhāvato varāhūn. -*Rgveda*, 1.88.5

⁷⁷ *Varāha ujjaghāna so'syāḥ patiḥ*

Prajāpatistenaivainametanmithunena priyeṇa dhāmnā samardhayati.

- *Śatapatha Brāhmaṇa*, 14.1.2.11

⁷⁸ *Vṛṣasecane*, *vṛṣa* + *rṣivṛṣibhyām kit.* - *Uṇādi-Koṣa*, 3.123

- Shower of bounties is your adamantine weapon and shower of blessings is your chariot; and so are your horses and armoury. You are the Lord of the spiritual happiness. May you enjoy to your satisfaction your own benign bliss.⁷⁹
- May the effective eulogium melt you, O showerer of blessings. Your radiance is borne by actinic rays. So, O showerer of blessings, splendid in form, wielder of the punitive justice, with mighty chariot, may you defend us in struggles.⁸⁰
- O resplendent Lord, you are the showerer of bliss, the bedewer of earth, the feeder of the rivers, the supplier of the aggregated waters. O fulfiller of all aspirations, you are the most excellent shedder of rain, the sweet elixir, verily, our loving devotion, as if honey-flavoured juice is offered for your acceptance.⁸¹

This epithet is also found for *Parjanya* or the god of clouds:

- I address the mighty cloud, with these invocations; I praise him with adoration. I worship him with reverence, who is the thunderer, the showerer, the bountiful, and who lays, in the plants, the seed for germination.⁸²

(iii) Cow (*Gau*)

The term *gau* represents not only a cow but the earth, the sun, and also the rays of the sun. Vedic lexicon *Nighantu*⁸³ states the synonym of word *gau* – *prthivī, aditi, vāk*, etc. The word *gau* in its plural form is used for the rays of the sun.⁸⁴ While explaining the importance of a cow and prohibiting to kill her, Vedic seer has presented her as a divine power and associated with gods:

- She is like the mother of the cosmic forces, the daughter of the cosmic matter, the sister of cosmic energy, the centre of the ambrosia- I address to men of wisdom-kill not her, the sinless inviolate cow.⁸⁵

The goddesses *Aditi*, *Idā*, and *Sarasvatī* are referred as cows in *Śatapatha Brāhmaṇa*.⁸⁶

⁷⁹ *Vṛṣā te vajra uta te vṛṣā ratho vṛṣaṇā harī vṛṣabhānyāyudhā.*

vṛṣṇo madasya vṛṣabha tvam iśiṣa indra somasya vṛṣabhasya trpnuhi. - *Rgveda*, 2.16.6

⁸⁰ *Vṛṣā tvā vṛṣaṇām vardhatu dyaur vṛṣā vṛṣabhyām vahase haribhyām.*

Sa no vṛṣā vṛṣarathah suśipra vṛṣakrato vṛṣā vajrin bhare dhāh. - *Rgveda*, 5.36.5

⁸¹ *Vṛṣāsi divo vṛṣabhad prthivyā vṛṣā sindhūnām vṛṣabhad stiyānām.*

Vṛṣne ta indur vṛṣabha pīpāya svādū raso madhupeyo varāya. - *Rgveda*, 6.44.21

⁸² *Acchā vada tavasām gīrbhir ābhīh stuhi parjanyām namasā vivāsa.*

Kanikradad vṛṣabho jīradānū reto dadhāty oṣadhiṣu garbham.

- *Rgveda*, 5.83. 1

⁸³ *Nighantu*, 1.1.11

⁸⁴ *Gāvah bhūriśringā.* - *Rgveda*, 1.154. 6

⁸⁵ *Mātā rudrāṇām duhitā vasūnām svasādityānām amṛtasya nābhiḥ.*

pra nu vocām cikituse janāya mā gām anāgām aditīn vadhiṣṭa. - *Rgveda*, 8.101.15

⁸⁶ *Idā higauraditīrhi gauḥ sarasvatī hi gauḥ.* - *Śatapatha Brāhmaṇa*, 14.2.1.7

(iv) **Horse (*Aśva*)**

In Vedic verses the epithet *aśva* is used to describe the most important Vedic god, i.e., *Agni*. In such verses *Agni* is demonstrated as swift as a horse. According to Vedic seers, *Agni* is like a swift horse.

- The wise men worshipping it in the cosmic ocean of the firmament establish its two - fold light among the people of universe. May it, the messenger of Nature's bounties, possessed of swift flames, be superior to creatures of all regions.⁸⁷
- The dedicated devotees glorify that fire - divine, who is the showerer of blessings, the bearer of homage to divine powers, just as a horse bears the rider to his home.⁸⁸

In *Śatapatha Brāhmaṇa* *Agni* is mentioned as horse and also as white horse.⁸⁹ Basically, *Agni* is well known for carrying the food of all the deities.⁹⁰ Thus, *Agni* is called a bearer of homage to divine powers.

(v) **Vulture (*Grdhra*)**

In *Rgveda*, this epithet is used for *Bṛhaspati* and *Sūrya*, when they try to secure rain for the welfare of living creatures:

- As a spark or just a drop in the sky, he comes near the ocean, still looking at us with a vulture's eye. His lustre shines in its own bright splendour and as he shines high in the sky, he illuminates the regions below.⁹¹

It is noteworthy that many animals are taken as an epithet to gods. Vedic literature is woven in symbolic language. The names of the animals are taken for deities because of their attributes. It is quite clear that animals have their inevitable importance due to their special traits.

In this way, it is absolutely clear that the importance of animals is existing from ancient period. Animals are considered as wealth. They not just increase human wealth in all respect, but also they are the best friends of human beings. An instance is found in the famous epic *Raghuvamśa* of Kalidasa that birds share the sufferings or sorrow of human beings by their cries.

Animals are the best teachers of mankind. *Rāmāyaṇa*, *Mahābhārata*, *Pañcatantra*, etc. contain a great deal of stories of animals which reveal morals to mankind. In short, the role of animals in human life is highly important, so the several laws to protect animals can be advocated in the present time. Indeed protection of animals will definitely save the life of human beings.

⁸⁷ *Eṣa viśvānyabhyastu bhūmā devānām agniraratar jīrāśvah.* - *Rgveda*, 2.4.2

⁸⁸ *Vṛṣo agnih samidhyate 'śvo na devavāhanah.* - *Rgveda*, 3.27.14

⁸⁹ •*Aśvo ha vā eṣa agnih.* - *Śatapatha Brāhmaṇa*, 1.4.1.30

• *Agnirvā aśvah śveto.* - *Śatapatha Brāhmaṇa*, 3.6.2.5

⁹⁰ *Agnirvai devatānām mukham.* - *Śatapatha Brāhmaṇa*, 2.5.1.8

⁹¹ *Drapsaḥ samudram abhi yaj jigāti paśyan grdhrasya cakṣasā vidharman.*

Bhānuḥ śukrena śociṣā cakānas trīṭyē cakre rajasi priyāṇi. - *Rgveda*, 10.123.8

Conclusion

The phenomenal space given to animals in ancient Indian scriptures is not mere religion of ancient society, but animals were part of public policies of welfare as modern equipment which could sense any calamity to human race in advance. We have heard dogs, cats, cows, and horses saving their masters like the Hachiko dog in Japan or Chetak horse in India, but mankind has failed to further their research into their incredible sensibilities to forewarn disasters. In brief, this chapter opens vistas for further an idea to be taken over by scientists across the world.

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Inter-agency Coordination in Disaster Management

16

Chetana Kumari

Contents

Introduction	212
Explanations Behind the Disappointment in the Context of Inter-Agency Coordination: A Perspective from J&K and Orissa	214
Solutions for Work on the Coordination Among Different Institutions at Various Levels are as per the Following: A Viewpoint from J&K and Odisha.	217
Conclusion	221
References	222

Abstract

An absence of “coordination” and consequently of fitting “collaboration” exists in all disaster management institutions (National Disaster Management Authorities, State Disaster Management Authorities, District Disaster Management Authorities) because of which the lives and livelihood of individuals are in danger and become more powerless against calamities. The bungling and absence of administrative coordination pre- and post-floods, earthquakes and in numerous different catastrophes, brought about loss of lives concerning human resources, non-human resources, and financial misfortune, etc. Monetary misfortune could be recaptured; however, it is absurd to expect the misfortune of humans and non-humans (who cannot talk) to recover. The job of the state power is not to reject the minorities; it is to set up the general public at large (which incorporates every individual and non-person) to confront the difficulties of the disasters and to give medical aid with almost no terrible expectation towards a specific local area and to set them up for future catastrophes. The chapter centres around “methodical disappointment” of the state administration in the setting of disaster management and “rehashed disappointment” of administration at all degrees of government-assisted organisations because the absence of coordination before

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and after normal disastrous catastrophes is the primary issue. Loss of lives of people and non-people has happened more in light of this “foundational and rehashed disappointment of administration” than in a disastrous event. The chapter depends on both primary and secondary data or information regarding the states Odisha and Jammu & Kashmir.

Keywords

Disaster Management · Coordination · Disaster Management Act 2005 · Institutions

Introduction

Any discourse on the governance imperatives of disaster mitigation gets embroiled in the institutional blame game or centre-state politics in a federal nation such as India. It has been difficult or even impossible to achieve a balanced understanding or the teamwork expected in a catastrophic situation. The Disaster Management Act 2005 appears to be just a skeletal reflection of the enormity of deep contingencies faced by institutions during a disaster, which leaves ample scope for them to act with indiscretion and also in isolation from others in the field. However, this situation is changing, and lately, a proactive role of courts has identified basic requirements (*Ramachandran vs District Collector Kottayam, 2015 WP (C) No. 11876 of 2015*), issued guidelines (*Swaraj Abhiyan vs Union Of India And Ors, 13 May, 2016, Writ Petition (C) No.857 of 2015*), and basic indicators, which institutions in disaster mitigation are mandated to follow and obey. If one goes through the history of repeated disasters and information on the devastatingly irresponsible administrative response, one would definitely ask the question whether institutions created under the Disaster Management Act 2005 are adequately prepared to work beyond the business as usual attitude of their insulated silos and segregated jurisdictional domain, which becomes deeper owing to their inability to collaborate and work in a more transdisciplinary environment of taking everyone together.

Institutional structures, skills, training and the traditional art of coordination are challenging targets to achieve in India. Institutions and stakeholders, which play a vital role in disaster governance in India, have no meaningful relationship amongst themselves, and even the institutional restructuring has not been as helpful as needed either. The Third Report of the Second Administrative Reforms Commission on Crisis Management (2006) identified key problems embedded within institutions, yet its recommendations continue to be side-lined. The federal and inter-district communication and coordination among stakeholders of disaster management seem slow, which results in disasters such as the floods we witnessed in the states of Jammu & Kashmir (J&K), Kerala, Odisha, Bihar, Uttarakhand, Tamil Nadu etc. The issue of federalism centres around disaster governance in this context.

In this situation, there is a need to re-examine the cycles of disaster governance. India, as a government state, plainly referenced the different capabilities under the

union list, state list, and concurrent list. These capabilities have been conveyed between the state government and central government, in which “disaster management and disaster governance” in a setting of floods, seismic tremors, typhoon, avalanches, torrential slides, etc., have not been referenced, and there is no circulation of obligations to oversee or administer these cataclysmic events. It has been expressed that disaster management is a state subject. Nonetheless, relegating explicit obligations and organising administrative instruments at an alternative degree of administration is vital.

With the drawing up of the National Disaster Management Act 2005, certain rules were arranged/laid out on how state and central governments can oversee catastrophes and administer during crises. However, two significant activity focuses passed up a great opportunity, i.e. “decentralisation and coordination” in disaster administration between state community workers and local officials, and at neighbourhood/ panchayats level networks with central government, are absent. No severe rules were outlined for the state, region, and nearby government to keep up with “coordination and participation” during a causality/casualty man-made or catastrophic event as it is a state subject. The central government has additionally not assumed any great part in that frame of mind among these institutions at the state/district/local level according to the previous encounters of disaster management.

In numerous disaster events such as the Ladakh floods in 2010, the Uttarakhand floods in 2013, the J&K floods of 2014, the Chennai floods of 2015 and the Kerala floods of 2018, no convenient reaction or readiness was seen, and there was likewise an absence of coordination between the centre-state agencies, between the military, the National Disaster Defence Response Force (NDRF), Coast Guards, neighbourhood police, and the State Disaster Management Authorities (SDMAs) and the District Disaster Management Authorities (DDMAs). Issues of provincial contrasts, between local issues and political contrasts were likewise seen and featured by the general population and media people. Because of these dangerous issues, the life and work of the humans, and non-humans during floods or any sort of calamities are more defenceless, horrible and full of fear. Under the Disaster Management Act 2005, the majority of the states have not even pre-arranged an essential disaster management plan. The greater part of the states have their executive disaster plan just on paper and not completely ready.

In the states that have do have plans, either those plans stay obsolete, non-executed, or disaster management specialists have an absence of information and skill in misfortune the board and are not working very well. The Odisha and Bihar models of catastrophe administration have been moderately effective with next to no capacity to support and archive the move made during the activities at each stage. Other than Odisha, the region and nearby specialists are not prepared to distribute the data to the networks, which are the people on call for cataclysmic events.

Following 70 years of freedom and two managerial changes, i.e. the first Administrative Reform Commission (ARC) and the second ARC, why are our state directors not in that frame of mind to facilitate with one another during normal devastating catastrophes to mutually deal with disasters? Why would that be a

foundational disappointment, and rehashed disappointment has been occurring? Why do our overseers have no dynamic power in setting up disaster administration and are absolutely reliant upon the central government? There is a need to address these disappointments in administration. As per research, it is written that and researcher quoted:

In the legislative federations, “the division of abilities was set in some kind of stone by identifying a rundown of strategy spaces over which the central government conceded a position to enact. Because of the government design of India, states have authoritative abilities to make regulations, yet during crises, the power is circulated according to the specific organisation’s range of abilities to oversee debacles. The connection between the state and the middle during crises of catastrophic events is more on salvage, help, and restoration instead of moderation and readiness. As well as appreciating distinguished powers, the public law-making bodies in these two alliances were allowed an unequivocal ‘matchless quality’ in those cases where any cross-over ought to happen.” (Alan Fenna, 2012 Chap. 47).

On account of disaster management, the job of communities is vital as they are people on call regarding any sort of catastrophe such as floods, tidal waves, tremors and twisters. The requirement for readiness and flexible working among them is vitally close to managerial/administrative coordination. The Hyogo Declaration of 2005 changed the talk from the previous to the last option. Sendai Framework 2015 has likewise settled the requirement for combining readiness with advancement, which brings the formative organisations and the fiasco the board offices close, covering, and cooperative. Unexpectedly an absence of coordination exists in federalism, which the nation of India has embraced (Basu, 2018).

The National Disaster Management Plan (NDMP) 2016 specifies coordination 106 times in 192 pages; however, a couple of organisations would research, contend and examine the coordination pre-catastrophe, post-catastrophe and during the catastrophe, which is amusing (mha.gov).

Explanations Behind the Disappointment in the Context of Inter-Agency Coordination: A Perspective from J&K and Orissa

During field work, researchers find many purposes behind the disappointing coordination in key disasters such as the Kashmir flood of 2014, the Orissa cyclones, the Kerala flood of 2018, and the Uttarakhand flood of 2013. Researchers recognised countless hindrances and difficulties in light of writing research, field perception and review. Apparently, there is no single variable that blocks or works with coordination.

The two locales affected by floods, specifically the Srinagar and Anantnag areas in J&K, have wide stream bowls and other water bodies such as lakes and wetlands. The flood of 2014 had occurred because of an authoritative lack of care and human insatiability, defilement and developments on riverbeds or developing agriculture on riverbeds or water bodies. One regulatory authority informed the researchers that

individuals are still wrongfully possessing the place where there are water bodies even after organisations see them; individuals as a rule disregard these notifications and step by step expand their development or agricultural land region in these areas — there is no enforcement of regulation at ground level.

During the researcher's field assessment, it was observed that institutions of disaster management are working from their comfortable workplaces. The execution of strategies and plans are just on paper, field work by researchers and pictures taken while doing the review clearly show the earnestness and attitudinal conduct changes in their work and individuals' obliviousness towards the security of regular assets. Individuals' cooperation is exceptionally less in all parts of formative exercises in the state, particularly in Kashmir Valley, despite the fact that people's contribution to the turn of events and the execution of assets is critical.

As per hands-on work by the researcher, meetings with authorities likewise reveal that in spite of being powerless against catastrophic events, J&K continues to have one of the lowest densities of weather condition stations in the country. There are just seven weather condition stations in the whole valley and six in the Jammu district to handle meetings and conversations with directors.

The disasters in both the states J&K and Odisha are a direct result of the "state's ecological debasement," which has helped a great deal in setting off these disasters. As per meetings and conversations with the authorities, the 2014 floods had come about in view of one of the underlying drivers, the absence of dependable data on climate, which was nevertheless answerable for the gigantic death toll and damage to properties in the case of flooding, avalanches and torrential landslides in the state.

During the hands-on work the analyst broke down that there was an absence of assets in setting to disaster management is one issue, yet then again assuming not many assets are accessible to deal with any dangers, the absence of ability is one more enormous issue in setting to calamity the board.

As per interviews with disaster management experts in the state of J&K (which is presently Union Territory, after repeal of Article 370 and 35A/5 August 2019) and the Public Health Engineering department (PHE), the Irrigation and Flood Control Department, they uncovered that digging and desilting needed more men and hardware, which were lacking within the framework; however, an honest effort is being made to clean the water bodies. Under digging, against 16.36 lac cumec, 8.53 lacs cumec of material has been dug out up to that point (2017–2018). From that point onward, no report or information has been disclosed.

Another point I might want to make here is about the "trust" of individuals of J&K; they have no trust in administrative notifications and alerts, then again, interviews with officials showed that they had given an warning to individuals through the press, electronic media, and through different non-governmental organisations (NGOs) that are working for disaster management; however, individuals had not expected surges of such a colossal extent. The collaboration of researchers with nearby communities on the opposite side totally denied any advance notice by the administration using any and all means. It shows us that there is no trust and coordination between the public and the managerial framework.

When a researcher looked at the two states J&K and Odisha concerning store use and execution of different tasks, the Comptroller Auditor General (CAG) reports for the two states showed that ventures are not carried out productively regardless of using crores of rupees and catastrophe moderation, and limit building systems at a local area level remained practically missing. Likewise, the absence of coordination between divisions brought about episodes of additional consumption and overabundance.

The researcher likewise found while doing hands-on work that the two states have been compromised by the disaster management specialists; in particular, the SDMA and DDMA at state and region levels are not following a solid system to prevent disasters, but rather they are dealing with catastrophe reaction and post-disaster help. Likewise, the state Odisha has recurrent disasters, and it is more ready and has a powerful component. One more issue lies in the design of Disaster Management and it is that they have organised impromptu individuals or have selected individuals from inside the organisation to take care of Disaster Management or generally the Revenue Department/Secretary. There is an absence of impressive skills in Disaster Management in regions such as Srinagar, Anantnag, Puri, and Khordha. There is an inadequate Institutional plan: if one reads the 2005 Act, full-time experts have not been locked in according to the rules, which is a main driver of the Indian disaster managerial framework being as yet deficient with regard to disaster mitigation and management.

During hands-on work in the valley, the analyst likewise saw a few stunning results of the unrestrained extension of the travel industry around Dal lake. Most importantly, the major legitimate system that ties each and every sectoral regulation to the life and security of people and non-people of J&K that is calamity the board Act 2005 was not executed and was not set up at that time (flood 2014).

One more exemplary illustration of the absence of coordination is found in the inclusion in the news of the High Court hearing on the Chennai flood, covered by PTI, 22 January 2018: the news report portrayed how the high court mediated to relieve the disaster in the state. As state organisations did not have dexterity and correspondence among themselves. Indeed, even the coordination between the naval force, armed forces and coast monitors was lacking, and furthermore the behaviour of nearby individuals with the help of merchants/agencies was bad. Hence, the backer A.P. Suryaprakasam moved the court, chasing “security” to help “laborers by framing miniature level overseeing councils following charges that administering party laborers and local people were bothering alleviation faculty conveying material for flood casualties.”

“Madras High Court today voiced concern over lack of coordination among agencies in the unprecedented floods in the city.

“What concerns (us) is there seems to be little lack of coordination among agencies in distributing relief materials,” said the first bench comprising Chief Justice Sanjay Kishan Kaul and Justice Pushpa Satyanarayana. Available as Public Interest Litigation (PIL) by advocate A. P. Suryaprakasam seeking “protection” for aid workers by forming micro-level managing committees following charges that ruling party workers and locals were

harassing relief personnel carrying material for flood victims.” (<https://www.thehindubusinessline.com>. Published by PTI, 11 December 2015, Updated PTI, 22 January, 2018)

Solutions for Work on the Coordination Among Different Institutions at Various Levels are as per the Following: A Viewpoint from J&K and Odisha.

A few planning organisations should be there to facilitate a more synergetic methodology for regulatory viability in disaster management in India. The meeting closed with a current individual from National Disaster Management Authority (NDMA), Kamal Kishore, by the researcher in his office (Year-2019). He referred to better coordination in the utilisation of innovation. As indicated by him, innovation (technology) is a more creative method of helping coordination.

Direction and administration likewise influence the coordination cycle in an establishment. Nothing is a higher priority than institutions. That is the reason why we make them; they can prompt uncommon changes in a disaster, the board situation of a dynamic authority and participatory dynamic cycle. Among departmental coordination, we have an enormous number of divisions and organisational bodies; if every one of these can be consolidated together, a brief reaction can be accomplished. He said that capacity building is one assignment for building more powerful foundations of catastrophe for the board. There is a need to make institutions of disaster the board more skilled and prepared for taking care of disasters. The ability of establishments is required in a disaster between the management and relief, and it is likewise connected to the designation, correspondence, direction, and between-organisation coordination in a foundation (Paton & Jackson, 2002).

In inter-agency coordination or institutional coordination, there is a requirement for clear instructions, jobs, obligations and connections between all degrees of government. In setting the authority for disaster management, the neighbourhood level administration building is an unquestionable requirement to settle on speedy and fitting choices when required (Paton & Jackson, 2002). In emerging nations such as India, disaster events require phenomenal administrative capacity, as these events overpower neighbourhood abilities and nearby networks. The absolute requirement of leaders at the public and state level, subsequently, is to adjust and reconstruct the crisis framework and plan to limit the detrimental impacts of the disaster in the briefest conceivable time (Paton & Jackson, 2002).

Likewise, there is an absence of proper power and obligation with public, state, regional, and neighbourhood level establishments (Disaster Management Act 2005) to answer in a crisis and under emergency circumstances. In that capacity, no plans are accessible for coordination between partners at the public, state, region, and neighbourhood levels. All are working in restricted ways with their locale (Disaster Management Act 2005). Additionally, there is no different service (separate ministry) that cares for disaster management solely in India.

During the hands-on work by researchers on disasters the board authorities such as Odisha State Disaster Management Authority (OSDMA), J&K State Disaster

Management Authority (JKSDMA) and DDMAs, the analyst found that all authorities concurred and said that opportune/timely coordination/better coordination between divisions/organisations have helped in saving lives, method for business and property. According to them, designs of the division, jobs, obligations, unbending administrative methodology, absence of trust, independence, credit, absence of assets and mentality prevents coordination among individuals/decision creators in an establishment of disaster the board.

At the point when the researcher asked them, "What can help coordination," they answered diversely according to their own involvement in the idea of work and establishments. They replied that mindfulness, preparing, a reasonable job and obligations with an adaptable framework can help to improve coordination. Likewise, according to the authorities we talked to, the principal challenge is the foundation of an exact coordination component between various legislatures and NGOs working at all levels. Coordination between the Ministry of Home Affairs, the NDMA, the SDMA and the DDMA should be fortified.

The researcher had an interview and a 1-h conversation with K. M. Singh, ex-official from the NDMA about the issue of institutional coordination in disaster management in India. K. M. Singh remarked that in an Uttarakhand flood of 2013, institutional coordination was seen; however, at that time no institutional component was set up by the Uttarakhand government. After this misfortune had occurred, the central power NDMA produced more NDRF Battalions. They began the NDRF in the 2008 with eight battalions. These battalions helped individuals during the Kosi River Flood in Bihar, the main significant flood dealt with by the NDRF. The fact that time by NDRF group makes around one lakh individuals were evacuated. That was a gigantic flood, and the NDRF accomplished exceptional work.

The Chief Minister of Bihar State, during that period, praised the NDRF, and proposed having NDRF battalions in Bihar too. The NDMA consented to that; however, the issue of the land took 3 months to lay out the power's ninth battalion NDRF, Bihata Patna, Bihar. The land was liberated from the cost from the state government by the NDMA to lay out NDRF Battalions. This shows the Bihar state's devotion and soul regarding keeping people and non-people safe from future catastrophes.

Additionally, Andhra Pradesh gave land and laid out the tenth battalion of the NDRF, ANU grounds, Nagarjuna, Guntur (AP). Presently, India has 12 NDRF battalions spread all over the country. The Odisha state also have one in Cuttack (3rd Battalion NDRF), the most leading state in context to disaster management and mitigation. The Odisha state organisation is executing orders at various levels and has outlined panels at state level, district level and town level on regular disasters. They have gatherings and meet at whatever point required. The designs for disaster management are amended yearly according to the changing idea of disasters, yet the issue of ground-level coordination in all actuality does likewise exist in Odisha.

K. M. Singh expressed that on account of Uttarakhand, the state government is not responsive and dynamic in setting to catastrophe the board. From 2009 onwards, the NDMA and central specialists in disaster management have been requesting the space, yet they were unable to give the land for laying out NDRF battalions (2019).

At the point when the Uttarakhand misfortune occurred in 2013, an enormous scope of decimation occurred. Indeed, even after that misfortune, no land has been given by the state government to the foundation of an NDRF battalion. Thus, the NDMA has land issues with the Uttarakhand state. The between-state struggle for land exists is the reason why the NDMA was unable to do all that it really needed to do.

In spite of the fact that we all realise that at the moment of a disaster, the fast responder is the NDRF, there is no question that the local area is likewise the specialist on call according to earlier research and scientists. The territory of Uttarakhand actually experiences various catastrophes; however no one makes a big deal out of it. An NMDA ex-member discussed the horizontal and vertical coordination in an organisation of disaster management. On account of Uttarakhand, even pre-disaster coordination was terrible, although vertical coordination was great, i.e. coordination at the central, state, and district levels. Level coordination exists in the state of Uttarakhand in the different state associations/departments that were deficient.

According to his experience, the J&K flood of 2014 was dealt with in a normal manner, in spite of the fact that organisations guaranteed that they dealt with it, in the best case scenario. On account of J&K, the board organisations and partners have no record accessibility. K. M. Singh said that in the case of Uttarakhand, the state government is not responsive and active in context to disaster management. In the year 2009 onwards, NDMA and central authorities of disaster management are asking to provide land, but still, the state could not give the land to establish NDRF battalions. When the Uttarakhand tragedy happened in 2013, a large-scale devastation occurred. Even after that tragedy, no land has been provided by the state government for the establishment of NDRF battalion. Thus, the NDMA has land issues with the Uttarakhand state. The centre-state conflict problems for land exist due to which NDMA could not do all that it actually wanted to do. Towards the end of the conversation, K M Singh referenced that local area support is vital in calamity the board, and they go about as essential facilitators whenever prepared and made mindful well about disasters.

In the case of Orissa, in the year 2013 Cyclonic Storm Phailin, was best taken care of and was an illustration of between-department coordination. He said that it was better coordination for such a long distance as far as anyone is concerned. The Indian Meteorological Department assumed a critical part during the 2013 Cyclonic Storm Phailin. The territory of Odisha was ready, and had promptly accessible structures/schools for people's evacuation. The state government knew which town region should be emptied. State and nearby government panchayats facilitated through microphones, speakers, SMS and let people know whether you get by, property and other materialistic things will return. This sort of coordination had been seen before at the time of the 2013 cyclone, also in Odisha. At the point when the state received the alerts, each office with food, medication, wellbeing, water, fire, etc., prepared and persuaded individuals at their level to leave their places and move to more secure spots. A few losses happened around then. The mind boggling position and coordination throughout the entire existence of the disaster management in India

were seen around then. Individuals abroad were interested in becoming aware of how Odisha did it so well.

The best of district-level coordination, which is exemplary, can be upgraded by the state administration by doing mock drills and gatherings at regular intervals. One more issue that was examined by K. M. Singh during the interview and discussion that if in the current scenario, the problem of coordination failure arises, it is because of political interference to disaster management institutions. K. M. Singh additionally referenced about the Kerala flood 2018, the most obviously terrible type of coordination among every single level power. Data dispersal is fundamental, that was inadequate. The way in which great coordination has an effect can be found on account of the Odisha state government.

After 2014, all individuals from the NDMA were approached to leave, and new individuals were selected because of the changing idea of legislative issues in India. The Failure of disaster management authorities and coordination began around then. K. M. Singh honestly says that SDMAs and DDMAAs are not useful at ground levels except for in a few states. Although the researcher likewise concurred, and additionally noticed something similar during her hands-on work; however, Odisha is doing great when contrasted with J&K. He said that the Bihar State Disaster Management Authority is ideal and practical in nature. He said that disaster management needs powerful characters, yet individuals who are working in a fiasco the board are not specialists and dynamic except for a couple of states such as Bihar and presumably Odisha.

As indicated by K. M. Singh, the National Disaster Management Authority is in an exceptionally low position at the present moment. According to K. M. Singh, National Disaster Management Authority is very down right now. The current regime removed the rank system, which makes a difference in disaster management functioning. All NDMA members are equal to the secretary, and now the secretary governs disaster management. All the perks and powers are gone. They have demolished the NDMA ranking and power. All NDMA individuals are equivalent to the secretary, and presently the secretary oversees disaster management. Every one of the advantages and powers are gone. They have destroyed the NDMA's position and power. K. M. Singh said that there are gaps and deficiencies in institutional courses of action, strategy, plan definition, as well as the execution of pre-disaster estimates in India.

To put it plainly, ironically and tragically, in J&K catastrophe the board authoritative framework reactions to many inquiries connected with arrangements, readiness, alleviation, the management of water bodies, wetlands, water channels, data spread to metropolitan and panchayat specialists, early admonition framework, jobs and obligations of the state disaster management specialists and region fiasco the board specialists, issues of coordination, the government's prompt help measures etc., has just repeated that the J&K flood was unprecedented; however, the report shows that the state is not being administered consistently with existing regulations and the moral edge, which considers human and non-human residences. Then again, the Odisha government on catastrophe the board and moderation made a colossal improvement beginning at around the time of the 1999 Super Cyclone; they have gained an example from each year of floods and twisters and are making

arrangements according to that, making networks strong by giving them preparation and by making them mindful about disasters. The state organisations are becoming well organised for future disasters and are ideally preparing and making arrangements for human and non-human residences.

In a meeting with the OSDMA authorities, it was found that Odisha likewise needs coordination at the field level. The authority said that they have tension from the central government for executing orders; however, making arrangements for building debacle though framework exists with the framework. For instance, telecom towers were made on the top of the house structures. During the twister-cyclone, these pinnacles fell and brought about the deficiency of the houses/infrastructure and loss of life. He additionally referenced in his conversation that individuals working within their specialties are restricted to issues within those specialisations. The sanctioning of specialists is an issue, and it is not plainly referenced in the Disaster Management Act of 2005. The role of Panchayats and Urban local bodies is not defined or clearly stated in the Disaster Management Act of 2005. Due to which enforcement of orders is not possible. Corrective activity for SDMAs, DDMAs isn't there in that frame of mind because of which managerial failure exists. The absence of assets, cash, and labour, and mental ability generally exist with the divisions and institutions. Yet, in addition, simultaneously, there is an absence of order, control and innovation too within the managerial framework.

Conclusion

The actual idea of an institution is attached in its capacity to arrange its human and material assets. Douglass C. North, in 1990 wrote in his book that foundations decrease vulnerability in the existence of individuals by giving design to daily existence. Be that as it may, when we see recent disasters in India, vulnerability was there among the two establishments and individuals. This implies that institutions are not aiding that mind-setting to disasters owing to an absence of a mix of expertise, system, assets and coordination.

At the point when there are various kinds of partners from various foundations/ backgrounds with various areas of interest (interdisciplinary methodology/subjects – software engineering, association hypothesis, science management, financial matters and brain research, etc.) who are working at various levels of organisations to serve society, coordination seems to become an integral factor. During disasters, they all need to team up and approach them together to facilitate and to help individuals. To unite and work in a team leaving behind the background and departments from where they belong requires coordination, because these are all separate/_multiple actors from different areas, entering an interdisciplinary field of disasters and disaster management. Likewise, every actor has various exercises to do, and to facilitate movements of every kind simultaneously and under all circumstances is an incredible test. Here, coordination is needed or lacking in the vast majority of catastrophic events (Malone, 1988). The coordination hypothesis goes under interdisciplinary fields. It investigates the normal issues of numerous actors, which were viewed as issues in various fields (Malone, 1988).

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Coastal Resilience and Urbanization Challenges in India

17

Mamta Sharma and Shadab Khan

Contents

Introduction	224
Study Area	224
Data and Methodology	225
Coastal Settlements	227
Coastal Livelihoods	227
Coastal States of India	227
Metro Cities, Class I and Class II Towns in the Coastal Area	230
Processes of Coastal Urbanization	230
Colonization and Coastal Urbanization	230
The Port Cities in the Region	232
Settlement	232
Coastal Regulation Zone (CRZ)	232
Flood, Cyclones, and Other Events	233
Conclusions	235
References	236

Abstract

This chapter explores the urban expansion in Indian coastal states since independence and how factors like population pressure, economic globalization, and natural hazards turned these states more vulnerable to disasters. The study focuses on urban density, coastal zone, and urban infrastructure. East coast of India is more prone to cyclones, whereas the west coast faces more threats of floods, erosion, and irregular rainfall leading to droughts/floods. This leads to aggravate the mitigation strategies and consequences of disasters on dense urban settlements that affect adaptation strategies. The peninsular coastal region has experienced rapid urbanization with an unequal spatial distribution pattern, particularly in Kerala. Urban

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expansion is projected to continue in the coming years that brought more area under disaster threats. States like Goa (in percentage) and Maharashtra (absolute number) have the highest level of urbanization in the country. Each coastal city in India is either facing challenges of infrastructure or basic services. The environmental threats to these coastal regions cannot be ignored. Keeping physical conditions of coastal belt in consideration, the coastal region is in various developing stages from Utkal coast to Kathiawar peninsula. This study emphasizes urban agglomeration and infrastructural development since globalization. Demographic change clearly marked the dividing line between coastal and inland states of India, which is also not untouched by disasters. Furthermore, the role of artificial intelligence (AI) cannot be ignored after Odisha's (1999) most destructive super cyclone. In this chapter, an attempt is made to correlate the lives and livelihood of coastal people across the urban region.

Keywords

Globalization · Urban agglomeration · Demographic change · Artificial intelligence · Hazard

Introduction

The total length of the ocean is 1,634,701 km, and more than 39% of people live within 100 km of the coastal zone. More than 600 million people live extensively in coastal areas around the world with an elevation of <10 m, of which 360 million reside in urban areas. The world's 10% of population inhabit low-altitude coastal zone making their lives and livelihood more vulnerable to natural hazards. Low-altitude coastal zones account only 2% of the world's land area that hold 10% of world's population and 13% of urban occupants. Million-plus cities, accounting for 75% of world's share, have their largest city close to coastal areas with <10 m elevation.

India's 7516.6 km-long coastline is supporting about 35% of its population within range of 100 km from the coast. India's share in the world's coastline is less than 0.25%, which is inhabited by 211.93 million people. With 640 districts in India, 76 coastal districts have 17% of its share in national population, and within 50 km of its coastline, nearly 250 million people reside. Seventy-seven cities come under the nine coastal states and four UTs, which comprise largest and most dense urban agglomerations in India.

Study Area

India's total coastline is about 7516.6 km, of which 5437 km are the mainland coast and the rest in the island territories of this subcontinent. Its share in the world's coastline is $<0.25\%$, but as a share of population, it counts 17% of the world's

population. Taking these facts into account, internationally the Indian coastline is the most densely populated (Sankhua 2012).

According to census 2011, 377.1 million people in India reside in urban areas. Forty-eight percent of India's population have lived in 2661 towns of coastal urban areas in 13 states and UTs (Sibananda and Vijaya 2014). 64.45% of people from slum areas live in poverty in nine coastal states. These areas are more vulnerable as exposed to frequent occurrence of cyclones, sea storms, tsunamis, and environmental hazards. People are more exposed to hazard and disasters if they live in longer coastline and lowlands with more dense population than those living in shorter coastline and less people in lowlands.

Data and Methodology

Nine states along with their coastal districts have been selected for the study, and data was acquired from the 2011 census of India. Governmental and different organizational reports were cited for the current situation in coastal districts of India. The decadal demographic database of census of India and the master plan of coastal cities were taken into account. ArcGIS 9.3 was used to acquire image processing and create the coastal district GIS database. The whole paper is based on secondary sources that include literature surveys.

The main objective of the study is to find the changing scenario of Indian coastal cities in terms of urbanization. How the continuous growth of population pressure and natural hazards has harmful effects on urban density from the disaster angle. The study also deals with the consequences of disasters on densely populated urban settlements.

The eastern side, known as Utkal and Coromandel Coast, has four coastal states of West Bengal, Odisha, Andhra Pradesh, and Tamil Nadu. The western side of Konkan and coastal belt has states of Gujarat, Maharashtra, Goa, Karnataka, and Kerala. Pondicherry, Andaman, and Nicobar Islands on the east coast represent as the union territories, while on the west coast Daman, Diu, and Lakshadweep Islands represent the same. These nine coastal states and three UTs constitute 1,395,933.69 km² area out of which 558,673.93 km² fall under coastal area, which includes 76 coastal districts. According to the 2011 census, there are 486 towns along the coastal region with 41.7 million inhabitants which constitute 20.7% of the total coastal population (GOI 2019-ENCORE).

Census of India 2011 shows that Kerala has seven million-plus cities (equal to UP) followed by Gujarat four million-plus cities, Maharashtra and Andhra Pradesh two each, and West Bengal and Tamil Nadu one each million-plus cities in the coastal plains. Malappuram, Thrissur, Kannur, Kollam, Kozhikode, and Thiruvananthapuram were added in 2011 census in Kerala. Vasai-Virar Maharashtra and Tiruchirappalli in Tamil Nadu added to the coastal plains in 2011 as well. These cities are represented by coastal climate (Table 1).

The above table shows that the districts of coastal India and its urban population are highly exposed to severe cyclones, erratic rainfall, storms, etc. The most

Table 1 Towns and cities in coastal states of India

States	Coastline (in km)	No. of coastal district	Population density 2011	Urban population in %	No. of million- plus cities	Class I cities	Class II towns	Class III towns	Million-plus cities
Gujarat	1214.70	17	260	42.58	4	7	14	24	Vaddoda, Surat UA
Daman and Diu	29.50	2	2066	75.16			2		
Maharashtra	652.60	7	628	45.23	6	6	4	1	Greater Mumbai UA, Vasai-Virar City (M. Corp.)
Goa	131.00	2	371	62.17			3	4	
Karnataka	280.00	3	1179	38.57	1	2	2	5	
Kerala	569.70	9	1074	47.72	7	6	9	49	Kollam UA, Kochi UA, Thrissur, Kozhikode UA, Kannur UA, Thiruvananthapuram UA,
Tamil Nadu	906.90	13	701	48.45	4	5	2	28	Chennai UA
Pondicherry	45.00	1	2428	68.31		2	2	4	
Andhra Pradesh	973.70	9	337	33.49	3	7	7	4	Vishakhapatnam
Odisha	476.40	6	399	16.68		3	1		
West Bengal	157.50	3	1333		2	4	3	8	Kolkata UA
Andaman and Nicobar	1962.00	3	51	35.67			1		
Lakshadweep	132.00	1	135	78.08					

Source: https://www.censusindia.gov.in/towns/lak_towns.pdf

The Challenged Coast of India, a report, by BNHS, NCPC, PondyCAN and TISS a Discussion Document, 1st Edition, Hyderabad, October 2012 (Ahana et al. 2012)

urbanized large states of India which include Tamil Nadu, Maharashtra, and Andhra Pradesh are more prone to cyclones. Most of their million-plus cities are located in the coastal zone as compared to the total million-plus cities. The population density of these coastal states in class I to class III towns is also very high.

Coastal Settlements

As far as lengths of the coastline are concerned, it occupies 4521.5 km in the east coast and 3009.5 km in the west coasts of mainland India with a share of population of 102.4 million and 87.4 million, respectively. The length of the west coast of India is comparatively longer than the east coast. The Indian coastlines have the largest urban agglomerations along with 76 cities and towns. Since 1901, Kolkata (then Calcutta) and later Mumbai (Bombay) are the two megacities of coastal India. Chennai, Tuticorin, Cuddalore, Visakhapatnam, and Puducherry are major cities of the east coast, while Kochi, Mangalore, and Surat on the west coast are prominent cities. These port cities are emerging as industrial hubs and turning into large urban agglomerations.

As far as fishing villages are concerned, there are 3288 marine fishing villages distributed in east and west of India. Tamil Nadu is at the top as far as marine fishers (8.02 lakh) are concerned, followed by West Bengal (6.34 lakh) and Kerala (6.10 lakh). It is difficult to apply the concept of primacy at the national level (CRZN 1991). To some extent, it is applicable to the state of West Bengal where primacy still exists.

Coastal Livelihoods

CMFRI2 conducted marine fisheries census in 2010, which shows 9 maritime states and union territories have 1511 marine fish landing centers. The population of marine fishermen is approximately 4 million, of which 61% of the fishermen live in the below poverty-level category (GOI 2019-ENCORE). Salt production is the second important coastal livelihood in India. With an average annual production of about 157 lakh tons, India's salt production is the third largest in the world. The contribution of sea salt making is up approximately 70% of overall salt production. The leading states of sea salt production are Gujarat and Tamil Nadu (CMFRI 2016–17).

Coastal States of India

The Western Coast Region

The west coast of India is characterized by estuaries with few beaches. The length of the west coast is 3009.5 km (including the UT of Lakshadweep) with a population of

87.4 million. The density of this region is 119 km^2 . The west coast of India is vulnerable to erosion, coastal flooding, storm surge, and pollution.

Gujarat

The coastal regions of Gujarat, geographically, can be divided into five regions: (i) the Rann of Kachchh, (ii) the Gulf of Kachchh, (iii) the Gulf of Khambhat, (iv) the Saurashtra Coast, and (v) the South Gujarat coast (CRZ 1991). The coastal area of Gujarat including the Rann of Kachchh is the largest in the country. Gujarat has the longest coastline of 1214.7 km in India with an area of $1,96,024 \text{ km}^2$. The state has population density of $308/\text{km}^2$ (2011 census). There are 17 coastal districts out of 33 districts of Gujarat.

Maharashtra

As far as size and population are concerned, Maharashtra is the third largest state in the country. The 652.6 km-long indented coastline of the state is geographically depicted by beaches, estuaries, and mangrove patches. The state's coastal belt known as Konkan coast comprises Thane, Raigad, Greater Mumbai, Mumbai, Ratnagiri, and Sindhudurg districts. According to the 2011 census, state density is 365 per km^2 , whereas Mumbai city's density is $20,038 \text{ per km}^2$; the suburban of Mumbai is quite dense with $20,925 \text{ per km}^2$.

Goa

The third state in Konkan coast is Goa, which is small in area (3072 km^2) but rich in minerals. Goa has the highest level of urbanization with 62.17% of its population living in urban areas. With a coastline of 131 km, Goa coast is famous for its beautiful pocket beaches, cliffs, estuaries, and bays.

Karnataka

Karnataka lies to the south of Goa; it is the eighth largest Indian state by area ($191,791 \text{ km}^2$) and has a coastline of 280 km. The coastal zone of Karnataka is narrow except around estuaries. Only three districts of the state are bordered by the Arabian Sea. Only 4.7 million people live in the coastal area of Karnataka, which is quite low as compared to the big states of Southern India.

Kerala

The state is characterized by Malabar coast with an area of $38,863 \text{ km}^2$. Kerala has 9 coastal districts with 33.38 million people. The elongated coastline of the state is 569.7 km long; its width varies from 11 to 121 km from north to south. As compared to Mangalore coast, the Kerala coast is a submergent one. According to an estimate, Kerala's 30 km of coastal belt is highly exposed to erosion and 21 km under accretion. Seawall plays an important role for protecting Kerala's approximately 360 km (63%) of the coastline. The entire coastal belt is characterized by its high population density, which is $1074 \text{ persons/km}^2$. The whole state is known for its urban spheres resulting in seven million-plus cities equivalent to Uttar Pradesh (ISRO 2012a, b).

The Eastern Coast Region

The eastern coast region differs from the west coast having a large number of deltas built by perennial (Himalayan origin) and non-perennial (peninsular origin) rivers flowing into the Bay of Bengal. The total length of this coastal region is 4521.5 km (including the UT of Andaman and Nicobar Island) with 109.12 million people. The region is more densely populated with a density of 158 km². The eastern coast is more prone to tropical cyclones, sea-level rise, tsunamis, and coastal pollution.

Tamil Nadu

In terms of area, it holds the 11th position in India and seventh most populous state. After Goa and Mizoram, Tamil Nadu is India's most urbanized (48.45%) state. The state has 13 districts with coastal boundaries. The coast of Tamil Nadu is approximately 906.9 km long with a population of 33.38 million. The state's position in sea salt production is second after Gujarat.

Puducherry

Puducherry is a union territory of India consisting of four enclaves. Earlier it was a part of French India. Karaikal, Yanam, and Mahé are other enclaves in Tamil Nadu, Andhra Pradesh, and Kerala, respectively. The territory has a total area of 490 km²: Puducherry 294 km², Karaikal 157 km², Mahé 9 km², and Yanam 30 km². In general, Puducherry has a coastline of 30 km of which 9.5 km is undergoing severe erosion.

Andhra Pradesh

According to the 2011 census, Andhra Pradesh is India's fourth largest state in terms of area and fifth populous state. It has a coastline of 973.7 km. The coastal area accounts for 33.6 million people with density of 337 km². The coastline of the state in south of Pulicat lake is indentation only; famous for its freshwater, Kolleru lake lies between Godavari and Krishna deltas (CRZ 1991).

Odisha

Odisha (Orissa) is 11th populous and 9th in terms of area. The state has share of 4.74% with an area of 1, 55,707 km² in Indian territory. The coastline of the state is 476.4 km facing Bay of Bengal. The Orissa coast is drained by two major river systems, namely, Mahanadi and Brahmani-Baitarani rivers. Both of these rivers form extensive deltas. The coastal region is exposed to severe cyclones (October, 1999 super cyclone). The Chilika lagoon is not only the state's largest natural water body but the country as a whole.

West Bengal

West Bengal with its unique physical features from mountains to plain spreads over 88,752 km². This second most densely populated state is fourth in population holding. The state's coastline is of about 157.5 km with a population of

29.28 million. West Bengal's southern part is a delta region with a density of 1333 km² per person. The coast represents a typical bird foot deltaic strip with a density of 1333 km² per person with almost flat terrain. The Hooghly river, which is a tributary of Ganga river, forms the most important drainage system of the entire state.

Metro Cities, Class I and Class II Towns in the Coastal Area

According to the 2011 census, 42 towns are classified as class I towns out of 486 towns that have a population of more than one lakh people. Class II with 50,000 to 99,999 persons and class III with 20,000 to 49,999 people have 48 and 129 towns, respectively. Of the total population of these coastal states that is 560.74 million, 211.93 million people live in coastal districts, which accounts for 37.8%.

Population of these coastal states is 560.74 million, which is 46.34% of total population of India. As far as populations of coastal districts are concerned, 211.93 million constitute the 17.5% of the coastal states (CPCB 2010).

Processes of Coastal Urbanization

A long time ago, all the great cities of today were born as villages or towns. They grew over decades, centuries, or millennia. Thousands of fisherman's villages have now become giant cities. Coastal urban centers are home to almost three billion people around the world and are experiencing unprecedented growth. Much of this growth occurs in developing countries due to the growing population.

It should be experiential that coastal urbanization is unequally located along the shore. The most appropriate system of urbanization of the coastal regions is the "pole and corridor system" of growth. Large coastal cities form the poles of this system, and corridors are formed by the remaining part of the elongated marine regions with a series of small urban centers, situated along the coastline.

Colonization and Coastal Urbanization

For thousands of years, the Indian Ocean region and the entire coastal region in general have been an important seat of civilization. There has been a long interaction of society with the coastal environment, particularly in India. Cities and ports, such as Mumbai (Bombay), Kolkata (Calcutta), Chennai (Madras), Diu, Surat, Goa, and Cochin, were established and developed by the Europeans initially to facilitate their commercial interests. This was used ultimately to enforce industrial and monopolistic capitalism, which later developed in the shape of large towns and cities (Table 2).

Table 2 Growth of the urban population in India (population in millions)

Year	1951	1961	1971	1981	1991	2001	2011	2019 ^a
Total population	361.09	439.24	548.16	683.33	846.42	1028.74	1210.19	1366.41
Urban population	62.44	78.94	109.11	159.46	217.55	285.35	377.1	471.03
Area in sq km				52,390.63	63,832.10	78,199.42	102,252.00	

Source: <https://censusindia.gov.in/2011census/population>
^a<https://www.worldometers.info/world-population/india-population/> Source

The Port Cities in the Region

The 11 coastal cities out of 16, which have more than a million populations, namely, Bombay, Calcutta, Cochin, Madras, Trivandrum, and Visakhapatnam.

Settlement

Approximately, a quarter of the India's population lives in the coastal belt. According to the 2011 census, 42 coastal towns fall under the class I towns. In the coming years, this population is likely to grow with a faster rate. The region is also characterized by 27 million-plus cities. This coastal belt is characterized by cities, towns, large metropolitan towns, million cities, and urban agglomeration. The settlements of these coastal regions are rural in character. Most of the inhabitants are involved in primary activities like fishing, agricultural, some in cottage industries, etc.

Coastal Regulation Zone (CRZ)

The Environment (Protection) Act of 1986, under parliament, has the objective to provide legal framework to protect our environment. The Section 3 (3) of this act gives power to the central government to establish authorities over it. This empowers the authorities to regulate coastal activities within a 500 m coast zone, which is further divided broadly into four zones as ecologically sensitive, built-up, rural, and islands areas (Marale and Mishra 2011).

Further, they are divided into four main broad domains as below:

CRZ-I (ecologically sensitive areas), there are restriction and prohibition of most of the activities in this ecologically sensitive ecosystem/zone.

CRZ-II (built-up areas), under certain conditions, development and construction activities are permitted.

CRZ-III (rural areas), limited activities are allowed in this undeveloped area.

CRZ-IV (islands), no construction activities are permitted.

The notification of 1991 prevents, restricts, and controls development activities from the high tide line along the coasts up to 500 m distance. The government of India in National Environment Policy, 2005, envisaged a vision of long-term management of coastal and marine areas. Twelve critically vulnerable coastal areas (CVCAs) have been identified by CRZ in coastal belt along with wetlands. India's coastline spread in 76 districts of 9 states, and 4 UTs accommodate 14.2% of its total population (GOI 2019-ENCORE). The coastal development in India can be best explained with the emergence of cities, towns, million cities, and ports along with SEZ, IT parks, economic hub, and marine fish centers.

The land area of the coastal region is shrinking not only due to the high concentration of population but also the development of industries. Not only garbage generated by these cities but effluent discharge, municipal sewage, chocking of rivers, desilting of drain, and recreational activities at beaches are immensely affecting our coastal environment.

The economic infrastructure in coastal region has significant share, not only in import-based industries but in petroleum industries as well. These are spread across 13 major and 138 minor port and 76 proposed ports with large-scale industrial units in 76 coastal districts. Coastal fishing provides employment to almost a million people, and the other 1.2 million people are engaged in postharvest fishery sectors. Rapid growth of population leads to expansion of urban fringe areas. Further this led to rapid industrialization, transportation, rapacious use of resources, excess in marine fishing, and coastal and seabed mining. The setting up of special economic zones (SEZs) has led to increased demand for energy, oil, gas, and infrastructure, hampering the wise use of natural resources to a large extent (Table 3).

Flood, Cyclones, and Other Events

The Indian coastal zone, particularly eastern coast, is exposed to several weather events like tsunami and cyclones. On an average, occurrence of nine cyclones per year leads to damage to lives and loss of property.

Between 1877 and 2005, the east coast of India has experienced a total of 283 cyclones within 50 km of its wide strip; on the contrary, west coast faced fewer cyclones, a total of 35 cyclones.

Nineteen severe cyclonic storms caused the human causality of more than 10,000 lives. The super cyclone of Odisha in 1999 resulted in enormous damage to property and massive loss of lives (>30,000 human lives). Similarly, the torrential rain in Mumbai in a single day of July 2005, which received a record 944 millimeters (mm) of rainfall, has created havoc among people (Sibananda and Vijaya 2014).

Around 12,388 people lost their lives and caused damage of \$32,615 million during 1999 to 2020. Bay of Bengal and the Arabian Sea accounted for only 7% of the world's cyclones which have severe impact on coastal districts and several major cities in the country. During the above period, Odisha coast witnessed 97 cyclones, followed by 79 cyclones in Andhra Pradesh, 58 in Tamil Nadu, 48 in West Bengal, 22 in Gujarat, 7 each in Maharashtra/Goa, and 2 in Kerala. In the last two decades, cyclones have 15% of its share in total natural disaster in India.

Purba Medinipur is the most vulnerable district of West Bengal in terms of occurrence of cyclones. The Sundarbans saw two cyclones Yaas and Jawad in 2021. The region has witnessed the devastation done by cyclone Aila in 2009. Baleshwar in Odisha is the most vulnerable district in severe cyclone category. In its third year in a row, Odisha witnessed a pre-monsoon cyclone after Amphan and Fani. Yaas has made landfall in Odisha's Bhadrak district in 2021. It has faced severe cyclone Phailin in 2013 too.

Table 3 Ports, SEZs, and cities in coastal states in India

State	Coastal district	Total area	Total pop. of the state (in millions)	Pop. coastal (in millions)	Notified minor ports	Major ports	Minor port	Proposed ports	SEZ in coastal areas	Cities along the coast	1 m. sea rise affected % of pop.
Gujarat	17	196,024.0	60.38	39.89	49	1	7	18	2	13	1.07
Daman and Diu	2	112.0	0.243	0.242	2	0	2			1	
Maharashtra	7	307,713.0	112.4	28.63	48	2	14	4	4	6	1.75
Goa	2	3072.0	1.45	1.45	5	1	5	4		3	7.25
Karnataka	3	191,791.0	61.13	4.7	10	1	10	5	1	3	0.56
Kerala	9	38,863.0	33.38	27.46	17	1	18	5	7	19	1.56
Tamil Nadu	13	130,058.0	72.14	33.38	20	3	17	17	10	12	2.91
Pondicherry	1	490.0	1.24	1.24	2	0	1	1		2	
Andhra Pradesh	9	275,069.0	84.66	33.6	13	1	14	10	5	8	0.93
Odisha	6	155,707.0	41.94	11.62	14	1	12	9	1	4	1.76
West Bengal	3	88,752.0	91.34	29.28	1	1	5	3	5	6	2.35
Andaman and Nicobar	3	8250.0	0.38	0.38		1	23			0	
Lakshadweep	1	32.7	0.064	0.064		0	10				
	76	1,395,933.7	560.747	211.936	181	13	138	76	77		

Source: <https://censusindia.gov.in/2011census/dchb/DCHB.html>
https://censusindia.gov.in/2011census/population_enumeration.html

Since 1975, Andhra Pradesh has witnessed nearly 60 cyclones which includes Titli in 2018, Fani in 2019, and Amphan in 2020. Nisha in 2008 made cyclonic impact in Cuddalore district of Tamil Nadu and damaged major parts of Sri Lanka. Cyclone Nisha 2008, Phyan 2009, Thane 2011, Nilam 2012, cyclone Vardah 2016, cyclone Ockhi 2017, cyclone Nivar 2020, and cyclone Burevi 2020 have caused devastation in Tamil Nadu.

Tauktae in Arabian Sea is one the strongest cyclone in 2021. Severe cyclone Nisarga made landfall slightly away from Mumbai in 2020. Cyclone Phyan 2009 caused heavy rainfall in Gujarat. From 1999 to 2020, there is a loss of property assets from \$2990 million to \$14,920 million which accounts roughly 2% of the country's GDP. From West Bengal to Tamil Nadu, the districts of eastern coastal region are highly vulnerable for cyclones. Twenty-five districts of the east coast are highly vulnerable to cyclonic storms which include ten districts from Tamil Nadu, seven from Andhra Pradesh, six from Odisha, and two from West Bengal.

A rise of 1 m in sea level would inundate nearly 6000 km² areas in India. The population living in these low-altitude areas is most exposed to natural hazards and disasters. Approximately, 63 million people live in a fear of exposure to these disasters with low resilience, particularly the poor communities. Due to climate change, infrastructure, ports, industries, and agriculture pattern of coastal region will be affected to a greater extent.

From management point of view, there is a need to improve the cyclone warning system, more addition of evacuation shelters, and increase in area of shelterbelt plantation and mangroves. State government must provide concrete and resilient households to the poor. This all can be achieved only when center and concerned states ensure healthy coordination to achieve zero fatality approach and minimize economic losses.

Conclusions

As a result of globalization, the varied and highly productive ecosystems on the coastal zone are under pressure due to increased anthropogenic activity. It is necessary to protect our ecosystems to ensure sustainable development of urban areas. Also, it is crucial to assess the interaction between various industrial and human activities conducted in coastal areas. To protect our environment, ecology, and its endangered species, there is an urgent need to ensure judicious use of resources around coastal zone. The poor are most at risk in cities due to exponential growth of urbanization. These urban poor are compelled to live in slums which emerged in low-lying areas. These low-lying areas are frequently exposed to coastal flooding and waterborne diseases. India must take great care to protect the natural assets and livelihoods of coastal people by making coastal governance transparent and accountable at the district level. There is an absolute need to have coastal policy, urban planning, coordination, capacity building, involvement of the civil society (local community in the decision-making process), assessment of damage, implementation

of CRZ, and information dissemination. Coastal areas as a resource in India are its natural assets, which every citizen has the right to use and protect. There is an urgent need to transform the old pattern of coastal management through artificial intelligence which may result in the socioeconomic development of coastal people.

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E-governance-Based Disaster Mitigation Strategies

18

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Contents

A Catalytic Role for ICT-Based Services in Disaster Mitigation	240
Development Disaster Dichotomy	241
Knowledge, Innovation, and ICT Tools: Creating Public Awareness	242
Application of E-Governance in Disaster Management and Disaster Risk Reduction (Pre-, During, and Post-Disaster Periods)	243
Sendai Framework for Disaster Risk Reduction 2015–2030	244
Application of Geographic Information System in Disaster Management	244
Emerging Technologies and Disaster Risk Management [DRM]	246
Institutional Apparatus for Disaster Management	247
Harnessing Technology for Better Disaster Management	248
Disaster and Community Participation	253
Conclusion	253
References	255

Abstract

Human civilization today is facing perhaps the worst kind of challenges for its survival, which are emanating from diverse fronts. Some of them are a product of man-made conscious decisions resulting in several ecological disasters. These are having profound consequences on the survival of the human race in the twenty-first century. Those natural and man-made disasters are posing serious threats to human security and are proving to be beyond the control of individual nation-states to mitigate and resolve pertinent issues such as climate change, global warming, and environmental degradation.

Hence, it calls for not only form resolve but also collective action, collaborative efforts, and innovative strategies by the nation-states to pull in their resources and share technology, information, and best practices. Decision-making of late has become a primary objective of every nation struggling with natural disasters

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taking place at alarming frequency. Hence, it is pertinent to discuss the subject of such great relevance in contemporary times to put in perspective the need for the right kind of strategy at the local front and collective action plan at the global front.

In the post-globalization era, much of the states' responses to challenges on multi-various fronts are articulated through substantial intervention of ICT. This has made the process of governance more efficient and faster in responding to the challenges and effective management of crisis. In brief, the new-age governance, popularly known as e-governance, provides a wide range of technical solutions, which are proving to be a game changer. An attempt has been made to contextualize disaster management in the larger process of e-governance initiatives of the states across the globe to respond to the challenges of climate change and its consequence on human lives.

Keywords

Disaster management · E-governance · Community participation · New technologies · Communication · Common service centers

A Catalytic Role for ICT-Based Services in Disaster Mitigation

In the contemporary times, both natural and man-made disasters have become a challenge for the mankind. They pose a serious threat to the survival and livelihood of people in different parts of the world that must be adequately addressed through the prevention, preparedness, and mitigation strategies. Countries across the world are facing natural disasters in the form of tsunami, severe cyclones, floods, excessive rainfall, landslide, etc. At the same time, there have been instances of man-made disasters taking place due to excessive economic activities and uncontrolled exploitation of natural resources such as mining and depletion of forest resources. These activities alongside rapid urbanization have led to the decrease of forest covers and encroachment into agricultural lands, thereby creating situations for natural disaster. Under such circumstances, the role of the state to mitigate these challenges becomes critical. However, given that fact, the capacity and preparedness of the state agencies to effectively address these recurring problems have always remained doubtful. Hence, there is a need for looking at such nonconventional security threats from a new perspective of public policy and management. This needs a multidimensional approach involving greater usage of technology. Both information and communication are important parts of the disaster mitigation strategy which can be extensively used through technological platforms to reach out to the targeted areas and population during natural calamities. Timely informing the unsuspecting people and evacuating them to safer places during such natural disasters save precious lives and valuable property. Thus, alongside government agencies, advanced ICT can play a catalytic role in disaster management efforts.

Each disaster has its own characteristic features, and this has to be taken into consideration while designing the most appropriate disaster mitigation strategy. Disaster management requires the active participation of multiple stakeholders which involves networking and coordination by different departments, organization, and agencies on the basis of information, service, support, and institutional framework. From early warning to post-disaster assessment, information can be shared and analyzed for effective management of disasters at different levels using different communication platforms. This can be used to prevent future disasters or at least control the damage intensity. The efficiency of the government is enhanced by increasing the use of ICT tools in administration, so that knowledge is disseminated faster and enables the citizens to make informed choices. This technological intervention in administration has reached a stage, where it needs to be explored as a critical catalyst to disaster management system. This chapter explores the positive intervention of e-governance, a critical enabler for disaster mitigation strategy through information dissemination. New technologies, such as information and communications technologies, have brought about amazing changes and played an important role by using geospatial information technology to disseminate information and increase community participation and community-based disaster preparedness, which is the key to effective disaster management.

Development Disaster Dichotomy

Ever since globalization unleashed forces to embark on rapid economic development, the pace and volume of economic activities all over the world have increased exponentially. In the era of the *Fourth Industrial Revolution*, the advances in digital technologies have empowered many and also have emerged as a pivotal tool to assist policy-makers for the purpose of delivering public goods and services. While advancements in technology have dramatically transformed the narratives on climate change mitigation and disaster management, they also play a key role to forecast weather across different locations and reduce risks and provide quick response during disasters. The Covid-19 pandemic has exposed the challenges and vulnerabilities at the regional, central, and global levels. Therefore, governments need to revisit the administration by restructuring governance and strengthening public institutions to ensure the achievement of sustainable development goals. In this context, it is pertinent to highlight the role of geographic information system, which in its various dimensions has fast-tracked the idea of disaster management by effective amalgamation of geospatial data and socioeconomic information for better decision-making.

The term “disaster” is to be seen in the context of three distinct situations where development and lack of it become precursors to impending disaster.

- First, disasters destroy hard-earned gains of development.
- Second, lack of development makes vulnerable communities more prone to disasters, than the communities which are better off.

- Third and ironically in an opposite direction, development increases the risk of disasters, such as houses and infrastructure without compliance of zoning and building regulations; mining and industries in ecologically fragile zones may destroy the natural buffer to disasters, while fossil fuel-based production and consumption increase the risk of climate-related disasters.

Most developmental activities, especially in high seismic risk areas, can trigger earthquake and landslides. It is necessary to incorporate earthquake-resistant features in the design and construction of all new buildings and structures. Thus, there needs to be a judicious use of natural resources, keeping environmental concerns at top priority so as to avoid disasters. Though the poor countries contribute marginally to the climate crisis, the actual impact on them is more severe and intergenerational. Climate change is also disastrous for the marginalized groups that face food insecurity, mass displacement, and loss of life and property, and the pandemic (Covid-19) has made it more challenging for them. These extreme consequences highlight the need for concrete climate action, especially finance and technology for the Global South by the developed North. It has been observed that the industrialized North has shown little interest to meet the goal of mobilizing hundred billion dollars for climate finance. It has also failed to provide a roadmap for funding as promised during the Glasgow meet, 2021. The developed world must adhere to the principles of climate justice and provide finance and technology to the developing world.

Apart from constructive cooperation, substantive collaboration, and effective coordination between the developed and the under-developed countries, there is also a need to undertake massive technological upgradation and usage of information and communication networks to face the challenge of recurring environmental disasters. For this, the new-age governance system based on the application of ICT tools and digital infrastructure supporting disaster mitigation efforts is considered to be the “game changer.” In other words, e-governance and its various technologically enabled means can prove to be a catalyst.

Knowledge, Innovation, and ICT Tools: Creating Public Awareness

In an event of a disaster, communities are always the first responder. Community participation ensures local ownership, addresses local needs, and promotes volunteerism and mutual aid to minimize and control damage. Community-based disaster preparedness is vital for effective disaster management (www.osdma.org). Imparting education raising awareness among the vulnerable communities, community-based monitoring, timely warning, and effective evacuation strategy are key to disaster mitigation strategy.

For example, Japan has a known history of natural disasters happening at a regular interval, some of which are the direct consequence of climate change. Besides earthquake and tsunami, there are typhoons, floods, landslides, and volcanic eruptions in Japan that has learned to live with natural risks making it a laboratory for resilient societies (Mihoko & Murayama, 2019). Japan Bosai platform: is a group of

firms that develop disaster-related technologies. Concept of resilience is what can be emulated by other countries from Japan (Omachi, The Economist, December 7, 2020).

The challenges of sustainable development and climate change are addressed by adopting green technology for the recovery, recycle, and management of wastes. However, the real issue is to move beyond the binary discussion of environment and development to environmentally sustainable and socially inclusive development mode. India has also initiated a multi-stakeholder partnership, Coalition for Disaster Resilient Infrastructure (CDRI), 2019, that aims to develop strong infrastructure in areas prone to frequent natural disasters; it has also launched an initiative infrastructure for resilient island states for vulnerable island nations as per the recommendations of COP26.

ICT plays an important role in disaster risk management; all stakeholder must be kept in the loop starting from the Ministry at central level with the grassroots developments relating to land use, developmental projects, road networks, communications networks, power plant grids, and water pipelines and must integrate disaster risk reduction practices into the planning process, which is possible by optimum utilization of e-governance applications and techniques.

Another new technique of weather forecasting relates to **Doppler weather radar system (DWRS)**. For a city like Delhi, forecasting of rain and thunderstorms is going to be more accurate with the India Meteorological Department (IMD) installing a third Doppler weather radar (DWR) system that predicts precise warning about rain, thunderstorms, dust storms, and severe weather conditions that can potentially impact flights into and out of Delhi. These orders have been designed and developed indigenously by IMD and the Indian Space Research Organisation (ISRO). Till January 2022, India had 33 operational DWRS. The Doppler installed at Leh is at the highest altitude anywhere across the country, which has proved to be successful in the use of information, response, and recovery phases of disaster (Gandhiok, 2022).

Application of E-Governance in Disaster Management and Disaster Risk Reduction (Pre-, During, and Post-Disaster Periods)

Natural calamities have taken a heavy toll on the lives of the poor and hapless people of the state leading to a situation, where basic human rights violations have taken place on a wide scale. The Sendai Framework for Disaster Risk Reduction and the recent advances in ICT, geographic information system (GIS), dissemination of sensing devices, and creation of networks have led to substantial reduction of losses in lives and livelihood during disaster. It has also led to better accuracy and enhanced the collection of different types of information regarding spatial data for cities, regional diversities, and environment that has provided the technical expertise for social development and urban and rural planning strategies (Choudhary & Vyas, 2020).

The United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) Report, 2017, emphasizes the use of ICT in all phases of disaster risk management to reduce risks, enhance coping capabilities, and provide quick response through ICT-enabled public administrative system. E-governance offers many opportunities for better information sharing efficiency and better service to citizens. The efficacy of the government is enhanced by increasing the use of ICT tools in administration, so that knowledge is disseminated faster and enables the citizens to make informed choices. UNESCAP promotes digital inclusion through latest ICT trends, cloud computing, and the power of big data that simplify everyday tasks (<http://www.unescap.org>).

- The role of ICTs is also recognized in terms of risk maps, as well as using GIS and ICTs for more accurate measurements.
- Education and awareness generation among communities.
- Establishing community-based monitoring.
- Timely warning.
- Effective evacuation strategy.

Sendai Framework for Disaster Risk Reduction 2015–2030

- Understanding disaster risk
- Strengthening disaster risk governance to manage disaster risk
- Investing in disaster risk reduction for resilience
- Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation, and reconstruction

The rapid advancements in technology have opened up the possibility where ICTs have the potential to play an indispensable role in all stages of the disaster life cycle. However, they cannot be treated as stand-alone applications or services (Reza, 2010). An ecosystem needs to develop with policies and plans in place that provides a clear roadmap for all institutions, community groups, and governmental and non-governmental organizations. Application of geographic information system (GIS) is useful for identifying the exact location and coordinates in the event of a disaster, so that relief could be dispatched at the earliest (www.unescap.org).

Application of Geographic Information System in Disaster Management

Geographic information system (GIS) refers to specialized databases and systematic integration information through hardware and software for capturing, storing, displaying, updating, manipulating, and analyzing spatial data. GIS system follows a decentralized three-tier structural framework that is an integration of primary components consisting of hardware, software, data, and people for better

preparedness, which is transparently managed. GIS is a powerful tool and involves experts that include cartographers and surveyors who create the maps and survey the land along with the geographical features (Dhunna, 2009). They also include system users who collect the data, upload the data to system, and analyze the results. According to the Environmental Systems Research Institute, 2010 (ESRI), GIS integrates data for capturing, analyzing, and displaying all forms of geographic information that can be shared easily through maps and charts. It keeps information in different layers and generates various combinations pertaining to the requirement of the decision-making. In the recent times, GIS has displayed enormous potential in the management of disasters, effective coordination of geospatial data, and socio-economic information for better decision-making in handling a disaster in a better way through planning and organizing capabilities. Different line departments and staff agencies who are stakeholders in the disaster management process use GIS as a medium to address issues of disaster management.

GIS has been effectively used in the following cases as a decision support tool.

- Identification of location for construction of multipurpose cyclone shelters.
- Grid analysis for setting up the automated weather stations (AWS).
- Preparation of the district- and village-level vulnerability maps.
- Strengthening of embankment and repair of roads.
- Identification and demarcation of weak points in the embankments and area to be affected by flood for preparedness planning.
- Preparing the base map indicating location and operation of boats and deployment of rescue personnel. For instance, GIS was extensively used in Odisha as a part of the Incident Command System and Decision Support System during the air dropping operations in management of floods in 2007 and 2008 and super cyclone “Phailin” in October 2013.

Burrough et al. (2016) highlight the importance of spatial data and the relevance of geographic information system in the modern world for solving a variety of practical problems. The process of GIS revolves around four significant steps:

- Creating data for accuracy
- Managing the data available in geographic and spatial technology
- Analyzing tools
- Display in the form of hard copy or in the web

GIS has been profusely used in map application and remote sensing and inevitable for any planning and space application and has helped to provide quick and able support in efficient disaster management. Furthermore, the digitalization of every village is possible through the application of GIS technology and through the village GIS cell (Google Earth application). Geographic information system along with spatial information technology known as remote sensing has profound implications in the governance and administration of the modern state which requires multifaceted planning and management. GIS enables the creation of a pervasive geospatial

platform, which plays a critical role in several areas like administrative mapping, land use mapping, terrain mapping, social mapping, drainage map and waste management, sewerage management, energy distribution, shortest route analysis, Google Maps services, Global Positioning Systems, and agro-industry location mapping. These services are universal in nature. Today, many local bodies in India are using GIS data for city development planning, urban conservation, documentation of biological diversity, and designing the disaster management programs.

Emerging Technologies and Disaster Risk Management [DRM]

There are various emerging technologies that have the potential to enhance various aspects of the disaster risk management [DRM] functions. Disaster management depends on a multi-sectoral response to work together to identify and implement solution. It refers to a multi-agency function that relies on administrative data and involves networking and coordination by different departments, organizations, and agencies on the basis of information, service, support, and institutional framework. Information dissemination through print and social media platforms is a crucial part of disaster management. In the recent times, GIS has emerged as an effective tool in the management of disasters since geospatial data and socioeconomic information need to be amalgamated for better decision-making in handling a disaster in a better way (www.unescap.org).

The Sundarbans, the world's largest dense mangrove forest cover, was severely hit by two cyclones, *Amphan* in May 2020 and *Yaas* in May 2021, that took a toll on the vegetation and severely damaged the delta region by increasing the salinity levels. The cyclones in every successive year have a profound impact on the natural ecosystem of Sundarbans. It has been found that the natural vegetation and the natural habitat of the wildlife have come under severe stress and irreversible damage. Given below are the various techniques and applications of e-governance strategies adopted in disaster management.

Artificial Intelligence (AI): is considered as a major game changer in diverse sectors that has immense potential to mold India's future. AI refers to the practice of designing computer systems to make prudent decisions based on the real-time data (Dhal, 2022). The most common application of this technology is the field of virtual assistants (machine learning-aided assistance) which is gaining currency in the wide areas of energy conservation, climate change, disaster preparedness, and environment monitoring.

Big Data: relates to the huge volume of data that cannot be processed using traditionally available computers and data processing software and techniques. Big data along with artificial intelligence (AI) can be an effective means for disaster mitigation strategy and effective disaster relief programs. Adopting AI in disaster management strategies has profound consequences for the society in implementing the Sendai Framework for Disaster Risk Reduction 2015–2030 (Kumar & Sud, 2019). It also provides timely information on human behavioral patterns such as

migration, mobility, social network, and so on. This has resulted in the generation of a large amount of data which has to be collected, categorized, and analyzed.

Unmanned Aerial Vehicles: In recent times, the unmanned aerial vehicles (UAV) commonly known as “drones” are used for disaster risk management (DRM) purposes, mainly in the critical phase of response and recovery. Their aerial view imagery and mapping gives an estimate on the extent of the damage and can help identify bodies trapped under debris. In areas of severe damage where transport links have been destroyed, drones provide a way of assessing the gravity of the situation. This is very useful where human personnel can't go because of the risks involved or inaccessible situations.

Community Response Grids (CRGs): CRGs make use of the Internet and mobile communication devices, allowing residents and responders to share information, communicate, and coordinate activities in response to a major disaster and facilitating assistance.

The rationale behind the application of various ICT tools and application of e-governance strategies are based on the assumption that their adoption will make a huge difference for disaster preparedness and disaster mitigation strategies.

Institutional Apparatus for Disaster Management

An in-depth analysis of the structural framework of the disaster management apparatus is characterized by a host of decentralized institutions that address the various changes and challenges through effective strategies and action plans. This also needs to be addressed by strong resolve and effective policy interventions by the government as well as by the introduction of innovative methods and application of ICT tools in the disaster management sector and through the development of adequate warning systems.

India has an extensive multi-tier natural disaster warning system, at both the central and the state levels (refer to Fig. 1). This also provides protection to the vulnerable groups in the society, who are affected the most by disaster and climate change.

The above figure outlines the significance of the different institutional mechanisms of natural disaster warning system operating and working in coordination at both the central and the state levels. Community-based disaster management also contributes to disaster mitigation strategies. The silver lining in this scenario of climate change and disaster preparedness is the resilience of the common man and their participation in the community preparedness programs to sustain itself by resorting to innovative methods and long-term investment in climate-resilient development and in the disaster management continuum. A case in point is the state government of Odisha that is constantly challenged by environmental degradation and recurring natural disasters.

Since 1965, the state has experienced floods for nearly 25 years, droughts for 20 years, and cyclones for 10 years. To help build efficient disaster management strategies, for the first time in India, the state of Odisha has announced a separate

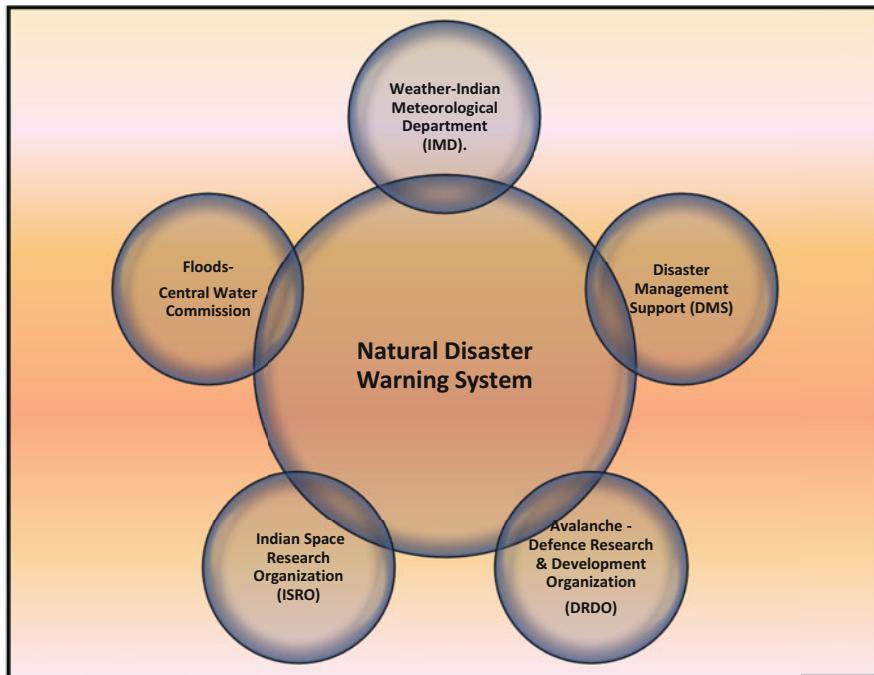


Fig. 1 Multi-tier and natural disaster warning system existing at both the central and the state levels; figure design: author

climate budget (2021) for creating climate resilience infrastructure and closely monitoring its outcome. It has implemented underground power cabling, to address the perennial issue of electric poles getting uprooted during cyclones. Several surge walls were created to prevent tidal wave water from entering the agricultural fields and thereby ruining the crops. When Odisha was hit by Fani super-cyclone in 2019, it impacted the economy in a significant manner (Rs 34,000 crore), and climate-related economic loss has been nearly \$1.5 trillion. So the climate budget introduced in Odisha in 2021 is very significant for building climate resilience infrastructure (<https://poshan.outlookindia.com/story/poshan-news-odisha-leads-way-with-climate-budget/348879>).

Harnessing Technology for Better Disaster Management

The use of various ICT tools artificial intelligence, GIS, drones, satellite imagery, social media, etc. enables the multidimensional understanding of disasters and aids in accessing the devastation and damage for better disaster preparedness. In this context, e-governance as an enabler in administration and governance plays a critical

role in all the three stages of disaster management that include pre-disaster management phase, during disaster management phase, and post-disaster periods.

- In pre-disaster phase: public awareness and sensitization drive toward disaster risk reduction and resilience through media, NGOs, and civil society
- During the disaster: dissemination of authentic information from reliable sources to reduce the panic among public and guide them to take appropriate action during the disasters
- In the post-disaster: sharing information related to rehabilitation and recovery works undertaken by the government

This strategy envisages a paradigm shift with the help of ICT tools from response and relief-centric approach to a proactive and comprehensive strategy toward disaster management taking into account all dimensions of prevention, mitigation, preparedness to rehabilitation, reconstruction, and recovery. It is important to integrate the emerging digital technologies, such as artificial intelligence (AI), social media, space applications, and geospatial information for disaster management.

This section explores how e-governance based on technological applications is adopted as critical disaster mitigation techniques that are used by the different states to address the natural calamities. The following two case studies pertain to the development and excessive economic activities contributing toward environmental degradation in the already fragile ecosystem of Uttarakhand and Kerala.

Case Study 1: Uttarakhand Disaster, June 2013 – Extreme Rains and Haphazard Development

Uttarakhand and adjoining areas received heavy rainfall, which was 375% more than normal monsoon. Nearly 1.5 lakh people were stranded due to heavy rain which resulted in flash floods, cloudburst and landslides. Precautionary steps taken by State Administration were not adequate in foreseeing disaster of this magnitude. None of the agencies like CWC, DMS, GSI, and DRDO except the Indian Meteorological Department [IMD] provided the early warning of the Himalayan Tsunami

Lessons Learned

No warning or advisory was issued by the state government to the residents of the affected areas or vulnerable pilgrims. The Char Dham pilgrimage has become highly commercialized. The tour operators wanted to complete the package ignoring the safety of the vulnerable pilgrims. The district administration was found lacking in organizing coordination meetings during preparatory stage with ITBP, local units of Army. The communication network normally gets disrupted in a disaster. No proper plan for alternative satellite-based communication was available. Though the center was willing to help, the state machinery at grassroots level was not equipped to execute it

(continued)

at field level. The Army somehow succeeded in evacuating the stranded population. Disaster of such a severe magnitude is a wakeup call. It is high time to learn from mistakes and organize the grassroots machineries through effective use of ICT tools.

Another factor of climate emergency has been the massive loss of forest cover due to the Char Dham project in Uttarakhand, which has made the state vulnerable to landslides, slope instability, and downhill creep. Highways have also become perennial problems particularly during the monsoon season. Loss of forests for local people results in the loss of minor forest products and local resources and also increases human and wildlife conflict. (Char Dham Project has increased states vulnerability, Interview with Ravi Chopra, Former Chairman of Panel on Char Dham Project, Sunday Hindustan Times, New Delhi, February 13, 2022).

Case Study 2: Kerala Floods 2018 – Implications of Climate Change

The state of Kerala witnessed heavy floods that were a result of heavy rains from June 1 to August 19, 2018, that was 42% above normal range. With strategic planning, funds were utilized effectively through e-governance techniques. The government handled the crisis situation well due to which the entire world lauded the state of Kerala for its deft handling of the flood of the century. Nearly 7 lakh flood-affected persons have received financial aid, and as many as 687,843 people received financial assistance of Rs10,000. Destroyed dwellings were classified into four groups and efforts were made to rebuild them.

Lessons Learned

Voluntary spirit of the younger generation and the role of technology helped to locate thousands of persons trapped in their homes; it also made the daunting task of distribution of relief materials especially food and water and managing of the relief camps easier. Further, thousands of stranded persons were rescued by the timely intervention of fishing community [super-heroes] who mobilized the rescue mission through their boats.

The experience of the above two natural disasters has flagged an important issue of development strategy, and economic planning is responsible for such unprecedented natural calamities which need to be addressed at a priority basis. This demands a thorough revision and review of the existing approach to economic development in and around such ecologically vulnerable regions where there has been a steady increase in tourist population in recent times. Both Kerala and Kedarnath are major tourist destinations and centers of pilgrimage, respectively, which bring additional pressure on civic infrastructure as well as available resources of the region. These have direct and indirect impact on the physical environment and local ecosystem (Eapen 2014; Kannan 2018).

The following case study 3 is with reference to the second dimension of disaster mitigation where prior planning and preemptive actions have led to a more effective resolution of unanticipated natural calamities.

Case Study 3: Community-Based Flood Early Warning System (CBFEWS) in Malawi

The Sendai Framework for Disaster Risk Reduction indicates that flooding is one of Malawi's most prevalent natural disasters, accounting for about 72% of the natural disasters in the country as recorded in the international database of disasters. A brief analysis of Malawi country profile in the Emergency Events Database (EMDAT) indicates that in the last two decades (2000–2020), Malawi has experienced total 156 hydrological flood (riverine and flash). Most of these flood-related disasters are often accompanied with loss of life, displacement of people, damage to public infrastructure and private homes, and crop and livestock losses, hence reversing the recent economic gains accrued. Many homes get flooded in most years, hence trapped in a poverty-vulnerability cycle limiting their opportunities for growth. It is projected that climate change, vulnerability, and population growth will expose the already vulnerable communities to increased flooding frequency and intensity resulting to enhanced economic and humanitarian disasters that require immediate attention.

The current flood early warning systems in Malawi are insufficient to provide the most vulnerable communities with timely and actionable flood warning information that can help them make decisions that reduce disaster risks and improve their livelihoods. Investing in community-based flood protection measures and early warning systems provision are being embraced to reduce the risk while improving community resilience to disasters. The priority for the Government of Malawi is to enhance adaptation and mitigation measures as reflected in the policy framework (2015) and national guidelines on early warning systems (2018) which lists a number of initiatives for flood disaster risk reduction. A total of 21 community-based flood early warning systems (CBFEWS) were installed and tested for the flooding rivers within the 8 selected districts (Karonga, Rumphi, Nkhata Bay, Nkhotakota, Salima, Dedza, Zomba, and Phalombe). The installed and tested CBFEWS comprises three units, namely, the Data Acquisition (DA) unit, the Data Upload (DU) unit, and the Alarm Unit (AU). The DA unit was installed depending upon the site feasibility: In the presence of bridge, the DA unit was anchored on the pillar of the bridge, whereas in the absence of bridge, the DA unit was assembled on a well-stable concreted galvanized metal structure. The water level of the river is periodically monitored through the contactless ultrasonic-based technology which transmits the measurements wirelessly to the DU unit. The DU unit placed at the caretaker's house within the communication range

(continued)



Fig. 2 Field demonstration of the CBFIEWS (DA) assembly and operations through community engagement and sensitization



Fig. 3 Leman Ngwena of DWR following the CBFIEWS installation and testing using the video provided

then processes the water level to generate localized messages and warnings and uploads measurements to a remote server through a cellular data connection. After processing the measurements received, the server then proceeds to display the data in a time-wise chart. The AU has been installed in the vulnerable downstream communities along the same rivers where DA and DU are installed. The AU sounds a loud siren after receiving the correct SMS that enables the flood early warning dissemination. The relay of the signal is done through an available cellular network compatible with 2G/3G/4G signals that are adequate for data transmission.

Despite field challenges, the CBFIEWS equipment, supply, installation, and testing were considered successful. A total number of 21 CBFIEWS stations were installed and tested to address the issue of perennial flooding and also through continued community engagement and awareness creation programs (refer to Figs. 2 and 3).

Source: Report on Establishment of Community Based Flood Early Warning Systems (CBFIEWS) in selected districts in Malawi, Department of Disaster Management Affairs, Malawi and UNDP, November 2021.

Disaster and Community Participation

Considering the recurring phenomenon of natural disasters taking place with unprecedented alert kitty in contemporary times, it is imperative for the government to revisit its strategy to mitigate these challenges. It needs a fresh look at disaster management and community participation in the efforts of the government. The impact of these natural disasters is sometimes so high that their efforts of the government are found wanting and people are left to fend for themselves. Hence, a collective mechanism involving the community and the civil society needs to be evolved for a well-coordinated response to disasters and natural calamities. The role of women self-help groups in this context is considered to be very critical for the very reason that such civil society agencies are considered to be the front line of defense as they are very familiar with the locality and share informal rapport with the local population.

During any disaster, community participation and technology play a critical role and help to prevent and minimize damage. Timely information of natural calamities and disaster management along with accurate weather forecast helps the local population especially those residing near the coastal regions, who generally remain at the mercy of the nature. Realizing the utility of the grassroots agencies for last-mile delivery of services like the common service centers (CSCs) for social change, the National Disaster Management Authority (NDMA) has involved the CSCs for spreading public awareness and information on the effective management of natural and man-made disasters that promotes better citizen-government interface.

Another game changer initiative relates to the significant role played by the women self-help groups in rural India for achieving women's empowerment and contributing to social capital by guaranteeing sustainable livelihood opportunities. It has been observed that women try to overcome the social prejudices against them through group solidarity and active participation in the public domain of socioeconomic spaces. A newfound awareness and the confidence among the women members are instilled by their indigenous skills and training vis-à-vis their men folk (Social Capital: A Shared Destiny, Second Administrative Reforms Commission, 9th Report, December, 2008).

It has been often observed by the local administrative authorities and agencies that WSHGs are effective community-based disaster management unit. They are the first line of volunteers who can aid the government machinery as service providers to reach out to the target population. The district administration in the various states of India has encouraged the WSHGs to enhance capacity building for helping the government machinery and the local administration in disseminating information and delivering services during disaster (Mohanty et al., 2013).

Conclusion

History of the evolution of mankind shows how human species have always converted every challenge into great opportunity and have negotiated with them through innovative ideas and meticulous planning. While confronted with ecological

crises of the twenty-first century, a multipronged approach is being adopted by every nation to mitigate those challenges. Contemporary environmental challenges are addressed through creating robust infrastructure, aided by emerging technologies and developing effective disaster mitigation strategies. However, for long term solutions of these problems, there is a need to adopt sustainable economic development and a coordinated action plan for the ‘global south’, who cannot afford the cost of environmental protection. At a time when the world is facing major environmental catastrophes, manifested in different forms, such as climate change, recurring tsunami, and global warming, there is an urgent need for collective and coordinated global action. In order to mitigate such challenges and save humanity from imminent danger of possible extinction, policy planners must come up with innovative solutions. Such endeavors must focus on the vulnerability and adaptation to climate change both at the global as well as at regional levels.

In this context, few recent endeavors are worthy of commendation. The quadrilateral initiative (QUAD) among four major democracies, the USA, Australia, Japan, and India, in the Indo-Pacific region is today emerging as a robust platform for achieving multi-various strategic objectives including climate action plan. According to Antony Blinken, US Secretary of State, “QUAD is becoming a powerful mechanism for delivering, helping to vaccinate a big part of the world, strengthening maritime security to push back against coercion in the Indo-Pacific region, working on emerging technologies” (quoted in *Hindustan Times*, February 10, 2022). Though QUAD today is seen as a strategic alliance against growing Chinese expansionism, its original mandate is reflected in the agenda of the organization at its inception in 2007 in the aftermath of the deadly tsunami that struck this region in 2004. There are other noteworthy initiatives like the international solar alliance pioneered by India under **One Sun One World One Grid (OSOWOG)** that is aimed at addressing the issue of climate change and environmental degradation through alternative renewal energy.

Another important component of disaster mitigation is “capacity building” of not only disaster management authority but also the vulnerable people who are at the receiving end. States must build their capacity to withstand, adapt, and recover from natural disasters so that their people can continue to lead the kind of lives that they value. The Sendai Framework for Disaster Risk Reduction 2015–2030 highlights the importance of strengthening the technical, financial, and administrative capability and preparedness of institutions, governments, and communities to successfully handle disasters at different levels. These measures address the issues of sustainable development and climate change as well. However, the challenge is to move beyond the dichotomy of environment and development to environmentally sustainable and socially inclusive development model through the application of knowledge, innovation, and ICT. To reduce and prevent the drastic impact of climate change on vulnerable citizens across the state, there needs to be nationwide concerted efforts to

understand the crisis and devise state-specific plans. Targeted interventions and strengthening the digital reach are the different ways in which gaps can be bridged.

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Building Resilience Against Nuclear Disaster

19

Rajesh Kumar

Contents

Introduction	258
Nuclear Disaster Risks: Causes and Concerns	260
Accidents at Nuclear Power Plants	260
Use of Nuclear Weapons in a War and Nuclear Proliferation Concerns in South Asia	261
Nuclear Disaster Risk Reduction and Resilience Building Measures	262
India's Nuclear Disaster Management Planning	262
Setting Up of a National Disaster Management Authority (NDMA) in 2005 and National Disaster Management Plan (NDMP) in 2016: A Paradigm Shift in Disaster Management	263
Management of Nuclear Disasters in India and Building Resilience Against Nuclear Disaster	264
Role of Atomic Energy Regulatory Board (AERB), Govt. of India	265
Disaster Management Reforms Post-Fukushima and COVID-19 Pandemic	265
Role of DRDO in Handling of Nuclear Disaster	266
National Disaster Management Authority (NDMA) and International Obligations	266
National Disaster Response Force (NDRF) (http://www.ndrf.gov.in/sites/default/files/13683%20-encl.pdf) for Handling of Nuclear Disasters	267
Contemporary Challenges before Indian Administration and Emerging Debates in Disaster Mitigation Plans	268
Inadequate Medical Personnel for Treatment of Radioactivity-Exposed Patients during Disaster	268
Challenges of Climate Change in Coastal Areas and Rise in Protests and Resistance Movements	268
Emerging Debates on Use of Nuclear Energy	270
Emerging Trends in Building Disaster-Resilient Indian Cities	270
Conclusion	271
References	272

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Abstract

Disaster risk reduction, mitigation, and resilience issues as of today form the core of any states' policy intervention. A huge gap exists between developed and developing world in general for preparedness and handling of nuclear disaster capabilities, India being the particular case. Fukushima nuclear disaster and capture of Zaporizhzhia and Chernobyl nuclear power plants in Ukraine by Russian forces have raised alarms regarding nuclear security and safety issues. A global demand for better approaches and methods for building resilience against disasters in general and nuclear disaster in particular is established worldwide, including India. India in recent years performed unsatisfactorily in handling of COVID-19 pandemic in terms of safety, resources, health infrastructure, specialized medicines, vaccines, and medical personnel; therefore, massive policy interventions of the Indian state for building resilience against nuclear disaster are required.

The study inquires India's imperatives for dependence on nuclear energy with probable dangers of a nuclear disaster. It maps domestic legislations, international obligations, preparations, and necessary structures for building resilience against nuclear disaster. It explores various strategies, necessary groundworks, and lessons learned in aftermath of past nuclear disasters, for mitigating disaster risks and building resilience against future nuclear disaster. The methodology used for the study is largely content analysis of literature available in public domain. There are three sections in this study: the **first** section discusses probable causes for rising threats of nuclear disaster; the **second** section highlights various levels of nuclear disaster mitigation planning; and the **last** section presents conclusion by identifying contemporary challenges and emerging debates regarding fresh policy interventions in India for making it a nuclear disaster-resilient society.

Keywords

Nuclear disaster · Nuclear energy · Nuclear war · NDMA · NDRF · Disaster resilience

Introduction

The losses attributed to disasters on a worldwide basis are reflected in the UN report titled "Disasters and Disaster Risk as Development Challenge (UNISDR, WMO, 2012)" that says in the year 2000 onward, more than 1.1 million deaths occurred and 2.7 billion people got affected because of disasters. An amount of \$1.3 trillion was lost during that period. India has a history of having been struck with mega man-made Bhopal gas disaster in 1984 in which around half a million people suffered because of leakage of poisonous chemical fumes/gas from Union Carbide chemical plant. It is disappointing to note that the issue of complete rehabilitation and payment of compensation to all Bhopal gas sufferers is still incomplete even to

today. The final settlement is still languishing between different government agencies and Indian courts in 2022. India's disaster handling vulnerability got exposed recently, when it struggled hard in handling of COVID-19 pandemic disaster. It is because of India's poor records of handling of any disaster in general and nuclear disaster in particular that a serious concern gets raised about its handling capacities of a probable nuclear disaster. This chapter helps us in problem identification, establishment role, policy analysis, and mitigation planning.

Out of several studies on disaster losses in India, the study done by the Integrated Research and Action for Development (IRADE) categorically points out that most of Indian cities lack disaster resilience (https://irade.org/ISET_Report.pdf). The Russian attack on Ukraine in March 2022 and subsequent capture of Zaporizhzhia and Chernobyl nuclear power plants by Russian forces and their constant threats to make use of nuclear weapons against NATO countries to stop them from supporting Ukraine have raised fresh alarms over nuclear safety issues all over the world. The hostile policies of India's two nuclear neighbors Pakistan and China are known for creating additional military security and nuclear safety burdens on India. The precipitation of a crisis on India-China borders in May 2020 at Galwan in Ladakh has triggered a fresh debate on nuclear safety issues in India. It is sheer coincidence that world over, a fresh debate has started demanding use of better approaches and methods for building resilience against disasters in general and nuclear disaster in particular.

In light of India's Chief Economic Adviser V. Anantha Nageswaran's observation, India would become a \$5 trillion economy by 2026–2027 (The Hindu, 24 June 2022); hence, it is important for country's planners to focus on the mainstreaming of nuclear disaster risk reduction plan in their all disaster plans at national, state, district, and local governments level. India's Nuclear Disaster Management Guideline-Nuclear, Radiological and Nuclear Emergencies (NDMG-NRE) (For details of NRE, please visit <https://nidm.gov.in/PDF/pubs/NDMA/6.pdf>) provides a roadmap for handling of nuclear disasters in the country (www.ndmg-nre). It needs to prepare itself so as to avoid colossal economic loss on account of disasters of any nature.

Till now the disaster mitigation plan is confined to government agencies like Nuclear Disaster Management Authority (NDMA), Defence Research and Development Organisation (DRDO), and armed forces of the country. Citizens have remote chances of having any official training and awareness about nature and risks arising out of nuclear or radiological disaster, and there is always a scope for enhancing their participation in nuclear safety debates in the country.

This study highlights India's imperatives for dependence on nuclear energy with probable dangers of a nuclear disaster. It maps domestic legislations, international obligations, preparations, and necessary structures for building resilience against nuclear disaster. It explores various strategies, necessary groundworks, lessons learned in the aftermath of Fukushima disaster, COVID-19 pandemic, and recent Russia-Ukraine war in March 2022 for mitigating disaster risks and building resilience against nuclear disaster. It also highlights upon a policy of safety, preparedness of local communities, training methods, etc., for realizing the goals of transition from

preparedness and risk mitigation to resilience against nuclear disaster. The methodology used is content analysis only. There are three sections in this study: the **first** section discusses probable causes for rising threats of nuclear disaster; the **second** section highlights various levels of nuclear disaster mitigation planning; and the **last** section presents conclusion by identifying contemporary challenges and emerging debates regarding fresh policy interventions in India for making the country a nuclear disaster-resilient society. The chapter doesn't discuss all types of disaster under CBRN category and covers nuclear issue only.

Nuclear Disaster Risks: Causes and Concerns

Accidents at Nuclear Power Plants

Since the signing of India-US nuclear agreement in 2008, India in light of its energy security goals has embarked upon a huge nuclear power generation program, besides generation through coal, gas, hydro, wind, or other renewable sources of energy, which has increased the probability of nuclear disaster becoming a reality on patterns of Fukushima nuclear disaster of 2011. India is of the view that nuclear energy does not affect climate change, because it is a cheap source of clean energy and its costs can be reduced to the level of energy through coal over a period of time. By 2032, India is likely to generate 60,000 MWs of electricity through nuclear route. (NPCIL, 2008). As of year 2022, it has nuclear power plants at seven places with 22 nuclear reactors that are functional, and another 60 new nuclear reactors are likely to be set up by the year 2032 because of India's nuclear agreements with countries like the USA, Canada, the UK, France, Japan, South Korea, and Russia. The probable risk of nuclear accidents at any of the existing 22 Indian nuclear reactors or additional 60 reactors likely to be set up can't be ruled out.

Post 9/11 period, concerns regarding chemical, biological, radiological, and nuclear (CBRN) disasters have increased substantially. The likely use of weapons of mass destructions like biological, chemical, or radiological (dirty bombs) by terrorist organizations on a worldwide basis has risen considerably. Use of nerve gas or anthrax by non-state actors has happened in different parts of the world. Several laboratories are functional where researches on pathogens have been taking place and issues of safety and security concerns have always been there. The case of alleged leakage of coronavirus (bioweapon) from Wuhan lab in early 2020 is still a mystery. However, the present chapter primarily discusses about nuclear issue only. As discussed in preceding paragraphs, India's nuclear power generation has witnessed considerable pace in construction and commissioning of around 60 nuclear reactors by 2032 of an average 1000 megawatts each, thereby leading to several fold increase in its civilian and military nuclear programs.

India's nuclear disaster plan under National Disaster Management Act (NDMA), 2005, has detailed provisions regarding disaster handling legislative framework consistent with domestic and international norms and practices, highlighting various structures needed for undertaking disaster-related rehabilitation and reconstruction

measures, etc. As India's nuclear program is regulated by the Department of Atomic Energy (DAE) under Govt. of India, the DAE has the primary responsibility of managing the accidents at nuclear power plants till date. However, in case of India's National Disaster Management Authority (NDMA), 2005, one is still uncertain whether the NDMA has developed postdisaster response strategy capabilities only or it has also succeeded in putting in place preventive strategies effectively. However, one may experience a complete absence of any CBRN intelligence mechanism functioning on a continuous basis on a countrywide basis. Experts have divided opinions over nuclear energy being the example of clean energy and are of the view that despite public concerns over least possibility of onsite accidents, waste disposal, and uncertainties over economics, fuel switching over to nuclear power remains the largest, proven, carbon-free generation option (Petras & Morley, 1988, pp. 151–153). All such disaster risks remain valid in case of densely populated countries of South Asia including India, Pakistan, and China. The section below discusses various causes that might lead to nuclear disaster.

Use of Nuclear Weapons in a War and Nuclear Proliferation Concerns in South Asia

The study is of view that the greater the dependence of India on nuclear energy, the greater would be the risk of accidental nuclear disaster at nuclear power plants. Even risk of climate change-induced tsunamis leading to disaster at nuclear plants based in coastal areas can't be ruled out. The threat of a probable nuclear disaster in South Asia remains on a higher side because of the presence of three nuclear powers, India-China-Pakistan shares geographical boundaries with each other, that too with a historical burden of having fought several wars with each other. Given that vast populations live close to India-Pakistan and India-China borders, chances of conventional wars turning into a nuclear war can't be ruled out. Any nuclear war would lead to official use of nuclear bomb against each other, or similar use of dirty bombs by non-state actors remains very high. Any exchange of nuclear weapons during a war in South Asian subcontinent would be catastrophic, and it would result in disaster of unmanageable scale.

Another issue that deserves mentioning here is regarding the border skirmishes between India and China in Galwan Valley in East-Ladakh near Line of Actual Control (LAC) in June 2020 that has aggravated probable nuclear crisis debate in South Asia. The India-China borders have emerged as a new battle ground for stationing of strategic arms close to their borders. The beginning of a war between Russia and Ukraine in February–March 2022 has further aggravated the nuclear crisis situation at international level.

The annual reports of different years of nuclear watchdogs such as SIPRI (<https://www.sipri.org/>) or IAEA (<https://www.iaea.org/>) suggest that South Asia has always been prone to acts of nuclear proliferation. Such subversive activities increase the threat of use of nuclear material by non-state actors against army or security personnel for revenge purpose. This type of threat looms large against India, that

is, the threat of use of crude nuclear devices against members of armed forces deployed in UT of Jammu and Kashmir during combing or counterinsurgency operations. The presence of extra powers like the USA and Russia in the region further aggravates the situation. The security situation stands deteriorated after the exit of US forces from Afghanistan in August 2021, as later has a poor record of having failed in stopping the use of their soil by internationally banned terrorist organizations.

It is pertinent to mention that the UN got a Treaty on the Prohibition of Nuclear Weapons (<https://www.un.org/nuclear>tpnw>) (TPNW) readied in 2017, and it came into force on January 20, 2021, so as to completely ban any development of weapon or to test any weapon, or to acquire, possess, or stockpile, use, or threaten to use nuclear weapons on part of signatory countries. However, there were no major outcomes during the tenth NPT Review Conference (<https://www.media.un.org/en/asset>) recently held at the United Nations, New York, from August 1 to 26, 2022. Countries continue to have differences over achieving goals of complete global nuclear disarmament. India also continues to pursue a policy matrix of reliance on nuclear technology for its security and development discourse. On the whole, it can be argued that in case of an outbreak of a nuclear war, management of nuclear disaster would be a highly difficult proposition in case of affected Indian cities. The author has written in detail elsewhere about possible causes of eruption/occurrence of a nuclear disaster in India (Kumar, 2019).

Nuclear Disaster Risk Reduction and Resilience Building Measures

India's Nuclear Disaster Management Planning

The International Atomic Energy Agency (IAEA) emphasizes on nuclear safety as well as nuclear security. The idea is to help countries in prevention of accidents at nuclear sites, thereby saving the lives of workers working there. However, nuclear security aspect helps countries in building capacities to prevent stealing of technologies illegally. Any nuclear disaster plan involves three crucial stages: *prevention, monitoring, and action*. As on date, science and technology enables managers at nuclear power plants to make use of dependable, highly precise, and accurate security and safety gadgets to prevent or narrow down the impacts of a nuclear disaster. In the Indian nuclear energy area, Integrated Command Control and Response (ICCR) exercise centers around testing order and control capabilities, reaction systems, and communication infrastructure. India's Department of Atomic Energy and the Atomic Energy Regulatory Board (AERB)/Bhabha Atomic Research Centre have 24 × 7 crisis control rooms for monitoring of radioactivity round the clock and have necessary mandate to tackle accidents occurring in and around nuclear establishments. Since 2005, India's National Disaster Management Authority (NDMA) has its own legislative framework, discussed in subsequent paragraphs, that organizes and carries out its tasks with necessary agencies at national as well as regional levels in case if any nuclear disaster or accident were to occur. In recent

years, Union Government has been going ahead with construction plans to set up around nine nuclear power plants or set up additional nuclear reactors at existing nuclear power plant sites by 2024, at places such as in Gorakhpur (Haryana), Kovada (Andhra Pradesh), Chutka (Madhya Pradesh), Kaiga (Karnataka), Kalpakkam and Kudankulam (Tamil Nadu), Haripur (West Bengal), and Chhaya-Mithi (Gujarat). There has been a rise of around 150% nuclear power plants (NPPs) along the Indian coastline, thereby increasing the threat of nuclear disaster. The reasons of nuclear power plants coming up in coastal areas and related challenges are analyzed in the last section of the study.

Setting Up of a National Disaster Management Authority (NDMA) in 2005 and National Disaster Management Plan (NDMP) in 2016: A Paradigm Shift in Disaster Management

With the objective of moving higher from relief-centric approach to risk mitigation approach, a statutory body known as the “National Disaster Management Authority of India” (NDMA) (<https://ndma.gov.in/about-us/introduction>) came into existence in 2005. As per statutory requirements, corresponding bodies like State Disaster Management Authority (SDMA) and District Disaster Management Authority (DDMA) were also set up in most of the Indian states and union territories (UTs). India had achieved immense success in direction of covering the entire country under the NDMA Act of 2005 for effective handling of COVID-19 pandemic which led to completing the process of setting up of State Disaster Management Departments/State Disaster Management Authorities (SDMAs) in all Indian states and union territories (UTs) (<https://ndma.gov.in/Governance/SDMA>) (www.ndma.gov.in).

Taking forward the disaster preparedness discourse, the Indian Government also prepared a National Disaster Management Plan (NDMP) in 2016 (www.ndmp.gov.in). This NDMP (2016) (For details of NDMP (2016), please visit <https://www.mha.gov.in/sites/default/files/National%20Disaster%20Management%20Plan%20May%202016.pdf>) was prepared in backdrop of three international developments: Sendai Framework for Disaster Risk Reduction (March 2015) (<https://unece.org/sendaiframework#:~:text=The%20Sendai%20Framework%20on%20Disaster,of%20persons%2C%20businesses%2C%20communities%20and>), Sustainable Development Goals (SDGs) (December 2015–2030) (<https://www.un.org/sustainabledevelopment/sustainable-development-goals/>), and Paris Agreement on Climate Change (December 2015) (<https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>). This NDMP (2016) enabled India to incorporate global experiences into National Disaster Management Plans for better handling of disasters in the future. The COVID-19 pandemic in 2020–2021 provided the Indian Government an opportunity for operationalizing the NDMA Act of 2005 throughout the country after imposition of lockdown for controlling the menace COVID-19 pandemic in March 2020. In one go, the entire country was brought under the ambit of Union Government administered NDMA (2005). Never ever on any early occasion, NDMA

(2005) was implemented throughout length and breadth of the country. One may debate whether the country and its people were ever prepared to undergo the harshest imposition of lockdown provisions leading to all kinds of hardships including crippling of the entire economy and prolonged lockdown leading to serious breakdown in production and approximately 40 million job losses (ILO Report, 2020). The author has restrictions not to discuss other details here.

Management of Nuclear Disasters in India and Building Resilience Against Nuclear Disaster

India's Nuclear Disaster Management Guideline-Nuclear, Radiological and Nuclear Emergencies (NDMG-NRE) (For details of NRE, please visit <https://nidm.gov.in/PDF/pubs/NDMA/6.pdf>.) provides a detailed roadmap for handling of nuclear disasters in the country (www.ndmg-nre). The NDMG-NRE document has ten chapters, with a lengthy preface, and 134 pages covering all technical and operational aspects of nuclear disaster. It defines "nuclear disaster" as that dimension of emergency situation leading to mass casualties and destruction of large areas and property; unlike a nuclear emergency, the impact of a nuclear disaster is beyond the coping capability of local authorities, and such a scenario calls for handling at the national level, with assistance from international agencies, if required (NDMG-NRE, Feb 2009, p. xxiv).

However, in light of ongoing recent Russia-Ukraine war since February–March 2022, India still needs to work seriously on many lines and adopt new measures for mitigating any type of disaster risk in the country.

The **NDMG-NRE** (ibid) document discusses actions to be taken by the administration in the aftermath of commencement of a nuclear disaster. It highlights elements of rescue, medical care, transportation, evacuation, providing food and shelter, etc. It elaborates on various decision-making structures and SOPs. Soon after the commencement of any nuclear disaster, the disaster management authority shall pass on to the National Crisis Management Committee (NCMC) assisted by the National Executive Committee (NEC), Department of Atomic Energy (DAE), Ministry of Home Affairs (MHA), and National Technical Research Organisation (NTRO) for handling of nuclear disaster emergencies. As nuclear disaster involves spread of radioactivity, it demands presence of specially trained National Disaster Response Force (NDRF), fire service personnel, civil defense, medical supplies, transport, civil supplies, civil engineering departments, etc., for handling of radiation emergency fully equipped with specialized dresses and equipment (NDMG-NRE, 2009, p. xxvii).

It seems that the NDMG-NRE document overemphasizes on involvement of defense department officials in case of nuclear emergencies under the impression that nuclear issues involve maintaining of complete secrecy besides the impression that defense establishments are likely to be targeted during a war. However, if disaster were to occur on any nuclear plant, there is a possibility that civil administration will lack coordination with defense establishment, thereby leading to disaster mishandling. The experience so far suggests minimum connects existing

between civil administration and ordinary citizens of the country as far as awareness about handling of nuclear disaster is concerned. A critical look at situation prevailing during COVID-19 pandemic lockdown imposition in March 2020 wasn't very satisfactory. A country of India's territory size and population still needs to focus a lot on strategies for having better coordination between federal-, local-, and state-level government agencies. They also need to work on developing better use of communication technologies during disaster situations. It was observed during COVID-19 pandemic that Prime Minister Narendra Modi often addressed the Chief Ministers of states and UTs through online Google Meet only. One needs to remember that nuclear disaster situation is expected to be very different from pandemic lockdown situation because of the ill effects of radioactivity on human body and evacuation plans. The situation would be completely unknown in case of dropping of a nuclear bomb.

Role of Atomic Energy Regulatory Board (AERB), Govt. of India

The role of AERB is important for ensuring stringent physical safety of nuclear installations and areas of waste disposal. According to the AERB safety guidelines of December 2009, the responsibility of safety and security of plant site lies with the operator of the plant itself, that is, the government itself, as nuclear power plants in India are owned only by the Government of India. However, the Central Industrial Security Force (CISF) is given the responsibility to take care of security of entire installation and also remain ready to handle disaster scenario in case of emergencies.

Disaster Management Reforms Post-Fukushima and COVID-19 Pandemic

As scholars debated the need for extra attention on nuclear safety in India, the Department of Atomic Energy got safety audits of all nuclear plants carried out in the country. It reviewed functioning of public health systems, availability of medicines, and training of extra personnel, focus on worker's skill development process, and paid extra attention to weather forecasts and earthquake issues. Despite all extra efforts and lessons learned post-Fukushima and during COVID-19 pandemic, it could be said that the operationalization of **NDMG-NRE (2009)** guidelines and **NDMP (2016)** would remain on paper only if proper evacuation plans in a densely populated country like India are not worked out and practiced in advance. In the aftermath of COVID-19 pandemic, there is a realization that spreading of disaster risk reduction and mitigation awareness and community participation about of handling of any disasters has to be undertaken on a priority basis. The manner in which people had been visiting different websites and e-resources for updating themselves about COVID-19 protocols and safety issues, similar awareness, and activism is needed for training and skill enhancement for nuclear disaster handling too. Hence, more transparency and sharing of information and greater connect

between officials of nuclear establishment and ordinary citizens are the need of hour. It is suggested that nuclear energy establishments in India should give more way to exchange of dialogues among different stakeholders comprising resident welfare associations, youth of the country, party leaders, medical scientists, sociologists, environmentalists, economists, and health and nuclear scientists so that nuclear safety issues are discussed and debated on a more regular basis.

Role of DRDO in Handling of Nuclear Disaster

India has another federal government agency, Defence Research and Development Organisation (DRDO), that is engaged continuously in providing training to government personnel and dissemination of necessary information to Union Government officials besides state government officials and their police and civil defense department personnel, who are expected to be involved as frontline warriors in any post-nuclear disaster operations. As on date, the role of DRDO has been commendable in training of medical personnel and several contingents of National Disaster Response Force (NDRF) for handling of radioactivity scenario and use of specialized protective equipment and gears for handling of contaminated goods and stopping the spread of contamination and taking care of evacuees in any of the evacuation plans. It must be said that DRDO till date has saved a huge amount of foreign exchange for the country by manufacturing several nuclear disaster equipment and devices indigenously. The role of DRDO was highly appreciated when India emerged as one of the leading suppliers of face masks and other PPT kits at global level during COVID-19 pandemic. However, functioning of DRDO gets criticized as it is part of a defense security establishment only and remains covered by secrecy and confidentiality clauses of the country, thereby marring the possibility of greater coordination with civil administration of the country.

National Disaster Management Authority (NDMA) and International Obligations

For avoiding nuclear disasters and implementing safety regulations, India is party to the Convention on Nuclear Safety (CNS) (1994) which has provisions to govern safety of nuclear installations (Arun Shull, 2008, pp. 5–6). India also signed IAEA supervised ISSA and brought all civilian nuclear reactors under the IAEA safeguards. In January 2003, the Union Government set up the Nuclear Command Authority (NCA) to manage its nuclear and missile arsenals and prevent its misuse. The complex system of control may be seen as a barrier against accidental or unauthorized use (www.nca.gov.in and Hans Born). In order to prevent proliferation of nuclear technology, the Government of India also got Nuclear Non-Proliferation Law enacted in 2007.

In light of increasing acts of terrorism and proliferation concerns in recent years, almost all cargo entry points in India – be it air, water, or land – are installed with

radiation detection equipment. In order to augment the security of strategic installations, radiological mock drill is being conducted with greater frequency (NDRF Training data, 2017).

As on date, a federal agency, i.e., NDMA, has been conducting series of training program on CBRN emergency handling to security personnel deployed on country's airports and ports, besides conduct of mock drills at important international airports of the country (Public Information Bureau, 2018). Several other exercises were conducted involving state government agencies like SDMA and DDMA. Despite such training programs which are small in number and largely confined to bigger metro cities of the country, it can be said that gaps continue to remain on ground level, and a good number of additional steps need to be taken for sensitization and providing training to NDRF and SDRF officials to deal with acts of nuclear terrorism effectively. The COVID-19 pandemic proved that if the government of today expresses its political will, then achieving difficult goals become easier as it enabled disaster agencies for putting into place standard operating procedures (SOPs) so as to have better coordination between federal and state government officials during lockdown period.

National Disaster Response Force (NDRF) (<http://www.ndrf.gov.in/sites/default/files/13683%20-encl.pdf>) for Handling of Nuclear Disasters

The NDMA (2005) Act lays down constitution of National Disaster Response Force (NDRF) for the purpose of specialized response to natural and man-made disasters. In 2006, NDRF was constituted with eight battalions for which men were drawn from para-military forces. Now NDRF has a total of 15 battalions and 22 regional response centers (RRCs) (http://www.ndrf.gov.in/sites/default/files/NDRF%20Brochure_0.pdf). Every battalion has 18 teams with 45 personnel comprised of medical personnel besides response forces. It is important to mention here that in light of increasing debates regarding CBRN issues in the country, NDRF battalion is trained in handling of CBRN disasters. However, a serious question can be raised here, i.e., can a country with a population of approximately 1.4 billion people be ensured complete safety with the presence of mere 12 battalions of NDRF (each having 1149 personnel) on a countrywide basis? It is in direction of increasing pressure of UN bodies and international obligations arising out of Sustainable Development Goals (SDGs) (2030) that the Indian Government has forced its 28 state governments to create State Disaster Response Force (SDRF) on patterns of NDRF out of their existing police forces for meeting disaster challenges and achieving the goals of building resilience for disasters in India. The final section of the chapter discusses some policy measures undertaken in recent timings toward the idea of implementing goals of building disaster-resilient cities in the country.

Contemporary Challenges before Indian Administration and Emerging Debates in Disaster Mitigation Plans

Inadequate Medical Personnel for Treatment of Radioactivity-Exposed Patients during Disaster

It is imperative for civilian administration at country level in general and in all district headquarters, including Punjab state which is a border state and shares boundary with nuclear Pakistan, for ensuring a large pool of specialized medical personnel trained for handling of post-nuclear disaster situations. It is unfortunate to mention here that preparations for handling of any nuclear disaster at district administration level in the state of Punjab is negligible as the author has done empirical studies for ascertaining that there is a complete absence of participation of local residents of the city in any disaster-related preparedness. It is believed that there is a significant presence of federal members of armed forces at Amritsar city which is close to nuclear Pakistan, and these defense personnel will be sufficient to attend disaster emergencies as they are expected to possess necessary skills for handling of nuclear disaster. It is also experienced that rarely any public or private hospitals have specialist doctors for treating people exposed to severe radioactivity. The increased role of DRDO is needed for imparting of training to personnel belonging to state government cadre as it is known to train mainly members of armed forces only. It is only in recent period that one can come across certain cities having presence of super-speciality hospitals which have started employing medical persons trained in treating radiological-affected patients within their premises. Barring few cases, the scenario remains very scary as it has allegedly been found that most of the medical colleges of the country, including Punjab state, do not train their MBBS students for treatment of radioactivity-exposed patients. It is in recent months that federal government-run hospitals have been set up in Punjab at Bhatinda and Mohali for treatment of cancer patients using nuclear technology at their premises, thereby increasing the availability of medical personnel trained in treating radioactive-exposed persons. There is a dire need for adequate specialized radiologist doctors employed by state governments who can treat patients exposed to radioactivity. They have to have specialized kind of training for taking protective and defensive measures in case of nuclear disaster situation. The COVID-19 pandemic did expose severe weaknesses existing in India's health infrastructure.

Challenges of Climate Change in Coastal Areas and Rise in Protests and Resistance Movements

As discussed earlier, India in recent years has seen 150% jump in construction of nuclear power plants in coastal areas of the country, thereby exposing coastal belt of the country to future nuclear disaster, besides constant threats of tsunamis and

dangerous storms so far. The reason for sudden jump in their number in brief is that nuclear power plants (NPPs) use a lot of water for heating purpose and steam generation so as to generate enough thrust through steam turbines and then producing of electricity through generators and their onward transmissions through different grids. It is easy to cool hot water after tapping of steam and release it safely into mainstream reservoir or recycle it again if needed. It is also considered that coastal areas remain prone to tides and storms; hence, they are thinly habituated and largely used for fishing and other activities only, thereby reducing the threat of nuclear accidents and its mass effect on local population. Thus, going by the safety consideration, coastal areas suit the planners for setting up of nuclear power plants.

India recently joined UNFCCC cum treaty concluded during Paris Summit on October 2, 2016. India says that the decision to raise the content of nuclear power to overall electric power generation in the country is consistent with its international climate change obligations. Studies point out that global warming and climate change have caused tsunamis and Fukushima tsunami in 2011 is an example of an earthquake-induced tsunami leading to catastrophic nuclear disaster. On the contrary, any serious nuclear accident or exchange of nuclear warheads during war will raise the overall temperature of atmosphere, thereby also contributing to global warming and climate change. It is because of this vicious relationship that agricultural sustainability in India during nuclear disaster assumes significance.

However, post-Fukushima disaster, Paris Climate Change Summits, and SDGs Conferences, a sharp rise in protests and agitations against nuclear plants on a worldwide basis is getting witnessed which is led by different civil society organizations, environmentalists, and conservationists' groups and other scientific associations. More and more concerns regarding marine safety including flora-fauna safety in coastal areas are being expressed, as stakeholders are of the view that presence of nuclear plants nearby coasts leads to release of contaminated material into seawater, thereby leading to contamination of seawater and underground land area.

All such civil society-led resistance movements are preventing policy makers to go ahead with new project constructions on either existing sites or proposed new sites. It has changed the discourse regarding the safety and security of people and other species living close to existing or proposed nuclear project sites world over. In recent years, India too has seen an increase in such protests and prolonged agitations often supported by opposition political parties. Protests at Kudankulam nuclear power plant in Tamil Nadu or Haripur in West Bengal are good examples. There is spurt in resistance to land acquisition exercise for nuclear power plants on the part of farm owners because of disaster concerns. People living in coastal areas are joined by fishermen and other stakeholders and have been resorting to protests and other techniques for stalling the projects on grounds of disaster risks and safety concerns. Hence, it is interesting to watch that cases of protests on a worldwide basis have increased with a serious economic consequence for trade and commerce of global nuclear reactor manufacturing companies.

Emerging Debates on Use of Nuclear Energy

The author is restricted from discussing another aspect of nuclear plant safety discourse, as policy planners influenced by climate change issues have developed attraction for latest technological revolution in power sector, specially the generation of electricity through renewable sources or CNG/LNG-based thermal power plants which is much cheaper than the electricity produced through nuclear mode. If more countries including India were to switch over to CNG/LNG-based thermal power plants for the electricity generation, then nuclear disaster threats would be reduced considerably. Among EU countries, Germany has decided to shut down their nuclear power plants because of climate change and nuclear disaster concerns. In many other EU countries, probable shutting down of nuclear plants is being debated seriously. Even in case of India, such pressures would be generated on the part of policy makers in times to come. Fukushima nuclear disaster proved the assumption completely wrong that onsite accidents are least possible because of advanced warning systems that would shut the nuclear power plant in time. The nature of study does not permit the author to discuss the impact of environmental and disaster concerns on the viability of global nuclear giants such as General Electric, Hitachi, Westinghouse, Toshiba, or Areva on their future business and shutdown threats.

Emerging Trends in Building Disaster-Resilient Indian Cities

All cities need to introduce innovative state-of-the-art technologies for achieving goals of disaster-resilient cities. All future and existing cities need to be built by applying innovative IT that combines safety with comfort. The role of private sectors needs to be increased for developing innovative ideas, solutions, and technologies along with PSUs. There remains a lot of scope for providing training for disaster mitigation and recovery techniques. Federal- and state-level authorities need to ensure ongoing disaster prevention education and training with holding of frequent mock drills with stakeholders.

It can be said that other than handling of flood disasters, cities in India's Punjab still lack infrastructure for making them nuclear disaster-resilient cities as they are located near international borders. There is not much of preparation till date on account of handling of nuclear disasters except certain lockdown SOPs during COVID-19 pandemic period. Because of question of preparations on account of other nuclear disasters, a comprehensive action plan is needed in the coming years. There is a need to make use of AI for developing joint human/robot decision-making. It can move in direction of involving human controllers with UAV in unpredictable and hostile environments. There is an urgent need to impart training in cyber security-related issues.

It is in backdrop of such genuine threats of nuclear disaster that civilian administrations need to take appropriate measures and expedite training of its police forces and medical and other civil defense personnel for meeting challenges of nuclear disaster. Any plan of building Indian cities in recent years must factor in "Nuclear

Disaster Risk Reduction and Disaster Mitigation” plans. The idea of implementing “disaster-resilient cities” shall remain incomplete unless the administration is geared fully and prepared for taking adequate measures in post-COVID-19 period for preventing large-scale causalities in case of a nuclear war with enemy countries or in the event of nuclear strikes occurring close to India-Pakistan border. The need for capacity building for mitigating disaster risk reduction in post-COVID-19 pandemic has increased substantially.

Conclusion

Indian policy makers need to bear that despite technological advancements ensuring zero accidents at nuclear power plants, areas falling under mega nuclear power projects continue to remain prone for being struck with nuclear disasters. The pace at which new nuclear power plants are being set up and becoming operational in India, pros and cons of generating nuclear power, and the entire issue of linkages between development and environmental degradation on account of probable nuclear disaster severely impacting upon agriculture and fishing communities residing in coastal regions has to be borne into minds by policy makers in India. Several studies point out that operating a nuclear power reactor is never entirely free of risk and mere assessments do not eliminate all risk no matter how well the hazards have been assessed, and the case of Fukushima disaster (2011) was an eye opener which confirmed the premise that even advanced countries like Japan could not prevent such disasters from occurring. One may conclude that a huge gap exists between developed and developing world in general and nuclear disaster preparedness in India in particular. The attack and capture of Zaporizhzhia and Chernobyl nuclear power plants in Ukraine by Russian forces, in an ongoing war with Russia since March 2022, have raised alarms over nuclear safety issues world over. India’s record of handling of a biological disaster during COVID-19 pandemic was hardly satisfactory, and it got criticized vehemently at international level over exposure of huge weaknesses in terms of safety, resources, health infrastructure, specialized medicines, vaccines, and medical personnel that killed around half a million Indians. On the whole, going by the past experiences of dealing with natural disasters by NDMA and SDMAs, it needs to bring their functioning more in tune with present realities, especially for dealing with nuclear disasters which until present mostly remains confined to metro cities of the country only. Indian federal and state authorities must fine-tune their energy policies by giving priority to switching over to tapping of vast potentials of solar and wind energy and other renewables on a much larger scale. The idea of reducing its dependence on nuclear energy must be ingrained in all its future energy policy making. On the patterns of EU countries, India also needs to train its population living in cities about NDMG-NRE guidelines which outlines actions that will reduce or eliminate the transfer of radioactive fallout to the food chain following a nuclear emergency. Involvement of youth in disaster-related task need to be taken up on a bigger scale in India.

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National Disaster Management Authority: Close Encounters with COVID-19

20

Subhradipta Sarkar

Contents

Introduction	274
Legal and Institutional Development of Disaster Management	275
Brief Introduction to the NDMA, NEC, and Biological Disasters Guidelines	276
Innocuous Presence of the NDMA During the Pandemic	276
Exploring NDMA's Existential Significance	279
Comparability to FEMA in the USA	282
Conclusion – The Way Forward	285
References	285

Abstract

Statistics indicate that India is one of the most disaster-prone countries globally. Despite such vulnerability, disaster management had barely been a mainstream political concern in the country until the COVID-19 struck in 2020. This is rather amusing considering that famine codes were framed and commissions were established during the British era. Since then, a long politico-legal journey culminated in establishing the National Disaster Management Authority (NDMA) in 2005. It was a revolutionary step in the country's institutional arrangement concerning disaster management. Nevertheless, it has failed to have an impactful existence even after one and a half decades. From poor planning to poor execution of projects, rendering committees dysfunctional to formulating disaster management guidelines without any practical implication, the story of the NDMA is far from reassuring. So much so that it has remained almost imperceptible even in the context of the ongoing pandemic. It has confined itself to holding meetings and issuing advisories and circulars and remained out of public view. Instead, the MHA, MoHFW, Prime Minister's Office, etc., have come to the forefront. The Supreme Court too became impatient and pulled up the

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authority for its failure in performing its statutory duty. The author briefly introduces the NDMA and outlines its limited role in this pandemic. Its analysis refers to the Comptroller and Auditor General of India and Government Task Force reports on the NDMA. Besides, it draws an analogy with the Federal Emergency Management Agency in the USA. It demonstrates how political interference and inept leadership have rendered it ineffective and thus have deleterious consequences on the country's disaster management. Finally, the author raises some fundamental questions regarding the structure and working of the NDMA and, eventually, the need for this institution.

Keywords

DM Act · Politics · Leadership · FEMA · Supreme Court

Introduction

We are still in the midst of one of the deadliest pandemics that have struck humanity. It has left India in a precarious situation. The World Health Organization (WHO) data report that India ranked second in terms of the affected population and third in terms of mortality till the end of January 2022 (WHO, 2022). However, India's tryst with disasters is not something unusual as it has been an extremely disaster-prone country. The Emergency Events Database (EM-DAT), developed by the Centre for Research on the Epidemiology of Disasters, Belgium (Université Catholique de Louvain, Brussels, Belgium, 2022), shows that India has consistently remained in the top three positions in the world in terms of the number of disasters, mortality, and damage caused. In the recent decades, between 2000 and 2019, India reported 321 disasters (Centre for Research on Epidemiology of Disasters (CRED) & U.N. International Strategy for Disaster Reduction (UNISDR), 2020, p. 9). Furthermore, even in 2020, a year dominated by COVID-19, besides the floods resulting in 1922 deaths, Cyclone Amphan accounted for the largest affected population (18 million) and became the second costliest disaster (US \$13 billion) in the world that year (CRED & UNISDR, 2021, pp. 7–9). Despite such vulnerability, it is unfortunate that the disaster management in this country did not become of paramount importance to the government until the COVID-19 occurred.

The central and state governments, nongovernmental organizations, and spirited individuals have played their roles in the fight against COVID-19. Such efforts have been a matter of public scrutiny, debate, and discussion for 2 years now. Nevertheless, the National Disaster Management Authority (NDMA), which should have been at the forefront of this combat, has almost remained conspicuous by its absence in the public discourse. Undoubtedly, the establishment of the NDMA was an essential landmark in the landscape of disaster management in this country. Nonetheless, the author endeavors to understand the significance of its existence for more than a decade and a half. He briefly discusses the legal and institutional development regarding disaster management in this country. Besides introducing NDMA, he

critically analyses its role before and during the pandemic. He draws references from the Federal Emergency Management Agency, the principal emergency management (or disaster management) agency in the USA, its leadership, and its contribution in combating disaster situations. Finally, the author recommends certain changes in its structure and governance to create a more responsible and accountable NDMA.

Legal and Institutional Development of Disaster Management

In India, modern institutional structures dealing with disasters began during the colonial rule in the late nineteenth century. Widespread famines and locust invasions compelled the British Government to set up the Department of Revenue and Agriculture and Commerce in 1871, followed by few famine commissions. The relief codes of the same era were in vogue even decades after independence (Kapur, 2005, pp. 4551–52). The much-discussed law in the context of COVID-19, Epidemic Diseases Act, 1897, was also a similar initiative to fight the bubonic plague in the Bombay presidency (Sherwani, 2020).

A Task Force, constituted by the Ministry of Home Affairs (MHA), Government of India (GoI), to review the Disaster Management Act, 2005 (hereinafter “DM Act”), noted that although administrative procedures existed, a law providing a statutory framework for disaster management operations, supporting organizational structures, and assigning vital legal duties, all of which are necessary for a successful execution, remained elusive (MHAa, 2013, pp. 11–13). Subsequent to the 1999 Odisha Super Cyclone, the GoI constituted a High-Powered Committee (HPC) to provide recommendations for institutional improvements and create disaster management strategies at all levels of governance. The HPC, in its report, suggested a National Calamity Management Act and provided a model for the State Disaster Management Act (Ministry of Agriculture (MoA), GoI, 2001).

The 2001 Gujarat earthquake up the ante for a law on disaster management. Some states like Gujarat (in the post-Gujarat earthquake), Bihar, Uttar Pradesh, and Uttarakhand (now Uttarakhand) enacted laws on disaster management between 2001 and 2005. Meanwhile, there was a paradigm change globally in disaster management: from relief and rehabilitation to prevention and mitigation. The first two World Conferences on Disaster Reduction in Yokohama (1994) and Kobe (2005), Japan, urged the international community toward the same. The 2004 Tsunami provided the final impetus for disaster management legislation (MHAa, 2013, pp. 8–9).

The DM Act virtually revolutionized India’s entire approach toward disaster management. The law unified the response mechanism and envisaged a new chain of authorities from the central to the local levels. The NDMA, along with their state and district counterparts, are the creations of this statute (Second Administrative Reforms Commission (ARC), GoI, 2006, pp. 32–33). Interestingly, the provisions of the DM Act were invoked for the first time to deal with the present pandemic – 15 years after its enactment (Chauhan, 2020).

Brief Introduction to the NDMA, NEC, and Biological Disasters Guidelines

The DM Act constitutes the NDMA as the principal authority at the national level. It functions under the chairmanship of the Prime Minister, *ex-officio*, with a maximum of nine other members “nominated” by the Prime Minister. In addition, the Prime Minister may appoint one of the members as Vice-Chairperson of the NDMA (DM Act, Sec. 3). The NDMA will establish policies, guidelines, and strategies, including the national disaster management plan, and coordinate and monitor their implementation to ensure a prompt and effective disaster response. It will also suggest allocating mitigation funds, taking measures to avoid disaster avoidance, disaster mitigation and readiness, and capacity building to cope with “threatening disaster situations” (*ibid.*, Sec. 6). The NDMA shall be assisted by a National Executive Committee (NEC) consisting of secretaries of 14 central ministries and the Chief of Integrated Defence Staff to the Chairman Chiefs of Staff Committee, *ex officio* (*ibid.*, Sec. 8). The NEC is responsible for supporting NDMA in carrying out its responsibilities and ensuring compliance with the central government’s disaster management directives across the country and laying down guidelines and giving directions to central and state government departments/ministries, as well as the State Disaster Management Authorities (SDMAs) on what steps should be followed in the event of a disaster or danger of the same (*ibid.*, Sec. 10).

Under Section 6 of the DM Act, the NDMA has prepared 30 different guidelines relating to various disasters, including one on biological disasters (NDMA, 2008), which is relevant to the present situation. Indeed, the guidelines highlight the danger of biological disasters, including epidemics and pandemics (*ibid.*, pp. 7–8). They also elaborate the legal and institutional frameworks in dealing with such disasters, especially designating the Ministry of Health and Family Welfare (MoHFW), GoI, as the nodal ministry for handling epidemics (*ibid.*, pp. 12–23). Furthermore, they unequivocally assert that isolation and quarantine can limit or prevent the spread of infectious illnesses (*ibid.*, p. 43). They identify poor public health infrastructure, lack of trained primary health workers at the grassroots level, etc., as impediments in the fight against epidemics (*ibid.*, pp. 29–34). Finally, they propose an implementation plan with different timelines for short (up to 3 years), medium (up to years), and long (up to years) terms (*ibid.*, pp. 113–16).

Innocuous Presence of the NDMA During the Pandemic

On March 14, 2020, the MHA designated the pandemic a “notified disaster” under the DM Act, and consequently, the NDMA was appointed in charge of dealing with the COVID-19 epidemic (NDTV, 2020). Further, on March 24, 2020, in the exercise of its power conferred under Section 6(2)(i) of the DM Act, the NDMA (read as ‘the Prime Minister as its Chairperson’) directed the GoI, state governments, and SDMAs to take strict measures for “social distancing” to stem the spread of the disease and thus to announce “lockdown” of the nation. It also stated that necessary guidelines in

this regard should be issued immediately by the NEC under Section 10(2)(l) of the Act (NDMAa, 2020). Accordingly, the Home Secretary, also being the Chairperson of the NEC, issued orders for the lockdown of the country with necessary guidelines and penal provisions *inter alia* for obstructing or disobeying orders of the public servants, raising false alarm, etc., under the DM Act (Secs. 51–60) and Section 188 of the Indian Penal Code, 1860 (MHA, 2020). They are being modified from time to time as per the requirement (MHA, n.d.).

Curiously, that is all the NDMA has done from then onwards. Without trying anything innovative, it routinely confined itself to holding meetings and issuing some advisories and circulars (NDMAa, n.d.). The advisories included various action points taken in consultation with the Cabinet Secretary and MoHFW, GoI, for the states and union territories. Interestingly, the challenges that subsequently gripped the country, e.g., social distancing, identification of quarantine facilities, building capacity for the frontline personnel, management of the spread of fake news, temporary closure of schools and workplaces, etc., were already mentioned in the February 4, 2020, advisory (NDMAb, 2020). Hence, it is surprising why it took such a long time for the government to identify them and prepare for the emergency.

In the context of COVID-19, the DM Act has become the fulcrum of all actions supported by the Epidemic Diseases Act, 1897 (Hemalatha, 2021). Therefore, the role of the NDMA becomes vital in this context and, as a nodal body, has unparalleled capabilities necessary for disaster control and management to be effective (Ram Mohan & Alex, 2020). COVID-19 was declared a public health emergency by the World Health Organization by late January 2020. However, the NDMA failed to take any comprehensive action, be it a plan of action for mitigation or preparedness as required under the DM Act and its Biological Disasters Guidelines (Sibal, 2020). It did not effectively coordinate with the SDMAs/state governments for the movement of the migrants. It failed even before the second wave of the pandemic, whether regarding the availability of basic essentials, arrangement of livelihood, management of relief camps, or entitlement of statutory minimum relief. Some commentators theorized that the lack of collaboration between the center and the states during the pandemic may be linked to the NDMA's diminished function (Prasad, 2020).

The Prime Minister (of course not in the capacity of the Chairperson of the authority), MoHFW, Indian Council of Medical Research, few Chief Ministers, healthcare experts, and district collectors *sans* the NDMA have been the faces of this massive combat against COVID-19. Former Kerala Health Minister K.K. Shailaja won multiple international awards for her tremendous work in managing the pandemic in the state (Abraham, 2021). From declaring lockdown to imposing a curfew, from surveillance to contact tracing, from testing to creating containment zones, from delivering essential medicine services to vaccinating the population – almost everything was done both at the policy formulation and implementation levels – all important information and works have been performed through the government (Shankar & Pandey, 2021). However, the NDMA largely remains a nonexisting agency. It has disassociated itself from the central

government's obligations and empowered the MHA to give any directives it deems fit in apparent contravention of the Act (Sibal, 2020).

The lockdown advisories ignored that the NDMA is required to recommend guidelines for the "minimum standards of relief" to be provided to the disaster victims in relief camps concerning shelter, food, drinking water, medical cover, and sanitation. The law also calls for *ex-gratia* aid in the event of a loss of life and the restoration of means of subsistence (DM Act, Sec. 12). The Supreme Court also became impatient. In a *suo motu* case (In Re: Distribution of Essential Supplies and Services during Pandemic, 2021), the Court observed that in the light of the tremendous human suffering and loss of livelihood because of the pandemic, "NDMA may consider laying down minimum standards of relief in this regard." The Court, however, clarified that this was "not a direction but a suggestion" that can be looked into by the NDMA (*ibid.*, para. 9). Nonetheless, the NDMA did not act.

Subsequently, in another case (Reepak Kansal v. Union of India, 2021), the petitioners questioned the nonadherence of the statutory duty by the NDMA in providing the guidelines for *ex-gratia* assistance regarding COVID-19 fatalities. The petitioners argued that the usage of "shall" under Section 12 mandates the NDMA to lay down guidelines. However, the GoI reasoned that "shall" is to be considered as "may," and hence the nature of function under the said provision is "directory/discretionary," considering "peculiar facts and comprehensive steps taken by the Union of India" (*ibid.*, para. 6.21).

The Court held that the legislature's intent is evident by using the word "shall" twice in the section, and the same is in tune with the Statement of Objects and Reasons for the enactment of the DM Act and the functions and powers of the NDMA. Hence, the NDMA has a statutory duty to recommend guidelines. Ordinarily, statutory enactments must be read according to their plain meaning if the wording of the provision is clear and unambiguous. The beneficial provisions must be interpreted literally to fulfill the legislative objective rather than defeat it (*ibid.*, para. 10.1). Furthermore, if any authority fails to carry out its statutory obligation, the Court might issue a writ of mandamus to compel compliance (*ibid.*, para. 7.3).

The Court found "nothing is on record that any decision/guidelines has/have been issued by [NDMA]." It rapped the authority for its failure in performing its statutory duty. It issued a writ of mandamus for recommending suitable guidelines for *ex-gratia* assistance in the event of a death due to the COVID-19 pandemic (*ibid.*, para. 10.4) within 6 weeks following the date of the decision (*ibid.*, para. 16). However, the Court left it to the "wisdom" of the NDMA to decide the "reasonable amount," considering various factors (*ibid.*).

Moreover, in this fast-communicating world with an ever-increasing number of smartphone users on social media platforms, where information spreads at a breakneck speed, the NDMA has failed to utilize the potential of communication even to a satisfactory level. For example, information on the Facebook page of the NDMA is very basic, mostly about dos and don'ts regarding COVID-19 (NDMA Facebook, n.d.). Instead, the NDMA could have used such platforms to inform people timely and accurately of the agency's activities, actual state of affairs in the country, activities

carried out in different states, key statistics, success stories, important announcements, webinars, and interactive sessions by the members and other experts associated with it. Even to this date, the only COVID Impact and Response Report regarding India available on the NDMA website is for the period between January and May 2020 (NDMA, 2021). Further, for the reasons known best to the authority, the case studies pertaining to various Indian states are available in six official UN languages instead of Indian languages (NDMAb, n.d.)!

Exploring NDMA's Existential Significance

Globally, disaster management is no more regarded as an ancillary act of regular administrative functions of the state but a specialized activity. Until this pandemic happened, disaster management had not bothered the political class much in this country. Apart from few issues like air pollution in Delhi, it has barely become an electoral agenda (Kandhari, 2020). Naveen Patnaik is rather an oddity under whose leadership Odisha has significantly improved in mitigation and preparedness since the Super Cyclone days and weathered this pandemic and a series of sea storms (Datta, 2020). So, it is unsurprising that the NDMA has very little "authority" in actually calling shots. The constitution, treatment, and performance of the NDMA raise its existential significance.

The very structure of the agency appears political. Besides the fact that it is headed by the Prime Minister of the nation, quite curiously for the NDMA members, there is neither any qualification attached to their nomination nor any appointment process prescribed under Section 3(2) of the DM Act. In a way, the DM Act legitimized appointing political appointees, leaving the system vulnerable to political abuse (Sarkar & Sarma, 2006, p. 3762). A comparison could be the National Human Rights Commission (NHRC). Under Section 3 of the Protection of Human Rights Act (PHRA), 1993, NHRC is a combination of judicial and nonjudicial members. The judicial members shall be from the higher judiciary, and even the nonjudicial members must have the knowledge and practical expertise in human rights issues. It also provides for the tenure, appointment, and removal of the Chairperson and the Members (PHRA, Secs. 4, 5 & 6). We may further consider the instance of the Gujarat State Disaster Management Act, 2003 (hereinafter "Gujarat Act"), which predates the DM Act. It established the Gujarat State Disaster Management Authority (GSDMA) with a good blend of senior ministers and bureaucrats, including the Director-General of Police and the State Relief Commissioner (Gujarat Act, Sec. 7). The political character of the NDMA is not unfounded. After the change of Government at the center in 2014, all Members, including the Vice-Chairman, but one resigned (The Hindu, 2014). Although India was reeling under a spell of disasters, the agency remained dysfunctional (Sethi & Makkar, 2014).

Since the establishment of the NDMA, India has suffered some of the worst disasters; yet it has not done anything worthy to be mentioned. The Comptroller and Auditor General (CAG) delivered a damning report on the NDMA's performance to

Parliament in March 2013 (MHA_b, 2013). According to it, the NDMA had neither knowledge nor control over how disaster management initiatives in the states were progressing. Its initiatives were in a state of disarray. In 2008, the NDMA launched several mitigation initiatives around the country; however, they were either discontinued or redesigned due to poor planning. The report further pointed out that there is no clear demarcation of functions among the NDMA, NEC, and MHA. It noted with dismay that the very idea of enacting the DM Act was to shift focus from disaster response to mitigation. Nevertheless, the execution of almost all the mitigation projects carried out by the NDMA was unsatisfactory (*ibid.*, 28–37). Projects regarding national vulnerability to floods and earthquakes have remained incomplete. Experts believe that if such initiatives had been effectively completed, the devastation in Uttarakhand in 2013 might have been significantly reduced (Shrivastava, 2013).

The CAG found high vacancies extending from 33 to 60% of the sanctioned 124 posts at the end of different financial years within the review period (2007–12), hindering the authority's work. The NEC has failed to meet even for a single time between 2008 and 2012 (MHA_b, 2013, p. 41). The absence of strong and able leadership plagues the authority. As the Prime Minister is the Chairperson, the day-to-day management of the NDMA falls on the Vice-Chairperson. The government failed to rise above the political interests and provide the authority with a strong driving force (Bhalla & Bagga, 2013).

After 7 years of existence, the NDMA was found to have no working plan. It took a rap from the Supreme Court (Swaraj Abhiyan – (I) v. Union of India, 2016) to prepare and publish the National Disaster Management Plan after more than a decade of the NDMA's existence. An updated plan was available in 2019, which details the roles and responsibilities of various ministries/departments of the central and states (National Disaster Management Plan, 2019, pp. 235–48). However, we do not know how the NDMA will ensure the actual working of this plan through effective coordination.

Similarly, the Guidelines on Biological Disasters have implementation datelines, but in practice, neither those datelines were complied with nor any action has ever been initiated for such noncompliance. All suggestions and action points remain excellent on paper with no impact on the ground. The consequences are visible as the state was caught napping even at the fag-end.

Furthermore, the Annual Reports indicate a variety of work carried out by the NDMA: from disaster risk mitigation projects to capacity building to mock exercises and awareness generation (NDMA_c, n.d.). However, all these operational activities are carried out with the approval and support of the central government. That being the case, and even during this mega-disaster, if the agency has to remain behind the curtains, how do we justify creating a separate statutory authority outside the government? In the author's opinion, all those works could have been accomplished in the same manner with a disaster management division within the MHA – as it existed prior to 2005. Hence, the entire edifice of the agency is an illusion and is not money's worth.

Well aware of the ailments of the agency, the UPA government had constituted the Task Force for reviewing the DM Act. The report of the Task Force has, inter alia, recommended restructuring the NDMA. The number of full-time Members was reduced to four who shall have the expertise of disaster management, science, or public policy, as well as credible accomplishments in these fields (MHAa, 2013, p. 63). However, it does not mean that we should fill the positions with retired military careerists. We have to realize that disasters are not wars – there are civilian problems for which military personnel are not necessarily well trained. Disaster response could be a military activity for which the National Disaster Response Force (NDRF) has been established under Section 44 of the DM Act. However, other aspects of disaster management require specialists, including healthcare professionals, scientists, social scientists, engineers, and policymakers, who are trained to deal with civil protection issues. Similar to the Members of the NHRC, it also recommended the selection process, tenure, and other terms and conditions of service for the Members of the NDMA. Additionally, like the GSDMA, to bring political heads and bureaucrats together, it suggested Ministers of Home Affairs, Defence, Finance, Agriculture, Urban Development as *ex-officio* Members of the NDMA (*ibid.*, pp. 62–63). These efforts were undertaken to ensure that competent and professional persons assume the posts at the helm of affairs. Therefore, in addition to the skills and abilities of a generalist manager, emergency managers also require mastery of a body of professional knowledge. As the NEC is practically dysfunctional, the National Crisis Management Committee takes over during a crisis. So, it suggested the abolition of the NEC (*ibid.*, pp. 64–65). It was evident from the orders issued by the Home Secretary during this ongoing crisis.

Let alone initiating actions to incorporate the recommendations of the Task Force, the importance with which disaster management is viewed politically in our country is evident from the attitude of the BJP Government at the center. The position of the Vice-Chairperson of the NDMA has been downgraded from the rank of Union Cabinet Minister to the Cabinet Secretary to the Union Government. In fact, the post has been virtually abolished as there has not been any Vice-Chairperson after Mr. Shashidhar Reddy. Similarly, the rank of other Members of the NDMA has also been reduced from Union Minister of State to the Secretary of the Union Government (Zee News, 2014). In such circumstances, it may well be possible that the present Government has scant interest in this organization, and therefore, in the context of COVID-19, NDMA has been relegated to an inconsequential entity, while the Union Government with the Prime Minister at the helm of affairs is at the center of all activities for political interest.

With no human resources at its disposal; an utter confusion that the DM Act has created between the functions of the NDMA and NEC under Sections 6(2) and 10(2), respectively; and the fact that the NEC is virtually redundant – the only way for this national authority to make its presence felt on the ground is through NDRF. It is a specialized response force and has arguably become the face of disaster management in India alongside the Armed Forces. Even though general superintendence, direction, and control of the NDRF lie with NDMA under Section 45 of the DM Act, the

Director-General of the force reports to the MHA (MHAa, 2013, p. 54). Once again, the NDMA turns out to be a ‘notional authority.’

Comparability to FEMA in the USA

Having discussed the NDMA at length, it is pertinent to explore the US experience with the Federal Emergency Management Agency (FEMA), akin to our NDMA. Not only like India, the USA is a highly disaster-prone country, several expert committees in India have also referred to the FEMA in their reports. For example, the High-Power Committee (HPC) constituted by the GoI in 1999 for suggesting institutional reforms and preparation of disaster management plans at the national, state, and district levels discussed the FEMA’s incident command system: the agency’s usage of the geographic information system (GIS) technology and disaster medical assistance teams (MoA, 2001, pp. 93, 142). In its third report on Crisis Management, the Second Administrative Reforms Commission noted the importance of the FEMA in dealing with disasters in the USA (ARC, 2006, p. 40). The Task Force, in its report, expressed apprehension that the idea behind NDMA “was to create an autonomous organization similar to that of FEMA.” However, it turned out to be “markedly different from FEMA in terms of its functions, reach and tasks assigned” in practice (MHAa, 2013, p. 41). It also appreciated the high level of autonomy enjoyed by the FEMA in its operations (*ibid.*, pp. 28–30).

The FEMA was established by Executive Order 12127, signed by President Jimmy Carter in 1979 (Bea, 2012, p. 107). The FEMA was obligated mainly to (1) organize federal resources, (2) collaborate federal efforts with those of state and local governments, and (3) oversee public and private sector disaster response activities (Schneider, 1998, p. 38). Further, under Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (popularly called “Stafford Act”), the principal emergency management legislation in the USA, the FEMA is given the responsibility to organize the government’s wide range of emergency mitigation, preparedness, and response efforts (Sylves, 2008, pp. 80–81). According to the agency’s website, as of July 2021, it has more than 20,000 employees countrywide, including its headquarters in Washington DC, 10 regional offices, and various training centers (FEMAa, n.d.). Nonetheless, the FEMA is not a self-contained functioning entity capable of mobilizing resources to respond to catastrophes but a collaborating one that assigns other federal agencies to assist state and local governments with their resources (Wise, 2006, p. 307).

The success of such a public organization depends on able leadership and political will combined. Recognizing the importance of proactive steps in disaster management, President Bill Clinton appointed James Lee Witt as the Director of the FEMA in 1993. He was FEMA’s first Director with experience in emergency management. Clinton conferred the FEMA with enhanced autonomy, and Witt became instrumental in bringing about various changes both outside and inside the agency. Restoring the FEMA was one of the Clinton administration’s most remarkable achievements (Waugh Jr., 2006, p. 12). Witt stressed the customer training of all

the employees. As a result, the agency's role became more collaborative than before. The FEMA also took up an ambitious project called "Project Impact: Building Disaster-Resistant Communities" to empower communities by asking them to identify hazards and develop a plan to mitigate them by including all community stakeholders. These changes did not simply happen on paper but delivered positive results. As a result, the FEMA effectively dealt with various disasters throughout the decade, including the Midwest floods (1993) and the California earthquake (1994) (Haddow & Bullock, 2003, pp. 9–12).

As soon as George W. Bush took over, he neutralized the gains reaped during the Witt-Clinton era. He eliminated funding of the popular Project Impact. Significant structural changes also happened during his tenure. Following the 9/11 terrorist attack, the objective of disaster management in the country primarily shifted to terrorism. The US Department of Homeland Security (DHS, commonly called "Homeland Security") was established following the passing of the Homeland Security Act of 2002 to improve coordination among the various federal agencies responsible for law enforcement, disaster planning and recovery, border security, and civil defense. As a result, the FEMA became part of the DHS in 2003. Consequently, *de facto* cabinet status enjoyed by the FEMA Director during Clinton's regime ended – a move criticized by some experts (Kettl, 2006, p. 283). Now the DHS has the central role to play in the emergency response. As a result, the FEMA's budget was cut, staff and resources were transferred to counter-terrorism initiatives, and employee morale plummeted (Waugh Jr., 2006, p. 17).

Bush also adopted the traditional approach of appointing political persons at the helm of the affairs in the agency. Consequently, the FEMA was consecutively headed by two Directors who had no experience in disaster management. Joe Allbaugh, a campaign manager of Bush, was followed by Michael Brown, a Commissioner for the International Arabian Horse Association (Haddow & Bullock, 2003, p. 13). They had to resign but not before inflicting unimaginable damage to the prestige of the FEMA. Brown would subsequently face the Congressional Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, constituted immediately after the disaster (Schneider, 2015, p. 178).

However, the Katrina fiasco compelled Congress to enact the Post-Katrina Emergency Management Reform Act of 2006, reinstating the FEMA as the lead federal agency within the DHS, taking charge of managing all kinds of disasters. It also established new requirements for the FEMA personnel, stating that the FEMA Director must have emergency management credentials with executive leadership and management skills. In addition, other top FEMA officials must know and be familiar with emergency management competencies (*ibid.*, p. 24).

During President Obama's tenure, the FEMA recovered from its tarnished image under the Bush administration. Obama's FEMA Director Craig Fugate is primarily regarded for refocusing the agency on community preparation and turning it around (Nilsenella, 2017). Even Donald Trump's appointee, Brock Long, was touted by many experts and critics as a well-known professional in the field (Hart, 2017). Unfortunately, in his brief tenure, he faced severe problems because of an incompetent President who did not recruit key staff members in the DHS and, being

immigration-focused, orchestrated budget-cut for the FEMA (Nilsenella, 2017). COVID has been the most significant challenge that the FEMA has faced to date. Acting FEMA Director Peter Gaynor was called on to manage the pandemic. Although many had reposed faith in Gaynor's ability (Barr, 2020), the FEMA failed to rise to the occasion appropriately with Trump as the broad leader.

The FEMA launched its Public Assistance (PA) Grant Program in response to the national emergency declaration for COVID-19 to assist state, territorial, tribal, and municipal government entities and certain private nonprofit organizations in promptly responding to and recovering from the pandemic. While some of those programs, although meant for the victims eventually, are provided to the state, local, or tribal government, there are an array of programs targeted towards individuals. Many such Federal assistance programs provided under the Stafford Act are either of fixed dollar limits or percentage costs (FEMAb, n.d.).

In addition to the PA Grant Program, no major assistance programs targeting individuals were declared in connection with the COVID-19 pandemic. Governors had requested additional disaster assistance programs to be activated in their states, so this was a direct conflict with their requests. The FEMA's Crisis Counseling Program, which provides mental health counseling to catastrophe survivors – an essential but rather a tiny program given the size of the pandemic – is the sole individual support that was approved for states (Calabro & Patton, 2021, pp. 1–2).

Trump's government was severely criticized for political bias on various occasions. Politicians were accused of funneling disaster funds to preferred districts while ignoring the constituencies of their opponents. President Trump, according to the Denver Post, "is treating life-saving medical equipment as emoluments he can dole out as favors to loyalists." A comparison of the first round of the Paycheck Protection Program, a loan program launched in 2020 to assist small businesses to continue paying their workers, shows that businesses in states that supported Trump received more generous government assistance than those supporting Hillary Clinton (Firey, 2020). Justifiably, some critics labeled Trump as the "worst President in the history of the US" for his role in mismanaging the pandemic (Boot, 2020).

When Joe Biden assumed power, he made a few adjustments to the FEMA's programs. For example, in housing projects, the FEMA financing through the PA program normally pays 75% of the eligible costs, allowing the remaining 25% to be covered by governments and nonprofit organizations. On January 21, 2021, President Biden signed an executive order authorizing the FEMA to cover 100% of the cost of certified noncongregate sheltering in hotels and motels across the country, including for homeless persons and occupants of congregate living facilities (Calabro & Patton, 2021, p. 2). Therefore, the FEMA was allowed to apply retroactively for total funding of relocating homeless people to hotels and motels under President Biden's directive. From the beginning of the pandemic in January 2020 until September 30, 2021, state and local governments would be reimbursed in full for any authorized noncongregate sheltering expenditures (*ibid.*, p. 3). This was a welcome development and would also benefit people experiencing homelessness during other major disasters.

Conclusion – The Way Forward

Considering the structure and performance of the NDMA, the agency must be vested with more authority and autonomy than it is. We can opt for some of the suggestions offered by the Task Force for restructuring the agency. There is an immediate need to have a disaster management specialist appointed as the Vice-Chairperson of the NDMA, who would be the face of the agency and responsible for its activities. The US experience is relevant in this regard. Like the FEMA, the NDMA deserves a larger workforce who would coordinate actions with SDMAs/state governments and work toward implementing the national plan and/or the guidelines. The agency must increase its visibility among citizens, both through its activities and social media tools. The NEC may be scrapped as it has not done anything mentionable to date. The community is the first responder; therefore, it is imperative to empower communities as Witt did through Project Impact. Capacity building remains one of the NDMA's various statutory functions, which it cannot afford to ignore. Disasters in general and the COVID-19 combat in the recent times have demonstrated that narrow political considerations or inapt political leadership would eventually lead to defeat. Some States like Kerala and Odisha have earned wide accolades for their successful actions and have emerged as "models." Why can't someone heading the operations in those states be brought to lead NDMA? The choice is ours – whether to go the Clinton way or Bush way. Otherwise, the NDMA will forever remain conspicuous by its absence, similar to its situation during the present crisis.

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Covid-19 Pandemic and Women's Reproductive and Sexual Health

21

Debahuti Brahmachari

Contents

Gender-Differentiated Impact of the Pandemic	290
The Missing Link	291
Lessons from the Past	292
Impact of Disasters in Low- and Middle-Income Countries (LMICs)	292
Impact on Reproductive and Sexual Rights	293
Mental or Emotional Health	296
Perceived Solutions in Sight	297
Engendered Recovery and Reconstruction in the Light of Covid-19: Recommendations	298
Conclusion	299
Annexure	299
References	299

Abstract

With the onset of Covid-19 as the biggest health disaster globally, the world witnessed the new phenomena of lockdowns, social isolations, containment zones, and quarantines. Affecting all dimensions of life be it social, economic, or health, this disaster has exposed the socioeconomic inequalities that will adversely impact the existing vulnerable sections of the population based on caste, class, ethnicity, religion, race, disability, and gender.

The existing gender inequalities will be exacerbated affecting women the most that stand at the intersection of such ascribed identities. “None of us will see gender parity in our lifetimes, and nor likely will many of our children. That’s the sobering finding of the Global Gender Gap Report 2020, which reveals that gender parity will not be attained for 99.5 years” (WEF, Global gender gap report

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2020, Insight report, 2020). Similar disease breakouts in the past have amplified gender implications, and thus the current pandemic will inexplicably affect women and girls. It is against this backdrop that this chapter tries to look into the irrevocable impact of the pandemic on women's health especially reproductive, sexual, and mental health concerns. Postponement and restrictions on essential maternal services, diversion of health resources, mental distress, and limitations of family planning services are some of the major concerns. It is crucial to underline the inherent nexus of health and gender inequality which is being amplified due to Covid-19 and will worsen it further. Thus, the study concludes by outlining the need for proactive inclusive public health responses at the earliest.

Keywords

Covid-19 · Reproductive and sexual health · Maternal health · Gender

Gender-Differentiated Impact of the Pandemic

Pandemics in the past have revealed that the worst off have always been women in terms of loss of every kind. Disasters over the years have demonstrated that certain sections of the population are worst affected. The impact of disasters is largely shaped by gender dimensions. The impact over male and female distinctively needs to be understood through a gender analysis. The socially constructed manifestations during disasters further add on to the prevailing vulnerability of women. Using the gender lens highlights a “great deal to do with their ability to cope with and bounce back from the effects of disasters” (IRP, 2007).

Gender-differentiated impacts due to disasters have been long identified in history, and hence its understanding will lead to sustainable recovery measures. The Covid-19 disaster has led to unprecedented crises all across the world. The failure of health structures and systems was highlighted at the forefront. The biological facets of the virus gradually engulfed nations and exposed the multiple layers of vulnerability within the societies. “The United Nations Secretary General has called the current situation a human crisis” (Mizutori, 2020). Complex in its nature, the pandemic has uncovered the various socioeconomic determinants of inequalities which have an overarching bearing on the vulnerability parameter. The world is continuously struggling due to this health disaster that has affected all dimensions of life. Primarily the urgent crisis is the exacerbation of the existing gender inequalities. The worst exposed are women and girls, whereby the pandemic has widened the existing gender inequalities. Outbreaks in the past have had gendered implications ranging from socioeconomic repercussions, risk of exposure, to rise in individual vulnerabilities. Covid-19 has disrupted the world in many ways, especially with adjournment and constraints on essential reproductive and sexual services. Public health responses have had limited responses toward the gendered

impacts of such health disasters. Hence, it is necessary to highlight the impact of Covid-19 on gender equity which is being amplified and will worsen the existing vulnerabilities.

Women are more susceptible to health risks as outlined by several researchers in the past. In the case of pregnancy, the risk factors intensify especially in terms of transmission of diseases. The health of the mother is directly proportional to that of the baby; thus the immunological responses during the pandemic are of great concern (Wastnedge et al., 2020). The Covid-19 virus directly impacts the respiratory system, thus making pregnant ladies more vulnerable as there is a reduction in total lung capacity (Goodnight & Soper, 2005). Physiological studies in the past have established the long-lasting detrimental effects on both the mother and the child (Liu et al., 2020). Though less research has been done to identify the definite trends of the Covid-19 virus on mothers, lessons from the past have reported adverse maternal mortality rates in the case of SARS and MERS (Di Mascio et al., 2020). As a result, this health disaster “could cause fetal growth restriction, preterm birth, and prenatal mortality” as witnessed in the case of past viruses (Wastnedge et al., 2020).

As Covid-19 unfolds in its different variations, it leaves millions of women behind who have no access to any sexual and reproductive health rights that are inherently human rights (UNICEF, 2021). Both the direct and indirect effects of the pandemic need to be analyzed with a gender lens in order to redress the gender disparities in these unparalleled times.

The Missing Link

The Sendai Framework for Disaster Risk Reduction was a conclusive push in 2015 from countries which were worst affected due to these epidemic disasters (Mizutori, 2020). Human health became the focus of governance with great concern and specific roles for various stakeholders in disaster risk reduction. The framework demanded the need for buoyant health systems to reduce morbidity and mortality (Selmi & Murray, 2015). Pandemics and epidemics were given a new definition within the disaster framework extensively. 2015 was earmarked as the year of global significance with the Sustainable Development Goals (SDGs) setting its path for future coherence along with other global policy mechanisms. A synergistic approach between sustainability and disaster risk reduction (DRR) was a significant outlook of this era (Zaidi & Fordham, 2021). Health has been at the core of such an approach, whereby the vulnerable sections are the worst off in case of disasters of any kind. Covid-19 has once again echoed the contemporaneous issue of missing out the gender lens within leading policy frameworks. The explosion caused by this disaster has led to multiple consequences that has an undulating effect, primarily on women. “Absence of a gender considerate approach to DRR” (*ibid*, p.2) fails to build on a long-term inclusive sustainable development outlook.

Lessons from the Past

“2020 was expected to be a year for reviewing achievements and accelerating progress in the implementation of the Beijing Declaration and Platform for Action 25 years since its adoption” (Grown & Paramao, 2020). The virus in the form of a public health disaster has stalled all efforts toward the empowerment strategies for the vulnerable sections. Healthcare structures have been distorted all across the world, whereby women and girls face disproportionate health risks. The pandemic has been expected to exacerbate the existing gender gaps especially in the case of access to resources. With the second wave breaking the existing health systems, the developing countries are threatened to cope up with the existing limited resources and weak health systems.

Past outbreaks of similar disasters have outlined the gendered norms where women were the worst off. Epidemics like SARS (2003), Ebola (2014), and Zika (2016) outbreaks highlighted the deepening of gender inequalities and the diversion of essential resources leading to high rates of maternal mortality (Wenham et al., 2020). Sierra Leone has been an example which is still fighting back to achieve its development goals in relation to maternal mortality rates post the Ebola crisis (Ghouaibi, 2021). Lessons from Ebola showed a decline in the use of essential services, such as care facilities, contraception uses, and family planning measures. The outbreak led to 3600 neonatal and maternal deaths along with stillbirths (Sochas et al., 2017). Health disasters push future generations into stake in the absence of gender-based resilience measures by the governments. “We think the collateral damage of the epidemic is higher than the damage caused by the epidemic itself” (Beech, 2020).

Lack of decision-making power is an inherent cause which limits women to make choices for their well-being. Absence of autonomy restricts women to even voice out their own reproductive and sexual choices. Disasters in history have highlighted the deeply gendered aftermath which leaves behind the most vulnerable sections of the society. The world is characterized today by social isolations and lockdowns which further intensify the barriers toward gender equity. “People whose human rights are least protected are likely to experience unique difficulties from COVID-19” (Grown & Paramao, 2020).

Impact of Disasters in Low- and Middle-Income Countries (LMICs)

The vulnerability toward the infection is high due to “multiplicity of social, economic, cultural and institutional factors that make them the worse off (*ibid*).” The new mutations are turning out to be deadly which will lead to disruption of sexual and reproductive health in LMICs leading to surge in MMR. The Guttmacher study predicted 1.6 billion women of reproductive age will be impacted, whereby 49 million women will lack contraceptive services leading to 15 million unintended pregnancies (PFI, 2020, pg. 4). With the health systems grappling all across and lack of access of care, 1.7 million expected mothers and 2.6 million newborns will be

under threat (*ibid*). LMICs of Asia, Africa, Southern and Eastern Europe, Latin America, and the Caribbean have seen in the past the commotion of essential health services along with the rise of HIV/AIDS, other sexually transmitted diseases (Tang et al., 2020), and high mortality and morbidity. Moving toward a sustainable path of development, the 2030 agenda focused toward the “leave no one behind” goal, whereby the disadvantaged and vulnerable sections of the population had to be the focal point. The past experiences have once again outlined the impact of Covid-19 in low- and middle-income countries, especially those of the indigenous sections.

Impact on Reproductive and Sexual Rights

Lockdowns brought back families together, and work from home became a norm even when lockdowns were over. The migrant workers refused to return home in view of uncertainty, but this situation came heavily on the reproductive and sexual lives of women both urban and rural. The new normal has disrupted the access of essential reproductive and sexual services available to women in all parts of the world “at a time when women and girls need these services most” (Beech, 2020). The overwhelming breakdown of health infrastructures has resulted in collateral damage to the vulnerable sections especially women leading to higher risks in the future. Disasters have always had an overarching impact on maternal services largely limiting women’s access to safe deliveries, contraceptives, and other sexual and reproductive health services. Diversion of essential services toward the pandemic responses limits women’s access, thus further deepening the existing inequities. The following section tries to explore the key areas that have been impacted due to the de-prioritization of sexual and reproductive services in the wake of one of the biggest health disasters.

The world has been grappling under the severe economic crisis as a result of the pandemic, leading to rising unemployment and loss of jobs for both men and women. The informal sector has been hit largely with 70% of the workforce being led by women in the Asian subcontinents (ILO, 2018). Job losses and lack of income shape the fertility preferences for families largely. Women tend to delay pregnancy choices keeping in mind the economic burden faced by the family. The magnitude of the burden is more for the sections of the population who suffer systematic health and social inequalities (Lindberg et al., 2020). Child-bearing preferences take a back seat keeping in mind the larger socioeconomic challenges in times of disasters. The United States witnessed “one third of women deciding to get pregnant later or have fewer children” (*ibid*).

Patterns of contraception usage have seen a downfall during such humanitarian crisis in the past. Loss of income directly limits choices of obtaining contraceptives. UNFPA has “projected that more than 47 million women could lose access to contraception leading to 7 million unintended pregnancies as a result of the Covid-19 crisis” (Aly et al., 2020). The impact of contraception disposal largely governs fertility decision-making choices for women. The marginalized sections bear the brunt of the de-prioritization of such essential services. The fear is magnified when

traditional methods fail leading to high percentage of unintended pregnancies. LMICs have been characterized largely with the disruption of supply chain of essential health services like contraceptives (Riley et al., 2020). Large family planning service providers (clinics) have been shut in India in the wake of nationwide lockdowns thus aggravating gender-based health disproportions (Stopes M International, 2020). Thus, neglect of the impact of such health disasters on essential time-sensitive sexual and reproductive services will exacerbate existing gender gaps.

Confinement measures, traveling restraints, and social isolations all across the globe have created barriers for the access of essential healthcare. Shutting down of healthcare centers/clinics and diversion of medical personnel toward the pandemic demands have adversely affected prenatal care, maternal care, and postnatal care. With even a decline of “10% coverage of health care services for mothers and new-born, the death toll would rise to 1.7 million pregnant women and 2.6 million new-borns experiencing complications” (Riley et al., 2020). Due to fear of infection, women tend to do away with their expected maternal visits at hospitals or clinics. Reduction in personal health visits has been identified as a major concern with respect to continued barriers in relation to maternal healthcare services. A study by the Population Foundation of India underlined that with the lockdown, Village and Health Nutrition Days (VHNDs) and outpatient department treatment (OPD) were disrupted largely in both urban and rural areas of India (Nguyen et al., 2021). The primary health centers were lacking in supplies due to travel restrictions, pushing women into greater dangers associated with reproductive and sexual healthcare.

Further medical troubles to women during the pandemic were caused by the socioeconomic deprivations faced by her at every level. Large-scale recession and growing economic insecurities have impacted women largely. Loss of jobs and absence of social security have been largely disrupting the access of reproductive and sexual health services. Absence of health insurance will largely disrupt the access to healthcare with large-scale job losses. The burden of unpaid care has pushed mothers to quit jobs twice as compared to fathers (Burki, 2020). Doing away with contraceptives and other family planning measures in the case of loss of income has been the major fallout of the pandemic affecting fertility preferences (Lindberg et al., 2020). Further, with a decline in purchasing power, regular traveling to health centers is also avoided to cut down on the costs.

“Socio economic deprivations is a clear driver of maternal morbidity and mortality and an appositive gradient has been observed between deprivation indicators and a range of adverse maternal child health outcomes” (Wastnedge et al., 2020). Further, the socioeconomic dimensions are entwined and will deeply “compound pandemic’s impact on sexual and reproductive health” (Lindberg et al., 2020). Gender gaps are exacerbated due to socioeconomic crisis, whereby the Covid-19 disaster has once again pushed women into a vulnerable status.

Among the major threats during such disasters are the rising numbers of victims of IPV (intimate partner violence). The condition of women and girls in conflict-struck areas and disaster-prone areas is extremely fragile. Adding to which is the rising danger of sexual violence which systematically adds up to the existing

discrimination. The pandemic has confined women and girls with the perpetrator at home leading to an upsurge in gender-based violence. “Women- and it is predominantly women who are victimised- are confined to isolated homes with abusive partners whose coercive and physically violent tendencies are enabled and further inflamed by economic stressors... Abuse thrives in silence and beyond closed doors” as stated by Laura Kuester, executive director of Help In Crisis (Gourd, 2020). In China’s Hubei province, the rate of domestic violence tripled with nationwide lockdown orders (Ghoshal, 2020). Rising incidents of IPV have resulted in direct consequences for physical and mental health, “leading to higher morbidity and mortality for co-occurring diseases” (Miller & Mccaw, 2019).

The immediate ramification is the rise in adolescent pregnancies and unwanted forced teenage pregnancies due to sexual violence. Women’s susceptibility to abuse is characterized through multifarious elements ranging from verbal to physical violence, from sexual to psychological forms that impact one’s future disproportionately. Past epidemic disasters have classified the rise in teenage mothers due to increased sexual abuse or “as negative coping strategy by girls” (Connor et al., 2020). With large-scale school closures, lack of education, and economic inconsistencies, young girls are forced into forceful marriages leading to unwanted pregnancies. Such exploitative basis of relationships has led to the rise of sexually transmitted diseases like HIV/AIDS (*ibid*). A study by WHO reported that victims of abuse would be prone to sexually transmitted diseases 1.5 times more and mental depression simultaneously (Ghoshal, 2020). Lack of contraceptives and limited health services may lead to a rise of teenage pregnancies up to 11% (UNFPA, 2020). In 2013, countries in Latin America and the Caribbean adopted the Montevideo Consensus on Population and Development prioritizing access to sexual and reproductive health services along with population dynamics in sustainable development (IISD, 2013). With the onset of Covid-19, the commitment toward comprehensive sexuality education took a back seat (UNFPA, 2020) leading to the de-prioritization of gender-based violence. Adolescent fertility has been a soaring concern in disaster-prone regions especially LMICs, and the pandemic has once again drawn the immediate attention to focus to mitigate such risks.

One of the prime and essential time-sensitive health service is the right to choose to give birth, that is, abortion rights. The pandemic has been a big blow toward abortion rights of women, whereby confining it to “nonessential healthcare” (Jones et al., 2020). Diversion of medical care toward the pandemic needs have created barriers for women to access abortion facilities all across. “Barriers to abortion may result in an increase in births from unintended pregnancies” (Lindberg et al., 2020). This threatens the lives of many women, especially young teenagers who are forced into such accidental births. Diversion of resources legally has delimited the access to safe abortion facilities largely all across the globe (Paul, 2021). One cannot delay the time line of abortion requirements as with each week of gestation the risk and complexities rise (Bayefsky et al., 2020). With delays the dangers of unwanted or enforced pregnancies are inevitable resulting in burdening an already under-resourced healthcare system during the pandemic times (Connor et al., 2020).

The past has portrayed several episodes, whereby sexual and reproductive health services like maternal care, safe abortion facilities, and birth control have been clamored upon. Largely the LMICs are impacted the nastiest as was seen in the case of Zika and Ebola virus disaster. With large-scale in-house lockdowns an “additional 3.3 million unsafe abortions” (PFI, 2020) is predicted as an aftermath of Covid-19. The health disaster has eroded millions of women and girls from their basic access to healthcare services. UNICEF has demanded governments immediately to reconstitute and reinforce the maternal and reproductive healthcare services.

Mental or Emotional Health

The physical impact of the virus has been the focal point of core research currently, neglecting the adverse impacts of mental or emotional health disorders. Unfortunately, the global health stressors in the pre-Covid times have been characterized with anxiety and depression as two of the foremost causes under disease burden (GBD, 2019). Health budgets across the world have been a glaring example of such causes with meager investments being done in the area of mental health. India as compared to Bhutan (2.5%) and Nepal (1.6%) has the lowest public health spending amounting to 1.02% of GDP (NHP, 2018). Studies during the pandemic period have highlighted the rise of depressive disorder and anxiety disorders largely in countries where the pandemic has hit the most (Santomauro et al., 2021). The existing inequalities and varied range of social determinants have highlighted that women are at the receiving end of the health crisis.

Large-scale economic burden and loss of jobs, burden of unpaid care round the clock, lack of essential maternal and neonatal healthcare facilities, and rising cases of gender-based violence have escalated the mental stress of women. The axis besides which the Covid-19 contagion is widening health disparities needs to focus on the gender-specific dimensions (Connor et al., 2020). Centers for Disease Control and Prevention stated that “women on average report more physical and mental unhealthy days per year than men despite utilizing more preventive care services outside the pandemic” (CDC, 2013). Disaster data in the past has highlighted the long-term effects of mental stress and is likely to be influenced highly by gender even now. The subsequent gendered structural inequalities enforce women to follow social roles without adequate social support. In times of distress, the overburdening due to such roles exacerbate nervousness and stress parameters of women. “Sociological studies hypothesize several sources of chronic stress: empathetic vicarious stress, workforce participation, caregiving responsibilities and lack of social support” (Williams & Kurina, 2002).

The Lancet study (Santomauro et al., 2021) analyzed “204 countries and territories which revealed an additional case load of 76.2 million in major mental disorders and 53.2 million in anxiety disorders, out of which 35 million cases for major mental disorders and 52 anxiety disorders were of women in 2021.” Mental trauma and disorders are characterized and are predicted to have long-lasting impact

and destroy a women's autonomy and self-identity adding to her existing disempowerment (Kim et al., 2022).

Over the two waves of the pandemic, the rate of depression among women doubled in India not leaving behind the children who expressed their anxiety at different levels due to increasing social isolation and lockdowns. Studies have shown that the second wave further triggered mental disorders with widespread rates of infection. Standing at the forefront of the battle against the pandemic, women have been exposed to greater risk of infection and mental health disorders.

The National Commission for Women in India reported a surge of violence against women in the absence of "social and protective networks" (PFI, 2020). This is further exacerbated with early marriages, whereby projections of 31 million gender-based violence cases were projected during the lockdown (UNFPA, 2019). The impact of violence is lifelong be it physically or mentally. Not to forget the large number of frontline workers (especially women) who have been suffering hostile responses through the pandemic shows high levels of distress. In India alone, the ASHA workers (accredited social health activists) account for 1 million in the health workforce. They have been responsible for administering medical care in the remotest corners even during the period of lockdowns (MoHFW, 2020), not forgetting the role of Anganwadi workers (nutrition activists) and auxiliary nurse midwives who account for 17 million and 1.4 million, respectively, within the health force (*ibid*).

Rise in caregiving burden in India has affected 51% of adolescents in some of the biggest states of India, Uttar Pradesh, Rajasthan, and Bihar (*Ibid*, Pg 3). Social isolation, limited healthcare access, and stigma around mental health concerns have further burdened women and girls in seeking adequate attention toward their needs. Women from the informal sector have been hit the hardest in India due to loss of employment and livelihood. More than 60% of women in India form the informal sector, whereby loss of jobs affects their entire family and future (PFI, 2020). The poor and the most vulnerable sections of the country are suffering the most with long-term consequences in store for them.

Perceived Solutions in Sight

The health disaster in the form of Covid-19 has once again demonstrated that women and girls are inexplicably impacted in cases of conflicts, disasters, emergencies, and other fragile circumstances. The fundamental rights have been undermined whereby the long-fought goals are simultaneously knocked off. The Global Gender Gap Report 2021 has estimated that the "world has stepped back 39 years behind" as a result of Covid-19 that has exposed the inherent economic and social imbalances (Ghouaibi, 2021). The immediate need of the hour is to mainstream gender into disaster recovery processes. For resilient, efficient, and long-lasting recovery, policy building needs to adopt the gender lens for its strategy building. Women are exposed drastically to all kinds of disasters due to their existing vulnerabilities as determined by the structurally defined gender roles. "Gender plays an important role in assigning

roles and responsibilities within groups and in determining the access to and control of resources among groups, gender sensitivity and gender aspect become a valid and important policy domain during disasters and throughout the rehabilitation, recovery and reconstruction process" (IRP, 2007).

Engendered Recovery and Reconstruction in the Light of Covid-19: Recommendations

Covid-19 has once again drawn attention toward the urgency of incorporating a gender spectrum in relation to public health. Human development is largely characterized through public health indicators, whereby the marginalized sections need to be empowered principally. Integrating gender-appropriate mitigation strategies in the recovery phases will enhance and strengthen the resilience toward future disasters of any kind (*ibid*). The paper has tried to highlight the following recommendations in an attempt to "build back better" (IRP, 2007):

- The immediate normalization of essential reproductive and sexual healthcare services and ensuring its access to everyone at all times. UNFPA has reiterated the states to provide full access to prenatal and postnatal care and ensure regular supplies of birth control contraceptives and safe abortion care facilities at the earliest to avert any future morbidity (Beech, 2020). Revamping the primary health centers is a must for the village populations who have direct access to medical care in India.
- With drastic loss of jobs, families tend to neglect the importance of timely reproductive care. As a result, comprehensive health insurance coverage (Lindberg et al., 2020) is the need of the hour to restore regular access to care for mothers and children primarily. Furthermore, regular sources of investment are a must to ensure smooth supply of reproductive services irrespective of any disaster. Stakeholders must keep building international development schemes in the area of health to fight any form of health emergency as posed by Covid-19 (Genest et al., 2021).
- At the onset of the pandemic, one of the major blows was in the area of family planning measures. UNPF projected "7 million unintended pregnancies" in lower- and middle-income countries adding up to high maternal deaths as well, as seen in Nepal (Ghouaibi, 2021). Policy-makers need to build effective planning measures and generate investment for the same. The Population Foundation of India has predicted that "approximately 2.9 million infant deaths, 1.2 maternal lives and 206 million unsafe abortions can be forgone in the period of 2015–2031 in India" if quality family planning measures are adopted (PFI, 2020).
- Past disasters have depicted the need to adopt a gender analysis which is an imperative for justifiable recovery. Data is lacking in relation to gender-differentiated vulnerability in respect to disasters. WHO has called on its members to adopt "planning and actions for epidemiological research and surveillance to assess the immediate, medium and long term effects on sexual and reproductive

health” in the wake of the health disaster (Tang et al., 2020). The pandemic has highlighted the need to understand the gender implications aiming toward gender-responsive research.

- Lastly, voices of women need to be represented in the form of strong leaders within the national responses. Women have been underrepresented since the beginning despite standing at the frontlines of this disaster. This post-disaster recovery should see “women as leaders of recovery and develop capacities for social change” (UNDP, 2011).
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Conclusion

The long process of disaster resilience needs to develop a strong relationship in terms of gender equality. Voices of both men and women need to be heard and their rights as similar as well. Policy-makers and stakeholders need to implement gender-inclusive strategy building in order to ensure the protection of fundamental rights of women in terms of disasters. Enhancing participatory and democratic voices will help in capacity building of women and resist stereotype biases. The goal to “build back better” seeks to turn adversity into “an opportunity for sustainable development, ‘seeking change in society’ in a more gender neutral manner” (IRP, 2007).

Annexure

- ASHA – accredited social health activists.
- DRR – disaster risk reduction.
- IPV – intimate partner violence.
- LMICs – low- and middle-income countries.
- MERS – Middle East respiratory syndrome.
- MMR – maternal mortality rate.
- OPD – outpatient department treatment.
- SARS – severe acute respiratory syndrome.
- SDGs – Sustainable Development Goals.
- UNDP – United Nations Development Programme.
- UNICEF – United Nations International Children’s Emergency Fund.
- UNPF – United Nations Population Fund.
- VHNDs – Village and Health Nutrition Days.
- WHO – World Health Organization.

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Disaster Preparedness in the Context of Mt. Apo Natural Park in the Philippines

22

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Contents

Introduction	304
The MANP-GMP 2013–2023	305
The UBT ADSDPP 2019–2023	306
The Davao Regional Development Plan 2017–2022	307
Conclusions and Recommendations	309
References	309

Abstract

The Mt. Apo Natural Park (MANP) in Regions XI and XII in Mindanao, Philippines, is the Philippine's highest peak at 2954 MASL. It is a primary trekking and camping destination and an ASEAN Heritage Park. It is a legislated protected area classified as a natural park since 1936 via Presidential Proclamation No.59 and RA 9237 the Mt. Apo Act of 2003 and the ENIPAS Act RA 11038 of 2019.

It is governed by a multi-sectoral Protected Area Management Board (PAMB) with the Department of Environment and Natural Resources regional director as its chairperson and the Protected Area Management Offices of Regions XI and XII in Mindanao, Philippines, acting as its secretariat led by a protected area superintendent (PASu).

In the latter part of the twenty-first century, the MANP has faced two major disasters; these are the Mt. Apo Fire Incident of 2016 that decimated 116 hectares of brushland in its strict protection zone (SPZ) near the peak and a landslide that has affected a major transportation artery and several local communities in 2019.

This study aims to measure the level of disaster preparedness of the governing Protected Area Management Board with the descriptive analysis of its current policies such as the MANP General Management Plan (2013–2023) and the

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disaster preparedness plans of selected local governments as mandated by RA 10121 (Disaster Preparedness Act of 2009) and RA 9729 (Climate Change Act of 2009) and the Ancestral Domain Sustainable Development Plan (ADSDPP) of the unified Bagobo-Tagabawa Tribe in MANP. The study will outline recommendations with the purpose of formulating strategies for the enactment of improved board policies leading to improved disaster planning, management, and recovery for the Mt. Apo Natural Park.



Mt. Apo Natural Park is an ASEAN heritage site, an active stratovolcano, and the highest peak in the Republic of the Philippines at 2954 MASL.

Keywords

Mt. Apo Natural Park · Disaster preparedness · Disaster planning · Protected area management

Introduction

The Mount Apo Natural Park in the Davao Region is a primary trekking and mountaineering destination in the Philippines and in the ASEAN Region by being the highest peak in the Republic of the Philippines and because of the varied mountain ecosystems that it can offer its visitors (DENR, CARCAP, 2018). The natural park's draw to nature enthusiasts has reached its pinnacle in the 2016 peak season where more than 500 guests were camping at the peak area in the Lenten season on March 26. An uncontrolled butane stove fire spread and decimated 116 hectares of brushland in the peak area. No loss of life occurred, but resources utilized by the national and local governments to halt the spread of the brushfire were

costly, and this has resulted in a Bureau of Fire “fire out” declaration in May of the same year.

This fire incident has resulted in the crafting of policies by the Protected Area Management Board (PAMB) of Mt. Apo Natural Park whose ex officio members comprise the 2 governors, 7 mayors, 44 barangay captains, leaders of indigenous cultural communities (ICCs), and the various national government agencies with a stake and mandate in the Mt. Apo Natural Park (MANP).

These policy issuances were in the full implementation of PAMB resolution 2015-01, “The unified trekking policy for the MANP” and “The Camp Management Policy for the MANP.”

The umbrella policies that govern these PAMB issuances are the primary guidelines that cover the management of the park including its disaster preparedness. These are the (I) General Management Plan 2013–2023, (II) Ancestral Domain Sustainable Development Plan, and the (III) Comprehensive Development Plans of the local government unit.

The MANP-GMP 2013–2023

General Management Plan of the Mt. Apo Natural Park is the enhanced plan for the Mount Apo Natural Park that covers a 20-year period, beginning in 2013. The elements of this GMP include (a) shared vision and mission; (b) unified goals, objectives, and conservation outcomes; (c) integrated management programs and strategies; (d) institutional arrangement and management; (e) unified management zoning; and (f) management standards and guidelines.

The vision and mission of this GMP reflect the desired condition of MANP in the future and are further translated into specific goals and objectives, which are similarly the consolidation of the different goals and objectives of the numerous plans covering the PA and its buffer zones. Goals are broad statements on what this plan wants to achieve in the next 10 years and further scaled down into specific objectives. These goals and objectives are aimed at responding to management issues and concerns affecting the protected area and its buffer zones.

There are six major management programs presented in this management plan. Each management program is further divided into several components with corresponding outputs, specific strategies, and activities. The main purposes of the different program components are presented in detail so that stakeholders shall be guided in implementing this GMP. The management programs included in this GMP are as follows: (a) Biodiversity Research, Protection and Rehabilitation Program; (b) Indigenous People’s Affairs and Cultural Program; (c) Community-Based Resource Management Program; (d) Participatory and Community-Based Ecotourism Program; (e) Institutional Strengthening, Partnership, and Co-management Program; and (f) Disaster Risk Reduction Management and Climate Change Adaptation Program.

For the Disaster Risk Reduction Management and Climate Change Adaptation Program, this was added in the later enhancement stage of GMP preparation. This

program is necessary because of the emerging changes in the climatic patterns affecting Mindanao where Mt. Apo is located. There is a need to build the resiliency of the PA ecosystems to extreme weather disturbances to ensure sustainable development and biodiversity conservation. This was also added to answer the need to identify the potential sources for sustaining the implementation of this plan which prompted the inclusion of the topic. The DRRM/CCA concerns were also incorporated considering that the health of the MANP upland natural ecosystems constitutes a potential source of hazards for the downstream settlements. The impacts of climate change on the Mount Apo Natural Park General Management Plan 2013–2033 and on the economy, biodiversity, and the safety of the settlements downstream are subjects that were also discussed in the plan (MANP-GMP, 2013).

Thus, the primary motivation for the later inclusion of the disaster risk reduction and climate change facet of the plan was added primarily for the purpose of leveraging possible internal or external funding of the plan, the health of the MANP ecosystems affecting the lowland inhabitants, and building the resiliency of ecosystems in the protected area.

The UBT ADSDPP 2019–2023

The unified Bagobo-Tagabawa Tribe's Ancestral Domain Sustainable Development and Protection Plan for 2019–2023 for its Certificate of Ancestral Domain Title/Claim covers nearly 90% of the Mt. Apo Natural Park (MANP-GMP, 2013). It outlines the required demographic, ethnographic, geographic, political, and social structures of the largest indigenous cultural community within the Mt. Apo Natural Park. In this plan the IP/AD (indigenous people's/ancestral domain) Development Framework, the major issues outlined cover the environment, socioeconomic-agricultural, and basic needs. The environment sector covers the issues of declining biodiversity, soil and land pollution, haphazard farming and settlement in SPZ (strict protection zone) of MANP, and environmental degradation.

The primary goal of this plan is to create a healthy and productive environment that is able to sustain biodiversity and generate nondestructive economic progress for the benefit of the indigenous peoples and all other entities in Mount Apo. The development goals are anchored in the four bundles of rights of the indigenous cultural communities/indigenous peoples (ICCs/IPs), the right to ancestral domains/ancestral lands, right to self-governance and empowerment, social justice and human rights, and right to cultural integrity and the responsibilities of the ICCs/IPs to their ancestral domain as stipulated in Section 9 of IPRA for sustainable development and protection of the ancestral domain. These responsibilities are the following: (a) maintain ecological balance, to preserve, restore, and maintain a balanced ecology in the ancestral domain by protecting the flora and fauna, watershed areas, and other resources; (b) restore denuded areas, to actively initiate, undertake, and participate in the reforestation of denuded areas and other developmental programs and projects subject to just and reasonable remunerations; and (c) observe laws, to observe and comply with the provisions of RA 8371 and the rules and regulations for its effective implementation.

This plan does not outline any issues or strategies that cover disaster risk reduction and management except for the identification of the need to hire forest guards, increase law enforcement, and conduct of information education campaigns and reforestation programs in landslide-prone areas. The plan prioritizes basic needs and services which are an apparent immediate need.

The Davao Regional Development Plan 2017–2022

The Davao Regional Development Plan 2017–2022 outlines the development roadmap on how the Davao Region in the Philippines can achieve the Philippine Development Plan 2017–2022. These are anchored in the national vision of (1) building a prosperous, predominantly middle-class society where no one is poor; (2) toward promoting a long and healthy life, implementing the 2016–2022 Philippine Health Agenda; (3) toward becoming smarter and more innovative, reviewing higher education institution curricula toward matching industry requirements; and (4) toward building a high-trust society, improving access to basic social services. The plan outlines environmental challenges and recognizes that climate change and water scarcity will pose serious threats to countries in South and Southeast Asia over the next several decades. These threats, which range from extreme weather events to limited water availability, are likely to have significant impacts on the Philippines' economy and its sectors. The challenge for Davao Region is on ensuring the environment and natural resources' sustainability for the present and future generations, while achieving economic growth and development (DRDP, 2017). The plan also recognizes Davao Region's vulnerability to hazards that are hydrometeorological and geologic in nature, namely, flooding, rain-induced landslides, and active fault lines, and has prioritized research agendas for this aspect (DRDP, 2017). The plan has also validated that all 53 LGUs have been validated to have functional Local Disaster Risk Reduction and Management Councils (LDRRMCs), established Local Disaster Risk Reduction and Management Offices, and installed early warning systems in the event of upcoming disasters. A “massive” orientation and training on DRRMCCA especially in vulnerable communities shall be undertaken. Coordination among government agencies such as the Department of Agriculture (DA), Bureau of Fisheries and Aquatic Resources (BFAR), and Department of Environment and Natural Resources (DENR), among other agencies, shall also be pursued to ensure the protection and preservation of the environment and natural resources (DRDP, 2017).

The focus of the paper is twofold:

1. The paper aims to present a descriptive analysis of the level of disaster preparedness in terms of MANP policies (such as RA 9237, RA 10121, RA 9729, and RA 8371 and specifically their realization in the MANP General Management Plan 2013–2023, the ADSDPP of the unified Bagobo-Tagabawa Tribe, and the related PAMB policies) and the Davao Regional Development Plan 2017–2022.

2. It also aims to determine policy recommendations for the improvement of DRRM disaster risk reduction and management in MANP.

The study utilized a simple descriptive narrative research study (Glass & Hopkins, 1984) where it involved data gathering that describes events and then organizes, tabulates, depicts, and describes the data collection (Glass & Hopkins, 1984). With the interim volume of information from the plans covering Mt. Apo Natural Park and the limited time frame and resources for the study, the topics from the three plans were reduced in manageable form, gleaning from the main sources the topics and points that covered disaster risk reduction and management. These points were outlined based on the similar statements that covered disaster risk reduction and how it is planned to be implemented in the aforementioned plans. The researcher also utilized similarities in the plans in relation to (1) aspects covered, (2) time frame, (3) DRMM aspect/s, (4) budget allocated, (5) specific programs, and (6) harmonization and cohesion between these three key plans.

Disaster risk reduction in the context of key plans that cover the Mt. Apo Natural Park

Aspects covered	MANP-GMP 2013–2023	Ancestral Domain Sustainable Development and Protection Plan 2019–2023	The Davao Regional Development Plan 2017–2022
Time frame	10 years	5 years	6 years
DRMM aspect	Goal 7 disaster risk reduction management and climate change adaptation program	The plan focused on the immediate needs of the unified Bagobo-Tagabawa tribe	Environmental challenges and recognizes climate change and water scarcity and Davao Region's vulnerability to hazards that are hydrometeorological and geologic in nature
Budget allocated	To be determined	To be determined	To be determined
Specific programs	States that IEC, patrols, and reforestation efforts need to be in place for mitigation measures	Outlines the need for coordination with the mines and geosciences bureau of the DENR for determination of hazard areas within their domain	Outline research avenues and possible strategies for adaptation and mitigation
Harmonization and cohesion	Several aspects of the GMP are similar in goals to the ADSDPP and can be complementary to the ADSDPP and the DRDP	The ADSDPP is also similar to the GMP and DRDP and is complementary to both plans but there are differences in timelines	Acts as the overall plan that is supposed to be the mother plan for the two previous plans and is also research supportive since it outlines the research initiatives needed

Conclusions and Recommendations

The three plans assessed in the study have stated the need for disaster risk reduction, management, and preparedness. It is apparent that there is a cursory mentioned of the negative impacts of climate change, but there is still a lack of awareness on the need to instill the need for awareness, planning, and action. The LGUs in the DRDP 2017–2023 all have functional Disaster Risk Reduction and Management Councils, DRMM Offices, and quick-response teams. However, there is a lack of coordination among the three plans for harmonization, coordination, and sustainable planning. This is apparent with the different time frames of the three plans, and these plans from the top-down should be collaborative and unified in nature.

1. Increase collaboration, communication, and cooperation among ICC, PAMB, and NEDA stakeholders in the formulation of unified plans.
 2. Timely synchronization of plans from the top-down DRDP to GMP and ADSDPP with an enabling law that will mandate this strategic action.
 3. Further studies on the level of disaster risk reduction and management for the Mt. Apo Natural Park.
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Resilient Cities, Vulnerable Communities: Disaster Governance in the Coastal Cities in Indonesia

23

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Contents

Introduction	312
Critical Factors of Disaster Governance in Indonesia	314
Mitigating Climate Change Impacts in Coastal Cities	316
Disaster Risk Reduction: Capacity, Decentralization, and Collaboration	317
Conclusion	319
References	319

Abstract

The government has always played a role in disaster governance, including at the community level. The Indonesian government has also allocated responsibilities to the local governments in disaster governance mechanisms. The aim of this study is to explore the regulatory and institutional framework for disaster governance, which emphasizes arrangements between city government organizations and communities to address disaster vulnerability. This research was conducted in coastal cities of Indonesia that are prone to disasters: Bandar Lampung, Semarang, and Makassar. The research method used is regulatory mapping (RegMAP), conducting discourse network analysis (DNA) and risk-based analysis based on threats, vulnerabilities, and capacities. The results of the study found that the framework for enforcing disaster governance rules in Indonesia is often contradictory, including the main issues in determining disaster status, budget allocation and regional cooperation, as well as strengthening the capacity of vulnerable communities. The regulatory framework needs to be reviewed to reduce the risk of flood disasters that often occur in the cities of Makassar, Semarang, and Bandar Lampung; the disaster management agency and development planning board are the front line to internalizing the disaster risk reduction agenda; and the need for

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strategic policies in disaster risk reduction that are integrated, climate inclusive, and have the adaptive capacity to address vulnerabilities at the community level.

Keywords

Resilient cities · Vulnerable communities · Coastal · Disaster governance

Introduction

After political reforms in 1998, Indonesia has launched extensive decentralization in political, administrative, and financial affairs. These changes, which brought reforms to the governance system with extensive political and economic impacts (Prianto, 2013, 2017a, b; Das & Luthfi, 2017). Decentralization gives the local governments the powers to manage and control their own affairs (Prianto, 2012). Indonesia is a country that is vulnerable to disaster (Djalante et al., 2017; World Bank, 2019). The last decade has seen how Indonesia suffers from major disasters that have a great impact (Das & Luthfi, 2017).

The Indonesian National Disaster Mitigation Board (BNPB, 2021) reported that between January and December of 2021, a total of 3058 natural disasters struck Indonesia. The majority of natural disasters were hydrometeorological. There were 1288 occurrences of flooding, 791 occurrences of extreme weather, 623 occurrences of landslides, 265 events of forest and land fires, 44 occurrences of tidal waves and abrasion, 31 occurrences of earthquakes, 15 occurrences of droughts, and 1 occurrence of a volcanic eruption. Java Island experienced a total of 1559 disasters.

Disasters and unexpected impacts are very dangerous and cause complex problems (Singh, 2018). The human population increase and the impact of climate change have caused the vulnerability and threat of disasters to become increasingly complex, frequent, and full of uncertainty. Disaster management also needs to change and adapt to institutional values. Facing the threat of disaster necessitates the need for a paradigm shift, from government to governance, by further expanding the roles and interactions of inter-institutional arrangements (Peters, 2019). Governmental regimes chosen from democratic procedures are expected to anticipate various public problems, which cannot be solved by only one single organization (Huxham et al., 2000). To this day, the terms “coordination,” “synergy,” “partnership,” “collaboration,” and “network” are an important part of public sector governance activities (Prianto et al., 2022).

There is a great deal of common terminology associated with efforts to prevent and respond to disasters, including disaster risk reduction (DRR) and disaster management (DM). DRR focuses on reducing disaster risk through systematic efforts to analyze and manage the causative factors, such as by reducing hazards and reducing the vulnerability of people with assets, wisely trying to manage the environment, and enhancing the level of readiness for adverse events (UNISDR,

2011; Mardiah et al., 2017). This reflects a growing understanding that DM entails more than responding to emergencies, and that preventative action in day-to-day planning and governance is crucial (Miller & Douglass, 2016).

From a mainstream perspective, the concept of DM implies several physical preventive measures, such as evacuation, reactive response during and after a disaster; with emergency aid, humanitarian assistance, and reconstruction (Singh, 2018). The new DM framework and decentralization have increased the role and responsibility of local governments in regional disaster response actions. But the frameworks do not work congruently, thus resulting in new challenges. As an example, DM effectiveness is based on local government capacity (especially adequate human resources and budget allocation); however, the capacities depend on pre-existing political and socio-cultural dynamics, where they have been changed by the impact of political decentralization, which varies widely (Antlöv et al., 2016; Bebbington et al., 2006). The increase in the authority and responsibility of local governments has not been matched by adequate capacity (Faisah & Prianto, 2015; Prianto et al., 2021; Rusnaedy et al., 2021). Therefore, it is very important to explore highly decentralized Indonesia, managing the new DM framework and its achievements and possibilities in the future.

What are the most significant effects of decentralization on disaster administration? How does the new framework for DM in Indonesia affect local governments' roles, responsibilities, and capacities? These are the primary questions that this chapter will address. Therefore, the objectives are as follows: (1) identify how decentralization affects local governance in Indonesia; (2) investigate how the new DRR framework will affect the roles, responsibilities, and capacities of local governments; and (3) discuss the effect of decentralized governance structures on enhancing community resilience to DRR frameworks.

The research method used is the Regulatory Mapping (RegMAP) method, a method for reviewing institutional arrangements through Discourse Network Analysis (DNA) and risk analysis based on threats, vulnerabilities, and capacities. Institutional networks describe cause-and-effect relationships among disaster events, institutional responses, and community actions; explore the roles of stakeholders in the government and community sectors, as well as adaptation actions taken to deal with disasters; studying economic, political, and cultural aspects under certain adaptation conditions. This study uses qualitative research techniques: reviewing the relevant official literature (reports, regulations, articles, and books); document analysis; content analysis and interviews; media news to supplement field information about DM and DRR initiatives.

This approach explores risk based on threats, vulnerabilities, and capacities. Trends in the impact of climate change or weather describe a cause-and-effect relationship between a disaster and certain aspects of the community, such as disaster literacy, decreased income, and gender sensitivity. Data were analyzed and interpreted through the steps data reduction, data presentation, data verification, to conclusions, which produce new findings.

Critical Factors of Disaster Governance in Indonesia

Geographical characteristics of urban areas in Indonesia, classify them as areas that are vulnerable to disaster threats. Disasters can cause several bad consequences for cities and their communities, the potential for hydrometeorological disasters, such as floods, landslides, forest fires and droughts. Rapid growth and increased urban activity increased the threat of damage to the urban environment. Urban areas are increasingly vulnerable to hydrometeorological disasters (floods, landslides, and droughts) that occur alternately in many areas in Indonesia (Amri et al., 2016). This article focuses on several coastal cities in Indonesia, the consideration of the choice is that these coastal cities have a medium and high disaster risk. The situation in Indonesia, where almost all coastal cities, have a moderate and high level of disaster risk. We identified problems in three coastal cities, namely Bandar Lampung city, Semarang city, and Makassar city. This choice is based on the level of disaster risk at the cities.

Based on Fig. 1, the level of disaster risk in coastal cities is in the high and medium categories, with a high hydro-meteorological disaster threat scale. These cities have improved to become cities that are resilient and adaptive to disasters. Actions promote resilience, through capacity building at the local government level, regulation making, and budgeting support. Nevertheless, disasters still hit periodically. Table 1 identifies problems in the three selected coastal cities, namely the city

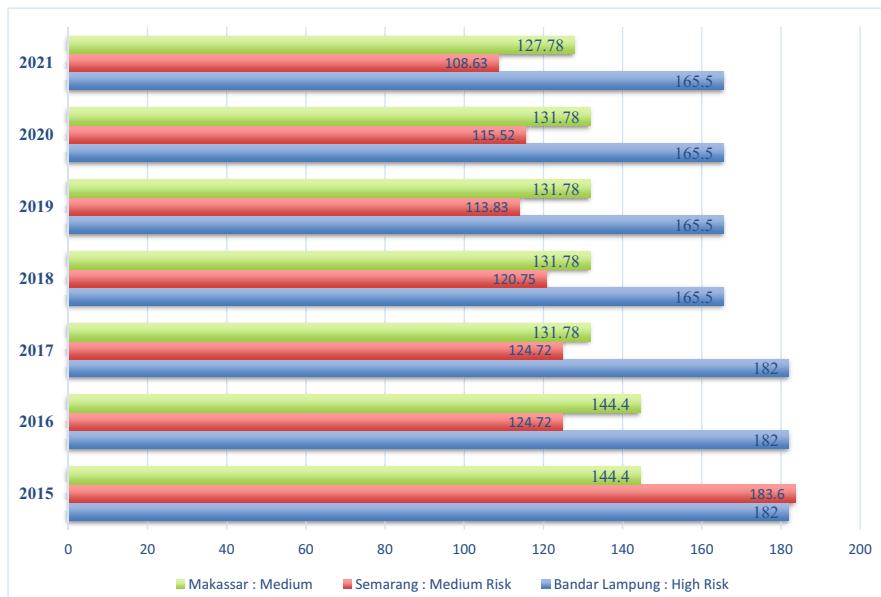


Fig. 1 Disaster Risk Index in Indonesian coastal cities 2015–2021. Source: InaRisk, Indonesian National Disaster Mitigation Board – BNPB (2021)

Table 1 Identification of disaster problems

No.	Cities	List of Disaster Issues
1	Bandar Lampung	The impact of disaster problems that occurred in Bandar Lampung City was caused, among others, by: Urban design and governance and Community activities in watershed boundaries People are still littering. Weak enforcement of legal sanctions
2	Semarang	Disaster problems in the city of Semarang are caused by High tide flood Unsustainable management of the mangrove ecosystem Topographic conditions are in the coastal areas, lowlands, and highlands
3	Makassar	Disaster problems in Makassar City are: Vulnerability of women in coastal areas The Lorong Garden program from the Makassar City Government actually adds to the burden for women Urban development is neither environmental friendly nor participatory Low adaptive capacity to climate change impacts

Sources: Sihotang (2020), Intan (2019), Erlani & Nugrahandika (2019), Danarto et al. (2019), Kurnianingsih & Santosa (2019), Chandra (2017), Malik et al. (2021), Rusnaedy et al. (2021), Prianto et al. (2021), Razak (2021), Fajar Pendidikan (2021)

of Bandar Lampung, the city of Semarang, and the city of Makassar. Based on this table:

Based on Table 1, the main problem is the flood disaster in the three cities. In Bandar Lampung City it is caused by city governance and urban design that are not realized, then there are still people littering, violating watershed boundaries set by the government, and enforcement of regulations is not optimal; it does not have a deterrent effect on violators. The coastal disaster of Semarang City is due to the area's topography, unsustainable management of mangrove ecosystems, and tidal flooding. Then, the causes of coastal disasters in Makassar city are unfriendly and have less participative development, as well as the threat of climate change impacts on women in coastal areas. Another finding is that the Lorong Garden Program by the Makassar City Government actually adds to the burden on women and the weak adaptation capacity to the threat of climate change.

Increased urbanization in Indonesia's fast-growing cities has brought burdens and vulnerabilities, especially for the urban poor communities. Even the municipal government services are not able to serve the residents who continue to come to the city, who have ultimately been marginalized for years and increasingly forgotten in times of crisis. Decentralization becomes two-faceted: to provide opportunities as well as threats in urban services. The policy authority allows city managers to solve the problems of city residents, but at the same time, implementation and frameworks that are not optimal to bring progress to the city. In order for cities to meet current and future challenges, national governments must complete a decentralization agenda that holds local governments fully accountable. At the same time, the dynamics of cities must accommodate local people's aspirations by improving

urban services, reducing poverty, and promoting local economic development (Asia, 2003).

Mitigating Climate Change Impacts in Coastal Cities

Disaster risk reduction is an approach to disaster management through mitigation and preparedness. The disaster management strategy in three coastal cities in Indonesia, namely the city of Bandar Lampung, the city of Semarang, and the city of Makassar, can be seen in Table 2:

Based on Table 2, the disaster management strategy in three coastal cities in Indonesia is explained as follows. In Bandar Lampung city, the procedures for dealing with it include expanding education areas and green areas; as a water catchment area, then normalize, naturalize, and build drainage to drain water; from upstream to downstream. This technical activity is supported by the collaborative action of various groups such as academics, environmental organizations, and local leaders in finding solutions, such as education and literacy activities to the community on disaster mitigation, by conducting disaster-resilient community training.

In the city of Semarang, the disaster management strategy began by integrating city activities with global movements, namely the 100 Resilient Cities program; to encourage the Semarang City Government to be more resilient in dealing with the threat of shock and stress. This action is supported by mangrove ecosystem management policies with community-based disaster risk reduction policies and

Table 2 Disaster governance strategy in coastal cities in Indonesia

No.	Cities	List of disaster governance strategies
1	Bandar Lampung	The strategy of the Bandar Lampung city in disaster governance is: expanding green areas that function as water catchment areas: Carry out normalization, naturalization, and build irrigation drainage Encourage collective and collaborative action in disaster management Promote education and literacy as disaster mitigation
2	Semarang	The disaster governance strategy in Semarang City is: 100 Resilient Cities program to build resilience in dealing with shocks and stresses Reduce vulnerability through the integration of mangrove ecosystem management and disaster risk reduction policies Design of disaster information system based on geospatial technology Standard Operating Procedure (SOP) for disaster management, from pre-disaster mitigation to post-disaster reconstruction
3	Makassar	The disaster governance strategy in Makassar City is Increasing the percentage of public green open space Improving the quality of infrastructure and public services Improving socioeconomic welfare, which is gender sensitive Strengthening the adaptive capacity of city governments Strengthening the resilience of coastal women

Sources: Sihotang (2020), Intan (2019), Erlani & Nugrahandika (2019), Danarto et al. (2019), Kurnianingsih & Santosa (2019), Chandra (2017), Razak (2021), Fajar Pendidikan (2021), Malik et al. (2021), Rusnaedy et al. (2021)

community empowerment to reduce vulnerability. Another program is the design of a geospatial-based disaster information system to make it easier for the public and stakeholders to obtain disaster information and to develop operational standards for disaster management, from mitigation to post-disaster reconstruction.

In the city of Makassar, the government programs such as the preparation of action plans for DRR, increasing the area of green open space, improving the quality of infrastructure and public disaster services, and increasing gender-sensitivity on social welfare policy. Another step is to strengthen the adaptive capacity of local governments in mitigating the impacts of climate change, as well as increasing the resilience of coastal women. Based on the disaster management strategy, the three cities were built, all based on the government, where the government builds city resilience with the support of regulations, budgets, and government employees. Meanwhile, the strategy developed at the community level is not yet connected to the strategy developed by the government. In these three cities, the city government's resilience strategy has not been able to deal with vulnerability at the community level.

Disaster Risk Reduction: Capacity, Decentralization, and Collaboration

Collective and collaborative action have had an impact on increasing resilience in disaster risk reduction in Indonesian urban areas (Singh, 2020; Malik et al., 2021; Rusnaedy et al., 2021). Organizing coastal women's communities is an effort to strengthen vulnerable entities in urban communities. They are involved in collaborative DRR actions. The reality of the vulnerabilities faced include damage to living space, decreased income, and limited clean water services, which further adds to the socioeconomic burden of coastal women.

Decentralization is the transmission of political, financial, and administrative authority to local government in an effort for them to provide superior public services. Numerous factors contribute to the effectiveness of a decentralized system, including: (1) institutions and human resources implementing the plan; (2) facilities, technology, information accessibility, budget, and institutional support; (3) infrastructure, technology, and information accessibility; and (4) institutional support (Prianto, 2012). In a decentralized system, the bureaucratic relationship between all areas of government is very complex, thereby increasing the complexity of provincial and global environmental policies (Steurer & Clar, 2015). In a decentralized system (federal system), the ruling political party has a strong influence, frequently limiting environmental political initiatives that conflict with do-nothing policies (Rabe, 2011).

Climate change policy research in Austria reports that a decentralized system for climate change governance is becoming increasingly difficult, because bureaucratic relationships between all levels of government in a decentralized (federal) system are very complicated, which in turn slows down climate change responses at regional and national levels. For example, in Austria's construction policy, the Ministry of national environment faced opposition from two other ministers and nine provincial

leaders. Owing to opposition from the federal government, construction policies often clash in the middle of the road (Steurer & Clar, 2015). The Austrian Environment Minister also finds it difficult to implement his climate change agenda because the responsibility for implementing the policy lies with other ministries.

Under the administration of George Bush, Jr., Barack Obama, and Donald Trump, US climate change policy went through critical times. Donald Trump decided to close the US Environmental Protection Agency, which ultimately exacerbated the crisis (Koski & Siulagi, 2016). The Republican Party is the largest political party and has always opposed climate change policies on the grounds that it would harm American industry. The Democrats are not Republicans, but their important figures such as Barack Obama and Hillary Clinton cannot promote the issue of climate change in their party.

According to the study, obstacles can be overcome through coordination and a shared vision between the federal and local governments. Government, private, and community institutions must collaborate to achieve socioeconomic benefits through sustainable programs (Chienwattanasook & Prianto, 2018; Jermitsittiparsert et al., 2019a, b; Sriyakul et al., 2019; Sutduean et al., 2019). Municipal governments reduce their vulnerability to climate change by influencing the community's sensitivity and adaptability. This can be achieved through physical and nonphysical actions (including capacity building, enhancing government service administration, supporting the local community organizations, and enhancing networks) (Malik et al., 2021; Rusnaedy et al., 2021).

The discourse and practice of building urban resilience is more frequently centered on the government. The government has the privilege of encouraging resilience, with regulations, budgets, and apparatus resources that control the territory. Community-based actions in building resilience have not received the attention of various parties. In fact, in three coastal cities; Bandar Lampung, Semarang, and Makassar; resilience challenges at the community level are still being faced.

In Table 3 it is explained that the resilience of the community in Bandar Lampung City, Semarang City, and Makassar City mean that they have their own approach to facing the risk of disaster impacts, as in the Kampung Bumi Mas Bandar Lampung program as a disaster-resilient village. In Semarang City, the settlement strategy of the Tambak Lorok fishing community faced tidal flooding. Furthermore, in Makassar City, disaster-resilient communities are represented by Anging Mammiri Women's Solidarity Organization and Muhammadiyah Disaster Management Center (MDMC) in flood disaster management in Makassar City. MDMC, through disaster mitigation actions, builds more literacy and disaster preparedness education. Meanwhile, the Anging Mammiri Women's Solidarity Institution has transformed into an institution that advocates for disaster-resilient communities, especially for coastal women who are very vulnerable to risk of disasters. At the level of policy advocacy at the city government, the programs that are being encouraged include (1) gender-based public policy, (2) improvement of socioeconomic welfare, and (3) increasing public green open spaces.

It is hoped that these coastal cities will execute the right strategy. The analysis concludes that decentralization and disaster management are often different. The fuzziness of capacity and collaboration of civil society has not supported DRR.

Table 3 Community resilience in dealing disasters in Indonesian cities

No.	Cities	List of community resilience
1	Bandar Lampung	Kampung Bumi Mas Bandar Lampung as legal-based disaster-resilient village and community development: Increasing basic legal knowledge about disaster-resilient villages Institutionalizing community participation Strengthening the function of law as a means of social control Concern for every stakeholders
2	Semarang	Tambak Lorok coastal settlement Household level adaptation Filling the land and increasing house building as an adaptation to tidal flooding Developing a vertical fishing village
3	Makassar	Disaster-resilient community in Makassar City: Muhammadiyah Disaster Management Center using a mitigation approach through disaster education and literacy Anging Mammiri Women's Solidarity As a resilient community facing disaster risks, it focuses on (1) gender-sensitive policies, especially for coastal women; (2) improvement of socio-economic welfare; (3) improvement of public Green Open Spaces

Sources: Mussadun et al. (2016), Evendia (2021), Fajar Pendidikan (2021).

Critical issues that arise include local institutional capacity and weak coordination and collaboration with communities.

Conclusion

In this chapter, we conclude that the resilience of cities to disaster vulnerability in coastal areas of cities in Indonesia finds that (1) the framework for enforcing disaster management rules in Indonesia is often contradictory, especially on the main issues in determining disaster status, budget policy, and regional cooperation, as well as strengthening the capacity of vulnerable communities. The regulatory framework needs to be reviewed to reduce the risk of flood disasters that often occur in the cities of Makassar, Semarang, and Bandar Lampung; (2) City government institutions, such as the Disaster Management Agency and the Development Planning Agency, are at the forefront of internalizing the DRR agenda; and (3) the need for strategic policies in DRR that are integrated, climate inclusive, and have the adaptive capacity to address vulnerabilities at the community level.

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Coastal Settlement Vulnerability on Risk of Abrasion Disaster

24

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Contents

Introduction	324
Disaster Vulnerability	326
Disaster Risk	327
Results and Discussion	328
Land Use Change	328
Residential Building: Physical Vulnerability	331
Residential Infrastructure Vulnerabilities	331
Economic Vulnerability Due to Abrasion	332
Abrasion Disaster Risk Analysis Study	332
Conclusion	338
References	340

Abstract

The vulnerability of settlements to the risk of abrasion disasters is caused by the phenomenon of changes in the land area of the coastal area of Barrang Lombo Island, Makassar, as a result of the pattern of settlement toward the waters and the decreased vegetation of coastal ecosystems. This research looked at how vulnerable residents of Barrang Lombo Island were to the risk of abrasion from the island's social, economic, and physical aspects. Vulnerability risk classification research methodologies, map overlay techniques, and interviews with vulnerable groups are all used in this study. Using risk analysis based on threats, vulnerabilities, and capabilities, the data is then created. The findings demonstrated that the high vulnerability of the physical aspect of the residential environment was caused by a number of factors, such as: (1) residential buildings with typologies above the waters located on the western side of the island with a frequency of disasters almost every year experiencing the risk of abrasion disasters; (2) wave-

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holding embankment infrastructure was only built on the east side; and (3) the density of residential buildings, especially above the waters. From an economic standpoint, vulnerability is the shift in the primary cycle of the people who work as fishers to other forms of subsistence employment. The density of population and the number of vulnerable groups with disabilities, particularly traditional diver fishermen, are linked to social vulnerability. The vulnerability to abrasion risk ranges from a high-risk level of 5.77 to a moderate level of 1.23.

Keywords

Vulnerability of settlements · Abrasion disasters · Residential building · Economic vulnerability

Introduction

Indonesia is an archipelagic country that experiences the impact of global warming and sea level rise which will affect the vulnerability of Makassar as a small-island urban area in the form of a mainland and an archipelago subdistrict. Of 15 areas, there are eight subdistricts that are directly adjacent to the coastal areas of the Makassar Strait with a coastline of 35 kilometers consisting of 11 small islands which are part of Sangkarrang Archipelago Subdistrict. Mining activities in the coastal area will raise the possibility of disaster in the coastal areas of Makassar due to increasing sea stockpiles or reclamation. The habitat of mangrove plants will be eliminated and this would result in more erosion and abrasion (Zulkifli Aspan, 2017).

The degraded environmental carrying capacity in the Makassar coastal area is caused by a lack of control over space utilization and the geomorphological conditions of the coastal area that is prone to disaster risk and with an estimated 5–10 mm/year sea level rise in the Makassar Strait (Timang et al., 2013). Meanwhile, the quality of the aquatic environment is very influential on the survival of coastal communities and small islands, because most of the people's livelihoods depend on marine products. Around 70% of the population depend on fishing activities. Others work as construction workers in the city, small traders, civil servants, and fiber boat craftsmen and even work in water transportation services or shops selling fishery products (Tamti et al., 2014). Based on the Tejakusuma Research of a geological review of the Makassar coastal area, sand, gravel, coral limestone, and mud clay are classified as very vulnerable with an elevation of 0–5 meters indicating that the vulnerability is very high (Tejakusuma, 2020). In addition, changes in the coastline of Makassar City indicate erosion and accretion where the southern coastal area is dominated by accretion while in the northern part is dominated by erosion. While abrasion is the erosion of coastal areas due to sea waves, the severity of abrasion to coastal areas also depends on the balance in the area. Expanding coastal areas can become a factor for an accelerated ongoing impact such as land flooding on small islands, beach erosion, sea water intrusion, and ecological changes in coastal

areas because the more a region is vulnerable, the easier it is to cause damage or change (Tahir et al., 2009).

Tahir et al. (2009) describe the vulnerability of sea level rise index in medium vulnerability based on three vulnerability parameters (elevation, population density, and population growth) with the score in Barrang Lombo Makassar Island with an index of 8.33; this island is predicted to have a large threat from sea level rise as an inundation area as in 2100 up to 80% more than its landmass. Almost every year Barrang Lombo Island experiences a change in coastline due to abrasion. Another phenomenon, based on interviews with local communities, was that before the abrasion disaster, the coastline was still visible, but now most of the island has no beaches, especially the western part, and the buildings that surround the island are not only on the mainland but shifted toward sea. The majority of the population of Barrang Lombo Island depend on the sea for their livelihood, where the main livelihood of the population is fishing. The category of fishermen on Barrang Lombo Island is based on the size of the boat and the type of catch. Fishermen who use large boats are sea cucumber fishermen. Fishermen using medium-sized boats are squid fishermen, while fishermen using small boats are fish fishermen, who are more often called papekang. There are around 88 sea cucumber fishermen who use large boats to go to sea. Fishermen who use it include fishers, squid fishermen, and papekang fishermen. Due to these economic factors, on average, those who work as fishermen choose to live close to the beach so that it is easier to monitor the boats and access to transportation from the boat moorings to their homes and where the catch is drying is easier and closer. Due to the dense population and the pressing need for housing, many residents choose to live on the coast which has entered the coastal border area. This is also the main factor that makes residents carry out reclamation independently, which has become a habit for those whose houses are directly adjacent to the beach to stockpile the sea without considering the safety, security, and comfort aspects of living.

Communities who choose to live bordering the Barrang Lombo beach border assume that the area directly adjacent to their land parcel is their territory, so they strive to be able to take advantage of it by expanding or adding space from the previous dwelling (Heriansyah, 2016). The results of the initial survey showed that another issue that caused the reclamation was one of the Barrang Lombo community's efforts to deal with coastal abrasion by levying the back of the parcel which is a marine area for reasons of security and safety from disasters. Meanwhile, when the abrasion occurred, the houses that were most affected were those located on the coastal border and above the sea and spatially located in the western part of Barrang Lombo Island. The adaptations being carried out in Barrang Lombo at this time are to build embankments on their parcel boundaries, elevate the house buildings, and build parts under the houses on stilts. In this study, it is very urgent to identify the impact of abrasion on the Barrang Lombo residential area, especially fishermen's residences, and assess the risk of abrasion disasters that occur and identify types of adaptation to the residential environment both from the aspect of residential buildings and environmental infrastructure. The negative impact of abrasion requires the people of Barrang Lombo Island to make a choice whether

they will stay in the disaster-prone settlements so that there needs to be interventions and efforts to handle these settlements. When a community chooses a place to live, a possible scenario is needed for community resilience and vulnerability reduction. This type of adaptation strategy is very important to be formulated with the aim of reducing the impact of disaster risk caused by abrasion.

Previous studies have studied more about the impact of erosion and flooding on coastal settlements, the vulnerability of coastal settlements due to climate change, and the direction of structuring coastal settlements based on erosion mitigation. Research in Makassar City related to disasters is more about coastal mitigation zoning and the risks of floods, fires, and landslides at Losari Beach Makassar. Meanwhile, research on Barrang Lombo itself that has been carried out concerns more about social and disease aspects and the vulnerability index of Barrang Lombo Island which has been carried out for a long time. Coastal settlements tend to have characteristics of high vulnerability and low capacity to disasters. This research is more focused on vulnerability analysis to determine the level or category of abrasion vulnerability of Barrang Lombo Island. The results of the vulnerability analysis are expected to contribute value that is useful in handling and mitigating disasters for coastal communities and specifically for local fishing communities living in Barrang Lombo Island. The contribution of this research to the development of science is to provide benefits for the development of urban settlement design studies and city theories that need to be considered in urban development. This research can enrich knowledge in the field of urban coastal settlement architecture, especially disaster vulnerability in fishermen's housing and help guide detailed spatial plans or zoning of coastal areas and small islands, especially in the context of capacity building for future island disaster mitigation.

The other side is to add research results that are oriented toward scientific collaboration in solving problems or challenges of coastal development. In contrast to previous studies, which were more dominant in studying economic and social aspects, the formulation of the adaptation strategy of fishermen's dwellings against the risk of abrasion disaster can be a reference for Makassar City government's consideration in formulating a sustainable direction of planning and coastal management in the long term, especially in the Spermonde archipelago. In addition, this research can develop an approach that is more oriented to the characteristics of buildings and local communities. Based on the above, it is considered important to conduct research with the formulation of the following problems: (1) How is the physical vulnerability, economic vulnerability, and social vulnerability of abrasion disasters in the coastal settlements of Barrang Lombo Island, Makassar City? (2) How is the level of vulnerability to abrasion disaster risk on Barrang Island? Lombo?

Disaster Vulnerability

Vulnerability can be measured based on exposure, sensitivity, and capacity by systematically integrating social and environmental aspects to reduce the frequency of risk and intensity of disasters (Chakraborty & Joshi, 2016). The importance of

assessing economic, social, and infrastructure vulnerability as an effort to develop effective mitigation strategies shows that increasing population and worker ratios are marginal and locations are selected based on density level and number of assets at risk (Sherly et al., 2015). Vulnerable households dealing with disaster events are temporarily moving, and 7.4% of the affected buildings are neglected and abandoned; from this study it was also found that access for urban residents is better than rural residents in obtaining post-disaster assistance packages (Wahab & Falola, 2022). Meanwhile, the results of the study (Lome-Hurtado et al., 2021) on urban households in Mexico which explored the relationship between morbidity and physical disability in vulnerable age groups, both children and parents due to exposure to natural events, showed an increasing impact of 52.8% for the elderly and 13.6% for children. Global environmental changes and pressures also affect community resilience in the face of natural disasters (Pelling & Uitto, 2001). Pre-disaster vulnerability and post-disaster recovery from the spatial aspect are influenced by development, sociocultural processes, perceptions of risk, attitudes, and beliefs both directly and indirectly (Thompson & Dezzani, 2021). The vulnerability index based on the components of economic impact, distribution, and sector size (Yu et al., 2014) found that the private service sector has a high vulnerability, followed by the trade, real estate, and residential ownership sectors. The poor are the most vulnerable group because they struggle more than other community groups for security and livelihood sustainability to cope with or recover from disasters (Le De et al., 2015). Disaster risk reduction planning has the potential to create new vulnerabilities such as the case of resettlement (Kita, 2017); however these efforts do not solve the main causes of vulnerability in disaster-prone areas such as construction security, poor infrastructure systems, institutional capacity, and land and settlement locations. Remote communities in island locations tend to experience a crisis of trust and do not want to rely on external parties, so it can be said that capacity and vulnerability coexist within a population (Hamza et al., 2021). The model of disaster management in Thailand was explored by Busapathumrong (2013) which focuses on vulnerable groups of women, children, and the elderly as well as people with disabilities in disaster-affected communities.

Disaster Risk

The frequency of disasters that experienced a fluctuating increase over a 13-year period in Zhuhai, Zhongsan, Dongguan, Jiangmen, and Shenzhen based on research conducted by Wang et al. (2022) was caused by a decrease in the area of vegetation cover and an increase in population, gross domestic product, and built-up area. Communities living in mountainous areas have low capacity to face natural disaster risks due to their spatial locality (Baig et al., 2021). Disaster management system applied in a city in terms of integrity and priority emphasis on disaster risk reduction efforts, participation, and collaboration as and community coordination. However, potential disaster risk can be analyzed using a tiered method to classify causes, effects, and escalation points both on the potential scale and level of damage caused

by disasters (Shakeri et al., 2021). Prediction of flood risk assessment using the method of combining Bayesian network models and Geographic Information Systems (GIS) has been applied in research (Shakeri et al., 2021), and after applying this method to diagnose the cause of flooding, the results are then compared with actual conditions.

The data used to measure the level of vulnerability to disaster risk are primary data and secondary data. Primary data consists of the results of field observations and mapping and the results of risk assessments based on Focus Group Discussions with the community regarding the conditions and history of disasters and identification of disaster risk factors from the aspect of threat sources and capacities. While secondary data comes from the publications of the Central Statistics Agency (BPS) of Makassar City, RTRW, Zoning Plan for Coastal and Archipelago Regions, and BPBD (Regional Disaster Management Agency) of Makassar City. To obtain accurate secondary data and primary data, the authors use data collection techniques through literature studies, field observations, analysis of disaster risk studies, spatial mapping, and vulnerability level overlays. The overlay method is a map merging system that unites spatial data sourced from different layers and generates attribute data in a hierarchical manner (Darmawan et al., 2017). Data analysis techniques used are the following: (1) overlay method (map overlapping) which looks at shoreline changes, using data from Google Earth per 5 years of land use development and shoreline changes, (2) and abrasion disaster risk assessment analysis which is obtained using the formula:

$$\text{Risk} = \frac{\text{threat} \times \text{vulnerability}}{\text{capacity}}$$

Disaster risk is seen as a multiple function by Wisner et al. (1994) that formulated three key elements to identify abrasion risk, namely risk, vulnerability, and hazard with an equation model: $R = H \times V$. Furthermore, it is said that the root of vulnerability is a social process, so analytical models related to human vulnerability and exposure to physical hazards due to natural events are used. A threat is an event that has the potential to cause injury, loss of life, or loss of property. This threat can be catastrophic or not. A threat is considered a disaster if it has caused casualties and losses. Examples of threats are fires, landslides, earthquakes, droughts, and floods. Vulnerability is a condition of a community or society that leads or causes inability to deal with the threat of disaster. Capacity is the combination of all existing resources in a community that can reduce the level of risk or impact of a disaster.

Results and Discussion

Land Use Change

Barrang Lombo Island is a coral island from the flat island group, with an area of about 20.58 ha. Barrang Lombo Island is one of the small islands in the administrative area of Ujung Tanah District, Makassar City. This island is poor in vegetation,

where about 90% of the island's land surface has been used as a residential area, and the only empty spaces remaining are sports fields, roads, and yards. The beaches around Barrang Lombo Island are dominated by sandy beaches, only a small part of which are rocky or pebble beaches with a total length of 2809.11 m. Most of the beaches have been constructed of concrete coastal protection structures that also function as security for buildings or houses for residents, especially on the west, east, and north sides with a length of about 2188.92 m. Barrang Lombo Island is a flat island with a maximum height of 200 cm above sea level with a fairly high density level, while the settlement pattern in the Barrang Lombo Islands is circular settlements. This island is also a concentration of public services for other islands in the Spermonde island group in the waters of Makassar City. Barrang Lombo Island is an island that stretches southwest of Sulawesi. Based on the policy overview of the Makassar City Spatial Plan for 2015–2034, the spatial pattern plan for Barrang Lombo Island is as follows: (1) protected areas including conservation areas for coastal areas and small islands and Spermonde waters; (2) areas prone to natural disasters such as tidal waves or sea level rise, coastal abrasion, and sedimentation disasters; (3) medium density residential area; (4) natural tourism area; (5) disaster evacuation room area; and (6) allotment area for capture fisheries in the coastal zone. One of the indirect causes of abrasion is land use change. The increasing pressure on land conversion where the beach on Barrang Lombo Island is shrinking from year to year due to conversion to residential buildings, so that the coastal zone of Barrang Lombo Island is almost completely covered by buildings. The development of the population from year to year as well as various community activities and began to penetrate into trade and services (Table 1).

Based on the results of interviews with residents of Barrang Lombo Island, mangroves still grow on the coast, but as the community activities to park boats and want to get closer to their homes, mangrove trees are cut down because they are considered to be blocking the circulation path of water transportation. Previously on this island there were still areas of mangrove vegetation on the coast. However, over time the increasing activity of fishing communities as well as the need for parking spaces and boat moorings made people to start cutting down mangroves. Due to the perception of the island community, especially those who live in outer areas, the

Table 1 Land Use in Barrang Lombo Island

No.	Land use	Area (Ha)	Percentage (%)
1	Settlement	10.12	46.32
2	Street	0.87	3.96
3	Health	0.02	0.11
4	Education	0.39	1.80
5	Worship	0.17	0.78
6	Offices	0.09	0.41
7	Open space	10.19	46.63
	Total	21.85	100

Source: Barrang Lombo Island Settlement Environmental Management Plan (2021); modified by Amalia (2022)



Fig. 1 Barrang Lombo Island land use pattern. (Source: Barrang Lombo Island Settlement Environment Arrangement Plan (2021); modified by Amalia (2022))

existence of these mangroves hinders the circulation of their boats when they are going to land. Initially, this island was known for its clear waters and the abundance of a variety of fish and other marine animals. However, now the shoreline has become shallow that the bottom can be seen because it is only 1 m deep. Meanwhile, the water depth at the pier is only about 3 m. The increasing area of this island is due to large-scale reclamation by the population in the last 10 years (Fig. 1).

These phenomena are also in line with the result of Veron et al. (2019) study that island is considered as the most vulnerable against climate change, there is expected change in temperature, rainfall, and/or sea level, islands are at risk due to climate change found in all latitudes, for example in Australia, Indonesia, Antarctica, Pacific islands, the United States, and more especially near the equator. Assessing vulnerability of each island is the first step toward risk analysis to identify where climate change is most. One of the factors causing the reduction is inorganic waste that accumulates on the coast. This will certainly have an impact on ecosystem damage

and reduce the ecological role and potential of an ecosystem, including seagrass ecosystems, and have implications for the role of seagrass as a habitat, a place to find food for various organisms where this condition occurs on the south, west, and north sides of the island (Shakeri et al., 2021).

Residential Building: Physical Vulnerability

Physical vulnerability of residential buildings in the condition of residential buildings. Most of them are unfit for habitation. In addition, people who are in the outermost layer of the island live outside the shoreline due to the impact of abrasion with the erosion of land areas. Coastal reclamation is independently carried out by residents as an adaptation of buildings to sea level rise, beach abrasion, and sedimentation disasters. The types of buildings consist of stilt houses with wooden construction, semipermanent houses, and landed houses. There are still many semi-permanent houses that use wood materials, such that when extreme weather often occurs it causes damage to the residence.

Residential Infrastructure Vulnerabilities

Reduced water catchment areas and vegetation density due to the increasing proportion of pavement with paving block surfaces or concrete rebates, violations of the basic building coefficient rules and coastal demarcation lines, and settlements on the edge and above the sea. This results in suboptimal infiltration and the potential for sea level rise every year which increases with high rainfall. Nearly 70% of roads on Barrang Lombo Island do not have drainage. This is based on the public perception that the character of the sandy soil is easy to absorb water, so drainage is not needed. There are 492 meters of existing drainage, but the condition is not maintained and so it smells and causes slums. Some residents who live on the beach need their own drainage as a channel for disposing of their household waste into the sea (gray water waste).

In general, the disaster on Barrang Lombo Island greatly affects vulnerability to water and sanitation conditions. This is because the quality of the infrastructure changes when there is a change in weather, the rainy season and the disaster of sea level rise, abrasion and coastal sedimentation. Based on field observations, it is known that the residents' clean water sources are obtained from dug wells and reservoir piping networks. There are 16 dug wells with brackish water conditions during the dry season, while in the rainy season the conditions are generally fresh. There is 1 unit of public well which is in fresh condition because there is still a lot of vegetation around the well location, including breadfruit. This is also a standard for local communities to identify the presence of water sources. There are nine Reverse Osmosis (RO) drinking water depots that serve drinking water needs with a selling price of Rp. 3500 to Rp. 5000 which are managed by 1 unit of community

institutions and the other by community businesses. Apart from drinking water, sanitation conditions are also vulnerable to disasters. Households on the beach do not have a septic tank and so their wastewater is directly discharged into the sea; the residents' septic tank is adjacent to a well; communal wastewater treatment plants (WWTPs) are available but they have not been able to meet the needs of all residents and are constrained by the cost of maintaining the WWTPs, and gray water waste stagnates on the streets and yards, thereby polluting the environment. From the aspect of the availability of waste management, the location of the islands requires a local and independent waste management system. Because the service system is not integrated into the city system, the location accessibility to the city center is separated by sea waters. The results of identification in the field, there are 4 units of garbage motors transporting residents' waste to a local final processing site (TPA). The TPA's waste processing is still traditional, involving burning, which causes pollution and residue.

Economic Vulnerability Due to Abrasion

In general, the coastal economy of Barrang Lombo Island is very dependent on fishermen because it is the dominant sector and is the main livelihood of the community (82%). So when fishermen's income is disturbed due to seasonal factors (dry and rainy seasons) as well as due to the risk of abrasion, it will automatically have an impact on the decline in other livelihood incomes. In addition to the impact on livelihoods, economic vulnerability from the risk of abrasion is also on assets and income. The vulnerability of the Barrang Lombo community to abrasion disasters has an impact on damaged residential assets where people with high income are able to build embankments and repair their dwellings (low vulnerability). On the other hand, people with low income are less adaptable to disasters (high vulnerability). Spatially, it can be seen in the following vulnerability map (Fig. 2).

Abrasian Disaster Risk Analysis Study

Abrasian disaster risk analysis study is based on the results of interviews with the community from the historical aspects of disasters that have occurred, namely, abrasion, cyclones, fires, tidal waves, and tsunami predictions. The shrinkage of the coastal area is the most obvious impact of coastal abrasion. The waves of ocean currents that usually help the fishermen's departure and return routes or provide a beautiful view and atmosphere on the beach then become terrible. The hard blows on the coast can vibrate rocks and soil which will slowly separate from the land area and become part of the flooded area. This also directly threatens the survival of residents around the coast who have houses or business spaces, such as in the coastal area of Barrang Lombo, where reclamation is carried out by the community; of course they



Fig. 2 The results of the mapping of economic assets of the Barrang Lombo Island livelihood. (Source: Author's Analysis (2022))



Fig. 3 The dwellings affected by abrasion (Source: Author Documentations). (Source: Author's Observation Documentation (2022))

Table 2 Disaster threat

Variable	Indicator	Class	Dignity	Weight	Score	
Threats	Low tide/wave tall	Low	1	50%	0.5	1.5
		High	3			
	Strong wind/low tall	Low	1	50%	0.5	1.5
		High	3			
				100%	1.0	3.0

feel the impact directly, and they need prevention so that the impact does not expand (Fig. 3).

Abrasion disasters occur almost every year; natural factors that can cause abrasion include ebb and flow of seawater, wind over the ocean, ocean waves, and destructive ocean currents. Of course, the natural factors that cause this abrasion cannot be avoided because the sea has its own cycle (Table 2). Abrasion threats are assessed based on indicators of the occurrence of waves/tides and storms/strong winds as follows:

Abrasion vulnerability study is based on indicators of social vulnerability, economic vulnerability, and physical vulnerability. (1) Social vulnerability looks at the level of population density and the presence of vulnerable groups (elderly, children, and people with disabilities). (2) Economic vulnerability looks at the level of the

Table 3 Vulnerability value based on indicators and parameters

Variable	Indicator	Parameter	Class	Dignity	Weight	Score
Vulnerability	Population density	Population density < 200 person/ha	High	1	10%	0.1
		Population density < 200–400 person/ha	Medium	2		0.3
		Population density > 400 person/ha	Low	3		
		Population density < 30% person/ha	Low	1	10%	0.1
		Population density 31–65% person/ha	Medium	2		0.3
		Population density 66–100% person/ha	High	3		
Livelihood	Not disturbed		Low	1	10%	0.1
	Quite disturbed		Medium	2		0.3
	Very disturbed		High	3		
	High		Low	1	10%	0.1
	Medium		Medium	2		0.3
	Low		High	3		
Income	Not experiencing		Low	1	10%	0.1
	Experiencing, but not severe		Medium	2		0.3
	Critical		High	3		
	<50 unit/ha		Low	1	10%	0.1
	50–75 unit/ha		Medium	2		0.3
	>75 unit/ha		High	3		
Building construction	Permanent		Low	1	10%	0.1
	Semipermanent		Medium	2		0.3

			Emergency	High	3	10%	0.1	0.3
Abrasion history		None		Low	1			
		Yes, but not every year		Medium	2			
		Yes and every year		High	3			
The position of the beach with respect to the direction of the wind	East		Low	1	10%	0.1	0.3	
	North-south		Medium	2				
	West		High	3				
Distance from the beach	>50 meters		Low	1	10%	0.1	0.3	
	10-50 meters		Medium	2				
	<10 meters		High	3				
					100%	0.8	2.4	

Table 4 Vulnerability classification

No.	RT-RW	Vulnerability			Income	Damage of assets	Building density	Building construction	Abrasion history	The position of beach	Distance from beach	Score	Class
		Population density	Vulnerable group	Livelihood									
1	RT001- RW001	2	3	2	3	2	2	2	3	3	2	2.4	Medium
2	RT002- RW001	2	2	2	3	2	1	1	3	3	2	2.1	Medium
3	RT003- RW001	2	3	2	3	2	1	2	3	3	2	2.3	Medium
4	RT004- RW001	2	2	2	2	2	2	1	1	1	3	1.8	Medium
5	RT001- RW002	2	2	3	2	2	2	2	3	3	2	2.3	Medium
6	RT002- RW002	1	2	2	3	2	1	2	1	1	1	1.6	Medium
7	RT003- RW002	2	2	3	2	2	2	2	3	3	2	2.3	Medium
8	RT005- RW002	1	1	2	3	2	1	2	1	1	2	1.6	Medium
9	RT001- RW003	1	1	2	3	2	1	2	1	1	2	1.6	Medium

10	RT003- RW003	2	3	2	3	2	1	3	1	1	1	1	1	1.9	Medium
11	RT005- RW003	3	3	2	3	2	2	2	1	1	2	2	2.1	Medium	
12	RT006- RW003	1	2	2	3	2	1	3	2	3	2	2	2.1	Medium	
13	RT002- RW004	2	1	2	3	2	1	2	3	3	2	2	2.1	Medium	
14	RT003- RW004	2	1	2	3	2	1	2	1	1	1	1	1.6	Medium	
15	RT004- RW004	3	2	2	3	2	3	2	3	3	2	2	2.5	High	
16	RT005- RW004	2	1	2	3	2	1	2	3	3	2	2	2.1	Medium	

Table 5 Capacity to deal with abrasion disaster

Capacity	Institution	None	Low	1	30%	0.3	0.9
		Yes, inactive	Medium	2			
		Yes, active	High	3			
	Beach embankment	None	Low	1	40%	0.4	1.2
		Yes	High	3			
	Mangrove vegetation	None	Low	1	30%	0.3	0.9
		Yes	High	3			
					100%	1.0	3.0

Table 6 Capacity value

Number	Capacity type	Rated capacity (1/2/3)	Notes
1	Institution	2	The population density is quite moderate in the slum delineation location; it is very risky to cause fatalities when abrasion occurs
2	Beach embankment	1	The coastal embankments are only on the north, east, and south sides, while on the west side there is no embankment so it is very vulnerable Against abrasion
3	Mangrove vegetation	1	There has never been a mangrove planting around the island of Barrang Lombo

economy and sources of livelihood. (3) Physical vulnerability looks at the level of building density, the distance between buildings, and building construction (Tables 3 and 4).

Capacity to deal with abrasion is based on organizational indicators, distance of public and social facilities, and presence of coastal embankments and mangrove vegetation (Tables 5, 6 and 7).

Conclusion

Based on the results of the abrasion disaster risk assessment, the level of abrasion disaster risk is in the high and medium categories. There are seven RTs (Veron et al., 2019) that have a high risk of abrasion, namely, RT 001 RW 001, RT 002 RW 001, RT 003 RW 001, RT 001 RW 002, RT 002 RW 003, RT 002 RW 004, RT 004 RW 004, and RT 005 RW 004. Areas at high risk of abrasion are mostly located in the western part of the island due to the influence of sea waves and westerly winds, and mostly there is no coastal embankment in the western part of Barrang Lombo Island. Based on the result of identification in the field, vulnerability analysis, identified sources of threats, vulnerabilities, and capacities that directly affect the risk of abrasion caused. Sources of threats based on successive events are high waves, high tides, and strong winds. Based on observations and studies,

Table 7 The results of the overlay of threat, vulnerability, and capacity studies as described in the abrasion disaster risk map

NO	RT-RW	Threats			Vulnerability						Capacity			Risk							
		Tidal wave	Strong wind	Score	Population density	Vulnerable groups	Wellhood income	Damage to assets	Building density	Building construction history	Beach position	Distance from beach	Score institution	embankment	Vegetation Score	Total score	Total class				
1	RT001-RW001	3	3	3	2	3	2	3	2	2	3	3	2	2,4	2	1	1,3	5,54	High		
2	RT002-RW001	3	3	3	2	2	2	3	2	1	1	3	2	2,1	2	1	1	1,3	4,85	High	
3	RT003-RW001	3	3	3	2	3	2	3	2	1	2	3	2	2,3	2	1	1	1,3	5,31	High	
4	RT004-RW001	1	1	1	2	2	2	2	2	1	1	1	3	1,8	2	1	1	1,3	1,38	Medium	
5	RT001-RW002	3	3	3	2	2	2	3	2	2	3	3	2	2,3	2	1	1	1,3	5,31	High	
6	RT002-RW002	1	1	1	1	2	2	3	2	1	2	1	1	1,6	2	1	1	1,3	1,23	Medium	
7	RT003-RW002	3	3	3	2	2	2	3	2	2	3	3	2	2,3	2	1	1	1,3	5,31	High	
8	RT005-RW002	1	1	1	1	1	2	3	2	1	1	1	2	1,6	2	1	1	1,3	1,23	Medium	
9	RT001-RW003	1	1	1	1	1	2	3	2	1	1	1	2	1,6	2	1	1	1,3	1,23	Medium	
10	RT002-RW003	1	1	1	2	3	2	3	2	1	1	1	1	1,9	2	1	1	1,3	1,46	Medium	
11	RT003-RW003	1	1	1	3	3	2	3	2	2	1	1	2	2,1	2	1	1	1,3	1,62	Medium	
12	RT005-RW003	1	1	1	1	2	2	3	2	1	3	2	3	2	2,1	2	1	1	1,3	1,62	Medium
13	RT002-RW004	3	3	3	2	1	2	3	2	1	2	3	3	2	2,1	2	1	1	1,3	4,85	High
14	RT003-RW004	1	1	1	2	1	2	3	2	1	2	1	1	1,6	2	1	1	1,3	1,23	Medium	
15	RT004-RW004	3	3	3	3	2	2	3	2	3	2	3	3	2	2,5	2	1	1	1,3	5,77	High
16	RT005-RW004	3	3	3	2	1	2	3	2	1	2	3	3	2	2,1	2	1	1	1,3	4,85	High

Sumber ancaman abrasi berdasarkan kejadian:

1. high wave
2. tide water
3. strong winds

vulnerability to abrasion risk is caused by high population density, high building density, vulnerable groups, history of abrasion occurring every year, position of the coast to the west wind direction, and distance from the coast. Meanwhile, the capacity value is low because the coastal embankment is only installed on the east side of the island, there is no mangrove vegetation, and the disaster response agency is less active.

Based on the study in this chapter we conclude that vulnerability to abrasion disaster risk on Barrang Lombo Island is triggered by physical vulnerability where there is a decrease in the quality of basic infrastructure, especially clean water and sanitation due to seawater intrusion during abrasion. Abrasion causes a reduction in the land area of the island so that community housing increases toward the water. This condition affects social vulnerability, namely the high number of children at risk of stunting due to inadequate clean water and sanitation, which has implications for increasing the number of vulnerable groups. Meanwhile, economic vulnerability occurs successively in the dry season, rainy season, sea level rise, tidal flooding, which is then followed by abrasion, which greatly affects the mobility of fishermen in going to sea. So when the source of income of fishermen as the dominant sector on the island is disrupted, it automatically affects the side income of the community in other informal businesses. Thus, the sea is still the main source of livelihood for urban island coastal communities so that abrasion as one of the natural disasters that occurs causes risks of vulnerability for the community in terms of environmental, social, and economic.

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Land Management and Disasters

25

Gaurika Chugh

Contents

Introduction	344
Land (Mis)Management and Land Lost	345
Loss of Land Due to Land Degradation and Desertification	346
Land Lost Due to Coastal Erosion	346
Urbanization and Informal Tenure	347
Land Mismanagement and Its Vulnerability to Disasters	348
Solutions and Recommendations	351
References	352

Abstract

Land lies at the fulcrum of protecting and sustaining the lives, livelihood, and well-being of millions of species and communities. Land is also a central vent of all forms of disasters. Land management in its most pristine existence is critical for disaster preparedness, for mitigation, and for reducing the economic losses caused due to disasters. Through this chapter, an attempt is made to study the interlinks between land use and the growing intensification of disasters. It also highlights how unabated use and exploitation of land reduces the coping capacity of land and makes it even more vulnerable to disaster risks. The interrelationship between land and disaster is thoroughly examined to find out the factors responsible for decline in the productive usage of land and its underlying impact and intensification of disasters that has incurred as a result of unsustainable land management practices. The study underlines how sustainable land-use management practices through protection of the natural habitats can severely reduce the risk and vulnerability and contribute to DRR.

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Keywords

Disaster · Land management · Ecosystem · Development · Disaster risk reduction (DRR)

Introduction

The need for judicious land management is critical for disaster preparedness, for mitigation, and for reducing the economic losses caused due to disasters. Land is a synthesis of different ecosystems, namely, rivers, wetlands, forests, wastelands, drylands, and coastal areas whose prudent use and planning is extremely important to achieve the objectives of disaster risk reduction (DRR). Over the past several decades and centuries, land is exposed to various vagaries of natural and man-made changes that have caused metamorphic changes in land use. Man-made changes have been particularly extrapolated due to various underlying concerns of urbanization, unplanned development, deforestation, and population explosion. The increase in human population is estimated to escalate to 9.8 billion people by 2050 and 11.2 billion by 2100 (IPCC, 2019) that will result in more urbanization, infrastructure buildup, and demand for food, and this would ultimately entail drastic shifts in land management. The escalated pressures on land in the form of land-use changes ultimately result in deforestation, land degradation, coastal erosion, soil erosion, and loss of productivity, thus triggering loss of pristine ecosystem functions and contributing to disaster risk. The key concern is therefore to manage the underlying pressures on land in a sustainable manner that takes into consideration the risks associated with its unbridled and escalated use.

The annual accumulated value of the world's total terrestrial ecosystem services has been estimated as approx. 75 trillion USD in 2011, which is equivalent to the annual global gross domestic product (GDP) of 2007 (IPCC, 2019). There are various global frameworks that have identified land use as a key factor for disaster risk management (Shaw & Banba, 2017), for instance, the Hyogo Framework for Action (HFA, 2005–2015), Sendai Framework for Disaster Risk Reduction (SFDRR, 2015–2030), and Sustainable Development Goals (SDG, 2015–2030). HFA (2005–2015) was the first global framework to rationalize DRR efforts that set forth five priorities for action, namely, institutionalize DRR efforts at both national and local levels; identify, assess, and monitor disaster risks; reduce underlying risk factors; and strengthen disaster preparedness for effective response. Among the priorities listed in HFA, land-use planning is one of the dominant factors to be adopted to reduce disaster risk and vulnerabilities. The global agenda for DRR was further strengthened in the SFDRR that entails four priorities focusing upon understanding disaster risk, strengthening disaster risk governance to manage disaster risks, investing in DRR for resilience, and enhancing disaster preparedness for effective response and to build back better. Land-use management has been the focus of SFDRR in its priorities of action that builds upon mainstreaming disaster risk assessments into land-use policy formulation and implementation. In comparison to

the HFA, the Sendai Framework targeted more on the factors responsible for escalation of disaster risk, of which land management in terms of land-use planning plays a critical role. Sustainable land-use management has been identified as a critical factor to achieve SDGs' targets. Goal 15 of SDG agenda aims to "protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss." The recent "Sustainable Development Report" (2021) provides an overview on the performance of the member countries and has ranked India at 120 out of the total number of 165 countries with a cumulative score of 60.1. India is ranked much below to some of the countries in the South Asian region like Bhutan (70), Sri Lanka (68.1), Nepal (66.5), and Bangladesh (63.5). According to the Sustainable Development Report (2021: 56), sustainable land use has been identified as one of the pivotal societal transformations that is imperative to achieve the SDG goals. It is thus important to have a holistic approach toward sustainable land-use management policies and practices.

While significant efforts have been made by the international and national governments in terms of early warning systems (EWS) and disaster response, the systematic failure of the national governments to strengthen disaster risk governance in terms of growing population, urbanization, and unsustainable land-use management practices has been of great concern. These factors are responsible for increasing the risk and hazards that ultimately enhance our vulnerability to disasters.

Land (Mis)Management and Land Lost

Land lies at the fulcrum of providing a safe and secure habitat to millions of species and native communities whose livelihood depends on land, but at the same time, there are underlying anthropogenic pressures on land for robust development and economic growth that cause inimical threat to growing intensification of disasters. The conundrum between land as a habitat and its unbridled exploitation makes it critical to adopt sustainable land management practices. Land management entails a process of fair and equitable management and utilization of land resources. Land entails a synthesis of different ecosystems whose sustainable planning and use is critical to reduce disaster risks and contribute to DRR. However, escalated pressures on land over centuries in terms of putting pressures on land for agriculture, grazing, urbanization, and economic development have indeed reduced the coping capacity of land to deal with the pressures of climate change and disaster risk. This has indeed caused land degradation, desertification, deforestation, and coastal erosion that have resulted in intensification of disasters in terms of drought, floods, forest fires, etc. This has in fact posed an enormous loss to the ecosystem and is a threat to humanity. Land is thus being lost to the growing intensification of disasters in the form of floods, landslides, and droughts. This section will discuss how substantial pressures on land in terms of land degradation, desertification, coastal erosion, and urbanization have reduced the productivity of land and its pristine nature and made it more vulnerable and fragile to deal with disaster risks.

Loss of Land Due to Land Degradation and Desertification

Land degradation results in loss of ecosystem and is significantly caused due to anthropogenic pressures, unsustainable agricultural practices, land fragmentation, urbanization, population growth, and climate change. It has been estimated by the Desertification and Land Degradation Atlas of India (2021) that out of the total land area of 328.72 million hectares in India, 97.85 million hectares is undergoing land degradation which is 29.77% of the total geographic area (TGA) during 2018–2019. The level and intensity of land degradation witnessed by the country have increased exponentially to 96.40 million hectares (29.32 percent of TGA) and 94.53 million hectares (28.76 percent of TGA) in 2011–2013 and 2003–2005, respectively. There are various factors such as soil erosion, salinity, alkalinity, acidity, mass movement, frost shattering, and waterlogging that cause land degradation, and among them the most significant cause for land degradation has been water erosion which is 11.01 percent followed by vegetable degradation at 9.15 percent and wind erosion at 5.46 percent in the year 2018 and 2019, respectively (Desertification and Land Degradation Atlas of India, 2021). Soil erosion is also a big concern as about 1 millimeter of top soil is lost every year due to erosion, thus causing land degradation (State of India Agriculture Report, 2017: 129).

Desertification, i.e., land degradation within the dryland regions, has also been a major cause of concern, and it is estimated by the report on desertification (2021) that about 83.69 million hectares of land has undergone desertification during 2018–2019. This has also intensified in the recent years from 82.64 million hectares and 81.48 million hectares in 2011–2013 and 2005, respectively. In arid regions, the most significant cause for desertification has been wind erosion, while in semiarid and dry subhumid regions, it has been water erosion and vegetation degradation that are of utmost concern. The report also highlights that more than 50 percent of the land area in the five states of India, i.e., Jharkhand, Rajasthan, Delhi, Gujarat, and Goa, is undergoing desertification and land degradation.

Land Lost Due to Coastal Erosion

The physiography of India includes a long coastline of 7516.6 km that stretches along Arabian Sea in the west and Bay of Bengal in the east. The long coastline comprises nine states which includes 5422.6 km of mainland coastline and 2094 km of island territories. The shoreline along the coast is subject to continuous change due to natural causes such as action of waves, winds, tides, nearshore currents, storms, sea level rise, etc. and is nevertheless exacerbated by anthropogenic factors such as urbanization, development activities, beach sand mining, and destruction of mangroves. This results in depletion of the coastline which results in significant land loss that causes destruction of the ecosystem and natural habitat and poses a great challenge for impending coastal disasters. The National Centre for Coastal Research (NCCR) in its report submitted to the Ministry of Earth Sciences (July 2018) has stated that between 1990 and 2016, 336.52 km of

shoreline (34 percent of cost) has faced erosion. Among the states, West Bengal in the east coast has faced the maximum loss in terms of coastal erosion that accounts for 336.52 km (63 percent), followed by Pondicherry, Kerala, and Tamil Nadu that accounts for a total loss of 23.80 km (57 percent), 263.04 km (45 percent), and 407.05 km (41 percent), respectively. Coastal erosion has also a profound effect in terms of land loss, and this is manifested from the fact that between 1990 and 2016, approx. 231.50 sq. km of land has been lost due to erosion along the coasts. Maximum damage has been accrued to the state of West Bengal that has witnessed a total land loss of 99.05 sq. km. The extent of land loss has been so immense in West Bengal that the NCCR report (2018) reveals that Chumkur island that once covered an area of 133 hectares has been eroded. Similar trends of erosion are also being witnessed in the case of Jumbudweep, Henry, Ghoramara, and Mousini islands of West Bengal region. The eastern part of India that is known for its majestic biodiversity and culture is also experiencing unprecedented loss, e.g., Majuli, which is the largest mid-Atlantic deltaic islands in the world. It has witnessed a massive contraction as it has shrunk from its original size of 1256 sq. km to 515 sq. km.

Urbanization and Informal Tenure

Urbanization is also a driving factor that increases pressures on land and leads to unparalleled expansion of cities and urban agglomeration. This leads to formidable augmentation of cities, development, and infrastructure projects tearing apart the natural habitat and ecosystems that are crucial for disaster preparedness and mitigation. It leads to spatial fragmentation of hinterland to serve the needs of growing urban population and economic growth. According to Pandey et al. (2018), the impact of urban land-use change has been nonlinear, i.e., following multiple changes over time, and it results in devastating consequences over the biosphere through land use, habitat loss, and changes in biogeochemical cycling, climate, and hydrology. As per the Census of India (2011) estimates, India's urban population stands at 31.16 percent of the total population, and the percentage of population living in urban areas has witnessed an upsurge of over 3.35 percent over 2001 estimates (27.81 percent). Among the big metropolitan cities, NCT of Delhi (97.50 percent) and Chandigarh (97.25 percent) are the most urban populated cities (Census of India 2011). Rise in urban population has also led to tremendous increase in the number of cities and towns that has increased from 5161 in 2011 to 7935 in 2011. Rise in urbanization leads to insurmountable challenges for the ecosystem as its upsurge leads to trespassing the natural and safe habitat areas that surround the periphery of urban areas. According to Patra and Kantariya (2014), disaster risk in urban settings is primarily driven by urbanization. The natural habitats in the form of forests, wetlands, mangroves, and lakes act as a buffer to protect the cities from the disaster risks. UN-Habitat in its "World's Cities Report" (2020) has alarmed that less developed regions of East Asia, South Asia, and Africa with three countries – India, China, and Nigeria – are more prone to the growing intensity of urbanization

and will together account for 35 percent of the total rise in global urban population from 2018 to 2050.

Increase in trends in rural-urban migration also results in urbanization, and this results in rise of urban agglomerations in the form of informal tenure settlements and slums. The 2001 census recorded that 43 million (23 percent) population of India's urban population were living in slums, and this statistics increased to 93 million in the 2011 census (Patel, 2017). The World Bank estimates that in 2018, 35.2 percent of the urban population were living in slums. Overcrowding, lack of adequate space and basic facilities, poor sanitation, and informal tenure with dilapidated living conditions and surroundings escalate their disaster risks. Their exposure to unsustainable living conditions disproportionately impacts them and makes them even more vulnerable. For instance, Dharavi, one of the world's largest slum in Mumbai, has a population density of 270,000 people per square kilometer.

Land Mismanagement and Its Vulnerability to Disasters

Land in its most pristine form has been exploited to generate capital out of it in the form of changing its land-use, building infrastructure, factories, industries, unsustainable agricultural practices, markets, and real estate business. This development-led euphoria has bereft the natural habitats out of its ability to sustain its ecosystem functions and protect it from natural hazards or risks. The natural resource base of land that exists in the form of forests, mangroves, wetlands, aquifers, and water channels has been destroyed, and this has been a major underlying cause for the growing intensification of disasters. The natural habitats act as a natural carbon sink which is critical for disaster preparedness and for mitigating risk. As per UNDRR report (2020), between 2000 and 2019, India has witnessed an exponential rise in the number of disasters with 321 catastrophes that makes it the third largest disaster-affected country worldwide after China (577) and the United States (467). The cumulative loss of people affected by disasters between 2000 and 2019 has also been to a great extent witnessed by India (1083 m) and China (1729 m), respectively, that together accounts for 70 percent of the total population affected worldwide.

A major cause for the growing intensification of disasters in the last two decades owes much to the land mismanagement practices that have destroyed the natural habitat areas that once existed to protect the area from disasters. There are numerous instances of land mismanagement that have resulted in the destruction of natural ecosystem and habitats and that have been the major underlying cause for the proliferation of disasters. This ranges from the destruction of mangroves in the Sundarbans region and destruction of ecological fragile zone in the Western Ghats to loss of green cover and water bodies in the major urban cities of India. A thorough examination of these instances has been explicitly discussed in this section to demonstrate the interlinkages between land misuse and proliferation of disasters.

The Sundarbans mangroves which is one of the largest mangrove forest (140,000 ha) that lies on the delta of Ganges, Brahmaputra, and Meghna on the

eastern side of Bay of Bengal has been destroyed and exploited for unnatural use. The ecologically fragile region of Sundarbans that lies on the side of India and Bangladesh has lost 24.55 percent of mangroves, i.e., 136.77 square km of land due to erosion between 1984 and 2018 (Bhargava et al., 2021). A major reason for the loss of land has been due to the conversion of Sundarbans mangroves for paddy cultivation and shrimp farming (Ghosh et al., 2015). Increase in shrimp farming has destroyed the natural habitat of Sundarbans mangroves and made it prone to increased levels of salinity. Increased salinity has the potential to destroy the ecosystem of mangroves which is critical to maintain the sustainability of the region. Mangroves are critical to protect the coastal ecosystem and to mitigate the impact of natural hazards as they act as a safeguard against strong winds, cyclones, tsunamis, and storms. Chakaria Sundarbans that lies in the district of Chittagong region, Bangladesh, in the delta of Matamori River with a recorded area of 71 square miles in 1911 has been completely destroyed due to the rapid expansion of shrimp farming and increased levels of salinity in the region. The destruction of the Chakaria Sundarbans can have similar ramifications in the adjoining Indian side of Sundarbans. There have been land management laws that protect the natural habitat of the region from land-use conversion, for instance, the West Bengal Land Reforms Act (1955) (S. 4D) that explicitly puts any conversion or alteration in land as a cognizable and nonbailable offence; the West Bengal Inland Fisheries (Amendment) Act (1993) (S.17 A) that bars conversion of water area for other use, and the Coastal Aquaculture Authority Act (2005) that prohibits coastal aquaculture in the coastal regulation zone (CRZ) (S. 13 (a, b)). In *S. Jagannath vs Union of India (1996)*, the detrimental impact of the rising shrimp industry on coastal environment and marine ecology was acknowledged. The judgment constituted an authority to protect ecologically fragile region of the coast and implement the precautionary principle and polluter pays principle. It also prohibited shrimp farming within the coastal regulation zone as defined by CRZ notification of 2011. However, the enforcement of these laws has been bleak to give way for rich global prawn industry to set its business in the Sundarbans. This has significantly contributed to increased levels of salinity, deforestation, and loss of biodiversity. The destruction of mangroves has paved the susceptibility of the region to floods and sea level rise, thus resulting in coastal land being lost. Out of the 102 islands in the Sundarbans region, only 54 are inhabited. Ghoramara Island which once comprised of a total area of 26 sq. km has shrunk to just 6.7 square km due to coastal erosion. The once inhabited Ghoramara Island with a population of 40,000 has shrunk to just 5193 as per the 2011 census.

Similar land mismanagement practices in the ecologically fragile zone of Western Ghats are resulting as a backlash in the form of insurmountable disasters in the region. One such instance was the unprecedented Kerala floods of 2018 that swept the incredible “God’s own country.” The unprecedented Kerala floods were the result of lack of preparedness at the institutional level, failure of political leadership to protect the ecosystem, and neglect of local self-governments and communities. The ecological sensitivity of the region was realized much earlier by the “Western Ghats Ecology Expert Panel” (WGEEP, 2011) report that declared that the entire Western Ghats region as an ecologically sensitive area (ESZ). This was the first

groundbreaking report that highlighted the ecological sensitivity of the region that was swept away by the unprecedented change in land use and was leading the region to the vulnerability of impending disasters. Most of the recommendations given in the Gadgil report were dumped aside as it sparked a debate between development and protecting the ecosystem and natural habitat. Singh (2016: 70) had already stated that “any wavering on implementing the CRZ law will make areas closer to water bodies vulnerable to disasters amounting to huge socio-economic destruction and loss of lives.” Kerala is a state with a mosaic of ecosystems that includes forests, mangroves, freshwater lakes, and marine ecosystem which is abode to a variety of rare, endemic, and endangered species of plants, birds, and animals. The rich ecosystem of Kerala is reeling under gigantic anthropogenic pressure in the garb of GDP-centric exclusionary growth that is sweeping off its pristine natural ecosystem that exists in the form of forests, wetlands, and mangroves, and this is resulting in impending disasters in the region. Mangroves have shrunk from 700 km² in 1975 to just 9 km² in 2021 as per the Forest Survey of India (FSI) statistics. There are just three districts in Kerala that include Ernakulam, Kannur, and Kasaragod with moderate and open forest mangrove cover. In terms of agricultural land use, there has been a tremendous reduction in the land utilized for paddy cultivation. This has been replaced by switching over to growing cash crops or utilizing land for developing real estate. The area under paddy cultivation has lowered down drastically from 8.8 lakh hectares in 1970–1971 to 3.2 lakh hectares in 2001–2002 and finally succumbing down to 1.98 lakh hectares in 2019–2020 (Agricultural statistics 2019–2020, Government of Kerala). Interestingly, among the plantation crops (tea, coffee, rubber, and cocoa), the share of rubber plantation is 80.2 percent, and the land utilized for rubber plantation has increased from 4.75 lakh hectares in 2001–2002 to 5.51 hectares in 2019–2020. This has had serious ramifications for the environment and ecosystem as conversion of paddy fields and wetlands impacts groundwater recharge and increases the severity of floods and erosion. Interestingly, the Kerala Conservation of Paddy and Wetland Act that was introduced in 2008 to stop the conversion of wetlands has been amended in 2018 to allow reclamation or conversion of wetlands justifying that this will not adversely affect the cultivation of paddy and free flow of water thereto.

Cities and urban areas are reeling under pressure of excessive heat and are turning into heat chambers. There has been an increase in the mean maximum temperature due to loss of green cover and trees which used to once provide a safety net against rising temperature. Increasing urbanization is resulting in outward expansion of cities and growth of built-up areas. This is indeed resulting in more concretization of land by destroying the green cover and natural habitats of the cities that used to once exist in the forms of lakes, wetlands, water bodies, and city forests. As per India State of Forest Report (ISFR 2021), the top mega urban cities where green cover has drastically reduced are Ahmedabad (from 17.96 sq. km in 2011 to 9.41 in 2021), Bangalore (from 94 sq. km in 2011 to 89.02 sq. km), and Kolkata (from 2.52 sq. km in 2011 to 1.77 sq. km in 2021). These are also cities that are turning into heat islands, and it is expected that the temperature of 70 percent of land surface in Ahmedabad will rise up to 45 degrees Celsius by 2025. Another reason for the rise of

heat temperatures is also due to the loss of water bodies that have the potential to mitigate the heating effect.

Similarly, Bangalore, the magnanimous IT city, is experiencing the woes of urban flooding every year. This is because the city has lost its lifeline that once existed in the form of surface water bodies. Rising urbanization has destroyed the ecosystem of Bangalore that existed in the form of lakes. According to Bruhat Bengaluru Mahanagara Palike (BBMP), there has been unprecedented encroachment over lakes for building infrastructure and industries. This has led to the conversion of 19 lakes into bus stands, golf courses, playgrounds, and real estate housing. BBMP website claims that there are 210 lakes existing in the city. However, a report submitted by the CSIR-National Environmental Engineering Institute in 2020 states that out of the 210 lakes, only 21 are fit for drinking purposes. The rest of them are polluted and are not fit for drinking and about 19 lakes are encroached upon. One of the primary reasons for the recurrent menace of urban flooding in Bangalore city is due to the loss of water bodies and encroachment over these areas that prevents water flow and causes excessive waterlogging in the mainstream areas.

Solutions and Recommendations

Efforts to conserve land and its underlying resources are extremely imperative for reducing the impact of disasters and paving the way for disaster risk reduction. There have been numerous global initiatives for improving land management practices and those have significantly reduced the risk and vulnerability and thus contributed to DRR. For instance, South Korea's efforts to reverse the process of land degradation through reforestation of 2.4 mha of forests in the late 1960s (National Forest Service) and 1970s (Forest Development Program) made a successful contribution to reduce the vulnerabilities associated with disaster risk and also contributed to carbon sequestration (IPCC, 2019; Lee et al., 2018; Kim et al., 2017). Similar efforts were taken by China toward restoration in the wake of severe droughts in 1997 and massive floods in 1998 through various restoration policy initiates such as the National Forest Protection Program (NFPP), the Grain for Green, or the Conversion of Cropland to Forests and Grassland Program (GFGP) (IPCC, 2019: 396). Trees build a natural ecosystem that improves resistance to droughts, fires, and windstorms (Jactel et al., 2017) and provides stability against landslides (Kobayashi & Mori, 2017; IPCC, 2019). Conservation and prevention of soil erosion is also a critical factor to conserve land, and it has been estimated if efforts are taken toward prevention of soil erosion, it could benefit 11 km² of degraded land (Lal, 2014) and improve the resilience of approx. 3.2 billion people affected by land degradation (IPCC, 2019: 601).

Nature-based solutions to conserve land and its ecosystems can also significantly contribute to reducing hazards. As per the recent IPCC report, “coastal ecosystems can help stabilize the shorelines, protect communities against storm surge, and from tidal influenced flooding.” Numerous studies have shown that nature-based approaches can protect the coastal ecosystems. According to Narayan et al.

(2017), wetlands have helped in reducing direct flood damages by US\$ 625 million during Hurricane Sandy (USA). The study conducted by Badola and Hussain (2005) reveals the ecological services provided by the Bhitarkanika mangrove system during the super cyclone of 1999 in Odisha helped in prevention of extreme life and livelihood loss. The study revealed that in villages protected by mangroves witnessed less damage as compared to those with little or no protection (Badola & Hussain, 2005). According to Badola and Hussain (2005: 85), “economic loss witnessed per household was greatest in village that had an embankment (US\$ 153.74), followed by village with no protection (US\$ 44.02), and was lowest in the village that was protected by mangroves (\$33.31).”

It is estimated that for every dollar that is spent on disaster risk management, countries can prevent economic losses of 4 USD or more emerging out of disasters (Mechler, 2016; IPCC, 2019). It is thus imperative to identify, recognize, and respond to the vulnerabilities on land and evolve a sustainable land-use management policy that can respond to the rising threat of disasters. Communities can also act as a catalyst in drawing out systematic and sustainable ecosystem-based solution as part of land management practices that can help in disaster preparedness and mitigation. There is also a need to strengthen legal and institutional preparedness for implementing land management practices that is crucial for disaster preparedness and risk reduction. Lack of accountability and lackadaisical approach of the authorities makes the due process for implementing the law difficult and cumbersome. There is a need for institutional preparedness at all levels – state, district, sub-district, and local levels – to enforce land-use restrictions and make the authorities accountable to any sort of callous embezzlement.

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Fishers, Community Resilience, and Disaster Management: Learning from the Grassroots of Odisha, India

26

Swarnamayee Tripathy

Contents

Introduction	356
The Profile of Indian Fishers	357
Disaster Management and Development	358
Understanding Community Resilience	359
The Research Setting	361
Public Policies for the Welfare of Fishers	363
Discussions	364
Way Forward	366
Conclusion	367
References	367

Abstract

Disaster and development are inextricably interlinked. The lesser the risk in a disaster, the better the outcome of development. One of the prescribed strategies in the Sendai Framework of Action for Disaster Risk Reduction 2015–2030 is to find out community resilience mechanisms that men have been adopting as survival strategies even before the state comes to their rescue.

Coping strategies of the coastal population provide a pointer to study the resilience of certain livelihoods which can stand against the fury of disasters. Fishers, who are exploring their livelihoods in water for generations, experience the after-effects of disaster in various ways. Different research studies indicate that they adopt coping strategies to trade through the crisis.

This chapter is an attempt to find out the disaster-resilient techniques adopted by the fishers in India which has a long coastline. The author argues that documentation of community practices to save livelihoods on the eve of the onset of a disaster through micro-research will be a pointer for policymakers to take into account the mechanisms of community resilience. This will help them to

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“Build Back Better” while framing a public policy for disaster management. Institutionalization of best practices will make the disaster-prone coastal areas safer and communities stronger.

Keywords

Coping strategies · Fishers · Fisherwomen · Community resilience · Disaster management · Sendai Framework

Introduction

Coping strategies of the coastal population provide a pointer to study the resilience of certain livelihoods which can stand against the fury of disasters. The devastating deluge in Kerala, India, witnessed the emergence of fishermen as saviors when hundreds of them decided to trade through flood waters to venture into areas that the Navy could not reach. They saved thousands of lives. This is an important case study for disaster research in social science. This expresses their resilience in a post-disaster situation and innovative thinking to trade through the crisis. This observation has prompted the present study.

Fish is an essential component of a balanced diet. It is full of macrominerals, vitamins, and minerals and ensures nutrition to three billion people across the globe. Sumaila and his research team have found in their study that the consumption of fish is much higher among the least developed and developing countries (Sumaila et al., 2016). For people of South Asia and Southeast Asia, fish is an essential food item in everyday meal. Fishing as a livelihood option is most common among a particular social group residing along the coast. Badjeck and his team have stated based on their repeated research that 90% of the fishers are small-scale entrepreneurs who use the conventional method of catching fish (Badjeck et al., 2010, 2013). These fishers do fishing in rivers or shallower seas within 4–5 kilometers from the coast with very little capital investment. Moreover, fish farming provides livelihood security to the poor coastal population in South Asia and Southeast Asia. Shrestha and his research team, in their research conducted in 2019, state “Aquaculture is emerging as a prime rural industry in India and Bangladesh, contributing to employment generation, food and nutritional security, poverty alleviation and an increase in export earnings” (Hossain & Shrestha, 2019: 334).

The life of a fisherman or a fisherwoman is full of struggle. From catching fish to drying them in the sun, the life of a fisher is hectic and tiring. Fisherwomen are engaged in hanging fish on a structure made of bamboo poles to sun-dry them and remove them after sun-drying. In the slack season, they stitch the fishnet. Many times, they go for scaling fish as a fish worker. They are also engaged in the sale of fish in the informal market moving from door to door. Social customs, traditions, and divisions based on caste limit the livelihood opportunities for fishers and particularly women. Despite varied roles in the fishing industry as fishers and fish workers, women’s earnings are very little compared to men. Besides, traditional perceptions

of women's role within the family combine to assign women a subservient status in the community.

Further, the fishing sector is highly affected by climatic change and the rise in sea temperature. Along with the commercialization in fishing that marginalizes small fisherfolk, the frequent occurrence of disasters along the seacoast has broken their backbone and pushed them into the vicious circle of poverty. Therefore, they develop survival strategies through "social engineering" in the community.

The number of fishers and fish farmers amounted to approximately 800 million across the world (Worldfish, 2019). In a study undertaken by the Southeast Asian Fisheries Development Center, it was stated that countries from Asia are among the major fish producers, contributing about 51.2% to the total fishery production from 2014 to 2018 (May 19, 2022) (South East Asian Fish Development Centre 2022). The South Asian region contributes 27.3% of the world's fish production (Shrestha et al., 2019: 334). This region has diversified aquatic ecosystems that encourage fishing as a livelihood for the coastal population. The population of South Asia constitutes one-fourth of the global population. This region has a long coastline of 12,000 kilometers. Bangladesh, India, Maldives, Sri Lanka, and Pakistan have shared this coastline. The other three land-locked South Asian countries, namely, Nepal, Afghanistan, and Bhutan, produce fish from their inland waterways and rivers.

The Profile of Indian Fishers

Due to its riverine ecology and 8129 kilometers (5051 miles) of coastline, India has a long history of fishing. This has become a culture in the country. Subsequently, fishing has become an intricate part of India's economy. Indians incline fishing in ponds and canals as a hobby. The country has 3827 fishing villages and 1914 traditional fish landing centers (Pai, 2017: 1). The Government of India has classified the inland water resources as rivers, canals, reservoirs, tanks and ponds, beels, oxbow lakes, derelict water, and brackish water. Total water bodies excluding rivers and canals cover an area of about seven million hectares. Odisha has been placed at the top as regards the total area of brackish water followed by Gujarat, Kerala, and West Bengal (Govt. of India, 2022). The total area of inland water resources is, thus, unevenly distributed over the country with five states, namely, Odisha, Andhra Pradesh, Gujarat, Karnataka, and West Bengal, accounting for more than half of the country's inland water bodies. India is the second largest fish-producing country in the world next to China with an annual fish production of about 9.06 million metric tons (FAO-UN, 2022).

Fishing has been treated as a sub-sector within the agricultural sector of the Indian economy, and the fishers have been designated as "fish farmers" in official records. In 2019–2020, the fishing sector made a value addition of 1.24% of the total gross value addition to the economy of the country (Economic Survey, 2021: 243). V. Vyshnavi and Rao in their research study have stated that India's water and

natural resources offer tenfold growth potential in aquaculture or farm-fishing (2016) (Sree Vyshnavi and Venkata 2016).

Economic Survey of India for the financial year 2020–2021 states “The livelihood opportunities provided by this sector have been instrumental in sustaining incomes of over 28 million people in India, especially the marginalized and vulnerable communities, and has promoted meaningful socio-economic development” (2021: 243). People are engaged in this sector as fish farmers, fishers, fish workers, and fish-food processors. Fishing has been considered a male domain for a long time; therefore, women fishers remained invisible in official statistics. However, in the late 1980s, researchers began researching them (Harper et al., 2020). Women do small catches for their home consumption and also sell a part of it to earn income for themselves and their families. Thus, women fishers have become a part of the subsistence sub-sector of the national economy. These findings underscore the role of women in the value chain of the fishing sector.

Fishing in India is a US\$ 6.73 billion major industry driven by the rapid development of brackish water aquaculture (India Brand Equity Foundation, 2021). In 2020, aquaculture accounted for 70–80% of the country’s total fishery exports.

However, the social actors in this multi-billion export industry are very poor. Their social status in India’s caste-ridden society is very low. They have little education and live under improper housing conditions. With a very low income from fishing, they support a large family as they are yet to realize the advantages of a small family. Consequently, at times, they borrow and fall into a debt trap.

Since the fishing community resides in coastal districts and states, they are most affected when disasters like cyclones or floods affect the coastal areas. The fishers lose their livelihood earnings due to the damage to boats during a cyclone or avoid going fishing due to fear of the sea in a post-disaster situation. Besides, in a post-disaster situation, the market for seafood plummets due to the fear of disease and water contamination of fish. This issue persists despite the efforts of health authorities to clear this fear and apprehension throughout the region. This further complicates the lives of those fishers who want to resume their livelihood. Low rainfall also affects fish culture.

Therefore, while strategizing management of disaster situations, it is important to keep in mind the management of the impact of disasters on the fishing community in India. The chapter attempts to document the resilience mechanisms adopted by fishers in a small administrative block of Odisha, a coastal state in India. The author argues that documentation of the best practices of communities to counter disasters will result in knowledge production and enable the fishers to learn from each other.

Disaster Management and Development

Disaster and development are inextricably interlinked. The lesser the risk in a disaster, the better the outcome of development. Therefore, the Sendai Framework of Action for Disaster Risk Reduction 2015–2030 announced a paradigm shift and

gave the call to the member states to focus more on risk reduction strategies that are to be adopted in a pre-disaster situation. In the contemporary intellectual debate on disaster mitigation, the often referred to acronym DRR (disaster risk reduction) has been replaced by new acronym, i.e., RRM (resilience building, risk reduction, and mitigation) (Amita Singh, 2018). The new paradigm prioritizes resilience building of communities against the fury of disasters, reduction of consequent risks due to disasters, and disaster mitigation.

One of the prescribed strategies in the “RRM” approach is to find out community resilience mechanisms that men have been adopting as survival strategies even before the state comes to their rescue. The RRM approach interprets “resilience” as the capacity of life to withstand nature and human frailties.

This chapter argues that the institutionalization of community resilience mechanism will go a long way in capacity-building to reduce disaster risks. This study is an attempt to find out the disaster-resilient techniques adopted by a particular community whose livelihood is most affected during a disaster. One such community is the fishing community across the globe.

The chapter has four sections. The first section gives the theoretical framework of the study. The socioeconomic condition of the fishing community in India and the issues of fishermen are given in the second section. The third section states the findings of the study, and the fourth section deals with certain actionable strategies to be adopted for the fishing community that is frequently affected by disasters.

Understanding Community Resilience

The sudden entry of disasters into one’s life and their after-effects do not make one feel that he/she is unfortunate. Disasters strike hard on a mass scale. The impact of natural disasters has been more profound during the last few years. Mega-disasters create vulnerability. Vulnerability, risk, and resilience in a disaster situation need to be understood in a different epistemological framework. “Earthquakes do not kill, but bad buildings do” (Walsh, 2010). Viewing in this framework, vulnerability has to be understood as a governance problem. Resilience is the capacity of life to withstand the condition of vulnerability through innovation and to protect oneself. The risk is proportionately related to vulnerability and resilience. Resilience reduces the risk and vulnerability of the community members. Thus, lack of law, weak governance, and a non-participative community convert a hazard into a disaster (Amita Singh, 2018: 27).

Poverty condition reduces the survival strengths of a given population when a disaster strikes. It furthers disaster risks. The population at the lowest level of the social hierarchy is the worst affected.

Though humans have experienced disasters quite often on earth, consciousness about disaster management is a twenty-first-century intellectual exercise. Prior to the millennium, disaster response was limited to short-term relief and rehabilitation.

The World Disasters Report forecasts that the heavy toll of disasters will fail our development targets (UN, 2002). The same understanding has been reiterated by the

2030 Agenda for Sustainable Development of the world. The super cyclone of 1999 and the tsunami of 2004 compelled the national governments to give serious thinking to developing a long-term strategy so that disaster losses can be reduced over time. The pedagogy of this long-term strategy of reducing losses borne out of disaster was a kind of “social engineering.” It was a macromodel or one can say a “mass culture” of disaster management.

Following this model, India enacted the Disaster Management Act of 2005. The main thrust of the disaster management exercise was a huge investment in building infrastructures like disaster shelters and relief camps, developing early warning systems, and maintaining food supply and disaster relief to rehabilitate the disaster-affected to reduce their vulnerabilities. The macromodel did not include an assessment of a disaster-prone area and its local ecology and local community practices. Gradually, this approach appeared to be devoid of humanistic concerns. The paradigm of “disaster risk reduction” gave way to a new approach that focused on documenting and analyzing resilience mechanisms practiced by different communities in different local areas.

Though disaster management has been a major concern in India since the last decade of the twentieth century, it has been realized currently that total disaster risk reduction measures are an ongoing national requirement. The 2005–2015 Agenda adopted by the international community at Hyogo expressed its commitment to “building the resilience of nations and communities to disasters.”

Further, the Sendai Framework 2015 gives a call for strengthening disaster risk governance and to “Build Back Better.” Within this framework of disaster risk reduction, the study aims to investigate the social and spatial reality.

The Sendai Framework of Action has the following essential components which will help us to frame our research questions.

1. Public policy for reducing disaster risks should take into account all dimensions of vulnerability, capacity, exposure of persons and assets, and the nature of hazards.
2. Developing a holistic public policy by integrating all sectors for strong governance to reduce disaster risks.
3. To “Build Back Better” preparedness to counter a disaster situation is significant. In this process, three steps are important: recovery, rehabilitation, and reconstruction.

Based on the Sendai Framework, the South Asian Association for Regional Cooperation has developed a Disaster Management Framework for the South Asian region. The SAARC nations arrived at a consensus on this during the 13th SAARC Summit held in [2005](#). Below are the given key points of this Framework:

- Developing a scientific group of professionals for the effective manning of the disaster management system.
- Prioritizing the reduction of disaster risks in public policies.
- Developing the strength of institutional mechanisms for disaster risk reduction.

- Empowering the communities experiencing frequent disasters.
- Expanding the scope of DRR programs.
- Enhancing the effectiveness of emergency response systems.
- Developing networks and partnerships among sovereign nations.

Against the backdrop of this understanding, this chapter argues that an area-specific approach to disaster management will motivate us to go for micro-studies in disaster management. Secondly, it emphatically states that imposing something exogenous on the local community will create anxiety in their mind. Therefore, it would be of lasting benefit for humans to manage disasters if we encourage resilient social and ecological practices adopted by the community for a long time. These practices are the resultant outcome of human innovation which has developed by using the “community spaces.” Thus, the chapter attempts to find out the social and ecological practices adopted by the fishing communities in India to curb disaster losses over time. The reasons behind focusing our study on fishers are that this section of the population depends on water bodies to earn their livelihood and is more prone to disaster risks.

The Research Setting

The study has been conducted in the state of Odisha. Odisha is the seventh largest fish-producing state in India, the first being Gujarat. Catching fish is an important pastime among the inhabitants of Odisha, though it is a livelihood option for a particular social group, *the Kaibarta*. This group has been designated as Scheduled Castes in the Census of India. Fish is a staple food for the Odias; therefore, the state has an assured market for fish. Further, all non-vegetarian population takes fish, while some of them avoid taking chicken or red meat. With the development of a variety of dishes/cuisine on fish, the demand for fish is increasing continuously. Also, the fishermen of Andhra Pradesh, West Bengal, and Chhattisgarh, the neighboring states, find the market for their fish in Odisha. The fish production in these three neighboring states has increased substantially, whereas the production in Odisha increased marginally. This is a matter of great concern as it affects the livelihoods of fishers, who constitute 3% of the total population of the state.

Home to a 4.19 crore population, Odisha is situated in the eastern part of India. It is a riverine state and has a 480 kilometer coastline. The coastal areas of Odisha have a higher density of population compared to the hilly areas. The sub-tropical climate and littoral location of the state subject it to frequent natural disasters, be it cyclones or storm surges or flashfloods or tsunamis. The rivers have a very little carrying capacity for which breached embankments cause flashfloods.

Due to the littoral location and presence of a large number of water bodies, the fisheries sector in Odisha provides livelihood opportunities to its people. We have discussed in previous paragraphs that the fisheries sector is counted as the primary sector and comes under the agriculture sector. Agriculture and allied activities in Odisha provide livelihood opportunities to 60% of its population. To make it a

vibrant sector, the Government of Odisha has been trying to augment income outcomes from the fisheries sector. Disaster creates constraints in stepping up agricultural production. The State Agricultural Policy 2020 and the Odisha Fisheries Policy 2015 show the path to sustainable development in the agricultural sector. The government has planned to achieve the average productivity of 5 tons of fish per hectare of fish farms. The mission of the state is to double the inland fish production and increase the present level of export earnings to Rs 20,000 crore (Odisha Economic Survey, 2021:96).

In terms of state gross domestic product, the share of the fisheries sector has been continuously increasing from 1.22% in 2011–2012 to 2.12% in 2018–2019 (Odisha Economic Survey, 2019: 54). The *Pioneer, the English Daily newspaper in India* writes, “It’s estimated that a population of about 12 lakh, including 9 lakh inland and 3.33 lakh in the marine sector, depends on fishing for livelihood. The inland fishermen population is highest in Chilika followed by Ganjam, Khordha, Cuttack, Kendrapara, Jajpur, and Puri (Geetanjali 2018). The marine fishermen population is highest in Baleswar, followed by Bhadrak, Jagatsinghpur, Kendrapada, Puri, and Ganjam. The fishing population is located in 3,878 villages all over the state out of which 641 are marine and 3,237 are inland villages. The literacy rate of fisherfolk is 48.15 percent and most of the fishing villages lack basic infrastructures like communication roads, electricity, drinking water, health, sanitary facility, school, and housing.”

Disasters have always affected the contribution of the fisheries sector to SGDP. The sector exhibited a growth of 12.4% in 2012–2013 but was reduced by 1.7% in 2013–2014 due to the damage to fishing equipment during the cyclone Phailin (Odisha Economic Survey, 2019: 54).

All family members of a fisherman who uses traditional fishing boats are engaged in the fishing activity in different roles. The members of the fishing community, engaged in marine fishing, are encountering many problems such as climate change, disasters, and corporatization of the fishing sector. The rise in temperature of the water makes it difficult for fishers to catch fish near the coast as there is a gradual drifting away of fishing zones. Consequently, they have to go to the relatively deep sea to catch fish. Rising sea levels, changing seasonal cycles, and climatic change patterns have adversely affected potential fishing zones in Kerala and Odisha. Numer8 Analytics Pvt. Ltd., a data science firm, has analyzed these changes (Himanshu 2020; Down to Earth, 16 July 2020).

Banerjee and Pasha in their study conducted in the Vetka village of Bhitarkanika Wildlife Sanctuary have found that fishermen’s households search for alternative livelihoods to overcome the loss of their primary occupation of fishing and dependence on forest products (Banerjee & Pasha, 2017:7). Sixty percent of the respondents in the study shared that mangroves enhance the productivity of marine and estuarine fish, prawns, and crabs which contribute to the growth of the fishery ecosystem, and with the decline of mangroves, there is also a decline in the fisheries (Banerjee & Pasha, 2017:7). During the poaching phase of the ‘olive ridley sea turtle’ and ‘crocodile census’, fishing is banned for 7 months from January to July in Bhitarkanika. The Government of Odisha compensates for this loss by providing

Rs7500 to more than 14,000 fishers. Another media report states that fishers are demanding to reduce the ban period by 2 months and enhance the compensation amount to Rs 10,000.

Displacement is a common experience with those fishers who reside in coastal areas as these areas are increasingly chosen for new industrial ventures and tourism. Further, fishing communities, who have been living along the coasts for generations, rarely have any “legal titles” to their land and, thus, do not get any compensation amount for being displaced (Naskar, 2018). Economically and politically weak, they often have little option but to leave their traditional lands in the face of pressure from the private entrepreneurs and the government.

Public Policies for the Welfare of Fishers

The Odisha Fisheries Policy 2015 is a comprehensive public policy aimed at developing livelihood opportunities for fishers in the state. The said policy emphasizes reviving primary fishers’ cooperative societies, providing financial support for cultivating finfish seeds in hatcheries and developing new ponds, and providing input support to WSHG and cooperative societies for inland fish production or pisciculture and marine fishing vessels. In other words, the public policies aimed at creating a robust support system for the fishers of Odisha to ensure the sustainability of their livelihood. Every fisher in a coastal village is provided with a marine card by which he gets subsidized rice from the PDS outfit as compensation under the World Bank-funded Integrated Coastal Zone Management Program. To meet the shortage of technical manpower in rural areas and to provide technical advice, the Government of Odisha has made provisions for higher education in fisheries. The state of Odisha collaborated with WorldFish in 2018 to conduct a study of reservoirs for cage culture 2018 and initiated the scheme of input assistance to the private sector in collaboration with primary cooperative societies. It is said cage fish culture in reservoirs is a “floating ATM.”

Below are given the names of a few welfare schemes to ensure the social security of the fishers, introduced by the Government of Odisha in Table 1.

The list in Table 1 is not exhaustive; it gives only some of the main policies. The list goes on, but targeted policies are lacking for fishers affected by natural disasters. The fishers in Odisha avail the benefits of the welfare schemes meant for Below Poverty Line (BPL) households. Pradhan Mantri Matsya Sampada Yojana of India, launched in September 2020, is also aiming at providing supplementary livelihoods to the fishers as part of agriculture and allied activities development.

To have the learning from the grassroots, the field study was conducted in the Krushna Prasad Block of Puri district of Odisha where a sizeable number of fishermen reside as natives of the villages. The study has interacted with 100 households of the fishing community in different villages. The study has adopted a qualitative research design that has captured the techniques adopted by the fishermen throughout the year to enhance their resilience against disasters. The research tools used in the study were focus group discussion (FGD), interaction with panchayat

Table 1 Social security for fishers by the state

Sl. no.	Social security policies for fishers	Year of introduction
	Mukhyamantri Krishi Udyog Yojana	1996
1.	Matsya Pokhari Yojana	2017–2018
	Matsyajibi Unnayana Yojana	2016–2017
2.	Financial assistance to WSHG for pisciculture in GP tanks/ponds	2020–2021
3.	Input assistance to private entrepreneurs in collaboration with WSHG/Primary Fishermen Cooperative Societies for cage fish culture in reservoirs	2018–2019
4.	Financial assistance for the construction of new inland ponds	10th Plan (2002–2007)
5.	Financial assistance for the construction of freshwater finfish seed hatcheries	10th Plan (2002–2007)
6.	Financial assistance for fishing equipment	2021–2022
7.	Reviving Fisheries Cooperative Societies	2020–2021
8.	Livelihood support to marine fishers during a ban period	2016–2017
9.	Financial support for deep-sea fishing vessels for fishermen	2020–2021

leaders and important personalities in the villages, and a case study method to document narratives of some fishermen which contains important findings for our study.

The following research questions were explored during our field study.

- What is the socioeconomic status of the fishing community?
- What is the socioeconomic status of fisherwomen?
- What is the impact of disasters on fisher's households?
- What disaster-resilient practices they have been adopting for a long time to stand against a disaster until the administration comes to their assistance?

Discussions

The research study was conducted in Krishnaprasad Block of Puri district of Odisha. Therefore, a discussion on the Puri district is essential to understand the social and ecological nature of the study area. In 1995, for administration convenience, the Puri district was divided into three new districts.

- i. Nayagarh.
- ii. Khurda.
- iii. Puri.

Currently, Puri district has 1714 villages, 1 subdivision, 11 tehsils, 11 blocks, and 1 municipality. It shows that Puri is primarily having a majority of the rural population. 16.9 lakh people reside in the district. The district has a literacy rate of

85.37%. The study area, the Krushnaprasad block, is located in the Puri Sadar subdivision. The conservative society of Puri is reflected in its sex ratio which is 963 females for 1000 males.

The research field area, i.e., Krushnaprasad Block, has 83 villages whose populations range from a minimum of 48 persons to 3222 in Maludkhas village. 42.5% of the population in Maludkhas are Scheduled Castes who have a literacy rate of 82.39%. The block is a rural area having 20 panchayats and no urban area. Twenty-four percent of its population are Scheduled Castes. Only 186 Scheduled Tribes live in this block. However, the literacy rate is 81.51% as per the 2011 census. In 2011, a total of 12,088 families were residing in Krishna Prasad Block (Census of Krishna Prasad Block 2011). The average sex ratio of Krishna Prasad Block is 942. In all panchayats, the ruling political party Biju Janata Dal has a stronghold.

According to the 2011 Census of India, Krushnaprasad Block had a population of 57,505, out of which males constitute 51% of the population and females 49% (2011). It has six marine fishing villages. Twelve percent of the households in the block belong to fisherfolks. In other words, 11% of fishermen in the Puri district reside in this block (Ammini et al., 2008). Four percent of fishermen in this block have formal schooling. Thirty-one percent of fishermen are engaged in actual fishing. Seventy-nine percent of fishermen have a gillnet for fishing. The respondents shared that due to climatic changes, they have to spend more time finding fish. This results in investing more fuel and getting exposed to unpredictable weather conditions. They also shared that they have abject sales margins and have to navigate through middlemen. Sometimes, they migrate to other coasts in search of fish.

It's a general practice among the fishers to respond to the early warning announcements made by the government before the onset of a cyclone. However, the fishers make themselves prepared when they visualize the onset of a cyclone. They call this natural phenomenon "Mahuli" which is the weather condition before the onset of a heavy storm and wind blows from the North. Our research team found the following community practices followed by fishermen when they apprehend the coming of "Mahuli":

- The majority of fishermen use country boats though some of them are using mechanized boats whose engine costs around 3lakhs. When they see the onset of "Mahuli," they take out the engine from the boat and keep it in a safe place in their house.
- Secondly, they choose a place to develop an artificial bay/harbor on the shore. They use gunny bags and grass patches to block it so that seawater does not enter in a large amount during a heavy storm. This creates a strong wall for the bay or a condition of the artificial harbor. After this, they keep the boats there and tie them strongly together with some strong support.
- The alternative practice adopted by them is that they prepare strong carriers with wood and grass which can roll on the sand to carry boats from the seashore to a far-off place. Precisely speaking, wood carriers work as vehicles to carry boats.

- After the shifting of the fishing-boats to a distant place away from the sea, the fishers turn the boat upside down on the sand to face the heavy storm so that wind does not flow away from the boats from them.
- In such a situation, they opt for the distressed sale of their fish. Due to the frequent occurrence of natural disasters, the fishermen experience distress sales quite often.
- Before the shift to the cyclone shelter made by the government, they keep their utensils and valuables in a safe place in someone's pucca house.
- These fishermen are always in a debt trap. Their debts are small debts that range between Rs 30,000 and Rs. 50,000. But, they are not in a condition for years together to pay back the debt. Therefore, indebtedness is a regular feature in fishermen's lives. This is the major reason behind their distress migration for livelihood.
- The majority of the fishers are marginal fish farmers having two to three nets. They own 1 acre to 1.5 acres of land. The fishermen with small boats experience a variety of hazards as they avoid going to the deep sea and operate near the coast. If the net catches turtles, it gets damaged. Till they arrange a new net, they remain at home without any livelihood earnings. In contrast to this, entrepreneurs with trawlers do not experience such hurdles in their business as they go deep inside the sea.
- Further, the introduction of modern technology and equipment like gillnets, fishing gear, etc. has happened due to the modernization of the fishing sector. Small and marginal fishers lack the finance to have access to this modern equipment. This has resulted in a loss of family businesses and converted them into workers in privately owned big trawlers.
- Fisherwomen have very little access to credits and fall prey to the informal loan network. They fall into the debt trap by borrowing money from the village money lender at a higher rate of interest. They continue with their trade with the help of the male members of the community. Many women own boats and nets but are unable to go fishing independently. Thus, fishing remains a male activity in the community. This has worked as a barrier to women's development in the community.
- In spite of the supportive public policies of the Government of Odisha, there has been no visible improvement in the economic condition of the fisher's households.

Way Forward

During our conversation, the fishers shared that if the administration provides assistance to support and sustain their community practices to stand against a disaster, it would be of great help to them. They expressed that such disaster-resilient practices followed in different countries are required to be documented through research. The traditional community practices, if supported along with knowledge on the use of modern technology, will make them stronger by developing

their resilience against disasters. Institutionalizing community resilience practices would help us to prepare ourselves to counter frequent disasters.

Further, recognition of rights of access to resources of traditional fishing communities is of foremost priority in a democratic state. Fishing involves long hours and strenuous work in a marine environment that may get disturbed suddenly by atmospheric conditions. Therefore, injury and fatality rates are much higher in the fishing sector. The International Labour Organization has taken note of these hazards to fishers and developed the ILO Fishing Convention 2007 (no. 188) and ILO Recommendations (Convention No. 199) for developing a social security net for regulating the living and working standards of fishers. The objectives of these Conventions are to ensure a decent standard of work conditions for fishers on board the fishing vessels, conditions of service, accommodation and food, occupational safety, and healthcare. Governance reforms are required as per these Conventions.

Conclusion

Each ecosystem and the fishers in it have specific problems. Therefore, an area-specific approach in public policies will help the fisher's households to "Build Back Better" in a post-disaster situation.

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Migrant Urban Settlements and Disaster Management

27

Gaurika Chugh

Contents

Introduction	370
Vulnerability of Migrants in Urban Spaces	371
Vulnerability During Disaster Response: How to Build Back Better?	374
Community-Based Efforts in Disaster Risk Management: Lessons Learned	375
Conclusion	377
References	377

Abstract

Urban cities which look smart with towering structures, massive infrastructure, have their backbone in the migrant labor, but they are also the ones which are most vulnerable to the plight of disasters. Migrant labor move to cities for better livelihood and income opportunities, but the city's landscape with its high rental rates, unplanned growth, does not accommodate the needs of the migrant population thus pushing them to periphery. Migrant communities usually occupy spaces that are hazard-prone areas and are vulnerable to disaster risk. These spaces come up as squatters, slums, and jhuggis that lack formal recognition of ownership rights with dwindled space, lack of basic infrastructure, and have higher population density that adds to the vulnerability of migrant communities. This affects the coping capacity of the migrant communities in the aftermath of a disaster, and it also poses a greater risk to these vulnerable communities in disaster response and recovery. This chapter argues that the migrant communities occupying spaces in hazard-prone areas differ in their context and vulnerability; therefore, there is no one-size-fits-all approach in disaster risk management. It therefore needs a bottom-up community-based participatory approach that integrates the efforts of communities in disaster preparedness, risk, and resilience.

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Keywords

Migration · Informal settlements · Disaster · Risk · Vulnerability

Introduction

The contribution of migrant labor to the formation of cities has been magnanimous. It cannot be denied that behind the veil of glitterati of smart cities lies the gigantic labor of migrants that has helped in shaping up of the cities to its livable form of enormous infrastructure, highways, urban centers, ports, real estate, industries, and townships. As cities expand, their share of migrant population also increases and contributes to the building up of its infrastructure and housing needs. For instance, Gurugram which is known as the Millennium City of India witnessed a massive rise of migrants with its in-migration levels escalating to 29 per cent between 2001 and 2011 ([Economic Survey 2016–2017](#)). The Census 2011 data on migration reveals that growth rate for migrant labor increased from 2.4 per cent per annum between 1991 and 2001 to 4.5 per cent in the next decade from 2001 to 2011. However, this runs contrary to the Economic Survey 2016–2017 data that says that the share of migrant population is more than 100 million as labor migration in India tends to be circular in nature, i.e., moving from one place to another for better livelihood and economic opportunities. The data brought about by the Economic Survey 2016–2017 on the rate of migration examines the unreserved railway passenger data between 2011 and 2016 and brings to light that Delhi accounted for maximum in-migration population followed by Maharashtra, Goa, and Tamil Nadu in 2015–2016. This was juxtaposed to the Hindi heartland states like Uttar Pradesh and Bihar that accounted for maximum population of total-out migrants.

Cities which look smart with massive, gigantic structures have their backbone in the migrant labor, but they are also most vulnerable to disasters due to their unplanned growth and expansion. The problem of disaster management in cities has much to do with rural-urban migration, high rental rates, and proliferation of lower-income households living in slums. Urban cities offer huge potential to migrants to scale up their income opportunities and economic well-being, but these spaces are also marked by vulnerability and disaster risk. Due to unavailability of adequate housing and higher cost of living, migrants are forced to live outside the cities around the peripheral areas occupying a city's heartland. Most often, these spaces are characterized as squatters, jhuggis, and slums that are surrounded around railway tracks, ill-drained marshland, coastal wetland, flood-prone areas, mangroves, and landfill sites. These areas make the living condition of migrants prone to climate and disaster risk because they occupy spaces that are vulnerable and are exposed to incessant flooding in low-lying areas, sea-level rise, landslides, and unabated fires.

Vulnerability of migrants was exposed during the Covid-19 pandemic as suddenly migrant population who are mostly informal workers and daily wage earners were left out of jobs. The immediate response to the pandemic across the globe was

overdriven by the imposition of series of lockdown and containment measures that left the vulnerable communities in a state of apprehension. The informal sector was the worst hit as workers were left either without jobs or without an assured income to meet their daily and basic livelihood measures such as expenditures for rent, water, electricity, etc. The situation in India was precarious as a sudden lockdown by the state turned out to be one of the biggest humanitarian disasters (Chugh, 2022). It is estimated that by May 2020, approx. 10.4 million population moved from urban to rural areas (Singh et al., 2020; Choudhury et al., 2022). Urban migrants occupying spaces in squatters and informal settlements were forced to leave their homes due to lack of secure tenure and loss of income (Choudhury et al., 2022). Singh (2021: 160) argues that “Covid-19 pandemic came out in the form of sudden lockdown that led to exodus of migrant labour and the only relief that was sought was not being charged any rent during the lockdown period, but without any security or enforcement they were soon thrown out by the landlords.”

Global frameworks and agreements have highlighted the need for a more community-based preventive approach by including the vulnerable population including migrants as an important stakeholder to achieve the targets of disaster risk reduction. It has been highlighted by the Sendai Framework for Disaster Risk Reduction (SFDRR, 2015–30) that a multihazard, multisectoral, and inclusive approach has to be incorporated that works in unison with the needs and priorities of migrant population to reduce disaster risk. Sustainable Development Goals (SDGs 2015–2030, Goal 11) have also underpinned the need for safe and resilient settlements with access to safe and affordable housing and improvement of slums with basic infrastructure and integrating it with goals of the Sendai framework to have a holistic disaster risk management framework. It also highlighted (Goal 1, 5, 13) formalization of land tenure through guaranteeing ownership and control over land and integrating it with strengthening disaster resilience of vulnerable communities.

Vulnerability of Migrants in Urban Spaces

Slums and squatter settlements generally expand near the peripheries of cities; they occupy spaces in low-lying and vulnerable areas that are prone to the vagaries of unprecedented disasters. These unmitigated urban expansions around the periphery of cities are marked with sociolegal vulnerabilities that add to disaster risk. These habited areas are clustered together with dilapidated and inhumane living conditions which remain outside the bulwark of the local administration. These spaces mostly remain unrecorded and mapped where the residents who occupy these spaces do not have ownership and other legal rights. When a disaster strikes, the migrant population residing in these spaces are most vulnerable to its impact, and there is no effort by the administrative machinery to unwind its repercussions. For instance, the Ghazipur landfill site in East Delhi which was commissioned back in 1984 for solid waste management has now become an abode for migrants as they hail mostly from Uttarakhand, Bihar, Uttar Pradesh, and West Bengal. Most of the migrants residing in this hazard-prone site are manual scavengers and rag pickers. The striking

Ghazipur landfill has become one of the most hazard-prone landfill site that is emitting harmful and poisonous methane gas which is detrimental for the ecosystem and is harmful for the well-being of migrant communities. They are forced to live in these shanty, dilapidated spaces with no proper drainage, sanitation, and pucca houses in a natural hazard-prone area as it is exposed to exacerbated fire accidents. The National Green Tribunal (Before the National Green Tribunal Principal Bench, New Delhi. Item No. 15. Original Application No. 288/2022.) has marked this landfill site as a “time bomb” as it continuously releases the poisonous methane gas that is averse to causing fires and explosion. The height of the landfill site with garbage and toxic waste all around is increasing every year thus turning out to be a health hazard and resulting in increased fire incidents every year.

Apart from the vulnerability of natural hazards in these urban spaces occupied by migrants, the impact of disasters on the informal settlements is much higher in its intensity and proportion as compared to other settlements due to absence of secure land tenure, inhumane livelihood conditions, exclusion, and lack of preparedness. The onslaught of Covid-19 pandemic was a litmus test to the resilience and limited capacity of communities living in informal settlements that mostly constituted migrant population. Informal settlements wrestled with excessive virus transmission due to challenges of high population density and inadequate access to water and sanitation, which made them vulnerable to keeping social distancing and maintaining hygiene (Wilkinson, 2020). Covid-19 pandemic turned out to be a major hotspot in urban informal settlements. For instance, Dharavi (Mumbai, India) which is Asia’s largest urban slum witnessed the worst crisis, and the biggest challenge it faced was how to maintain hygiene and sanitation amid prodigious population density of 354,167 per square km.

As per the World Cities report (2020), 1.6 billion people or 20 percent of the world’s population live in slums. This estimate will further intensify due to shrinkage of livable space in urban areas and urban expansion will more likely extend in low and middle-income countries. These areas remain unrecorded and are neglected by the administration due to failure of formal land markets and planning. UN-Habitat (2003) has defined a slum household that is marked by absence of a resilient infrastructure, access to clean water, sanitation, sufficient living space, and a secure tenure. UN-Habitat statistics reveals that in 2018 approximately 24 percent of the urban population were living in informal settlements and out of these, approximately 54 percent and 38 percent of urban population were living in sub-Saharan Africa and South Asia, respectively. Secure land tenure is not only important from the vantage point of ensuring legal protection from eviction, land grabbing, or displacement, but it is also a sine qua non for providing improvement in housing and physical capital (i.e., access to water, electricity, sanitation, and drainage) (Field, 2005; Gelder, 2009; Nakamura, 2014).

Quality of housing is essential from the perspective of mitigation of vulnerability to disaster hazards such as fire and flooding (McDermott et al., 2021). Secure land rights are inextricably linked to improvement in housing and resilient infrastructure. Investment in housing and infrastructure is a gradual and incremental process that makes the communities resilient and prepared against impending disaster risk.

However, insecure land tenure inhibits the local communities from investing in land and other housing infrastructure as they mostly occupy public land that is averse to eviction and dispossession without any sort of fiscal and rehabilitation support. The potential and lack of resources to stay prepared against disasters and invest in disaster mitigation is more severe in instances where land tenure is insecure (Burby et al., 2003). Intensification of urban slums near low-lying areas and landfill sites makes them vulnerable to increased disaster risk with no motivation to invest in housing. Field (2005) examined a nationwide titling program in Peru to highlight an intricate relationship between tenure security and investment in housing and found that guaranteeing property rights led to an increase in investment in housing in informal settlement. It has also been argued by Nakamura (2014) that tenure formalization initiatives undertaken in India have led to stimulation of housing investments.

Cities across the world occupy just 3 percent of land area which means that urban sprawl is likely to occur in this limited space, thus putting pressure on cities to strive for sustainable living. These informal settlements remain outside the glitterati of megacities and occupy spaces in hazard-prone and low-lying areas due to higher affordability and shrinking of livable space in cities. These spaces remain outside the formal land markets with no enforcement of land administration, land-use planning, and building codes. Mitchell et al. (2015: 191) has argued that “*impact of natural disasters is magnified by inappropriate land-use planning...hazard risk is the cumulative result of deficiencies in previous decisions about land use, land development and building standards.*”

If one looks at the statistics of world’s largest informal settlements in terms of population, they largely occupy spaces in low- and middle-income countries. World’s largest slums lie predominantly in the Africa and Asia region, and these are Manshiyat Nasser, Cairo (2.62 L); Khayellitsha, Cape Town (4 L to 1.2 Mn); Tondo, Manila (6 L); Dharavi, Mumbai (1 Mn); Kibera, Nairobi (1.5 Mn), and Orangi Town, Karachi (1.5 Mn to 2.4 Mn). There is a close link between migrant population occupying spaces in informal settlements and disaster risk as the occurrence and intensity of disasters is much more in low- and middle-income countries, and this is evident from the fact that, between 2000 and 2019, the world recorded 7348 disasters, out of which Asia suffered the maximum with 3068 disasters, followed by Americas (1756) and Africa (1192). In terms of economic loss also, Asia and Pacific suffered the maximum loss as the region lost on an average of 1.6 percent of its GDP to disasters (UNDRR, 2022). This is followed by Africa which is the second most affected region globally, with an economic loss of 0.6 percent of its GDP (UNDRR, 2022). Economic loss due to disasters is relatively more in low and middle-income countries as they suffer 0.8 to 1 percent of their national GDP to disasters as compared to 0.1 to 0.3 percent in high-income countries (Ibid). This is only a tip of the iceberg as there are major lapses by the government to report disaster economic losses. For instance, between 2000 and 2019, only 35 percent and 23 percent of disaster events reported any data for economic losses in Africa and South Asia, respectively (UNDRR, 2020).

Vulnerability During Disaster Response: How to Build Back Better?

It is well perceived that those who are at the margins are the most vulnerable to the impact of a disaster. Disaster impacts the coping capacity of the communities to deal with a sudden catastrophe or outbreak, and thus the Sendai Framework has explicitly mentioned, in its Priority 4, the need to strengthen disaster preparedness for response and to “Build Back Better” through integration of DRR into development measures. Migrants generally settle in areas that do not have the requisite infrastructure to cope with the impact of a disaster, and they also face difficulty in disaster recovery and response as they do not have secure land rights as evidence to prove their ownership. These areas where migrants settle are outside the formalization process, and the local administration does not take necessary steps to recognize these spaces. Lack of secure land title significantly impacts the communities at the periphery who live in informal settlements. Mitchell (2009: 6) argues that *“a secure land title is necessary to respond to disasters in terms of allocating assistance and retribution in reinstating homes and livelihood.”* Legalized land tenure is also important for using land as a collateral to cope with the aftermath of a disaster.

Without any formal recognition of land laws, communities lose their pristine land which is the only source of sustenance and is also crucial for recovery and resilience. The Asian Tsunami of 2004 was most devastating and lethal as more than 228,000 people lost their lives in 14 countries across the Asian region. The pervasive impact of the tsunami was all the more pernicious for the communities located at the periphery due to lack of secure land tenure or loss of title documents during the disaster. This led to land disputes in Aceh (Indonesia) caused by land grabbers as there was lack of clarity over land and prevalence of uncertain inheritance rights (Mitchell, 2009). Many native communities had been occupying land for generations without any formal records; thus, tsunami paved the way for land grabbers to displace native communities – thus transforming public beaches into private goods (Handmer et al., 2006). Mitchell (2009: 4) argues that disasters also caused significant impact on the capacity of land administration systems due to damage to land records, inaccuracy in recording spatial information due to loss of land, damage to boundary and survey marks, and loss of administrative staff.

Impact of insecure land tenure on the resilience of communities was also witnessed during the Bhuj earthquake of 2001 as much of the government land identified in the land records was occupied by informal settlers (UN-Habitat, 2010; Burns, 2010). This paved the way for formalization and regularization of land tenure post 2001 disaster. Legalization of land tenure was primarily *in situ* to respond to the needs of informal settlers (*Ibid*). Similar risk was also faced by the communities in 2013 Typhoon Haiyan that comprised largely of informal settlements as their effort for recovery and reconstruction was severed due to lack of secure tenure (Sarmiento et al., 2020).

The Thomas Fire in Ventura County, California, in 2017 that lasted for more than 40 days resulting in total damage of \$ 2.2 billion forcing 104,000 habitants to

evacuate caused irreparable damage to immigrants in disaster relief, response, and rescue operations (Mendez et al., 2020). California is abode to an approximately 2.6 million undocumented Latino/immigrants, mostly farmworkers or involved in housekeeping jobs (*Ibid*). These immigrants were excluded from receiving disaster relief aid from the Federal Emergency Management Agency and the Disaster Unemployment Assistance program (*Ibid*). Even the disaster warnings that were issued remained out of reach for these immigrants as they were not issued in their native language. These immigrants were forced to live in these natural hazard-prone areas that were vulnerable to forest fires. It is an undeniable fact that when a disaster strikes the cost of it is proportionately higher for those who are at the margins of the governance paradigm. The State also treats them differentially in providing them access to relief and response measures as they do not have the requisite documents that validate their citizenship and legal ownership rights.

Community-Based Efforts in Disaster Risk Management: Lessons Learned

In the context of embedded vulnerabilities of migrant population and intensification of disasters, the solution lies in a nuanced approach that integrates community-based efforts in disaster risk management. This needs a holistic background and understanding of deep entrenched vulnerabilities of migrant population occupying spaces that are informal in nature and prone to natural hazards. These vulnerabilities can range from physical and social marginalization, cultural and language constraints, and absence of legal rights to claim ownership which is important from the vantage point of loss and damage assessment during relief and response measures. Communities have a better understanding of their vulnerabilities and how to deal with these vulnerabilities when a disaster strikes and recover from its impact. Community-based organizations have a stronger cultural understanding of the differentiated vulnerabilities and engage with the communities to identify, analyze, monitor, and evaluate disaster risks (Mendez et al., 2020). Thus, it is important to draw on the knowledge and adaptive capacity of the communities in disaster preparedness, mitigation, and response.

A case study of Portmore, Jamaica (North America), reveals that concerted efforts of communities with different national and local government agencies can reduce disaster risk by securing land tenure. This initiative was undertaken in 2015 by Habitat for Humanity known as Building Resilience and Capacities for Emerging Disasters (BRACED). Approximately one-fourth of the three million population were living in 700 informal settlements that were precarious to hazards with no compliance for building and safety standards. As per the Habitat for Humanity, approximately 45% of the land in the country is unregistered. The project adopted an inclusive and participatory community-based approach by focusing on improving tenure security to improving resilience to disasters. Technology was used as a tool for engaging communities in the formalization process. Through participatory governance measures, communities were engaged in enumeration and mapping of areas

to be undertaken for tenure formalization and enhancing disaster resilience. Formalization of land tenure braced up the communities' efforts to augment access to basic infrastructural needs such as access to drainage, water pipe, and electricity. Sarmiento et al. (2020) argue that ensuring tenure security along with making investments such as addition of brackets, hurricane straps were adopted as preemptive measures to reduce disaster risk and simultaneously reduce vulnerability of informal settlements.

Another case study of Vietnam's National Urban Upgrading Programs (VUUP) in the Mekong Delta Region (MDR), implemented by the World Bank since 2004, has engaged communities in the slum-upgrading process to enhance disaster resilience. The estimated cost of the project was 418 million USD with an additional funding of 160 million USD by International Development Association (IDA) (Garschagen, 2015). Vietnam with an extensive coastline of 3260 kms is one of the most severe and hazard-prone country in the Asia Pacific region. Approximately nine million human population (UN-Habitat) in Vietnam live in informal settlements close to the coasts, low-lying vulnerable areas, and are exposed to hydrometeorological hazards that include cyclones, coastal erosion, floods, and landslides. The complex nature of granting land-use certificates and going through inadvertent insurmountable procedures where the onus for verification of permanent residency lies on the claimant led to the rise of informal settlements (Minnery et al., 2013). The project aimed at in situ upgrading of low-income communities by improvising basic infrastructure and focusing on environment sustainability and institutional strengthening in four cities Can Tho, Hai Phong, Nam Dinh, and Ho Chi Minh. A multisectoral approach was applied by engaging communities with local government to enhance basic infrastructure that aimed at improving the living conditions of inhabitants (Baker, 2012). It aimed at engaging and working with local communities in the planning, design, and implementation of the project (*Ibid*).

These case studies have highlighted that there is no one-size-fits-all or a universally accepted solution for improving the resilience of vulnerable migrant communities and integrating it with DRR efforts. Therefore, there is a need not only to strengthen land laws but also to look closely at the contextualization of migrant communities. They have undertaken different methods like using technology for integrating government and community efforts and slum-upgrading for improving disaster resilience. But a commonality that strikes a cord between all such initiatives is that the role of communities remains the linchpin for reducing the risk and vulnerabilities. There can be inter-regional and intraregional differential understanding of how the spaces occupied by migrants look like based on the various multi-dimensional factors bringing in social, cultural, and disaster vulnerability. Migrant settlement located at the peripheries of urbanized metropolitan city like New Delhi will vary from a squatter located close to the coastal region of Mumbai in terms of social, cultural, and hazard vulnerability. For instance, the coastal city of Mumbai faces immense challenge of hydroclimatic hazards whereas Delhi which is in seismic zone IV faces the challenge of seismic hazards, continuous heat waves, and air pollution.

Conclusion

Community participation should be embedded within the efforts of the state to integrate people-centered community-based efforts in disaster risk reduction. It is the community which is the first responder to avert or deal with any crisis or disaster. Community not only lies at the essence of any public policy framework, but is also the spirit behind how to stay prepared, deal, and recover from the setbacks of a crisis. The HFA (2005–2015) explicitly underlined the need to strengthen community resilience to deal with disasters. This was also recapitulated in the SFDRR (2015–2030) that aimed to integrate “disaster risk reduction efforts into development measures, making nations and communities resilient to disasters.” Migrants constitute an important stakeholder in disaster risk management at the local level, and therefore there is a need to understand their differentiated vulnerabilities, cultural context, and engage with them to reduce disaster risk and strengthen resilience.

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How Local Governments in Kerala Play Crucial Roles During Natural Calamities

28

George Mathew

Contents

Introduction	380
How the Panchayats Came to the Forefront	380
Conclusion	383
References	384

Abstract

Natural disasters were there from the very existence of the human kind and nature in the universe. No place in the world is a disaster-free zone. But, how the challenge is faced by mankind is a matter of great concern. This chapter analyzes how Kerala, geographically situated in a natural disaster-prone area, fought three calamities in 2018, viz., (1) the floods, (2) the Nipah virus, and (3) Covid-19 epidemic, bravely. It focusses on how Kerala society has resilience against calamities and the role of local governments (panchayats) in saving people's lives. The People's Plan Campaign, initiated by the Kerala State Planning Board in August 1996, aimed at strengthening the decentralization process through the local bodies, and it has become an integral part of people's lives in the state. The chapter highlights the success, the state achieved, during calamities in saving people's lives and property, emphasizing the need that the other parts of the country could follow the Kerala model of development, particularly in dealing with disasters of any nature.

Keywords

Disaster · Development · Local government · Resilience

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Introduction

The Kerala state, with a population of 3.46 crores (2018), is geographically situated in a natural disaster-prone area – between 590 kms coastal and 450 kms along the eastern side with Western Ghats. As the climate change is a reality, Kerala has become a victim of disasters. Moreover, Keralites are all over India. Globally in all the countries, there are Malayalees. They are students, employees, employers, and citizens in foreign countries. Therefore, it is no surprise that our students came from Wuhan in January 2020 and the Covid-19 pandemic appeared in Kerala for the first time in India. This chapter focuses on how Kerala society has resilience against calamities and the role of local governments (panchayats) in saving people's lives since 2018.

Natural disasters like cyclones, floods, and landslides which have hit Kerala frequently for the last few years and epidemics like Nipah and Covid-19 have brought the best out of the local bodies which have played a significant role in managing them and bringing succor to the ravaged land and people. The local bodies were primarily responsible for making the people, especially youths, rise like a man forgetting the caste, communal, social, or political differences that divide the state during normal times.

In the year 2018, Kerala had two calamities: (1) the floods and (2) the Nipah virus. The floods in 2018 killed some 500 people, caused more than 5000 landslides, impacted three-fourths of the villages in the state, and temporarily displaced almost 1.5 million people. The total damage and losses were estimated to be worth USD 3.8 billion.

Nipah virus is a deadly pandemic caused by the Nipah virus transmitted from animals and birds. It broke out in Kozhikode and Malappuram districts in 2018, but it was contained quickly.

In 2019 Kerala had the worst flood calamity, more than 120 dead and 1780 houses collapsed in northern Kerala – Malappuram and Wayanad.

Kerala was the first state in the country to report a Covid-19-positive case in January 2020 and quickly declared it a health emergency. Sceptics were later proved wrong as in a few weeks' time the virus spread like a tornado. From end of February, the cases rose steeply in Kerala and topped the charts along with Maharashtra. During the second wave that started from Pathanamthitta, the government launched an action plan consisting of contact tracing of patients, home isolation of primary/secondary contacts, and increasing testing numbers.

How the Panchayats Came to the Forefront

Kerala has been a forerunner of the new panchayats. As early as 1958, the District Councils Bill was introduced in the Kerala state assembly with a view to bring about district government, coordinating the functions of the panchayats and municipalities at the village and district levels.

The election to the district councils on January 21, 1991, was the first election after vesting the district councils with enormous powers (about 150 subjects have been transferred from the state to the districts), making Kerala the federation of districts, a unique feature in the local government system in India. The Institute of Social Sciences conducted a survey of the 1991 election, and it revealed many interesting dimensions of Kerala's sociopolitical and economic aspects as well as the emerging characteristics of political leadership. Out of the 366 members interviewed, 126 were women and 240 were men. The women members were about 34 percent of the total elected members., which was far above the 30 percent reservation for women then being discussed nationally (Institute of Social Sciences, 1991). Today in local governments in Kerala, 52 percent of women get elected. This means a large number of women contest from non-reserved constituencies against men and win the election.

The People's Plan Campaign, initiated by the Kerala State Planning Board in August 1996, aimed at strengthening the decentralization process through the local bodies becomes an integral part of people's lives in the state.

The Kerala People's Plan campaign has brought to the forefront the fundamental role of certain variables: best practices at the microlevel, "think tank" at the state level, civil society associations, political and democratic consciousness of the citizens, and, above all, political will.

Today, Kerala is on the front line in conducting regular elections to the local governments. Kerala has 18,372 elected members in the local governments, and out of this, 15,962 are in the village panchayats.

The undisputable lesson from the people's plan exercise in Kerala was that planning must begin at the grassroots – voicing the survival concerns of the people and prioritizing their needs and choices – and both must be formulated and implemented by people themselves. Apart from electing representatives during election time, participation encapsulates the spirit of democracy, the right to be heard in the public sphere and to play a critical role in decision-making. Such participation takes place only when ordinary people assemble in the Grama Sabhas at regular intervals to discuss, decide, prioritize, and monitor the activities of the panchayat, when nonofficial experts and volunteers prepare the reports, formulate projects, and draft the local plans following a people-centered approach.

In Kerala, the officers play a key role. They spearhead fascinating innovations and win the trust of the local self-governments. Kerala provided a lead in demonstrating how officials can work in cooperation with nonofficials to achieve the set goals.

According to American sociologist Patrick Heller, "nowhere in India are local governments as resourced and as capable as in Kerala... Whether in focalizing containment efforts in hotspots, tracking down those who have been exposed or managing the broad array of direct benefits that have been distributed to migrant workers, the elderly and differently abled, the key has been the capacity of state actors and civil society partners to coordinate their efforts at the level of Panchayats, district and municipalities" (The Hindu, 2020).

Kerala's evolution of a strong public health system laid the foundation for the state to address this current pandemic crisis. On the plank of its *Aardram* mission that focused on providing quality healthcare accessible to the poorest of the poor, 500 primary health centers were upgraded to community health centers, and over 170 health centers in the state were converted into family health centers.

Since the local self-governments in Kerala have the capacity through its skilled human resources, infrastructure, citizen support, and financial base, the panchayats successfully address problems that seem insurmountable. The local government landscape enabled the state to oversee and focus on crisis management holistically. The local government setup along with the strong and proactive support of the district administrative machinery ensured that these measures reached each and every village panchayat or urban part of the state.

According to the Post Disaster Needs Assessment (PDNA) that was prepared by United Nations, ADB, government of Kerala, the World Bank, and the European Union after the 2018 floods, the local governments had a paramount role in achieving the vision of *Nava Keralam* (New Kerala). The report recognized the panchayats' role in restoring services, reconstructing houses, and supporting local economic recovery and other public services. It said that the local government actions "will go a long way not only in restoring normalcy but also in rebuilding a resilient Kerala," stated the PDNA report.

At the panchayat level, ASHA and *Kudumbashree* workers have been given the responsibility to track people who have returned from foreign countries in their areas. A unique program in Kerala is the community kitchens in every panchayat, powered by the network of the *Kudumbashree*. The response to the call for volunteers has been overwhelming.

The Constitution of India (11th Schedule: Article 243G, Subject no.23) stipulates that "Health and sanitation, including hospitals, primary health centers and dispensaries" come under the responsibility of local self-governments, the panchayats. Accordingly, the grassroots institutions for public health service delivery in India, namely, health subcenters, primary health centers (PHC), and community health centers (CHC), should ideally come under the administrative jurisdiction of the Panchayati Raj system.

It may be mentioned here that only in Kerala all the panchayats have the primary health centers. Not only that every panchayat has subcenters and all are well-equipped with medical doctors, paramedics, well-functioning office, and so on. Thus in the panchayats, these primary health centers are the epicenter for the victims of the pandemic.

Kerala's public health system (PHS) comes under the local governments. The PHS network consists of 6000 doctors, 9000 nurses, and 15,000 health workers. Then there is a second line of health workers: Asha workers, *Kudumbasree* health volunteers, Anganwadi workers, hospital development committee members, palliative volunteers, and health activists.

The way panchayats – its elected members, Gram Sabha members – deal with the present crisis is exemplary. Here is a report from the field.

According to a field report, “Kerala Covid fight starts bottom up, panchayats lead the way”: “For the hard-pressed State Government officials say the active support of the local bodies has come as a big boost. On the ground leading the fights are panchayats” (Shaju Philip, 2021).

Mayyil panchayat in Kannur, with a population of 31,000 and 18 wards, has set up a 24 x 7 call center of its own and deployed a rapid response team (RRT) with 140 active volunteers, including college students, youth leaders, daily wagers, and taxi drivers. Every ward has “jagratha committees” comprising a local panchayat member. The focus is on monitoring the Covid-19 cases.

According to K. K. Rishna, panchayat president, “Our call centre is for people to inform us about all their requirements – food, medicine and vehicles to go for Covid tests and vaccination. Three persons have been deployed at the center to alert RRT teams in each ward on the requests received. The idea is to ensure that people do not come out of their homes for even a minor requirement” (Sabrang, 2021).

The panchayat had only one ambulance at the primary health center. But when we asked for more vehicles, a local organization handed over its ambulance and several others their vehicles and taxis.

The elected members of the Kerala village panchayats take courageous efforts to save the people during calamity. Take the case of Ms. Sajimol Francis, member of the Alappuzha district panchayat, who got elected first in 2005 as village panchayat member. During devastating floods in Kerala in August 2018, Sajimol Francis did commendable work.

More than 500 fishermen were sent for more than a week to Alappuzha, Chengannur, Ernakulam, and Aluva – the worst affected areas – on 50–60 boats for rescuing and rehabilitating the victims. Then, as the whole world noticed, fishermen/women became Kerala’s new army. At great risks to their own lives, they reached food, clothes, and medicines to those who were severely affected. The rescue team work was heroic and exemplary. Children got their study materials which were destroyed by the flood waters. Under the leadership of Sajimol Francis, several flood relief camps were set up to provide temporary shelter for the affected people. About Kerala elected panchayat members, one can say: a true leader is the one who knows the way but also shows the way (Institute of Social Sciences, Outstanding Women Panchayat Leaders Award, 2019).

According to Joy Elamon, director general, Kerala Institute of Local Administration: “These local bodies have given space for civil society in Covid management. That is what we see in panchayat level war rooms, call centres and domiciliary care centres. Volunteers along with the people’s representatives, panchayat staff and ASHA workers have made the Covid fight a mass movement” (Sabrang, *ibid.*).

Conclusion

Let me conclude quoting the Reserve Bank of India lauding Kerala’s Covid-19 containment strategy, attributing the success to empowered local governments and a robust healthcare system: “Kerala’s 1200 strong LSGs worked in tandem with the

State government to create effective interventions during the Covid-19 crisis. Intensive contact tracing and case isolation followed by the LSGs succeeded in containing large scale community transmission of the infection” (Covid Fight: RBI Praises Kerala’s Health Sector: Local Self-governments, 2020).

The panchayats were instrumental in spreading awareness, implementation of quarantine and lockdown guidelines, and reaching essential services to people under quarantine.

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Animals in India's Disaster Management Policies

29

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Contents

Introduction	386
Disasters and Cattle Losses	386
Animals in National Policy Framework	387
Role of NDMA in Promoting Animal Welfare	389
Drawbacks and Way Ahead in Absorbing Animal Welfare Policies	391
Conclusion	392
References	393

Abstract

Since long, animals have been brutally lost to disasters despite their owners' best effort to save them. There is a great emotional as well as an economic bond between humans and animals. The State has so far not made animals partners in disaster management plans. This chapter attempts to discuss and extensively survey the cattle losses in disasters and their impact upon human lives and national economy of the country. However, the argument made to express and establish animals as sentient being and attributing "legal personhood" to them may go a long way to sharpen human understanding of animals and an equal amount of attention to them as well during tough times.

Keywords

Parens patriae · Livestocks · Veterinary emergency · Boat-clinics

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Introduction

Animals have been ignored in disaster management policies all across the world till recently, when many powerful authors (Beaudry 2019, Singer 1993, Skopek 2014) and judicial pronouncements (Courts across the world, i.e., Cecilia's 1916, Sierra's 1972 cases) advocated their sentient existence within a world dominated by humans. More recently, Narayan Dutt Bhatt's Uttarakhand High Court¹ (July 2018) case and Karnail Singh's Punjab & Haryana High Court² (May 2019) case recognized that animals breathe and need food, water, shelter, care, and medical attention like humans with whom they also share emotions. So, there is no reason to ignore them in disaster management policies. It is logical, ethical, and legal to give their due to animals when they get washed off in floods, get buried in landslides, and starve for basic needs when trapped in droughts, hurricanes, and fire without a bit of guilt in human-dominated rescue operations. When animals contribute a substantial share in generating resources consumed by humans, these resources should logically also be spent to protect them from many of these calamities. This has been recognized by Courts as falling within the State's moral and legal duty under doctrine of *parens patriae* (the power of the state to act as guardian for those who are unable to care for themselves, which includes children, disabled, etc.). This chapter focuses on cattle only, as author has a long experience in the National Disaster Response Force (NDRF) in India and neighborhood countries, with available authentic data but the argument is applicable equally on other animals as well.

Disasters and Cattle Losses

Natural disaster literature has ignored legitimate concerns for animals, and so neither in law nor in a structure of mitigation has this featured as a policy priority. This has devastated agrarian economy due to lack of a strategy to protect rare and expensive support system of rural households in the form of cattle, horses, sheep, goats, and poultry from floods, landslides, and drought. Agrarian economy is a pleasant blend of animals and crops which form an integral part of more than 70 percent of rural households. India has a large and thriving animal sector contributing around 5% to the GDP. It is blessed with the largest population of cattle and is the largest producer of milk in the world. The value of milk produced alone is more than wheat, rice, oilseeds, and pulses combined.³ For rural population in our country, animals are

¹ Narayan Dutt Bhatt's Uttarakhand Case 2018

² Karnail Singh & Ors vs State Of Haryana on 31 May, 2019, CRR-533-2013

³ Dairy is the single largest agricultural commodity contributing 5% of the national economy and employing more than 8 crore farmers directly. India is ranked first in milk production contributing 23% of global milk production. Milk production in the country has grown at a compound annual growth rate of about 6.2% to reach 209.96 million tons in 2020–2021. Based on data taken from the National Dairy Development Board and DAHD:p.277, Economic Survey 2021–2022. Available at https://www.indiabudget.gov.in/economicsurvey/ebook_es2022/files/basic-html/page277.html

sources of economic well-being, food, security, and companionship, and more importantly they promote generation of wealth. Even during disasters when crops are destroyed, farmers having some highland manage to subsist through livestock. A recent study showed that farmer suicide was less among those who had livestock. Therefore, the challenging task for achieving Sustainable Development Goals (2015–2030) is to protect our livestock through proactive mitigation and capacity building measures with regional and global cooperation.

Indigenous animal breeds have inherent resistance to diseases and withstand diverse climatic conditions. However, despite this embedded strength and growth potential in the Indian animal husbandry sector, there are serious roadblocks to growth in the form of recurrent floods, droughts, and other man-made calamities. In short, lack of a streamlined institutional policy that absorbs shocks from nature and man-made disasters has been generating disaster-triggered poverty in agrarian lives. The flood guidelines of NDMA⁴ reveal that more than 94,830 animals perish every year in just one disaster “floods” every year repeatedly. This is in itself a shocking number and enough to sink rural households in abject poverty, yet if losses and impact on account of other disasters on animals are added to this number, then the developmental efforts in rural areas may appear meaningless. Disaster officials while going through the rescue operations in villages have found equally significant number of other milch animals but which do not get reported or highlighted by the media. Earthquakes, floods, landslides, cyclone, tsunamis, droughts, wild fires, etc. play havoc with human and livestock population. These challenges are increasing manifold with environmental threats which our planet faces today.

Disaster management (DM) is designed to protect, conserve, and safeguard livestock and other animal wealth through preemptive and proactive mitigation measures through regional as well as international support measures. In this context Bangladesh, India, and Nepal as well as Bhutan have entered bilateral animal protection agreements. These agreements rarely become any priority in implementation. Recently, India and Bangladesh signed seven agreements but entered only one on animals and that too for transborder elephant conservation but none on what has become an unending battle between the two nations, that is, cattle in cross-border floods. This neglect also prevents treatment of cattle during cross-border epidemics like lumpy skin disease or foot and mouth diseases.

Animals in National Policy Framework

Article 48A of the Directive Principles of State Policy in Chap. III of the Indian Constitution and in the National Policy on Disaster Management has brought out animal concerns in disaster management with specific recommendations. This becomes important to formulate a policy of preparedness for animals in disasters.

⁴National Disaster Management Authority (NDMA) Flood Guidelines, Government of India, available on <https://ndma.gov.in/Natural-Hazards/Floods>

The Department of Animal Husbandry and Dairying (government of India) has also prepared a disaster management plan which lays down how to protect animals before, during, and after disasters. Significantly, India is the first country in the world to have prepared its national plan on management of animals in emergencies way back in 2016.

In the context of contemporary developments, this issue of management of animals in disasters has assumed greater significance in the wake of emphasis given on livelihood protection in the “Sendai Framework of Disaster Risk Reduction” (SFDRR), 2015–2030. SFDRR, while delineating a clear commitment to the protection of livelihoods, has significantly highlighted the connection of livelihood to productive assets which for a rural terrain are livestock, working animals, tools, and seeds.

Another significant development in this context is the landmark judgment of Uttarakhand High Court on 4th July, 2018,⁵ on protection and welfare of animals. The high court stated that the animal and plant kingdom are one, and in declaring it as such, the apex court relied on the supreme court verdict in Animal Welfare Board vs A. Nagaraja and others.⁶ “The entire animal kingdom, including avian and aquatic animals are hereby declared ‘Legal entities’, having corresponding rights, duties and liabilities of a living person” (Uttarakhand High Court 2018).

The vision enshrined in the National Policy, SFDRR, and Uttarakhand High Court verdict relating to animal welfare calls for legislative support for effective implementation. However, in the Disaster Management Act, 2005, which is otherwise a very well-drafted act, there is no specific mention of animals. This act provides for a three-tier institutional mechanism at national, state, and district levels for implementation of its provisions. But there is no role assigned to the Department of Animal Husbandry. This is a serious gap which needs to be addressed by including appropriate provision relating to management of animals in disaster in the act. It is high time that a much awaited holistic vision that accommodates SDGs’ developmental strategies with commitments to the Sendai Declaration on disaster risk reduction may accelerate sustainable development in disaster-affected villages.

In this backdrop, the India chapter of World Society of Animal Protection (WSAP, now known as World Animal Protection, WAP) conducted an exercise in 2012 to identify the gaps in the field of management of animals in emergencies. This exercise identified the following major gaps:

- Inadequate trained human resources
- Inadequate training infrastructure and facilities
- Department of Animal Husbandry not integrated in the disaster management framework

⁵Narayan Dutt Bhatt vs Union Of India And Others on 4th July, 2018, Writ Petition (PIL) No. 43 of 2014.

⁶Animal Welfare Board vs A Nagaraja and others. SC CIVIL APPEAL NO. 5387 OF 2014, SLP (Civil)No.11686 of 2007.

- Absence of national-, state-, and district-level disaster management plans for management of animals in emergencies
- Lack of awareness among farmers and other stakeholders
- Lack of involvement of knowledge institutions

Role of NDMA in Promoting Animal Welfare

Taking cognizance of this report, the NDMA held a series of meetings with WSAP in 2012–2013, and the following decisions were taken to fill the gaps in the field of management of animals in emergencies:

- To establish Veterinary Emergency Response Units (VERU) in veterinary universities and colleges to impart knowledge and skills to veterinary students on this issue and also to initiate steps for awareness generation among farmers, etc.;
- To train personnel of National Disaster Response Force (NDRF) for swift rescue operations of animals during disasters
- To develop training modules for the National Institute of Disaster Management (NIDM) for capacity building of stakeholders in this field, as per its mandate
- To initiate other steps for effective management of animals in emergencies

In pursuance of above decisions, six centers of VERU were established in the veterinary universities/colleges at Patna, Chennai, Guwahati, Jabalpur, Palampur (HP), and Anand (Gujarat) by NDMA in association with WSAP and state authorities. These VERUs in the states act as regional training centers/center of excellence with the primary task to deliver trainings on animal-specific issues related to disaster management for the veterinary students, para-veterinarians, farmers, communities, and other relevant stakeholders. The VERUs carry specific value addition within the veterinary fraternity for effectively bringing resiliency of the vulnerable communities in the states. VERUs have been established as an integral part of the disaster risk reduction program in the respective states which needs to be emulated by other states as well.

As far as training of responders is concerned, around 300 NDRF personnel have undergone Training of Trainers (ToT) programs organized at different VERUs by the Policy Perspectives Foundation (PPF) in association with World Animal Protection and state administrations. As a result of these trainings, the NDRF has rescued 14,178 animals till mid-2021. The personnel of Bihar State Disaster Response Force have also been trained. The training of responders should be an ongoing process with personnel of SDRF in other states also being trained in animal rescue operations. National Institute of Disaster Management (NIDM), which is mandated to take proactive initiative in organizing capacity building, should organize capacity building and awareness generation programs in this field for all stakeholders in association with State Disaster Management Authorities (SDMAs), training institutions in the states (ATIs), VERUs, and other veterinary institutions. For the success of this

initiative, involvement of Panchayati Raj Institutions (PRIs) would be very important.

Notwithstanding the fact that animal-related issues do not find any mention in the Disaster Management Act, 2005, nor is there any structured institutional mechanism mandated to deal with this subject, many states and veterinary institutions have taken commendable initiatives to deal with this subject. Examples of good initiatives in this field by some of the states and veterinary institutions are as follows.

Bihar is the first Indian state to develop a [Road Map on Disaster Risk Reduction in 2015](#) in line with the Sendai Framework of DRR. This document has an exclusive chapter on “resilient villages” which covers almost all issues dealing with management of animals in emergencies. Bihar is also the first state to establish a VERU center in Bihar Veterinary College to provide essential knowledge, skills, and hands-on training to veterinary students to support emergency needs of animals. The VERU center in Bihar has so far trained 568 veterinary students and 1180 veterinary officers, besides conducting 3 training programs for personnel of NDRF and SDRF and organizing 29 animal health camps and awareness programs to sensitize people of flood- and drought-affected areas.

In Assam, one of the most disaster-prone states, the various provisions relating to mainstreaming animal issues in disaster risk reduction have been included in the Assam Disaster Management Manual, 2015. Considering the fact that this issue is the primary responsibility of the Animal Husbandry and Veterinary Department, their role is identified in the manual. The roles are defined for phases like preparedness, prevention, mitigation, response, recovery, and rehabilitation. The Animal Husbandry (AHD) & Veterinary Council of India (VCI) and Veterinary Department (VD), Assam also has a departmental Disaster Management Plan in place. Other significant initiatives taken by Assam include formation of rapid response teams and introduction of “boat clinic” and mobile veterinary units with 24x7 call center system for door step veterinary services, etc.

Kerala has taken significant initiative in decentralizing disaster management with major responsibilities shifted to the local self-government (LG). The LG disaster management plan is inclusive of animal care. Among other initiatives, the state has gone for identifying potential temporary shelters and also having raised platforms as relief centers for animals at ward levels. The state has also gone for network of trained animal rescuers in fire and rescue departments, civil defense, Aapda Mitra, LG Emergency Response Teams, etc. It has also included animal care requirements in the State Disaster Response Reserve.

Since Rajasthan has scarcity of fodder, cattle camps and fodder depots are being managed by the state DM department in ten drought-affected districts. Rapid response teams have been constituted at district as well as block levels for any emergency situation. Veterinary mobile teams have been constituted with required resources like medicines, vaccines, mineral mixture, etc. to deal with any drought situation. Other significant initiatives include mass vaccination programs of animals in affected areas, identification of space for proper disposal of carcasses, promoting livestock insurance, etc.

In Tamil Nadu, the first VERU in south zone was set up at Madras Veterinary College, Chennai, in 2013. Subsequently VERUs have been established at three other veterinary colleges in the state. Each VERU has a coordinator, two co-coordinators, and four faculty members. These VERUs regularly organize block courses which have three components: knowledge-based trading, skill-based activities, and simulation exercises/mock drills. In association with Tamil Nadu Veterinary and Animal Sciences University (TANUVAS), the Madras Veterinary College has prepared a *Handbook on Management of Animals in Disaster* in 2020. It is a very comprehensive document covering animal handling, wildlife rescue, feeding strategies, disease control, animal shelters, carcass disposal, etc.

Drawbacks and Way Ahead in Absorbing Animal Welfare Policies

As far as these initiatives are concerned, the states are working in silos without any mechanism of sharing of experiences or best practices with other states. Since issues related to management of animals during disasters is important, this needs appropriate institutional coordination and an infrastructure that caters to support varieties of rural animals. Concerns for poverty reduction and food security should work on one platform. Keeping this aim in mind, many nongovernment organizations including Policy Perspectives Foundation and Sphere India organized a national-level workshop under the aegis of Ministry of Animal Husbandry, National Disaster Management Authority (NDMA), and Veterinary Council of India in New Delhi on 22nd of June, 2022. All these ground-level community organizations unanimously agreed to achieve such a framework for action on rural animals and livestock populations trapped in recurrent disasters.

The objective of this workshop was to deliberate on measures to institutionalize animal-related issues in disaster management framework and formulate an appropriate framework of coordination for multi-stakeholders in the field. It also envisaged furthering the initiative to establish Veterinary Emergency Response Units (VERUs) in veterinary universities to impart knowledge and skill to veterinary students, veterinarians, and other stakeholders and capacity building of responders (NDRF, SDRF, etc.) for swift rescue of animals in disasters, besides generating awareness among stakeholders on management of animals in emergencies. The significant feature of these deliberations was high-level participation of key agencies of the government of India, namely, Ministry of AHD, NDMA, and VCI, besides experience sharing by four states (Assam, Kerala, Rajasthan, and UP) and NDRF and presentations by two premier veterinary institutions, namely, Tamil Nadu Veterinary and Animal Sciences University (TANUVAS) and Bihar Veterinary College. The workshop was conducted in hybrid mode.

Referring to a very clear economic rationale to invest in animal protection, the deliberations in this workshop highlighted that strengthening animal protection during disasters would need various measures like laws, regulatory framework, community-based approach, integration of planning process and SOPs in state and district DM plans, capacity building of veterinarians and responders besides

investment in wildlife protection, etc. Some of the key recommendations of this workshop include the following:

- Amending the Disaster Management Act, 2005 to include Animals in DM framework and also to include Secretary, Animal Husbandry in the National Executive Committee
- Promoting training and capacity building on management of animals in emergencies to key stakeholders like veterinarians, para-vets, SDRF, etc. to generate more human resources in this field
- Adopting a community-based approach toward animal protection in disasters by training community representatives, PRIs, "Aapda Mitras," etc.
- Encouraging ex-servicemen from veterinary corps to register themselves with District Disaster Management Authorities to be force multiplier
- Proposing amendment by all the veterinary universities and colleges to Minimum Standards of Veterinary Education (MSVE), 2016, with dedicated chapters on disaster management, DRR, and the challenges relating to disaster management with regard to animals in consultation with VCI
- Establishing more Veterinary Emergency Response Units (VERUs) in veterinary universities and colleges
- Establishing National Digital Animal Health Mission on the lines of National Health Mission to prioritize animal protection
- Furthering the initiative of AHD relating to census of livestock by tagging of animals
- Increasing investment and efforts toward integration of animal protection in disaster management policy and programmatic framework
- Ensuring effective multi-sectoral coordination between Department of Animal Husbandry at center and states, SDMAs, NDRF, and veterinary institutes for disaster preparedness, response, and rescue of animals

Since the key agencies dealing with this issue at the national level, namely, Department of Animal Husbandry, NDMA, and Veterinary Council of India, have been involved in this workshop, hopefully these recommendations will pave way for appropriate amendments in the Disaster Management Act, to include animal care and protection into national, state, and district disaster management plans, inclusion of animal-related issues in the disaster management framework in the country, and an action plan for capacity building of all stakeholders in this field.

Conclusion

Animals deserve attention in disaster management policies from a moral, ethical, and legal reasoning. Economically also the State may not be able to bear the loss of many of these animals. The key agencies dealing with this issue at the national level, namely, Department of Animal Husbandry, NDMA, and Veterinary Council of India, have been involved in deliberations to make a strong case for their inclusion in the

mainstream disaster management policy. Many of their recommendations have already paved the way for appropriate amendments in the Disaster Management Act, to include animal care and protection into national, state, and district Disaster Management Plans, inclusion of animal-related issues in the disaster management framework in the country and an action plan for capacity building of all stakeholders in this field. The future can be made brighter for animals trapped in disasters with certain changes in ground level functioning of governance agencies.

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Management of the Impact of Extremely Severe Cyclonic Storm “Fani” of 2019 in Odisha

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Damodar Panda and Maya Devi

Contents

Introduction	396
Extremely Severe Cyclonic Storm (ESCS) Fani	399
Impacts of Cyclone Fani	400
Preparedness, Prevention, and Mitigation	401
Response and Relief	407
Recovery and Reconstruction	408
Conclusion	409
References	410

Abstract

Odisha is frequently affected by cyclonic storms of various intensities due to its location on the eastern coast of India. In the recent past, very severe cyclonic storm (VSCS) like super cyclone ravaged the state. The state govt. initiated various management practices to lessen the impact of such natural calamities. In this chapter, an attempt has been made to study the management of impact of the most recent tropical cyclonic storm Fani that hit the Odisha coast. Fani hit the Odisha coast near Puri, a coastal town of Odisha on May 3, 2019, at 8:30 A.M. Due to its impact, 14 coastal and adjoining districts were affected with heavy rainfall and wind speed up to 175 kmph. The most severely affected districts were Puri and Khordha. The state govt. took necessary steps to disseminate cyclone warnings received from the India Meteorological Department (IMD) to the likely affected districts before Fani could strike the state in order to reduce the loss of life and property. Necessary preparations were made by

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sending manpower, machine, and relief materials to the districts. As preventive measures, people living in vulnerable areas and livestock were evacuated to the cyclone/flood shelters with necessary arrangements; all kinds of transports were suspended, holiday was declared for the education institutions, and leave of the employees was cancelled. For emergency communication, district collectors were provided satellite-based phones. Due to well-planned measures, human casualty could be minimized. Most of the damages occurred to temporary houses, power transmission line, telecommunication, agriculture, horticulture, livestock, infrastructure, and natural vegetation. Rescue and relief operation started immediately in the affected areas. State govt. provided compensation and subsidy to the affected people on the basis of the state relief code. Steps were taken to restore normalcy on war footing. Damages due to Fani caused heavy economic loss to the state.

Keywords

Preparedness · Response · Warning · Evacuation · Compensation

Introduction

Human sufferings have increased in recent years due to increasing frequency and magnitude of natural and man-made disasters in the world (Akter & Wamba, 2017; Mavhura, 2015). Human lives, properties, and infrastructures are severely affected by these disasters. About 75,000 people were killed and 200 million people affected. The annual economic loss in the last decade due to natural disasters was about 162.2 billion USD and is likely to increase in the future (IFRC, 2015). The factors responsible for increasing disaster risks are global climate change, population growth, inadequate govt. preparedness at national and local level, weak legislation, and absence of disaster management institutions (Mukhtar, 2018; Rivera et al., 2020). Disaster risk can be reduced by adopting multisectoral, multidimensional, and community-based approach for disaster management (Ahmed, 2013). Adoption and implementation of comprehensive disaster management by the government is essential for successful disaster management by (1) government policy on disaster management; (2) enactment of laws for mandates, duties, and responsibilities of the stakeholders; and (3) institutional structures and policy for coordination of local governments and communities (Ishiwatari, 2013; UNISDR, 2015). Many nations of the world have enacted their own DM system, based on their experience, political system, cultures, legal contexts, availability of resources, vulnerability to disasters, and past experiences (GoI, 2013).

Climate of the Earth is changing from its inception, but the recent climate change is adversely affecting the living community (IPCC, 2013; Solomon et al., 2007). Natural disasters (severe cyclonic storm [SCS], flood, drought, etc.) are increasing intensity and frequency due to climate change adversely affecting socioeconomic development and the living communities (Azam et al., 2019).

Tropical cyclones and other weather-related disasters account for 91% of all natural disasters that occurred between 1998 and 2017 in the world (Arrieta et al., 2009). Most of the deaths are due to geophysical disasters, whereas most of the economic loss are due to climate-related disasters. In the period 1998–2007 about 2,245 billion US dollars (or 77% of the total) loss in the world due to geophysical disasters, out of which 59% are due to storms. As most of the disaster losses were not reported, the loss could be much more. Only 13% of climate-related disasters were reported in the developing countries. The 2005 (Wilma, Rita, and Katrina) or 2017 (Maria, Irma, and Harvey) hurricane resulted in economic loss of 245 and 201 billion US dollars, respectively. It shows huge losses due to cyclonic events. With the global climate change, the situation will further deteriorate as the precipitation pattern in the tropical region will be more extreme leading to flooding in association with sea level rise (Berke et al., 1993; CEOS, 2002; Chang & Miles, 2004; Chittibabu et al., 2004; Badola & Hussain, 2005; Chamlee-Wright & Storr, 2011; Chhotray & Few, 2012; Berrang-Ford et al., 2015; Anthes, 2016). On the basis of the above observations, global initiatives are taken for preparedness and prevention to minimize loss under the Sendai Framework for Disaster Risk Reduction 2015–2030, Agenda for Sustainable Development of 2030, the Paris Agreement, and the Addis Ababa Action Agenda (Collins, 2009; Das, 2005; Cretney, 2017; UNDRR 2018). Under the Sendai Framework, it is planned to reduce economic loss, mortality, disruption of basic services, and damages of critical infrastructure by 2030 (Collins, 2009). For long-term recovery from disasters, planning has been made to change from post-disaster response to pre-disaster prevention and preparedness (Collins, 2009). Disaster risk can be reduced based on the assessment of the recovery capability (Dash et al., 2004; Das & Crépin, 2013). For recovery from disaster, it is necessary to understand, identify, and assess essential conditions (Debarati & Below, n.d.; DeSalvo et al., 2007; Das & Crépin, 2013). Recovery rates from disaster depend on environmental, infrastructural, and socioeconomic conditions in different disasters lead to different recovery rates (Das & Crépin, 2013). As not much studied about recovery rate from disaster, it may be quick or delay (Gray, 1968; GoO, 1999; Das & Crépin, 2013). Maximum people were killed and affected leading to economic loss due to natural disasters. Asia is a leading disaster-prone region of the world, especially hydrometeorological disasters like tropical cyclones, which result in maximum loss of life and property (ADRC, 2014). In the assessment report of the intergovernmental panel on climate change, Working Group I (IPCC, 2013) observed that the number of tropical cyclones is not likely to increase, but wind speed and precipitation will increase. Due to the impact of severe tropical cyclones, some coastal regions are severely damaged. In terms of the cyclonic storms, the Bay of Bengal is ranked sixth in the world (Iwasaki et al., 2009). The region experienced 26 severe tropical cyclonic storms out of 36 that occurred in the world (Weather underground, 2015).

Usually tropical cyclones develop in the post-monsoon season in the month of October and November in the Bay of Bengal (OSDMA, 2016). Due to the impact of

climate change, the sea surface temperature increases leading to increasing intensity of tropical cyclones in the Bay of Bengal.

Due to disasters, India lost about 79.5 billion dollars between 1998 and 2017. India is one of the top ten countries of the world in terms of loss due to disasters (Arrieta et al., 2009). Among the coastal states of India, Odisha is highly vulnerable to tropical cyclones. Most of the cyclones developed over the Bay of Bengal hit the Odisha coast in the past. In terms of the number of land fall of the tropical cyclones along the Indian coast, the Odisha coast hit by maximum number (29%), West Bengal coast (14%), Andhra Pradesh coast (13%) and Tamil Nadu coast (7%). The Odisha coast is hit by severe cyclonic storm every 4 years and West Bengal coast every 5 years. The revisit period for cyclones to the Odisha coast is 2 years much shorter than other states (Memorandum Fani 2019). The super cyclone of October 29, 1999, with wind speed of 270 to 300 kmph made a landfall at Paradeep in the Odisha coast which was the most intense tropical cyclone developed over the North Indian Ocean.

Odisha with its 480 km long coastline along the Bay of Bengal is the eastern coastal state of India (Fig. 1). The state has 30 districts, of which 6 coastal and 8 adjoining districts are cyclone prone (Mohapatra et al. 2011). Balasore and Bhadrak districts are the most vulnerable districts of the state. These 14 coastal and adjoining districts have a population of 24,862,273 (59.23% of the total population), and the six coastal districts have a population of 13,883,624 (33.07%). Most of the people of the state live in rural areas, and agriculture is their main source of



Fig. 1 Location of the study area – Odisha state

livelihood. More than 75% of people depend on agriculture, and most people live in semipermanent and temporary houses not resilient to cyclone and flood. In rural areas, 66.73% of people and in urban areas 41.58% of people live in such type of houses.

After super cyclone of 1999, Odisha became the first state in India to develop disaster risk management structure. The Odisha State Disaster Management Authority (OSDMA) was formed under the provision of Disaster Management Act, 2005, in the Department of Revenue. The state developed disaster mitigation strategies by huge investment in multipurpose cyclone and flood shelters (OSDMA, 2016).

Extremely Severe Cyclonic Storm (ESCS) Fani

The name "**Fani**" has been chosen from the list of names created by South Asian countries. The name was picked by Bangladesh. Fani is different from other cyclones due to its intensity and took a long time to travel over the sea. After its origin near the equator, it travelled a long distance over the Bay of Bengal and gathered massive strength and moisture. Fani is classified as an extremely severe cyclone (ESC) on the basis of its wind speed. In the last 52 years, Fani is the tenth such cyclone that hit the Indian coast in the month of May. In 2004, such type of cyclone hit the Indian coast in the month of May. In the post-monsoon season (October to December), the east coast of India is normally hit by extremely severe cyclones. IMD has classified the cyclones into five types on the basis of wind speed: cyclonic storm (CS) with a maximum wind speed of 62–88 kmph, severe cyclonic storm (SCS) with a maximum wind speed of 8–119 kmph, very severe cyclonic storm (VSCS) with a maximum wind speed of 119–165 kmph, extremely severe cyclonic storm (ESCS) with a maximum wind speed of 166–220 kmph, and super cyclone (Sup CS) with a maximum wind speed of 221 kmph and more. IMD forecasted on April 21, 2019, the condition ideal for the formation of low pressure in the equatorial Indian Ocean and south Bay of Bengal. The cyclone Fani meandered over the Bay of Bengal for a long time and changed its track many times over the sea. IMD had to revise its forecast nine times before landfall in the Odisha coast. Fani made a landfall in the morning of May 3, 2019 instead of evening or late night as predicted by IMD. After super cyclone of 1999, Fani is the second strongest cyclone that passed over Odisha. After 1976, cyclone Fani passed over India in the month of April. In comparison to the recent past severe cyclonic storm "Titli" and "Phailin," it is more severe. Fani, an extremely severe cyclonic storm (ESCS), made a landfall between Satapada and Puri at 8:30 A.M. with wind speed of 205 kmph and tidal surge of 1.5 meters. It made a landfall in the morning against evening or late night with wind speed of 170–180 kmph predicted by IMD. After the landfall, it continued with same intensity for 6 hours and moved in north-northeastward and entered Khordha district around Bhubaneswar. It passed over Cuttack, Jagatsinghpur, Kendrapara, Jajpur, Bhadrak, Balasore, and Mayurbhanj districts of Odisha and emerged into Gangetic West Bengal as a severe cyclonic storm (SCS) (Fig. 2).

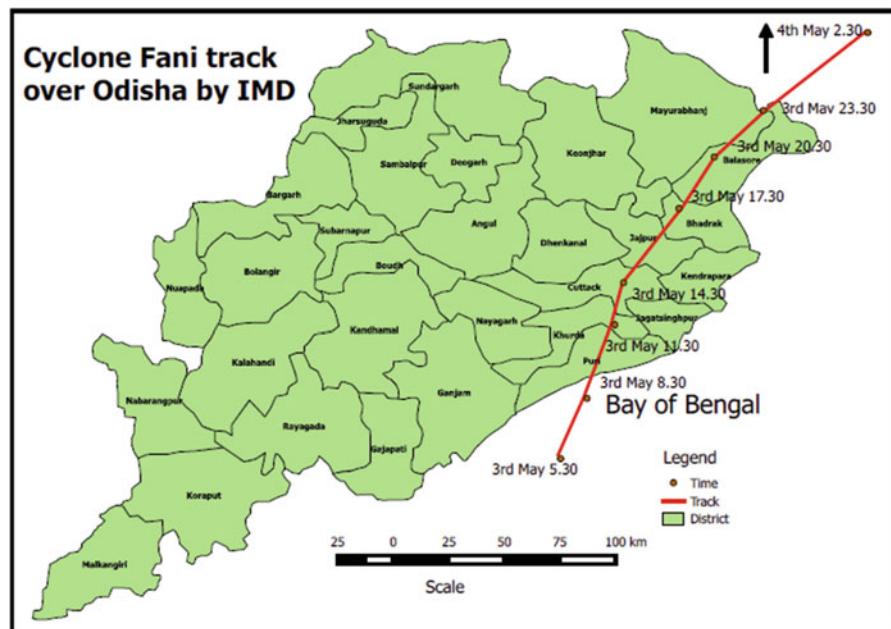


Fig. 2 Track of Fani by IMD

Impacts of Cyclone Fani

Fani hits the coastal Odisha on May 3, 2019, with devastating wind speed, heavy rainfall, and storm surge. Due to the impacts of strong wind and heavy rainfall, thatched houses, trees, power, telecommunication, roads, railways, crops and irrigation systems, and livestock were affected. The affected districts received rainfall of 100–300 mm on May 3 and 4. Khordha district received a maximum rainfall of 187.8 mm, and Angul district received a minimum rainfall of 49.2 mm. 20367 villages were affected. A maximum of 2673 villages in Ganjam district and a minimum of 67 villages in Angul district were affected. About 159 C.D. blocks and 51 urban local bodies were affected. A maximum of 12 urban local bodies were affected in Ganjam district. Total houses damaged were 679155 with a maximum of 323140 houses damaged in Puri district and a minimum of 519 houses damaged in Angul district. About 15993851 people were affected in 14 districts which are about 36% of the population of the state. A maximum of 2502008 people were affected in Khordha district, and a minimum of 5709 people were affected in Angul district. Human casualty minimized through preventive measures taken by the govt., for example, evacuation to cyclone shelters. Total human casualty was 64. A maximum of 39 people were killed in Puri district, the landfall point of Fani. The deaths were due to collapse of the houses and falling of the trees. About 5333186 livestock and poultry birds were killed with a maximum of 2671929 deaths in Puri district.

The total crop area damaged was 181711.4 hectares, with a maximum crop loss in Puri district of 60339 hectares. The total cost of damages of the state was Rs. 933627.23 lakh. Maximum cost of damages in energy department of Rs.115977 lakh and minimum in labor department of Rs.78 lakh. The vulnerability analysis of the state due to Fani has been analyzed, and it was found that out of the 14 affected districts, very highly vulnerable districts are Puri, Khordha, and Cuttack; highly vulnerable districts are Jajpur, Jagatsinghpur, Nayagarh, Balasore, and Ganjam; moderately vulnerable districts are Mayurbhanj, Bhadrak, Dhenkanal, and Kendrapara; and low vulnerable districts are Angul and Keonjhar. The vulnerability decreases with increasing distance from the coast and distance from the track of the cyclone Fani (Table 1 and Figs. 3, 4, and 5).

Preparedness, Prevention, and Mitigation

Fani was monitored on the basis of the forecast of India Meteorological Department (IMD), Joint Typhoon Warning Center (JTWC) of the USA, and Regional Integrated Multi-Hazard Early Warning Systems (RIMES) of Thailand. Massive preparedness was undertaken on receiving the cyclone warning from IMD. People of the likely affected districts were alerted about the cyclone to minimize the loss of life and property. District collectors of 14 coastal and adjoining districts were advised to identify vulnerable people living in temporary houses or living close to the coast or low-lying areas as part of the preventive measures. The vulnerable people will be shifted to the multipurpose cyclone/flood and other safer shelters (Fig. 6). Tourists were evacuated from the coastal districts. Steps were taken to provide safe drinking water, free kitchen, lighting, health, and sanitation facilities at the shelters. To streamline emergency services, control rooms of related departments were functioning on a 24-hour basis. Three hundred power boats of Special Relief Organization were kept ready with crew and fuel for emergency relief operation. To shelter evacuated people, 879 multipurpose cyclone/flood shelters of the Odisha State Disaster Management Authority (OSDMA) were kept ready. For proper preparedness at the shelter level, the district administration consulted with the Cyclone/Flood Shelter Management and Maintenance Committees (CSMMCs/FSMMCs). The volunteers of the shelter-level task force were used to assist the local community for evacuation and any emergency results due the cyclone. Another important step taken by the govt. for livestock protection during cyclones is the identification of 635 animal shelters as school premises and multipurpose cyclone shelters. In order to avoid livestock loss, field veterinarians were instructed to inform the dairy farmers and small animal owners to take necessary measures to shift their animals to safe places. To avoid spilling or leakage of hazardous materials in industries/factories, instructions were issued for safe storage of such materials. Very often matured crops are damaged due to cyclones and associated floods. In order to minimize crop loss of the farmers, district-level officers were advised to circulate agro-based crop advisory to the field functionaries and farmers prepared by Odisha University of Agriculture and

Table 1 Vulnerable districts of Odisha due to cyclone Fani

District	Population affected	Livestock and poultry affected	Number of villages affected	Rain fall in mm	People killed	Livestock killed	Houses damaged	Crop area affected in ha	Vulnerable index
Angul	5709	0	67	49.2	0	0	519	0	Low
Balasore	11333374	62268	2535	120.5	0	32	1188	17775	High
Bhadrak	1015742	6245	910	69.7	0	1530	6295	5907	Medium
Cuttack	1689432	1673785	2062	171.1	6	1187403	120724	15868	Very high
Dhenkanal	302461	0	961	128.1	0	4515	4330	2063	Medium
Ganjam	2000000	173709	2673	111.3	0	4955	1302	15	High
Jagatsinghpur	1136971	859282	1321	93.3	0	83176	34738	31959	High
Jajpur	2192630	901816	1865	143.9	3	18461	20928	23961	High
Kendrapara	1522901	550200	1529	54.6	3	14318	23998	11060	Medium
Keonjhar	7200	5803	163	89.9	0	0	615	0	Low
Khordha	2502008	1126976	1669	187.8	9	1326853	130198	12385	Very high
Mayurbhanj	173095	1324	1400	131.8	4	1	1522	62.4	Medium
Nayagarh	344100	466767	1377	141.7	0	20013	9658	317	High
Puri	1968228	2982575	1772	128.2	39	2671929	323140	60339	Very high
Total	15993851	8810750	20367	1621.1	64	5333186	679155	181711.4	

Source: Memorandum on Fani (SRC)



Fig. 3 Devastation due to Fani (OSDMA)

Cost of damages in Rs.Lakh due to the impact of the Tropical cyclone Fani in 2019 in Odisha

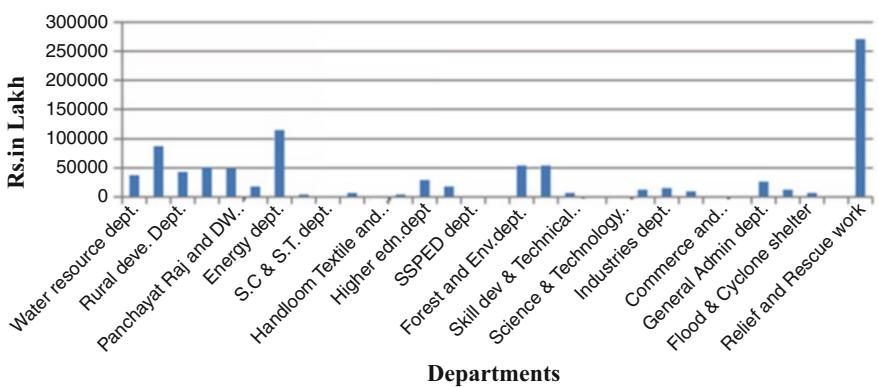


Fig. 4 Cost of damages in the departments due to Fani

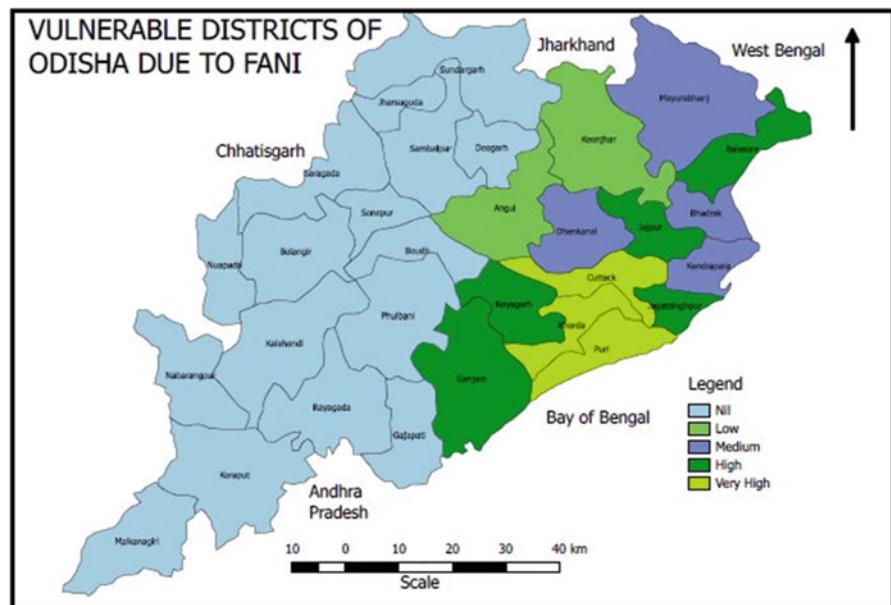


Fig. 5 Vulnerable districts due to Fani

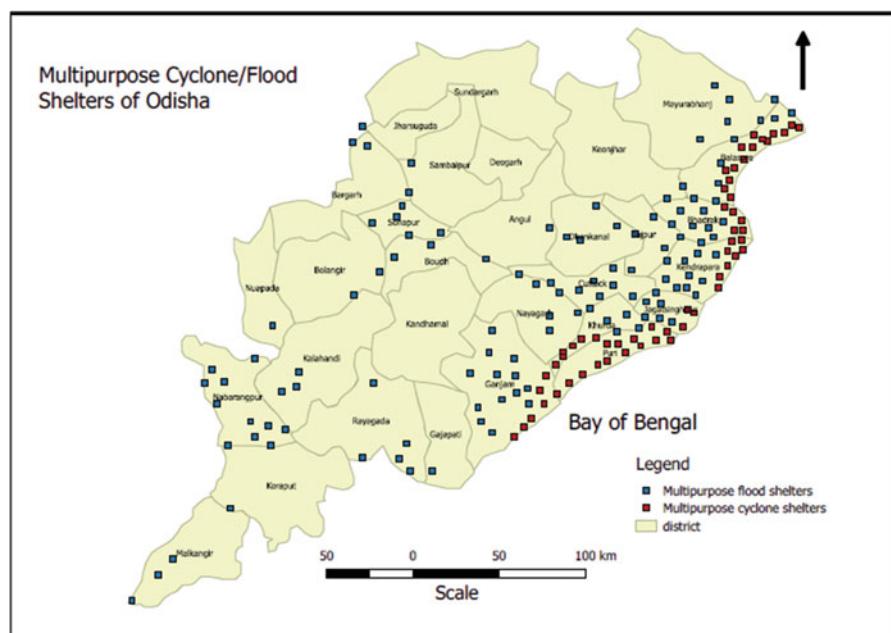


Fig. 6 Multipurpose cyclone/flood shelters

Technology (OUAT) and Directorate of Agriculture on crop management during and before the cyclonic storm. Farmers were advised to harvest matured crops and keep them at a safe place to avoid crop damages. Urban floods occur due to incessant rain coupled with urban drainage congestion. To prevent urban flood and water logging, drains were cleared of blockages and de-silted for free flow of storm water. In order to drain out water logging in urban areas, high-capacity diesel pump sets were kept ready. The coastal wild life sanctuaries are normally affected due to cyclones, and wild animals enter into human habitation. Precautionary steps were taken to sensitize the villagers living in and around the Balukhand-Konark sanctuary area. For protection and rescue of wild animals in vulnerable areas, the forest department deployed special squads. Print, electronic and digital media played a proactive role in dissemination of information on cyclone path, predicted intensity, evacuation of people, encourage people to face the situation, spread of awareness, removal of rumor, post disaster real picture, mobilize, state, nation and international resources for better disaster management. Due to the impact of cyclones, people usually suffer from health problems like diarrhea due to drinking of contaminated water and snake bites. In order to prevent health problems, all emergency logistics (antibiotics, antipyretic, antidiarrheal, ORS, Halogen/chlorine tablets, anti-snake venom, IV fluids, etc.) in sufficient quantity were provided to all 14 districts likely to be affected by Odisha State Medical Corporation Limited (OSMCL). In case of any disaster, the highly vulnerable people are the elderly, differently abled persons, women, and children. Instructions are issued to take special care of women, elderly, differently abled persons, and children. For effective disaster management, meetings were conducted between govt. and NGOs for proper coordination at OSDMA office and in the districts. For timely response to the cyclone disaster, interdepartmental coordination meetings with the nodal officers were conducted regularly to assess the preparedness. State govt. requisitioned two helicopters from the Ministry of Defense, Govt. of India (GoI), for emergency rescue and air-dropping of relief materials. With the help of Odisha Rural Development and Marketing Society (ORMAS), Industrial Development Corporation (IDCO), and Food Supplies and Consumer Welfare Department, 100,000 food packets were prepared. All educational institutions (both private and government) were closed from May 2, 2019, and examinations were rescheduled as preventive measures. Senior IAS and IPS officers were given responsibility to extend all possible support to the district collectors of the districts likely to be severely affected. To provide relief to the marooned people, 5,97,006 numbers of polythene sheets were kept ready for distribution to the affected people. Due to cyclone, power and telecommunication were severely affected. Fifty-five satellite phones were provided to the likely affected districts, and response forces were kept ready for establishing emergency communication. To avoid loss of life, boat operation ferrying tourists in the Chilika Lake was prohibited. Keeping in view of the risk of life of the fishermen in the coastal areas, the govt. debarred them from fishing in the sea. The state govt. issued fishing ban from April 15 to May 14 as per the uniform fishing ban imposed for east coast of India by the Govt. of India (GoI). To avoid damages to the fishing boats by wave surge,

fishermen safely berth their fishing boats at a safer place in fishing harbors and fish landing centers. With the past experience of Odisha super cyclone of 1999, people suffered due to disruption of train, bus, and air services; therefore, to avoid repetition of such situation, the state govt. in advance suspended these services. Most vulnerable villages in the coastal area were identified using GIS platform based on forecasted track. The buffer area of 10km distance from the forecasted track on the landward side and entire area of the seaward side were taken as the severe impact areas. A total of 9886 villages and 52 towns of nine districts were identified as severe impact areas of the cyclone. On the basis of the severity of the impact of the cyclone, the collectors of the districts were asked to take preparedness measures. Twenty-eight teams of the National Disaster Response Force (NDRF) at strategic locations of 14 districts were kept ready with requisite equipment for immediate response (Fig. 7). Anticipating the severity of the event, the state govt. sent request to IG, NDRF, New Delhi, for deployment of additional 20 NDRF teams from the neighboring NDRF battalions. Fire services in all the districts were kept ready for immediate response. Personnel of Odisha Forest Development Corporation (OFDC) were kept ready to remove damaged trees blocking the road and rail communication. Drinking water sources were contaminated due to flood caused by heavy rainfall. Hence adequate arrangements were made for safe drinking water like water pouch, water storage in over head tank and pvc tanks. DG sets with fuel, electricians and other necessary requirements were kept ready for supply of drinking water.

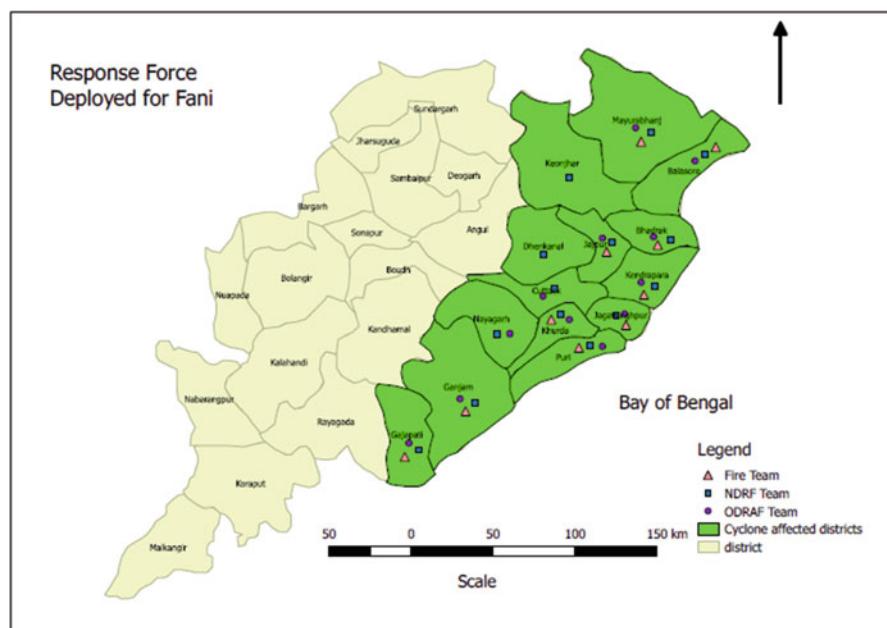


Fig. 7 Response forces deployed

Response and Relief

The state govt. as part of the response to the disaster alerted the people about the cyclone and precautionary measures to be taken through SMS and location-based alert system (LBAS). People of the likely affected districts were alerted through 1.8 crore SMS to BSNL subscribers. On the basis of threat of an area, group-based alert messages were sent. Voice messages were sent every hour in the coastal area, and Sirens installed at the coast were activated. In the district, warning was sent through official channels and PRI members. At the local level, public announcement was made to inform the people (Fig. 8). Fourteen satellite-based mobile data and voice terminals (SBMDVT) under early warning dissemination system (EWDS) were also activated for emergency communication. 15,57,170 people were evacuated in 14 districts from May 1, 2019, to May 2, 2019 (late night), before the cyclone could hit the coast. Much before the cyclone approached the state, the elderly, differently abled persons, women, and children were evacuated to the shelters on priority basis. From Puri, Ganjam, Cuttack, and Balasore districts, 24,889 tourists were evacuated. Livestock are the poor man's livelihood; earlier, no steps were taken for safety of the livestock from cyclones. Due to lack of protection, lakhs of livestock were killed. As preventive measures, 28.65 lakh cattle were accommodated in 6367 cattle camps and provided fodder/feed. Transport of relief materials to the affected people is a challenging task. Arrangements were made for free transport of relief materials by air and rail. For the smooth transport and distribution of relief materials, 23 trains, 18 OSRTC buses and other local transports were arranged. At the shelters, steps were



Fig. 8 Early warning, evacuation, cyclone shelter, and media report

taken to provide cooked food through free kitchen. Measures were taken to maintain sanitation at the shelters. Basic amenities like lighting and safe drinking water were provided at the shelters. The domesticated animals were shifted to the shelters with adequate fodder, drinking water, and medical care. Provisions were made for health care during the disaster by deploying health workers, doctors, and medicines. Steps were taken for the removal of carcass of dead animals to prevent spread of epidemics. In the severely affected districts, emergency communication was established using HAM radio, very high frequency (VHF) and satellite phones, and other traditional communication systems. To bring back normalcy in the affected area, restoration work started on war footings. District administration and concerned departments taken up the restoration work of road communication, electricity, drinking water supply, telecommunication, and other critical services. The response forces deployed in the affected area were immediately mobilized for search and rescue of the stranded people. People needing medical treatment were immediately shifted to the hospitals. In the past, due to lack of coordination between govt. and NGOs, problems were reported in the distribution of relief materials. Therefore, the GO-NGOs at state and district level were activated for smooth distribution of relief materials. Keeping in view of the needs of the affected people, the govt. decided to provide relief materials in shape of rice along with cash and polythene sheet for temporary shelter. The banking service was paralyzed due to failure of power and Internet service. Therefore, the beneficiaries were provided gratuitous relief in cash with due approval of the Government of India. Families under food security were given 50 kg of rice plus Rs. 2000 and polythene, and families not covered under food security were provided 50 kg of rice plus Rs. 2000. Health services were restored, and fodder was provided for the livestock.

Recovery and Reconstruction

Recovery and reconstruction is a challenging task before the government. Most of the people in coastal Odisha depend on agriculture and live in temporary houses due to low economic status. Their livelihood and houses are easily damaged due to cyclonic storm and associated floods. As the frequency of the cyclonic storms is increasing day by day in the recent past, people are panic-stricken hearing the imminent cyclonic storm. Frequent cyclonic storms have broken their economy. In coastal Odisha, in addition to agriculture, people do livestock farming, horticulture particularly coconut farming, betel vine farming, and fish farming. The livelihood of the people depending on agriculture and related primary activities are severely affected. To bring back normalcy and pre-disaster situation, a lot of investment is required. As per the relief code, affected people were provided compensation based on the extent of damages. Compensation provided for the reparation of damaged houses Rs.2100 – 95,100, crop damages and input subside per hectare Rs.6800–18000, livestock loss with limited compensation Rs.3000–30,000, loss of poultry Rs 50 per bird to maximum Rs.5000. Compensation was given for the loss of fish ponds, fishing equipments, handicraft industries and street vendors. Exemption of



Fig. 9 Relief distribution, restoration work, and visit of the central team

school fee and supply of one pair of school uniform was done. Short-term loans for kharif and rabi crops were sanctioned to the affected farmers. Land revenue and water tax were exempted for the year 2019–2020. A 5-year action plan has been taken up by the govt. for the revival of shelter belt and afforestation. 50 lakh seedlings were distributed free of cost to the public and institutions. 30,000 uprooted but surviving trees were restored on war footing. The banking sector was affected due to Fani; steps were taken to normalize banking sector, and mobile ATMs were put into service. Steps were taken for the removal of debris, flood water, and disposal of carcass. The damaged infrastructure, road, river and canal embankments, water supply, power transmission system, and public buildings were repaired on emergency basis. Pensioners were given 1 month pension extra in severely affected district as relief. The central team visited the affected areas to take stock of the situation to recommend for central govt. assistance (Fig. 9).

Conclusion

The National Disaster Management Act 2005 enacted by the Government of India in order to mitigate the impact of the disaster in the country is a paradigm shift in the management of disaster. Fani occurred in pre-monsoon season which is a rare incident. Its prediction was most difficult as it went on changing its course nine times and hit the Odisha coast 6 hours before prediction. It was the most destructive cyclone after the 1999 super cyclone. It severely affected three coastal and adjoining districts with heavy damages. The loss of life and property was next to the 1999 super cyclone. The state govt. made all necessary arrangements after getting the

cyclone warning from the IMD. The cyclone warning was communicated to the people, and high-level meeting at state headquarters and district headquarters was conducted for smooth organization of Fani disaster management. Man and machine were sent to the field. Relief, medicine, and health workers were deployed to provide immediate service to the affected people. Cyclone/flood shelters were kept ready with all necessary facilities for people and livestock. Evacuation of people and livestock started before Fani could make a landfall, thus reducing human and livestock casualty. As a preventive measure, road, railway, and air communications were suspended to reduce hardship and casualty. Due to maximum damages in power transmission system, restoration of power and water supply was delayed. Unlike the super cyclone of 1999, people volunteered for evacuation and did not want to take any risk. Huge loss of property occurred in the capital city Bhubaneswar and coastal city Puri. Steps are being taken for underground power cabling to reduce damage to power sector. Loss of life could be minimized, but loss of property and livelihood is still very high. Efforts were made by the govt. to bring back normalcy by providing ex-gratia payment to the kin of the deceased, compensation for the loss of crop, livestock, houses, handicrafts and street vendors as per the relief code. To reduce damages of rural and urban temporary houses, state- and central govt.-sponsored housing schemes are being implemented for the poor people. Steps must be taken for disaster resilient power and infrastructure as part of the long-term solution to the cyclonic disasters. The disaster management of the state govt. was very successful. The state govt. got appreciations for successfully handling the cyclone Fani from the United Nations in India, Regional Integrated Multi-Hazard Early Warning System Programme Unit in Thailand, and Nanjing Autonomous Institute of Water Conservation and Hydrology in China.

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Disaster-Induced Vulnerabilities and Institutional Response in Indo-Nepal Tarai Region

31

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Contents

Introduction	414
Case Study: Area and Methodology	415
Disaster-Induced and Other Vulnerabilities in Indo-Nepal Tarai Region	416
Institutional Structure and Mechanism	417
International Institutions	419
UNDRR (United Nation Disaster Risk Reduction)	419
CARE International	422
SAARC (South Asian Association Regional Cooperation)	423
National Institutions	425
GNK (Gram Niyojan Kendra) India	427
Rapid Response NGO (India)	428
Manav Seva Sansthan “SEVA”	428
Local NGOs	429
DEHAT (Developmental Association for Human Advancement) India	429
Maiti Nepal	430
Conclusion	431
References	432

Abstract

Indo-Nepal Tarai region is well-known for recurring disasters like flood, cyclone, earthquake, drought, and landslide. They have been affecting the people of this region almost every year. Regular occurring of disasters increases the social, economic, physical, and psychological vulnerability of the population. SAARC called for attention the condition of Indo-Tarai region and declared it a matter of human concern. It urges for initiatives on the preservation on the environment and disaster risk preparedness and response in the region. In addition, several

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international, national, and regional NGOs and Government Agencies such as UNDRR (United Nation Office for Disaster Risk Reduction), CARE International, National Disaster Management Authority (NDMA) India, National Centre for Disaster Management (NCDM) Nepal, Rapid Response NGO (India), GNK (Gram Niyojan Kendra) India, Manav Seva Sansthan SEVA and DEHAT (Developmental Association for Human Advancement), India are playing important roles in disaster response, mitigation, and spreading awareness. But disaster response in the region is facing continuously challenges like absence of vertical and horizontal coordination between public and private organizations and organizations working across the border. It is worth mentioning that disasters do not consider political boundaries, and disaster-prone transboundary basin like Indo-Nepal Tarai region needs a strong international strategy and commitment for transboundary institutional cooperation's, which is generally absent in the region. Though the International and National organizations are usually following a common disaster management strategy, most of the time they remain unaware and insensitive toward the local requirements. These constraints often triggered disaster-related risks. Institutions are key players in developing policies and tools for disaster management. The focus of this study is to observe and assess the coordinated and uncoordinated responses of these institutions and existing international transboundary cooperation framework to achieve the objectives of reducing risks and vulnerabilities.

Keywords

Institutional response · Transboundary cooperation · Disaster management · Vulnerabilities

Introduction

Natural hazards are physical phenomena of nature, which is generally unpredictable and recurrent in nature; to manage them a well-structured and integrated frameworks and policies and combined efforts of local groups, national, and international level organizations and authorities are required. Disaster management is a continues process. It is mainly the responsibility of the government to play an important role by forming a favorable authority and setting up norms in the sector of disaster management. It is the government's duty to work as a defense and take care of the well-being of people. It has been noted the resources that are being used in the recovery process in the aftermath of a natural hazard are sometimes much more than required in the precautionary measures that can avert the disasters from happening. But it is also a fact that in any stage of disaster management, it may not be possible for government to reach out to each and every citizen of the country. At this point comes the role of nonprofit organizations. NGOs play a secondary role but a very significant one and are capable of helping the government in various matters. NGOs generally try to make sure that people's voices reach the policy makers. They praise

and also disapprove government's policies when it is required. NGOs play a very special role in the disaster management sector since they work very profoundly in local and global disaster risk management, climate-related adaptation and in humanitarian assistance (Lassa, 2018). But when a region falls under the political boundaries of different countries and most of the time get affected by natural and human-induced disasters, a cooperative effort in disaster mitigation and recovery is needed.

Therefore, the foremost objective of this study is to trace the role of institutions and organizations, which are actively working in the sector of disaster risk mitigation or disaster preparedness in Indo-Nepal Tarai region. The difference between government and nongovernment organizations response, the situation of vertical and horizontal coordination between various organizations, the core idea and purpose of the institutions and from where they are collecting the funds and how they are managing it are also some key areas to study. This study also tries to identify the critical issues that create hurdles in the smooth functioning of the institutional engagement in disaster management for plummeting the possible impact from future disasters.

Case Study: Area and Methodology

Indo Nepal Tarai region is Situated on the border of two converging tectonic plates and experience trans influencing climatic conditions therefore, the region is highly susceptible to geophysical and hydrometeorological disasters.

This research is about the Tarai region of Nepal and the bordering regions of Indian States: Uttar Pradesh, Bihar, and Uttarakhand; these areas have grown with diverse structure of governance and state devises for managing disasters risks.

According to the Human Development Index 2022, India is at the 132nd and Nepal is at the 143rd position in the list of 191 nations. Nepal comes under the category of low human development and India is categorized as medium development nation. It is crucial to understand that India has significant interstate disparity. On the basis of its multidimensional poverty index, it is found that more than half of the population of these border regions of Indian states live below the national poverty line and share similar socioeconomic characteristics. The region spread in both countries is mainly rural. There is a significant undersupply of public goods in the region such as electrical energy, water and healthcare, and other development activities. However, these civic amenities are well supplied in urban areas. Furthermore, caste and ethnicity based social inequality is very high across the borders in these regions. Like the rest of South Asia, the region has had uneven experience with decentralization.

The empirical data collection for this research was undertaken by a semi-structured questionnaire, which was mailed to representatives of different organization in March 2021 after a telephonic conversation. The questionnaires were intended to explore the institutional response for DRR, the role of different stakeholders, cooperation between two nations and the aspects that allow or hinder disaster risk reduction in the region. The questionnaires were sent to representatives

of international organizations, government bodies, and national and international NGOs. Few organizations did not respond but some did, the response received were recorded, transcribed, analyzed, and coded based on different key themes of this research. An analysis of the policy literature and several informal conversations help to understand the institutional response in both nations.

Disaster-Induced and Other Vulnerabilities in Indo-Nepal Tarai Region

The Indo-Nepal Tarai regions, owing to its geographical location, every year face thrilling rainfall, seismic activities, and landslides. The region, due to regular occurrence of natural disasters, bears heavy loss of lives, property, and infrastructural assets. In fact, the number and intensity of catastrophic events seem to have been on the increase because of various natural and human persuaded reasons.

The insular areas of the region are vulnerable to not only the intense cyclonic frequency but also the plate tectonic activities. The region bestrides the edge of fault line between the Indian and the Eurasian major tectonic plates. These plates push each other and relocate the crust of the earth. The strain built up by the pushing of plates along the fault line intermittently causes earthquake. The region is well known for one more natural hazard, that is the recurrent floods. Nepal has a large number of waterbodies consisting of 6000 rivers and rivulets totaling about 45,000 km in length. They are the lifeline of the region. They provide water for drinking and irrigation of vast agriculture area. Though, in monsoon seasons, because of overflowing, they become the reason for loss of life and property in Indo-Nepal Tarai region and other areas.

Other than monsoon floods, the region is also exposed to one more type of flood that is “bishyari.” It has become more frequent with climate change. “Bishyari” happens when a river is blocked by a landslide penetrated by a pool of water that forms upriver of the blockage. The “bishyari” is hard to foresee and have been a menace to assets, infrastructure, and life. On the basis of many environmental risk indices, the Indo-Nepal Tarai region is recognized as one among the environmentally most vulnerable areas in the world.

The region is facing several simultaneous challenges related to climate change such as frequent glacial lake overflow at upper region, flash floods causing damage, landslides, erratic precipitation, and variations in the pattern of temperatures, winds, fog, and hailstorms.

In the background of climate change-related environmental vulnerability, an important concern is the speedy growth of the population, which is a known factor for environmental degradation such as deforestation, soil erosion, air pollution, water pollution and accumulation of unmanageable solid waste (Vulnerability Profile of Nepal, United Nations, 2018).

The social, economic and demographic features of Indo-Nepal Tarai region traversing with geophysical and hydrometeorological processes present extreme social vulnerability of the area.

The backwardness related to these features is rooted in a historically lethargic development process. In the recent past, the focus of development work remains in capital cities and only in few urban centers of Nepal and bordering Indian states, which sideline the rural areas in the Mountain, Hill, and Tarai regions from the development. The social and economic condition become more worse due to nonexistence of infrastructure, energy, government answerability and financial resources. (UNDP 2016).

According to a study done by Aksha, S.K., Juran, L., Resler, L.M. et al. in 2018, Tarai districts comprise a significantly large number of villages and municipalities with high social vulnerability. This study highlighted that the geographic distribution of the principal component like death-related vulnerability and poor infrastructure is concerted in the Tarai region. It is seen that almost all villages and municipalities showed high vulnerability in relation to poverty and poor infrastructure. Another factor, favourable social conditions, displays higher levels of vulnerability all over the Tarai region relatively vulnerable areas for migration and gender are distributed across the entire Tarai region. The highest levels of social vulnerability for component ethnicity are in the western part of Nepal, as well as the eastern Tarai region. Another component education, reveals higher vulnerability in central and eastern Nepal – particularly the eastern Tarai region – with small areas of the western Mountain region also showing greater levels of social vulnerability (Aksha et al., 2018).

In the central and eastern Tarai regions, many villages and municipalities, which comprises inconsistent population, are kept in the High and Medium vulnerability class categories, whereas population centers in the western Tarai region are mainly kept in the category of medium or lower level of vulnerability. This categorization corresponds to the fact that the central and eastern Tarai regions drop back in education and health even though being home to a huge number of poor, Dalit, and minority groups (Sharma et al. 2014).

In this way natural hazard risk along with social vulnerabilities place this region in a high disaster risk zone.

The traditional approach to disasters management in Indo-Nepal Tarai region mostly remains the focus of post-disaster management by countering the events and rebuilding destructed assets after the disaster has happened. Generally, the main stakeholder's response remains reactive rather than proactive, and because of this approach loss of life and economic losses were found to be very high in the region.

In the last few years, the region has started efforts to institutionalize and mainstream the disaster risk reduction and management activities. Though the degree is not same, both countries in the region arrange to set up institutional structure and an ex-ante approach to lessen the impacts of hazardous incidents at the national and subnational levels.

Institutional Structure and Mechanism

In both countries the governments are working to decrease the disaster risks and their management, therefore many organizations have been set up and facilitated to work in this area.

In Nepal the policy, regulatory, and legal frameworks have facilitated to establish proper Disaster Risk Reduction and Management (DRRM) structures and mechanisms for the country and its respective government agencies.

The legal devices also provided clear directives to concern ministries and departments to establish and operationalize their corresponding DRRM institutional structures.

Nepal's contemporary landscape of disaster governance is guided by its Constitution 2015 and the Disaster Risk Reduction and Management (DRRM) Act, 2017. The DRRM Act 2015 gives various legal, institutional, and operational directives to the federal government with organizational arrangements such as the National Council, the Executive Committee and the NDRRMA, under Ministry of Home Affairs, which is directed by the Home Minister. The DRRM Act allocates full and specific mandates to the NDRRMA to lead, facilitate, and support federal, provincial and local governments on disaster risk reduction, response, and reconstruction. All federal ministries and departments have set up units and assigned officers to undertake DRRRM-related work. Federal agencies, like the Ministry of Federal Affairs and General Administration (MoFAGA) provide help to local governments by preparing and sharing model laws such as the model DRRM Act. The local leaders and experts during the interaction for this study mentioned that these supports remained helpful in strengthening the local government's DRRM governance.

The Ministry of Home Affairs' jurisdiction provides a provision for a network of emergency operation centers, which includes one National Emergency Operation Centre (NEOC) and 77 District Emergency Operation Centres (DEOC) for each district. The Prime Minister's Disaster Management Fund in Nepal is a well-established fund for bigger disaster response. There is also a Central Disaster Relief Fund. The federal government also has provision of an unfrozen (designated) fund, targeting provincial and local governments for disaster management activities. In Nepal, the Council of Ministers works at the top followed by the Ministry of Home Affairs (MoHA) in which the Disaster Management Section is situated, followed by the various Departments.

The National Disaster Management Authority (NDMA), headed by the Prime Minister is the top institute for Disaster Management in India. Setting up the NDMA and starting institutional mechanisms at the State and District levels are directed by the Disaster Management Act, 2005. NDMA is delegated to lay down the policies, plans, and guidelines for Disaster Management. India envisages the growth of an ethos of Prevention, Mitigation, Preparedness, and Response. NDMA has five major divisions, viz., Policy and Plans, Mitigation, Operations and Communications and Information and Technology, Administration and Finance.

The NDMA is responsible for laying down the plans, policies, and guidelines for disaster management and the states are preordained to formulate policies and plans in accordance with the guidelines laid down by the NDMA. At the state level, institutional arrangements are flexible. States which face frequent disaster have set up their own Disaster Management Departments whereas others have also set up smaller Disaster Management Authorities that sit within a Department of Revenue.

UN organizations and other central level government departments occupied the second tier of institutions in both the countries. In Nepal this consist the Nepal Risk Reduction Consortium (NRRC), which comprises the Government of Nepal, multi- and bilateral donors, and humanitarian and development partners working together for Disaster Risk Reduction and some protuberant national NGOs. In Nepal, the Kathmandu Valley municipalities were inserted below reflecting the power of the municipal governments in the Kathmandu Valley, which is seen to dominate the country.

A third tier included INGOs (International Non-Governmental Organizations) in Indian states and Nepal and multi- and bilateral donors and development banks, which are more active in Nepal.

The UNDP has had a long existence in Nepal and since the early 1990s supports the various organizations to contribute in disaster risk reduction. It also helped in setting up the NRRC. Designed around 50 priority areas or flagships. According to Panday, more than 60% of Nepal's development budget is contributed by bilateral and multilateral donors (40% being state generated), of which 70% goes through the Finance Ministry (i.e., to government). The rest goes through the Social Welfare Council to NGOs and civil society groups. NGOs in Nepal are predominantly important for the execution of DRR projects indicating the limited capacity of the government at the local level (Pandey, 2013).

In comparison, presently India has a robust government structure for disaster risk reduction and donors and multilateral agencies play not as much of a significant role in determining the agenda (Samantha Jones et al., 2016).

Within the broad institutional framework this study is mainly looking at the three types of selected institutions which are working in Indo -Nepal Tarai region: (1) International institutions – UNDRR, CARE International, CARE India, CARE Nepal, and SAARC, (2) National NDMA (India), NCDM (Nepal), Rapid Response (NGO), Gram Niyojan Kendra, and (3) local organizations: Dehat and Maity (Figs. 1 and 2).

International Institutions

UNDRR (United Nation Disaster Risk Reduction)

UNDRR (United Nation Disaster Risk Reduction) was established in 1999 with a vision to facilitate the implementation of the International Strategy for Disaster Risk Reduction. It was mandated by UN General Assembly. It is a leading International Agency to ensure coordination among UN systems and regional organizations on disaster risk reduction and in humanitarian activities. UN adopted an action plan to develop the UN Plan of Action on Disaster Risk Reduction for resilience on March 2013. This action plan mainly focuses on disaster risk reduction and it also seeks to integrate disaster risk reduction and coordination among countries that come under

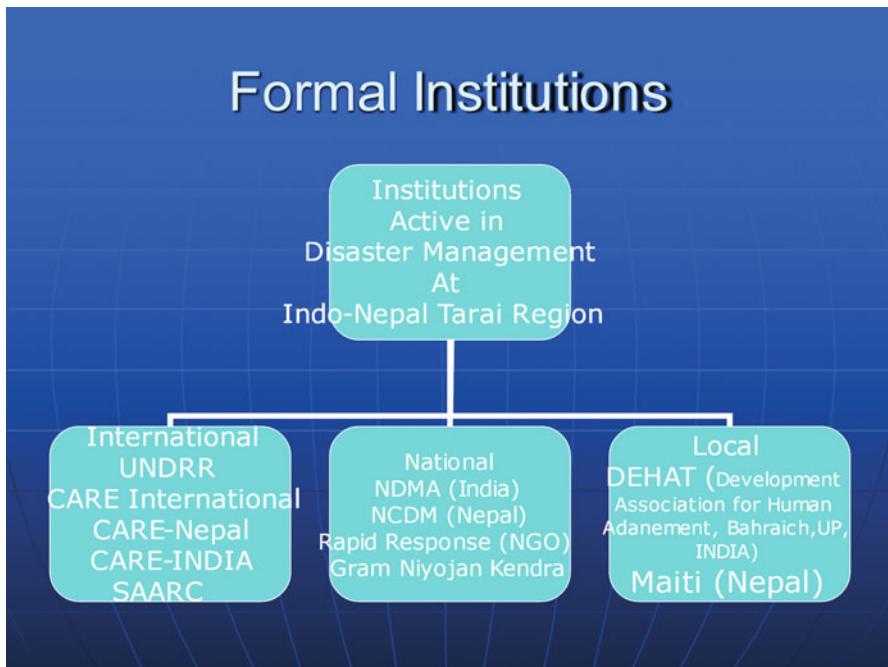


Fig. 1 Formal institutions working at Indo-Nepal Tarai region. (Source: Author)

the UN country level program and activities. According to UNDRR, disasters force approximately 26 million people into poverty every year. UNDRR publishes “The Global Assessment Report of disaster risk reduction,” biennially. UN adopted the Sendai framework for disaster risk reduction which aimed at seven goals. This framework is a first major agreement of the post-2015 development agenda. Under the UNDRR, the Global Platform for Disaster Risk Reduction is a forum for information exchange. At this forum countries share their knowledge and latest development aiming toward better communication and coordination. The core objective of this program is to enable the governments, NGOs, researchers, and UN organizations to share their experience and guide them for implementation of global disaster risk reduction agreements.

UNDRR’s regional offices work as the supporting secretariat for regional platforms. From 2005 to 2015, regional platforms for disaster risk reduction grew progressively. In the concluding years of the Hyogo Framework, participants of these platforms asked for specific acknowledgment of regional mechanisms to contrive and manage disaster risk reduction.

During the post 2015 Sendai Framework era, regional platforms endured a significant prospect to resolve transboundary issues around disaster prevention and

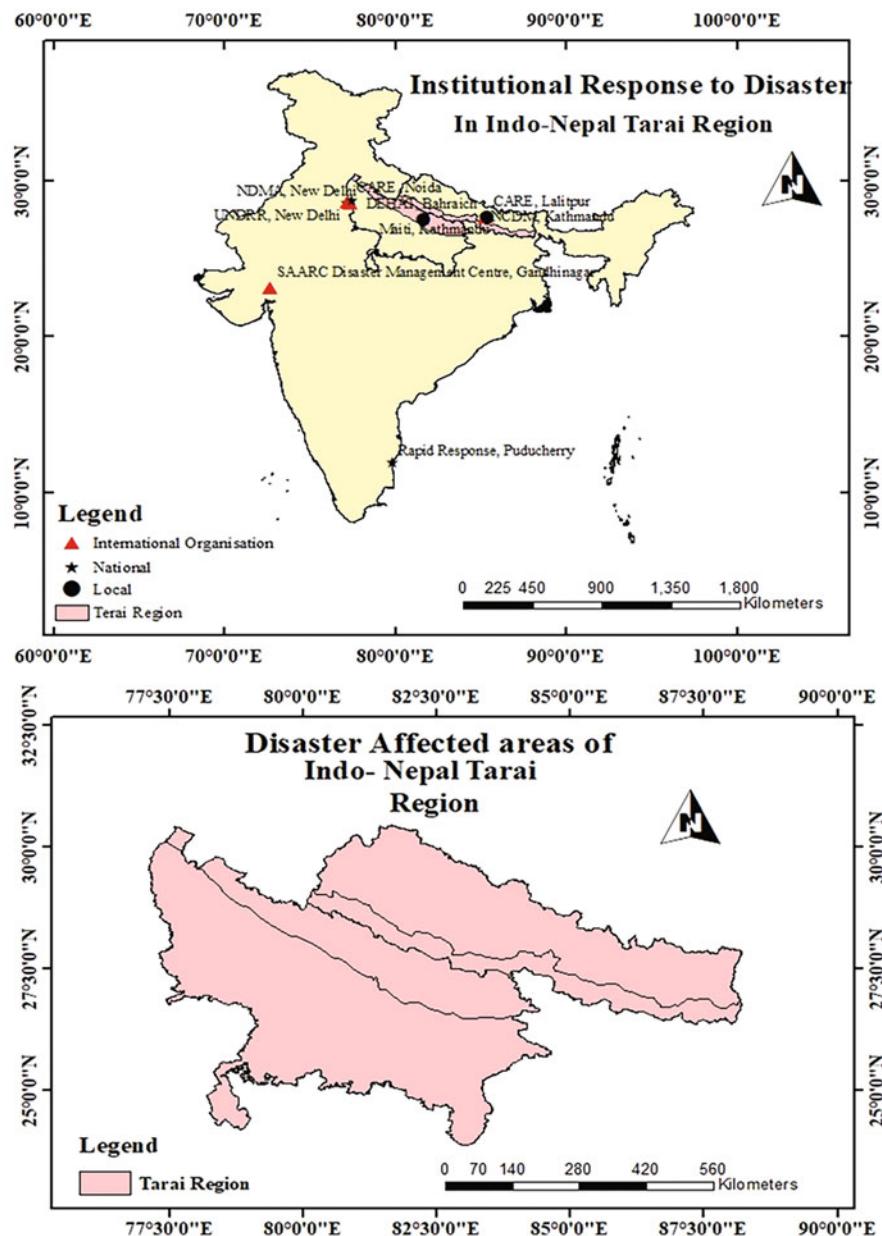


Fig. 2 Institutes working in disaster affected Indo-Nepal Tarai region. (Source: Author)

preparedness, make available leadership and direction and suggest appropriate solutions to tackle disaster risks and to construct the resilient nations and communities.

The UNDRR Regional Office for Asia and the Pacific (ROAP) do disaster risk reduction efforts across the Asia-Pacific region. ROAP works with governments, United Nations Country Teams, regional and international organizations and other stakeholder groups to safeguard people from disasters, develop resilience and promote sustainable development.

ROAP work in 39 countries and 13 territories in total. It is based in Bangkok, Thailand with a subregional office in Suva, Fiji, a liaison office in Kobe, Japan, and an office for North-East Asia in Incheon, Republic of Korea. India and Nepal both countries through their Ministry of Home Affairs work with ROAP (*Disaster Response in Asia and The Pacific: A guide to International Tools and Services, 2013*).

UNDRR also supports to build the capacity of United Nations country teams to update the incorporation of DRR into nation's analysis and programs. Apart from this UNDRR has given guiding principles to intergovernmental organizations in the Asia-Pacific region, such as ASEAN and SAARC, to enhance their cognizance of disaster risk reduction and incorporating it in their sectoral plans. Other areas in which UNDRR has worked are mainstreaming the disaster risk reduction into other sectors, integrating the DRR tools into the humanitarian action cycle and developing the resilience in micro, small, and medium enterprises. The Indian government contributed US \$ 1 million in November 2016 in the sideline of 7th Asian Ministerial Conference for Disaster Risk Reduction and signed a Statement of Cooperation to encourage regional capacity buildings for the Asia-Pacific Region in the area of Disaster Risk Reduction (DRR). However, the presence of UNDRR and ROAP does not help in bringing any cooperation between India and Nepal to tackle the disasters risks in the Indo-Nepal Tarai region.

CARE International

Another very important international organization is **CARE International**, which is very actively working in both the countries. It is an international organization seeking for hope, tolerance, and social justice and also helps people to overcome poverty and live life in dignity and security. CARE International has 14 members of global network, three candidate members and one affiliate member. It works in 97 countries to save lives and its mission is to defeat poverty and achieve the goal of social justice (2017 annual report). Care has no biased nature, it provides help regardless of any discrimination on caste, color, creed, or race. It promotes the protection of humanitarian space and works solely for vulnerable groups particularly for women and girls. It follows a set of programs in emergencies that includes rehabilitation and long development work.

CARE Nepal works in partnership with state agencies, donors, NGOs, research institutes, private actors, and native communities. It works to reduce gender-based violence, enhance women and girl child leadership and their voices, raise the awareness on sexual reproductive health, inclusive governance growth, fulfill food and nutrition security, and disaster risk reduction and climate change. In May 2015,

when Nepal was rocked by two devastating earthquakes of 7.8 and 7.3 magnitude subsequently, CARE served emergency relief with the help of partners in four of the worst affected villages. The villages are Gorkha, Sindhupalchowk, Dhading and Lamjung covering approximately 1,30,000 people including its capital, Kathmandu. After the earthquake CARE responded very quickly; under the program named Shelter, it not only rescued people but also provided shelter to families whose homes were heavily destroyed. CARE provided them shelter repair kit, which helped them to rebuild their houses stronger and sturdier than before. Care Nepal steadily donated at the time of disaster and also appealed before the world community for donation during flood, earthquake, and landslide emergencies in Nepal. These appeals attracted millions of dollars in disaster aid, which meant that they were working on ground zero in Nepal including Indo-Nepal Tarai region and had better sense of coordinating relief efforts.

CARE in India is working over the 68 years, and in all these years it has made a considerable shift by providing direct service to the poor and vulnerable groups. CARE India focuses on planning and comprehensive projects in health, education, livelihood, disaster preparedness, and response. CARE India has a “Disaster Preparedness and Response Strategy,” which maintains the Emergency Response Teams at National and State level in the country. This emergency team is specially trained and prepared to provide relief and rescue program. CARE India also partnered with various states like UP, Bihar, Tamil Nadu, West Bengal, etc. to build their capacities on disaster preparedness and response and also remains active in Indo-Nepal Tarai area, fall in the boundaries of UP and Bihar. In 2007, during the flood, CARE rescued peoples from Uttar Pradesh and Bihar. But CARE NEPAL and CARE INDIA never partnered for disaster management while working in the Indo-Nepal Tarai region.

SAARC (South Asian Association Regional Cooperation)

The South Asian Association Regional Cooperation (SAARC) was established on 8th December 1985. India and Nepal are members of the SAARC association. The SAARC secretariat was established in Kathmandu in 1987. The objectives of the SAARC association are to accelerate economic growth, social progress, and cultural development in the region and to promote the mutual trust between SAARC nation by enhancing the understanding among them and strengthen their relationship so that they can make a common interests and fight against the climate change with one accord. SAARC being a regional cooperation is highly concerned with preservation of environment and disaster risk preparedness and response.

In view of the regional dimensions of natural disasters, the third SAARC Summit had specially made an inclusive regional study on the causes and consequences of natural disasters. A SAARC Meteorological Research Centre was set up in Dhaka in 1995 and a SAARC Coastal Zone Management Centre was established at Male in 2004.

A Special Session of the SAARC Environment Ministers in June 2005 espoused the Male Declaration, which insists on formulation of a Comprehensive Framework of Disaster Management in South Asia. The 13th SAARC Summit at Dhaka in

November 2005 accepted the proposal of regional cooperation for preparedness and mitigation of national disasters and approved the offer of India to set up a SAARC Disaster Management Centre (SDMC) in New Delhi. The center was inaugurated on 10th October 2006. Later, in November 2016, the Interim unit of SDMC was shifted to Gujarat Institute of Disaster Management Campus. The scope of the center was expanded by merging the other regional erstwhile centers such as SAARC Meteorological Centre (SMRC Dhaka, Bangladesh); SAARC Forestry Centre (SFC Thimphu, Bhutan); and SAARC Coastal Zone Management Centre (SCZMC Male, Maldives) with SDMC. The center is steadfast to work according to the approved blue print of SDMC-IU. The center is entrusted with the responsibility to support Member States in their DRR initiatives through application of Science and Technology, knowledge from multiple disciplines, exchange of good practices, capacity development, collaborative research and networking in line with the global priorities and goals and other relevant frameworks adopted by Member States.

In 2011, the SDMC developed and approved the SAARC Agreement on Rapid Response to Natural Disasters (SARRND) to provide more coordinated, cooperative and planned efforts to reduce disasters risks in the region (Cook and Chen, 2020). The agreement consists of protocols for disaster relief and emergency response, use and mobilization of resources as well as coordination of response operations. It calls on countries to “earmark assets and capacities for regional standby arrangements on a voluntary basis.” The provisions also include the setting up of a dedicated rapid action force for disaster management. However, SAARC leaders have thus far “failed to gather consensus on the issue, and this remains a point of contention.”

In the last few years SAARC has been trying to develop comprehensive strategies for enhancing preparedness for extreme weather events, pandemic and geological disasters like earthquake through organizing seminars, webinars and meetings. In these events experts from both India and Nepal participated and shared their understanding along with experts from other member states. India and Nepal actively participate in the SAARC STORM (Severe Thunderstorms: Observation and Regional Modelling) program taken up by SAARC Meteorological Centre (SMRC), Dhaka in association with Bangladesh Meteorological Department (BMD), Dhaka, Bangladesh; Department of Hydrology and Met Services (DHMS), Thimphu, Bhutan; and Department of Hydrology and Meteorology (DHM), Kathmandu, Nepal; and India Meteorology Department (IMD), India.

STORM Program was comprehended as a cooperative scientific endeavor between SAARC countries for improving prediction of severe storms frequenting India, Nepal, Bhutan, and Bangladesh. ISRO’s commitment toward the project includes supply and installation of meteorological equipment’s including 50 numbers of Automatic Weather Stations (AWS), 4 numbers of GPS Sonde Stations with associated consumables and a Doppler Weather Radar (DWR) in Bangladesh, Bhutan and Nepal (<http://saarc-sdmc.org/implementation-saarc-storm-project>).

Experts from India and Nepal along with experts from other member countries also participated in South Asian Disaster Management Exercise (SAADMEx) in November 2015. They undertook a massive simulation and field training exercise known as the South Asian Disaster Management Exercise (SAADMEX) organized by India, it sought to “test intergovernmental coordination efforts, create synergy and

synchronise efforts to institutionalise regional cooperation on disaster response among the member countries.” One of the joint field exercises include an earthquake scenario. This allowed participating teams to observe their own abilities in disaster response, while also enhancing coordination efforts with other stakeholders.

India and Nepal have been provided relief and food security during the period of floods, earthquake and in other disasters in the Indo-Nepal Tarai region from SAARC food bank; under the SAARC Food Bank Agreement 2007, there is a provision for stocking wheat and rice in member countries. In times of disaster a member country can request for these food grains.

Various policy mechanisms at the regional level are codified the disaster mechanism hitherto execution of mechanism so far not remain successful. South Asia still does not have a functional and effective regional HADR (high availability disaster recovery) mechanism and efforts to improve coordination and integration remain a sluggish and irregular process. This is clear from the fact that there has been no joint arrangement of any SAARC level contingent at the time of regional emergencies in the past few years. For example, in an aftershock of the 2015 Nepal earthquake, assistance from six South Asian countries were given bilaterally with very less coordination at the regional level.

While the SDMC has attempted to produce guidelines and conducted technical disaster response training for SAARC member states, scholars point toward the lack of political support from its members as one of the factors preventing it from fulfilling its mandate effectively.

One of the respondents gave an opinion that the absence of multistakeholder approach, highly bureaucratic functioning, low priority given to capacity building for Disaster Management compared to traditional governance concerns such as national security and the need for economic development make SAARC almost ineffective in the Disaster Management specially in the transborder areas like Indo-Nepal Tarai region.

Though individual countries in South Asia have started their own national disaster management frameworks and structures, this has not yet decoded to tangible cooperation at the regional level. In reality, quite a few respondents indicated that South Asian states preferred ad hoc bilateral engagements during the disasters rather than following a coordinated comprehensive approach.

National Institutions

National Disaster Management Authority, India was established through the Disaster Management Act in December 2005. It is headed by the Prime Minister of India. NDMA is responsible for framing policies, plans, and guidelines. Its sole purpose is to coordinate response to natural disasters or human-induced disasters and enhance the disaster resiliency and improve capacity building. NDMA coordinates with State Disaster Management authority (SDMA), other government agencies and nongovernmental organizations to ensure a holistic, proactive and distributed approach. The Disaster Management Act of India focuses on prevention, mitigation, disaster preparedness and relief. The agency promotes people’s participation in order

to mitigate and prevent disaster, which generates a prompt and efficient response during disasters.

In 2016, NDMA adopted a new Disaster Management plan; the basic function of this is to give direction to all phases of disaster management cycle. The NDMP is consistent with UN Sendai framework for disaster risk reduction 2015–2030. India is following the recommendations of Sendai Framework to reach the global targets set up by United Nations. NDMA has developed a GIS system India Disaster Resource Network (IDRN), which collects data from the states based on which a decision support system is being developed. IDRН, which is initiated by MHA in collaboration with UNDP; BHUVAN, which is the single largest web GIS portal for free data and services over India; multilayered GIS platform by NDMA & NIC; web-based composite risk atlas (WEBCRA); geo-enabled messaging platform; and National Database for Emergency Management (NDEM). It was used in Uttarakhand floods very effectively. Neighboring states like Nepal can also use this database for disaster management. NDMA through MHA is actively coordinating with National Disaster Risk Reduction and Management Authority (NDRRMA), Nepal for disaster risk reduction. **The National Disaster Response Force (NDRF)** is a specialized force to serve in the special situations like disaster. NDRF team was deployed in Nepal to provide relief and aid equipment after the 7.8 magnitude earthquake in April 2015. NDRF did commendable work in Indo-Nepal Tarai region too.

The NDRF team in Nepal rescued 11 injured people and repossessed 133 dead bodies from the debris. The team members also set up 06 medical camps and looked after 1219 people. NDRF assisted the MHA and NDMA to deliver 1176.571 tonnes of relief materials as donation arranged by various agencies to quake affected people of Nepal via various routes. The different teams spread out to different areas in the Kathmandu district and commenced USAR operations at once at Balkhu, Kopan, Gongabu, Tanhu Hospital, Balaju, Basundra, Maharajganj, Brijeshwari, Shobha Bhagawati Bridge, KV Army area, Tilganga, Sondara, White Gumba, Shankhu, PM residence area, Balaju bypass and Kathmandu to assist the Nepalese Authority in “Humanitarian Assistance and Disaster Relief” (HADR) work.

On the basis of MHA directions, NDRF sent its 04 teams on 25th April 2015 to Supaul, Motihari, Darbhanga, and Gopalganj in Bihar and 01 team to Gorakhpur in UP. Next day on 26th April 2015 a team deployed at Motihari further diverted to Raxaul (Bihar). Teams positioned in Bihar did rescue operation and shifted 180 patients from destructed buildings to safe places in Darbhanga Medical College and Hospitals. Another team, which was working at Raxual, East Champaran helped State Government in shifting of 409 persons coming from Nepal to Relief Centre at Hajarimal High School, Raxual.

The work of NDRF in Nepal was praised in media and social media all over the world but China and Pakistan, it is believed, have criticized and communicated to the Nepalese government that the Indian Government was more interested in self-promotion than in sincerely extending help. Reporters accompanying Indian relief helicopter missions were cited as an example of Indian aggrandizement (Rahul Kanwal, 2015). However, the Indian government denied this and NDRF continued its work.

The National Disaster Risk Reduction and Management Authority (NDRRMA), Nepal is relatively a new agency mapped within the Ministry of Home Affairs. It is currently working on the five priorities; first one being risk assessment and setting up of a national disaster risk assessment portal. The agency is also working on hazard assessment with other departments that can convert the assessments into risk information that's accessible down to the municipal level. The risk information helps build capacity of the local government and make informed decisions. During the pandemic, the NDRRMA developed COVID portal wherein near real-time data is reported. The second priority is on early warning system – impact-based early warning system that includes not only communication but also capacity building specially landslide EWS. The third area is reconstruction and the recovery works. Fourth area is effectiveness in the response system; support has been received by UNSPIDER in terms of training users on using satellite-based system. The last area is disaster risk financing. It highlighted the need for similar capacity building programs and exchange of knowledge within the region. The organization has given special focus to Nepal Tarai region while developing these programs.

National Centre for Disaster Management (NCDM) Nepal NCDM was established by the Nepal government in February 2002 with an aim to effectively mitigate the impact of disasters in the country. NCDM is committed to enhance the capacity of the local communities in disaster preparedness by the way of training and awareness. The agency firmly believed that people's participation to mitigate the effects of disaster is an effective mean. The vision of NCDM is to adopt a pragmatic approach to work in the disaster preparedness so that Nepal can become a safer country from disasters. To reach out the goal, the center is always looking forward to establish an environment of trust, friendship, and cooperation among the national (governmental and nongovernmental) organizations as well as international organizations. Because of its geographical position, Nepal is highly prone to disasters, keeping that in mind the disaster statistics of Nepal always supports an urgent need for disaster risk reduction program. Therefore, Nepal has also adopted the Hyogo Framework Action (HFA) to assign a national mandate toward DRR through various programs.

The respondent from NDMA and NDRRMA denied any direct coordination between National Disaster Management Authority, India and The National Disaster Risk Reduction and Management Authority (NDRRMA), Nepal in Indo-Nepal Tarai region.

GNK (Gram Niyojan Kendra) India

Gram Niyojan kendra is a national-level organization, which is working in rural India to bring social equality, justice, and development since 1977. Its main office is located at Adhyatmiknagar, Dasna, Ghaziabad and the project offices are located Nautanwa, Mahrajganj (Uttar Pradesh), and Roopwas, Bharatpur, Rajasthan. This institution has strong belief in Gandhian philosophy and its focused area of work is

the marginalized community. The objectives of the institutions are to provide several facilities to strengthen the women, children, and other disabled and marginalized people, to bring rural community closer with the state and regional organizations and assist them, to conduct research and organize seminars and conferences on social and development issues at various levels. Currently, it is working in seven states of India. In Maharajganj, GNK is actively involved in disaster risk management, especially livelihood generation for women and other vulnerable groups of people, education, training of health attendants, and control/prevent involvement of children in smuggling/prostitution and trafficking. One of the representatives from the organization stated that with CSR partnership and government help GNK organized and conducted various activities to reduce the disaster risk by empowering the vulnerable groups but at the border areas of two countries and in those cases where trafficking takes place and traffickers belong, the situation becomes very difficult to handle. Even running a simple development program in border areas becomes a challenging task (<http://gramniyojan.org/about-us/objectives-of-the-kendra>).

Rapid Response NGO (India)

Rapid Response is a nonprofit organization, which is committed to provide disaster response and relief to vulnerable communities in almost every state in India. It is also active in Bihar and Uttarakhand. This NGO also provides help to marginal communities in non crises situation aiming to make a better, safer, and resilient India. Rapid Response contains three programs, which are rescue and medical assistance, relief, and rehabilitation. They provide relief kit, medical kit, hygiene kit, educational kits, and other essential items to families affected by natural disasters. The Seed Ball is a special project of this organization, which focuses on increasing green cover across India, especially in cyclone or drought affected areas. The process involves making golf ball-sized mixture of soil, seeds, and compost and scattering it in suitable places for trees to grow. Rapid response team helped thousands of people of Bihar in 2016 floods and recent floods in Patna, which is caused by high intensity monsoonal rain. It is actively working in many districts of Bihar and Uttarakhand, which are also the part of Indo-Nepal Tarai region. One of the respondents informed that the organization's main challenge in the bordering areas is in gaining the trust of the people and the administration.

Manav Seva Sansthan “SEVA”

Manav Seva Sansthan “SEVA” is a nonprofit organization which is currently working in several districts of Uttarakhand, Uttar Pradesh, Bihar and West Bengal. It was established in 1988 with a mission to ensure socioeconomic development of the poor people, women in vulnerable situation and children deprived of basic rights through community-based area development approach. The major focus of MSS is protection of women and children. Current portfolios of MSS are working on cross-border child right, child protection and anti-human trafficking campaign along with

gender rights and women empowerment, health and HIV. It is also focusing on inclusive growth of schedule cast/schedule tribe community. The organization also expands its focus on sustainable agriculture, sustainable livelihood, and migrant rights. The prime focus of MSS is disaster risk reduction, relief and response and climate change. It provides help related to livelihood, rehabilitation, food, and safety to people returning to normal life after disasters like flood, earthquake and other types of disasters. MSS has vast experience of addressing problems related to disaster through various approaches of supply of essentials, medications and counseling. In 2015, during the Nepal earthquake, it provided non-food things to victims (<http://www.manavsevaindia.org/disaster-management.aspx>). MSS has a strong General Body, which has members from all walks of life including those from client communities.

The Governing Body of 11 members are elected by the General Body. The Governing Body has a 5-year term. The Governing board members comprise eminent personalities from diversified fields. The MSS management comprises the Executive Director, Director and manager/officers handling programs, human resource, finance, and administration. There is a Core Committee with representatives from the Governing Body, executives, and staffs. This committee meets quarterly to reviews program, monitors budget, and decides on new programs.

The organization follows consultative decision-making processes. This institute is more active in Gorakhpur, Kushinagar, Maharganj, Balrampur, Bahraich, Basti, Siddartha Nagar, Santkabir Nagar, Deoria, and Ballia districts of Uttar Pradesh. This area has peculiar physical or social characteristics. Some districts are very close to Indo-Nepal border and the area is surrounded by major rivers like Gandak, Narayani, Rohin, Rapti, etc., which cause floods almost every year and the demographics of the area are among mostly backward districts of the country.

Mr. Rohan Sen, Program Manager mentions that this institute and its staff face various challenges during the work; these are mostly economic, physical, and phycological. He said, socially they did not face any problems. He said the most important challenge includes constraints in fulfilling all the needs of the target group because of the large population and less resources and funds. He said the other challenges in these areas are poor road connectivity along with water loggings and forest areas that create physical hurdle to reach on time to help the affected people.

The other problem is psychological as the expectation of communities are high; so in times of crisis, fulfilling all the expectation becomes challenging and invites criticism.

Local NGOs

DEHAT (Developmental Association for Human Advancement) India

DEHAT was founded in year of 1989 in Bahraich in Uttar Pradesh. In initial 10 years DEHAT served as a school for "Tharu" tribal villagers and forest children until being registered under the Society Registration Act 1860 on the 21 August 2000. This NGO started with the belief that without securing the development of children no

society can achieve sustainable development. This organization firmly assured the children survival, protection and participation with the aim to educate, enable, and empower the underprivileged. Therefore, the core work area of this institute is to assure the safety of children and it delivers service in the most backward rural region in India. The main objective of this organization to rescue children from being vulnerable. DEHAT is working with worldwide partner to empower and advocate for the most vulnerable community. DEHAT is inspired by the United Nations Convention on the Rights of Child (UNCRC) and is committed to shape a child's life safely by bringing together education along with women literacy and empowerment, human trafficking protection, sustainable livelihood option and maternal and child health (<https://dehatindia.org/our-story/about-us>). Though the organization is not directly related to disaster management, it actively provides support to the vulnerable population affected by various forms of disasters. A worker from DEHAT informed that acute poverty is the main challenge in this region, which places constraint on any innovative development program.

Maiti Nepal

Geographical, economic, and social landscape of Indo-Nepal Tarai region provide all suitable conditions for most heinous crime of today, that is human trafficking. The region is economically poor, socially backward, geographically fragile and being a transit zone is identified as a prominent point of trafficking.

Maiti is an organization that works to protect girls and women from various types of abuse like child and sex trafficking, domestic violence specially during a disaster and in the post disaster phase. In Nepali "Maiti" means the home of a girl's biological parents. This institute was established in 1993 with the aim to make Nepal free from sexual exploitation against child and women. It is also actively working in the legal sector to provide justice for the victimized girls and women. Its main focus is to prevent human trafficking for the various types of illegal activities by means of raising awareness level of community and empowering women. The objective of the organization is to rescue the victim of human trafficking and rehabilitate them by providing education and necessary counseling. Currently it is operating a rehabilitation center in Kathmandu, as well as at the transit zone of Indo-Nepal border. This NGO organizes prevention programs by giving information about human trafficking to vulnerable girls and it also provides temporary shelter houses for the victims (<https://maitinepal.org/about-us/introduction/>).

Maiti Nepal is quite successfully rescuing thousands of girls and women from trafficking but it faces some criticism; it has been found that Maiti does not always respect the will of the victims and is also criticized for not providing proper rehabilitation to former prostitutes. But one of the respondents informs about the various challenges faced by the organization, most importantly the social stigma attached to the trafficked person, which sometimes do not allow the organization to work according to the wish of the rescued person.

Conclusion

This analysis shows that disaster management in Indo- Nepal Tarai region still has a piecemeal and an ad hoc approach. The South Asian Association for Regional Cooperation (SAARC) has identified the need to associate efforts with its active role to reduce the effects of disasters through awareness and preparedness for rescue and relief. To this end, SAARC has set up a SAARC Disaster Management Centre (SDMC) in 2006 and many warning centers. But when in 2015 devastating earthquakes ravaged Nepal, it showed the actual limits to a regional disaster management and response. Around 4175 troops from 18 countries were positioned for rescue and relief operations. India was the first neighbor to join the Nepalese disaster response. Except Afghanistan and Maldives, all SAARC member states tried to help in the Nepalese disaster. The United States, United Kingdom, China, Japan, Germany, and South Korea were among the other countries providing help in rescue, relief, and rehabilitation of victims. But SAARC was not prepared for the right response once the support reached Kathmandu. Its institutional presence in rescue and relief operation in Nepal was missing. The absence of a pre-coordinated plan or resource management formed strains even in the capital. The condition in the inaccessible areas was even bad, where the road networks were destroyed and helicopters were the only mode of carrying relief materials.

SAARC has problem of indecision and implementation of programs, including disaster management measures. Though, the better hope for the regional approach to disaster management in SAARC is the commitment from all the member states on regional effort to reduce the loss and relieve the victims as early as possible. However, the implementation is slow in South Asia, members are still very optimistic to address issues like poverty alleviation, food security or disaster management and have not refused to take coordinated actions in these directions.

While in Nepal inadequate intergovernmental synchronization with provincial and local government is partially due to a paucity of human resources, the problem at federal level has more to do with bureaucratic siloes. Therefore, the formation of DRRM institutional and legal structures, and the modest fulfillment of staffing requirements may be inadequate to address intergovernmental coordination gaps. In India too Tarai districts fall within the political boundaries of different states, which have different disaster response mechanism. Even the Central Government is not looking at the need to develop a comprehensive disaster management plan for this region. Categorization of disaster is also different in both countries, which create a major hurdle in coordinated response during the emergencies.

India and Nepal both are mainly following top-down approach in disaster governance. The challenges of coordination and communication during crisis have more severe and obvious consequences. It has seen that several times in this region lives are lost and recovery retarded as responders and decision makers are unsuccessful in moving resources, personnel and aid in time to disaster-struck communities. Nations have moved to create frameworks intended to better handle catastrophe coordination for which turning policies into practices requires finding the appropriate balance between top-down and bottom-up engagement.

It has been stated during the online interaction by various respondents that the government and nongovernmental institutions are working without any coordination especially in this region, sometimes they are not aware about the work done or that can be done by other organizations. Therefore, NGOs fail to receive administrative support while government fails to take advantage of NGOs in disaster risk reduction program in Indo Nepal Tarai region.

It has been seen that generally at the time of disaster, institutions concentrated their activities and remain more active at the epicenter of affected areas and forgotten peripheral areas impacted by disasters, which increases the suffering of the people living in those areas. It is necessary to acknowledge them while formulating intervention strategies.

In spite of the unrelenting urgency of disaster response, the situations under which local, regional, and national authorities and residents synchronize well during disaster remain vague. International organizations despite their best efforts remain mostly unable to deliver the coordinated disaster risk reduction in the region.

Coordination at the transboundary level is very challenging. There is a lack of institutional structure, inadequate staffing, and poor functional ability to undertake designated responsibilities in these areas. However, both governments coordinated during the disasters in the past but current efforts are insufficient. This gap in intergovernmental collaboration and coordination may be determined with adequate DRRM institutional structures in place, improved staffing, and greater resource mobilization with strong political and civilian will.

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Natural Hazard and Disaster Planning in the State of Oregon: Action and Wishful Thinking

32

Edward J. Sullivan

Contents

Introduction: Natural Hazards and Disasters in the United States	436
Riverine and Coastal Flooding	436
Earthquakes and Tsunamis	439
Coastal Erosion	440
Landslides	441
Wildfires	441
Real-Time Dilemmas for Planning Officials	442
Dwelling in a Floodplain	443
Industrial Facility at or near a Seismic Fault	444
Coastal Vacation Home	444
Community in a Landslide-Prone Area	445
Dwelling on Forestland	445
The Oregon Approach	446
Conclusion	451
References	452

Abstract

This chapter deals with the history and present activities of the state of Oregon, located in the Western United States, with respect to natural hazards and disasters under a 50-year-old planning program. The chapter deals only peripherally with the activities of the federal government and is focused upon land use planning activities in that state.

Oregon has had a statewide planning system since 1973. See Oregon Revised Statutes, Chap. 197. County and city governments must have a “comprehensive

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plan” to which their land use regulations and actions must conform. In turn, those plans must conform the applicable statewide planning “goals” that deal with various subject areas, including Goal 7, Natural Hazards and Disasters. Goal 7 directs these governments to inventory likely hazards and disasters (including riverine and coastal flooding, earthquakes and tsunamis, landslides and coastal erosion, and wildfires) and take steps to mitigate or avoid them. Local plans must be “acknowledged” or certified by a state agency to conform to the goals.

All local plans have been “acknowledged”; however, problems remain. Local governments sometimes avoid raising issues that may raise landowner concerns over limitations on property use and subsequent litigation. Further, local governments are underfunded to undertake further studies on potential or less understood hazards and disasters and the regulatory steps to mitigate or avoid them. The present accommodation is that no new obligation to mitigate or avoid disasters will occur unless the state agency so determines. While the state’s land use program does more in this area than other states, it could do a much better job.

Keywords

Planning · Land use regulation · Natural hazards and disasters · Flooding and coastal erosion · Earthquakes and tsunamis · Wildfires · Landslides

The news cycle brings an unremitting catalog of national and international natural disasters to the public consciousness. Hurricanes, wildfires, earthquakes, and tsunamis fascinate for a while and then fade away. For a time, disaster recovery may occupy public attention, but it is less riveting than political and social events – or the next disaster – and these items inevitably come to occupy reader or viewer interest. As such, planning to mitigate or reduce damage from these natural disasters is rarely given priority, as it is seen as too inconvenient or politically impractical to bring to reality or, in some cases, is considered a scandalous example of government overreach.

This chapter discusses the role of comprehensive planning and land use regulation in planning for, adapting to, and mitigating the social, economic, and environmental impacts of natural hazards and disasters – phenomena that are and will continue to be greatly exacerbated by climate change. (See Coastal Flooding, SCIENCECIRECT, <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/coastal-flooding> (last visited Oct. 12, 2019).) We advocate ditching the default response of providing for relief and reconstruction following natural disasters in favor of the more difficult business of inventorying, analyzing, and studying significant anticipated hazards, devising optimal strategies to mitigate or avoid them, and crafting policies and regulations to prevent or reduce the damage they cause. This approach requires an adequate factual base, conscious policy choices that may prohibit development in risky areas, and adherence to regulations that carry out those policy choices. While this regime is logical, there are short-term economic and

political obstacles to its attainment. From a national perspective, this article asks whether prudent states should continue to subsidize incautious local jurisdictions that continue to permit development in areas vulnerable to natural disasters.

Let us be clear: natural hazards are always with us. (The author is indebted to Ted Lorensen, a retired assistant state forester for Oregon, who believes most “hazards” (such as flooding, landslides, and wildfires) are natural ecosystem processes and that humans “modify” at own their peril, often to the detriment of the ecosystems themselves, as well as life and property. Modifying the effects of wildfires simply through fire suppression has resulted in fuel loads increasing. Similarly, “protecting” coastal dwellings with riprap and filling in wetlands too often end poorly, as nature overcomes mankind. To build in a margin of safety, Lorensen suggests that it would be better to accommodate and mimic ecosystem processes. The Institute for Natural Resources maintains a similar view. See Inst. for Nat. Res., Managing Dynamic Forest Ecosystems (2009), <http://library.state.or.us/repository/2010/2010040114-25514/index.pdf>. While the author agrees with this approach, the accepted nomenclature of “hazards” and “disasters” is used in this chapter.) They only become tragic disasters when they inflict personal injury or property damage that could have been avoided. The subject of this chapter is the role of land use planning and regulation in preventing natural hazards from becoming disasters. With some exceptions, (Riverine flood control was a logical starting point for federal involvement, as rivers cross state lines and the Commerce Clause of the US Constitution gives Congress authority to intervene. See U.S. Const. art. I, § 8, cl. 3. While federal involvement in flooding and flood relief was occasional before that date, justified on a navigational basis, the 1936 Flood Control Act declared that flood control was an appropriate area for federal regulation and became the beginning of various flood control projects managed by the United States Army Corps of Engineers. See Flood Control Act of 1936, Pub. L. No. 74-738, 49 Stat. 1570; Joseph L. Arnold, The Evolution of the 1936 Flood Control Act (1988), https://www.publications.usace.army.mil/Portals/76/Publications/EngineerPamphlets/EP_870-1-29.pdf (noting that, in Gibbons v. Ogden, 22 U.S. 1 (1824), the Supreme Court interpreted the Commerce Clause as allowing federal involvement in public projects on rivers in the United States.) this approach is generally not available or used at a national level in the United States, since planning is more often viewed as a function of state and local government (See Organisation for Econ. Co-operation & Dev., The Governance of Land Use in OECD Countries: Policy Analysis and Recommendations: Country Fact Sheet United States (2017), <https://www.oecd.org/regional/regional-policy/land-use-United-States.pdf>.) with some amount of federally mandated planning and financial contribution, usually through grants. (See Adam B. Smith, 2018’s Billion Dollar Disasters in Context, Climate.gov (Feb. 7, 2019), <https://www.climate.gov/news-features/blogs/beyond-data/2018s-billion-dollar-disasters-context>. The Federal Disaster Mitigation Act of 2000 requires, as a condition of most federal assistance, that state, local, and tribal governments undertake coordinated disaster planning and mitigation efforts and provides some federal funds to that end. See 42 U.S.C. §§ 5121–5207. Such grants have funded the University of Oregon’s Oregon Partnership for Disaster Resilience and the Oregon Department of Land

Conservation and Development's natural hazard mitigation planning program. See personal communication from Michael Rupp to author (Oct. 17, 2019) (on file with author). Thus, for the most part, the established paradigm is that state and local governments bear the brunt of planning for natural hazards. This chapter assumes that that is the most frequent template on this subject and focuses on how natural hazard planning and regulatory implementation can be more useful tools for state and local governments in preventing natural hazards from becoming disasters.

Introduction: Natural Hazards and Disasters in the United States

The geographic diversity of the United States gives rise to many occasions for natural hazards and disasters. This chapter highlights several of the most common hazards as primary examples. We acknowledge that many other hazards exist – including tornadoes, hurricanes, volcanoes, and droughts – however, we have elected to omit them here in the interest of brevity and readability. The following catalog sets out several of the most prevalent examples and discusses the availability of data which, when properly used, enable us to evaluate the probabilities of their occurrence and avoid or mitigate their impacts.

Riverine and Coastal Flooding

Flooding is best understood by breaking the phenomenon into two categories. Riverine flooding refers to the inundation of rivers and lakes by runoff from surrounding surfaces, The United States Geological Survey identifies two types of riverine flooding:

A flash flood occurs when runoff from excessive rainfall causes a rapid rise in the water height (stage) of a stream or normally-dry channel. Flash floods are more common in areas with a dry climate and rocky terrain because lack of soil or vegetation allows torrential rains to flow overland rather than infiltrate into the ground.

River flooding is generally more common for larger rivers in areas with a wetter climate, when excessive runoff from longer-lasting rainstorms and sometimes from melting snow causes a slower water-level rise over a larger area. Floods also can be caused by ice jams on a river or high tides, but most floods can be linked to a storm of some kind.

What Are The Two Types of Floods?, U.S. Geological Surv., https://www.usgs.gov/faqs/what-are-two-types-floods?qt-news_science_products=0#qt-news_science_products (last visited Oct 12, 2019). This chapter also considers flash floods as a component of riverine flooding.) while coastal flooding is inundation of oceans beyond astronomical tide levels, usually by storm surges or a combination of storms and astronomical tides. (See Nat'l Oceanic & Atmospheric Admin., U.S. Dep't of Commerce, Understanding Coastal Flooding Terminology, <https://www.weather.gov/media/okx/coastalflood/Understanding%20Coastal%20Flooding%20Terminology.pdf> (last visited Oct. 12, 2019).) The United States Geological Survey (USGS), in

conjunction with other state and federal agencies, collects and publishes data on past floods and the likelihood of future flooding. (See USGS Flood Information, U.S. Geological Surv., https://www.usgs.gov/mission-areas/water-resources/science/usgs-flood-information?qt-science_center_objects=0#qt-science_center_objects (last visited Oct. 12, 2019).) The predictive element of these efforts is found in the USGS's Flood Inundation Mapping (FIM) program, in which significant flood risks are mapped for state and local government use. (See Flood Inundation Mapping (FIM) Program, U.S. Geological Surv., https://www.usgs.gov/mission-areas/water-resources/science/flood-inundation-mapping-fim-program?qt-science_center_objects=0#qt-science_center_objects (last visited Oct. 12, 2019); see also FEMA Flood Map Service Center: Welcome! Fed. Emergency Mgmt. Admin., <https://msc.fema.gov/portal/home> (last visited Oct. 12, 2019) (providing access to flood maps).) The Federal Emergency Management Agency (FEMA) also provides flood risk information in the form of Flood Insurance Rate Maps (FIRM), usually in terms of 100- and 500-year floodplains indicating where there is a 1% or a 0.2% chance of flooding in a given year. (See Fed. Emergency Mgmt. Admin., U.S. Dep't of Homeland Security, Definitions of FEMA Flood Zone Designations, https://efotg.sc.egov.usda.gov/references/public/NM/FEMA_FLD_HAZ_guide.pdf (last visited Oct. 12, 2019).) FEMA offers flood insurance for landowners in jurisdictions that belong to the National Flood Insurance Program (NFIP) and that use its maps to regulate structures in the floodplain. (According to the National Association of Insurance Commissioners Center for Insurance Policy and Research (CIPR), there is a need to provide for flood insurance:

Floods are the most common and most destructive natural disaster in the United States. Ninety percent of all natural disasters involve flooding, and all 50 states have experienced floods or flash floods in the past five years, according to [Floodsmart.gov](https://www.floodsmart.gov). The damage from a flood is not covered under a standard homeowner's policy. Flood insurance is a special policy that is federally backed by the National Flood Insurance Program (NFIP) and available for homeowners, renters and businesses.

Flood Insurance, Nat'l Ass'n Ins. Commissioners, https://www.naic.org/cipr_topics/topic_nfip.htm (last updated Apr. 22, 2019). The CIPR goes on to describe the NFIP, created under the National Flood Insurance Act of 1968 in response to the lack of available private insurance and the continued increase in federal disaster assistance due to floods. The NFIP is a federal program, managed by FEMA, with three objectives: to provide flood insurance, to improve floodplain management, and to develop maps of flood hazard zones. The program allows landowners in participating communities to buy insurance protecting against flood loss. Participating communities must establish management regulations in order to reduce future flood damages. This program is intended to furnish an insurance alternative to disaster assistance and is an attempt to reduce the rising costs of repairing flood damage to structures and their contents. See *id.*; see also Nat'l Ass'n of Ins. Comm'r's & Ctr. For Ins. Policy & Research, Flood Risk and Insurance (2017), https://www.naic.org/documents/cipr_study_1704_flood_risk.pdf.) While there is a degree of confidence in the accuracy of floodplain data (as periodically revised), (See Flood Map Accuracy: Hearing Before the Ad Hoc Subcomm. on Disaster Recovery & Ad Hoc

Subcomm. on State, Local, & Private Sector Preparedness & Integration, S. Comm. on Homeland Security & Governmental Affairs, 111th Cong. (2010) (statement of David R. Maidment, Director, Center for Research in Water Resources, University of Texas at Austin), <http://www.ce.utexas.edu/prof/maidment/giswr2011/docs/FloodplainMappingSenate.pdf> (expressing optimism that the new FEMA mapping program will be more accurate than previous mapping efforts); see also Howard Kunreuther and Marilyn Montgomery, The Importance of Accurate Flood Hazard Maps and Risk-Based Premiums, Wharton Sch. (Mar. 28, 2018), <https://riskcenter.wharton.upenn.edu/resilience-lab-notes/importance-accurate-flood-hazard-maps-risk-based-premiums/>.) it is not universally shared and is prone to disagreements on occasion. (See Jake Varn, Let's Start with Better Floodplain Maps, Bipartisan Pol'y Ctr. (Nov. 8, 2017), <https://bipartisanpolicy.org/blog/lets-start-with-better-floodplain-maps/> (asserting that the FEMA maps are a hodgepodge of data collected between 1900 and 1960 and the product of a 1973 compromise between the Army Corps of Engineers' strict standards and more lax local policies); Ramin Skibba, Why Are FEMA's Flood Maps So Horribly Flawed? Slate (Sept. 6, 2017), <https://slate.com/technology/2017/09/heres-why-femas-flood-maps-are-so-terrible.html> (suggesting that FEMA maps do not calculate for climate change, are expensive to maintain in the face of other changing inputs, and can be manipulated by local governments); Joel Scata, FEMA's Outdated and Backward-Looking Flood Maps, Nat. Resources Def. Council (Oct. 12, 2017), <https://www.nrdc.org/experts/joel-scata/femas-outdated-and-backward-looking-flood-maps> (suggesting that 58% of FEMA maps are out of date and do not account for anticipated future events, such as changes in rainfall patterns and other incidents of climate change). In addition, because the maps focus on existing conditions, they do not account for such things as channel migration.) Nevertheless, these maps provide a national perspective on riverine and coastal flood management.

Despite NFIP participation by most coastal jurisdictions, coastal flooding hazards are becoming less predictable. While the USGS is experimenting with data collection, (See Surge, Wave, and Tide Hydrodynamics (SWaTH) Network, U.S. Geological Surv. (Feb. 10, 2016), https://www.usgs.gov/mission-areas/water-resources/science/surge-wave-and-tide-hydrodynamics-swath-network?qt-science_center_objects=0#qt-science_center_objects. The USGS's SWaTH system was deployed along the Atlantic Coastline of the Continental United States following Hurricane Sandy to "enable scientists to measure and analyze wave height, frequency, and devolution as functions of water depth and distance inland—important factors that dramatically influence storm-tide damage." Coastal Storm Response Surge, Wave, and Tide Hydrodynamics Network (SWaTH), U.S. Geological Surv. (Aug. 26, 2019), <https://www.sciencebase.gov/catalog/item/560aa95ce4b058f706e-5374b>; see also Coastal Flood Exposure Mapper, Digital Coast, <https://coast.noaa.gov/digitalcoast/tools/flood-exposure.html> (last visited Oct. 19, 2019).) predictions are more difficult for this phenomenon due to its multifarious causes, many of which relate to climate change: rising sea levels (especially for small island nations), high tides and storm surges, higher temperatures, melting ice caps, the impact of

El Nino and La Nina on weather patterns, and humankind's obsessive desire to locate vulnerable land uses in flood-prone coastal areas. (See Coastal Flooding, ScienceDirect, <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/coastal-flooding> (last visited Oct. 12, 2019) (listing articles on the causes of coastal flooding).) Despite this lack of predictability, we know that persistent sea rise threatens low-lying areas such as the City of Miami, (The City of Miami projects that, by 2030, sea level will have risen 6 to 10 inches above the 1992 mean sea level and that, by 2060, it will have risen 14 to 34 inches above that level, inundating lower-lying roads and land uses. See Miami's Vulnerability to Flooding, City of Miami, <https://www.miamigov.com/Government/ClimateReadyMiami/Flooding> (last visited Oct. 12, 2019); see also Miami Underwater?, Nat'l Geographic, <https://www.nationalgeographic.com.au/videos/explorer-bill-nyes-global-melt-down/miami-underwater-3669.aspx> (last visited Oct. 12, 2019).) as evidenced by the harsh impacts of Hurricane Katrina on New Orleans and Superstorm Sandy on the Eastern Seaboard. (See Sara Gibbens, Hurricane Sandy, Explained, Nat'l Geographic (Feb. 11, 2019), <https://www.nationalgeographic.com/environment/natural-disasters/reference/hurricane-sandy/> (setting out the human and property costs of Hurricane Sandy and suggesting that many similar events will occur as a result of climate change); see also Hurricane Sandy - New York, U.S. Geological Surv., https://www.usgs.gov/centers/ny-water/science/hurricane-sandy-new-york?qt-science_center_objects=0#qt-science_center_objects (last visited Oct. 12, 2019).) As coastal flooding becomes increasingly persistent, caution counsels against further development on vulnerable seafronts.

Earthquakes and Tsunamis

At present, there is no scientifically accepted method of predicting the exact time, place, or magnitude of earthquakes and resulting tsunamis. (See Can You Predict Earthquakes?, U.S. Geological Surv., https://www.usgs.gov/faqs/can-you-predict-earthquakes?qt-news_science_products=0#qt-news_science_products (last visited Oct. 12, 2019). The academic community appears to agree with this conclusion. See Yan Y. Kagan, Are Earthquakes Predictable?, 131 Geophysical J. Int'l 505, 506, 523 (1997) (concluding that such predictability is an "open problem" and surveying literature on the issue). With tsunamis, it is obviously better to factor in distance so that the availability of additional time makes it more likely that harm will be avoided or alleviated.) As a result, scientists have focused instead on the areas that are most prone to these phenomena. Since approximately 80% of earthquakes occur along the Pacific Rim, many seismologists advocate using data to enact responsive building codes, propose tsunami inundation zones, and ensure adequate insurance ratings, rather than await the "silver bullet" of exact predictions that may never fully develop. (See Robert Lamb, Will Earthquakes Ever Be Predictable?, HowStuffWorks.com (June 14, 2010), science.howstuffworks.com/nature/natural-disasters/earthquake-predictable.htm; see also Can We Predict Earthquakes?, Planet Sci., <http://www.planet-science.com/categories/over-11s/natural-world/2011/03/can-we-predict->

[earthquakes.aspx](#) (last visited Oct. 12, 2019) (asserting that there is a 67% chance that an earthquake will strike the San Francisco Bay area within the next 30 years.)

Coastal Erosion

The force of waves pounding on coastal rocks, changing them into pebbles, and later changing pebbles into sand, which may be borne away, can change the shape of entire coastlines. (See Erosion, Nat'l Geographic, <https://www.nationalgeographic.org/encyclopedia/erosion/> (last visited Oct. 12, 2019); see also What is Shoreline Erosion?, Am. Geosciences Inst., <https://www.americangeosciences.org/education/k5geosource/content/rocks/what-is-shoreline-erosion>.) Moreover, its adverse effects change with location – hurricanes on the Atlantic Coast pose different risks than extratropical storms on the Pacific Coast, and all coastlines are affected by winter storms. (See National Assessment of Storm-Induced Coastal Change Hazards, U.S. Geological Surv., https://www.usgs.gov/centers/spcmsc/science/national-assessment-storm-induced-coastal-change-hazards?qt-science_center_objects=0#qt-science_center_objects (last visited Oct. 12, 2019); see also National Assessment of Coastal Change Hazards, U.S. Geological Surv., https://www.usgs.gov/natural-hazards/coastal-marine-hazards-and-resources/science/national-assessment-coastal-change-hazards?qt-science_center_objects=0#qt-science_center_objects (last visited Oct 12, 2019) (noting research “to identify areas that are most vulnerable to coastal change hazards including beach and dune erosion, long-term shoreline change, and sea-level rise”). The USGS has predicted that sea level rise will dramatically accelerate the ongoing loss of coastal cliffs in Southern California. See Sea Level Rise Could Double Erosion Rates of Southern California Coastal Cliffs, U.S. Geological Surv. (July 9, 2018), <https://www.usgs.gov/news/sea-level-rise-could-double-erosion-rates-southern-california-coastal-cliffs>.) Due to its highly localized nature, not to mention factors related to climate change, coastal erosion is difficult to predict. Indeed, the best that we might hope for is an assessment of coastal vulnerabilities. (See Coastal Erosion, U.S. Climate Resilience Toolkit, <https://toolkit.climate.gov/topics/coastal-flood-risk/coastal-erosion> (last updated Sept. 13, 2019). (“Sea level rise will cause an increase in coastal erosion and the human response will be critical. If we choose to build hard structures in an attempt to keep the shoreline position stable, we will lose beach area due to scour. If we let the shoreline migrate naturally, we can expect to see erosion rates increase, especially in regions of the coast that are already dealing with starved sediment budgets and rapid shoreline migration.”).) The most frequent land use conflict in this context is the use of physically protective structures such as seawalls, groins, riprap, and levees – practices that are extremely expensive and have had overall negative effects (See id. These solutions have been discounted due to their prohibition under state and local regulations, erosive impacts on beaches and dunes, diversion of stormwater and waves onto other properties, and installation and

maintenance costs.) and which are further dealt with below. (See infra discussion of Rockaway Beach, Oregon, under section “[Coastal Vacation Home](#)” below.)

Landslides

As with previous examples of natural hazards, the incidence, force, and impacts of landslides are not precisely predictable; however, to a great extent, their probabilities are. We do have some knowledge about landslides – their types, elements, triggering mechanisms (especially the interaction of water with unstable rock and soil and the impacts of earthquakes and volcanic activity), mapping, remote sensing, and monitoring. (See Lynn M. Highland & Peter Bobrowsky, U.S. Dep’t of the Interior, U.S. Geological Survey, *The Landslide Handbook: A Guide to Understanding Landslides*, https://pubs.usgs.gov/circ/1325/pdf/C1325_508.pdf (compiling data, research projects, and recommendations for dealing with landslides).) With available tools, we often have sufficient information to assess landslide probabilities in order to fashion regulations to mitigate or negate their impacts through avoidance or responsive building codes. (See, e.g., Predicting Landslide Hazards in Near Real-Time, Earth Observatory (Apr. 18, 2018), <https://earthobservatory.nasa.gov/images/92018/predicting-landslide-hazards-in-near-real-time> (announcing the development of the Landslide Hazard Assessment for Situational Awareness (LHASA) model, which utilizes space-based observations to estimate landslide potential on a global scale); Byung-Gon Chae et al., Landslide Prediction, Monitoring and Early Warning: A Concise Review of State-of-the Art, 21 Geosciences J. 1033 (2017), https://www.researchgate.net/publication/321654509_Landslide_prediction_monitoring_and_early_warning_a_concise_review_of_state-of-the-art (reviewing literature on the subject); Emanuele Intrieri & Giovanni Gigli, Landslide Forecasting and Factors Influencing Predictability, 16 Nat. Hazards & Earth Sys. Sci. 2501 (2016), <https://www.nat-hazards-earth-syst-sci.net/16/2501/2016/>.)

Wildfires

This term includes forest, vegetation, and grass fires in dry circumstances. While it usually denotes uncontrolled fires in forests or wildland areas, wildfires can also consume houses and agricultural resources. (See Wildfire, ScienceDaily, <https://www.sciencedaily.com/terms/wildfire.htm> (last visited Oct. 12, 2019). While the public’s attention has largely focused on loss of life and damage to property, the media and government often ignore the broader impacts of wildfires on the environment. Wildfire is now the biggest factor in the loss of older forest on federal lands and reduced northern spotted owl habitat. See personal communication from Ted Lorenzen to author (Oct. 18, 2019) (on file with author).) Wildfires need a fuel source (the greater the load, the more intense the fire), air (oxygen and winds), and an

ignition source – whether natural in origin (e.g., lightning) or through human sources (as is more often the case at the national level). (Unlike for landslides and floods, there is a suppression system in place for wildfires on which states have relied. Unfortunately, increasing expenditures on fire suppression is no longer effective. See The 2018–19 Budget: Fire Recovery Proposals, Cal. Legis. Analyst's Off., <https://lao.ca.gov/Publications/Report/3767> (last visited Oct. 19, 2019). The amount of resources allocated to fuel modification is proportionately paltry, and administrative inefficiencies have truncated success. See personal communication from Ted Lorenzen to author (Oct. 18, 2019) (on file with author).) They are most common in the American West, where heat, drought, and both natural and human fire sources are prevalent. (See Claire Wolters, Climate 101: Wildfires, Nat'l Geographic (Aug. 9, 2019), <https://www.nationalgeographic.com/environment/natural-disasters/wild-fires/>.) These combinations are capable of mapping, (See Nat'l Interagency Fire Ctr. et al., North American Seasonal Fire Assessment and Outlook (2019), https://www.predictiveservices.nifc.gov/outlooks/NA_Outlook.pdf; North American Fire Danger, Wildland Fire Assessment Sys., <https://www.wfas.net/index.php/fire-danger-rating-fire-potential%2D%2Ddanger-32/north-america-fire-danger-map> (last visited Oct. 12, 2019); Predictive Servs. & Nat'l Interagency Fire Ctr., National Significant Wildland Fire Potential Outlook (2019) https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf (gauging wildland fire danger through assessments of climate, weather, fuel loads, fire danger, and fire activities and through coordination with state, local, and other federal agencies at the National Interagency Fire Center in Boise, Idaho, and ten regional centers).) but the hazard itself is more amenable to probabilistic analysis than precise prediction. (See Probability of Wildfire, Climate.gov, <https://www.climate.gov/maps-data/data-snapshots/data-source-probability-wildfire> (last visited Oct. 12, 2019) (using continuous data streams to predict wildfire probabilities); Patricia Andrews et al., Predicting Wildfires, Sci. Am., Aug. 2007, at 48, https://www.fs.fed.us/rm/pubs_other/rmrs_2007_andrews_p001.pdf; Haiganoush K. Preisler et al., Near-Term Probabilistic Forecast of Significant Wildfire Events for the Western United States, 25 Int'l J. Wildland Fire 1169 (2016), <https://www.fs.usda.gov/treeresearch/pubs/53305>; Jeremy S. Fried et al., Analysing Initial Attack on Wildland Fires Using Stochastic Simulation, 15 Int'l J. Wildland Fire 135 (2006), <https://www.fs.usda.gov/treeresearch/pubs/24567>.)

The common theme in this catalog of potential disasters is that, while we may not know the date or hour of their occurrence, watchfulness is necessary in order to avoid or mitigate their impacts.

Real-Time Dilemmas for Planning Officials

In this section, we examine five proposed developments in areas that present some statistical vulnerability to one or more of the foregoing natural hazards.

Dwelling in a Floodplain

Floodplain mapping is a common feature of American land use planning and regulation. (Omitted from this discussion is the issue of risk evaluation and its impact on flood insurance premiums under federal flood insurance programs.) Most floodplain mapping is undertaken as part of the National Flood Insurance Program (NFIP). Landowners in participating jurisdictions are eligible to purchase NFIP flood insurance for lawfully constructed residences. (See Floodplain Management Requirements, Fed. Emergency Mgmt. Admin., <https://www.fema.gov/floodplain-management-requirements> (last updated July 24, 2019) (explaining the framework under which the federal government designates 100- and 500-year floodplains [i.e., lands with a 1% and 0.2% chance of being flooded over those respective time periods], the restrictions that local governments can impose on construction in those areas, and the system of federally subsidized insurance for residences in those areas.) Such insurance is required for dwellings located in floodplains that are subject to federally backed mortgages. (Under federal law, the purchase of flood insurance is mandatory for all federal or federally related financial assistance for the acquisition and/or construction of buildings in high-risk Special Flood Hazard Areas (SFHAs). If the property is not in an SFHA, but instead in a moderate- to low-risk area, federal law does not require flood insurance; however, lenders can still require it. If, during the life of the loan, FEMA's maps are revised and the property is incorporated into an SFHA, the lender must notify the landowner of their obligation to purchase flood insurance. See Mortgage Lender Requiring Flood Insurance, Fed. Emergency Mgmt. Admin., <https://www.fema.gov/faq-details/Mortgage-Lender-Requiring-Flood-Insurance> (last updated Sept. 26, 2019).)

In theory at least, this kind of development involves elevating or otherwise protecting residential structures that are located within the designated floodplain and therefore at greater risk of being flooded. (Fed. Emergency Mgmt. Admin., National Flood Insurance Program: Floodplain Management Requirements (2005), https://www.fema.gov/media-library-data/1481032638839-48ec3cc10cf-62a791ab44ecc0d49006e/FEMA_480_Complete_reduced_v7.pdf) Nonresidential structures in the floodplain must also be flood-proofed or elevated to avoid problems associated with flooding. (See Floodproofing, Fed. Emergency Mgmt. Admin., <https://www.fema.gov/floodproofing> (last updated Sept. 24, 2019).) Even under the NFIP, however, concerns remain regarding the accuracy of FEMA's maps against the background of climate change, local application and enforcement, uninsured structures, and liability for either the grant or denial of permits for structures in the floodplain. (See Jon A. Kusler, Ass'n of State Floodplain Managers, No Adverse Impact: Floodplain Management and the Courts (2004), https://www.floods.org/NoAdverseImpact/NAI_AND_THE_COURTS.pdf (regarding permit appeals); see also James Schwab et al., Am. Planning Ass'n, Subdivision Design and Flood Hazard Areas (2016), <https://www.planning.org/publications/report/9112664/>. Liability may also attach for negligence in preparing or approving development applications that result in flood damage. See Hutcheson v. City of Keizer, 8 P.3d 1010 (Or. Ct. App. 2000) (imposing liability for subdivision approval where flooding

occurred); Jon Kusler, Ass'n of State Floodplain Managers, Professional Liability for Construction in Flood Hazard Areas (2007), https://www.floods.org/PDF/ASFPM_Professional_Liability_Construction.pdf.)

Industrial Facility at or near a Seismic Fault

Actual and potential earthquake zones are particularly common in the Western United States – especially around the San Andreas Fault in and near the crowded metropolises of Los Angeles and San Francisco. (See David K. Lynch, The San Andreas Fault, [Geology.com](https://geology.com/articles/san-andreas-fault.shtml), <https://geology.com/articles/san-andreas-fault.shtml> (last visited Oct. 13, 2019); Jasmine Aguilera, Two Big Earthquakes Shook Rural Southern California. What Would Have Happened If They Hit a Major City?, Time, July 8, 2019 <https://time.com/5622301/two-big-earthquakes-california-san-francisco-los-angeles/>.) While the near certainty of earthquake activity in these areas has not stopped all development, it has informed local governments as they enact and administer building codes or otherwise regulate that development. (This issue was nearly raised in San Diego Gas & Electric Co. v. City of San Diego, 450 U.S. 621 (1981). There, due to earthquake hazards, the city “downzoned” land that had once been planned for a nuclear power facility to allow for open space and other low-intensity uses. Although the Supreme Court never reached the land-owner’s takings claim, significant land use changes based on natural hazards are likely to see similar challenges in the future (such as challenges to the quality of the information relied on to support the changes). See Jonathan B. Sallet, The Problem of Municipal Liability for Zoning and Land-Use Regulation, 31 Cath. U. L. Rev. 465 (1982).) As such, those areas have walked a tightrope in managing land uses.

Coastal Vacation Home

A recent Oregon case demonstrates the difficulties of building in coastal areas. There, a landowner obtained a permit to construct a beachfront home behind the building line, which was mistakenly set by city officials and only discovered after construction was complete. (See Cody Mann, Rockaway Beach Riprap Saga Continues; \$1.8M Lawsuit Filed, Tillamook Headlight Herald, Apr. 4, 2019, https://www.tillamookheadlightherald.com/news_paid/rockaway-beach-riprap-saga-continues-m-lawsuit-filed/article_9c14615a-5751-11e9-93a1-177a7ad3ff07.html; Aimee Green, Decks Now Collapsing on Oregon Beach House at Center of Riprap Battle, [OregonLive.com](https://www.oregonlive.com/pacific-northwest-news/2018/04/saga_to_save_oregon_beach_hous.html), https://www.oregonlive.com/pacific-northwest-news/2018/04/saga_to_save_oregon_beach_hous.html (last visited Oct. 13, 2019); Troy McMullen, Once Prized and Profitable, Beachfront Real Estate Can Now Be a Losing Proposition, Wash. Post, Aug. 9, 2018, https://beta.washingtonpost.com/realestate/once-prized-and-profitable-beachfront-real-estate-can-now-be-a-losing-proposition/2018/08/07/9757b248-7efd-11e8-b660-4d0f9f0351f_story.html.)

When the home began collapsing, the city refused to authorize the installation of

riprap to shore it up. The landowner sued, and the city (and the State Parks and Recreation Department, which manages the state's coastal interests) was ultimately required to both authorize the installation of riprap and pay the landowner's attorney fees and costs. In addition, the city now faces another lawsuit involving takings and racial discrimination claims. This case illustrates the difficulties that can result from applying anything less than the best available information in the permit application process.

Community in a Landslide-Prone Area

Assuming a building is otherwise allowed under existing regulations, the permitting process may still raise liability concerns. On March 22, 2014, a landslide in Steelhead Haven, near Oso, Washington – on a mountainside saturated by rainwater – killed 43 people. Today, legal proceedings dealing with fault and damages are still pending. (The propensity for landslides was known, but development was allowed to proceed nonetheless. See Joseph Wartman, What We've Learned from the Deadly Oso, Washington Landslide Two Years On, Conversation, Mar. 21, 2016, <https://theconversation.com/what-weve-learned-from-the-deadly-osو-washington-landslide-two-years-on-56528> (concluding that the courts must sort out any liabilities); see also Vince Stricherz, Oso Disaster Had Roots in Earlier Landslides, U. Wash. (July 22, 2014), <https://www.washington.edu/news/2014/07/22/osو-disaster-had-its-roots-in-earlier-landslides/>; Mike Baker & Ken Armstrong, Oso Neighborhood Never Should Have Been Built, Seattle Times, June 7, 2014, http://old.seattletimes.com/html/localnews/2023794966_landslidehistoryxml.html.) The incident raises the question of whether state and local governments have a duty to inquire further about the risk of landslides within their jurisdictions, and amend their regulations accordingly, or whether landowners assume all the risk of development. (As discussed below, Oregon's planning program rarely requires local governments to reevaluate their plans and regulations and, since 2001, imposes no obligation on them to address natural hazards unless the state's Department of Land Conservation and Development (DLCD) provides notice of new hazard information, which has not yet occurred. See infra discussion of Oregon's Goal 7, below.)

Dwelling on Forestland

Landowners often seek to construct dwellings in forested areas so as to take advantage of rural amenities and low taxes. The downside is a lack of public safety resources, particularly fire suppression. (See Howard E. Moore, U.S. Dep't of Agric., U.S. Forest Serv., Protecting Residences from Wildfires: A Guide for Homeowners, Lawmakers, and Planners (1981), https://www.fs.fed.us/psw/publications/documents/psw_gtr050/psw_gtr050.pdf; Or. Dep't of Forestry, Considerations for the Siting of Dwellings on Forest Land (1991), <https://www.oregon.gov/ODF/Documents/AboutODF/LandUsePlanningNote2DwellingSiting.pdf> (pointing out

the dangers of locating dwellings in fire-prone forests and discussing efforts to deal with the same); see also F.C. Dennis, Colo. State Univ. Extension, Forest Home Fire Safety (2012), <https://extension.colostate.edu/docs/pubs/natres/06304.pdf>.) In these situations, the political and legal opprobrium of denying landowners the ability to construct homes on their land, (While the US Supreme Court has noted that personal property may be the subject of rigorous regulation, it has added that:

In the case of land . . . we think the notion . . . that title is somehow held subject to the “implied limitation” that the State may subsequently eliminate all economically valuable use is inconsistent with the historical compact recorded in the Takings Clause that has become part of our constitutional culture.

Lucas v. S.C. Coastal Council, 505 U.S. 1003, 1028 (1992) (Scalia, J.) the likely but indefinite nature of the danger, and the fear of liability combine to make outright denial a more difficult proposition.

The Oregon Approach

Oregon’s planning program combines a system of mandatory, binding local comprehensive plans that control local land use regulations and actions with state policy direction in the form of binding state policies or “goals.” (See generally Edward J. Sullivan, *The Quiet Revolution Goes West: The Oregon Planning Program 1961–2011*, 45 J. Marshall L. Rev. 357 (2012).) One of these binding policies is Goal 7 (Areas Subject to Natural Hazards), (See Or. Admin. R. § 660-015-0000(7); Oregon’s Natural Hazards, Or. Dep’t Land Conservation & Dev., <https://www.oregon.gov/lcd/NH/Pages/Natural-Hazards.aspx> (last visited Oct. 19, 2019); Natural Hazards Mitigation Planning, Or. Dep’t Land Conservation & Dev, <https://www.oregon.gov/lcd/NH/Pages/Mitigation-Planning.aspx> (last visited Oct. 19, 2019).) the purpose of which is “[t]o protect people and property from natural hazards.” (Or. Dep’t of Land Conservation & Dev., Goal 7: Areas Subject to Natural Hazards 1 (2001), <https://www.oregon.gov/lcd/OP/Documents/goal7.pdf> [hereinafter Goal 7].) The goal has four parts, in addition to numerous nonbinding guidelines:

1. Natural hazard planning – local governments must adopt comprehensive plans that reduce risk to people and property from natural hazards (i.e., flooding, landslides, earthquakes, tsunamis, coastal erosion, and wildfires). (See id. Coastal and Western Oregon is within the Cascadia Subduction Zone, a 600-mile fault that runs from northern California up to British Columbia, is about 70–100 miles off the Pacific coast shoreline, and is overdue for “the big one.” See Cascadia Subduction Zone, Or. Office Emergency Mgmt., <https://www.oregon.gov/oem/hazardsprep/Pages/Cascadia-Subduction-Zone.aspx> (last visited Oct. 13, 2019). Coastal areas in particular are at a significant tsunami risk. See Kathryn Schulz, Oregon’s Tsunami Risk: Between the Devil and the Deep Blue Sea, *New Yorker*, July 1, 2019, <https://www.newyorker.com/news/news-desk/oregons-tsunami-risk-between-the-devil-and-the-deep-blue-sea>. For its part, Oregon has taken steps to prepare for such risks. See Or. Seismic Safety Policy

Advisory Comm'n, The Oregon Resilience Plan: Reducing Risk and Improving Recovery for the Next Cascadia Earthquake and Tsunami (2013),

2. https://www.oregon.gov/oem/Documents/Oregon_Resilience_Plan_Final.pdf; see also Michael J. Rupp, Is Western Oregon Ready for the Big One? (PowerPoint presentation on file with author) (describing the impacts of an overdue earthquake and tsunami on Oregon and measures to deal with the same); Kathryn Schulz, The Really Big One, New Yorker, July 13, 2015, <https://www.newyorker.com/magazine/2015/07/20/the-really-big-one> (same). The Oregon Department of Geology and Mineral Industries has compiled digital maps showing where landslides have occurred or are likely to occur. See SLIDO: Statewide Landslide Information Layer for Oregon, Or. Dep't Geology & Min. Industries, <https://gis.dogami.oregon.gov/maps/slido/> (last visited Oct. 19, 2019). As discussed below, there is generally no requirement that local governments update natural hazard information unless DLCD requires it – something which, as of the date of this article, DLCD had not done since that requirement was first adopted in 2001.
3. New hazard information – the state's Department of Land Conservation and Development (DLCD) must consult with state and local representatives and review new hazard information provided by federal and state agencies. If DLCD believes local governments should respond to that information, it must notify them and allow them at least 36 months to do so.
4. Implementation – on receiving such notice, local governments must evaluate the new information in terms of risk to people and property (The goal sets forth certain assessment standards, namely:
 - a. The frequency, severity and location of the hazard;
 - b. The effects of the hazard on existing and future development;
 - c. The potential for development in the hazard area to increase the frequency and severity of the hazard; and
 - d. The types and intensities of land uses to be allowed in the hazard area.
5. Following comment and further evaluation, the local government will then incorporate such information into their comprehensive plans and implementing measures in accordance with certain risk management principles. (These include:
 - a. Avoiding development in hazard areas where the risk to people and property cannot be mitigated
 - b. Prohibiting the siting of certain essential facilities, major structures, hazardous facilities and special occupancy structures . . . in identified hazard areas, where the risk to public safety cannot be mitigated, unless an essential facility is needed within a hazard area in order to provide essential emergency response services in a timely manner.
6. Local governments are deemed in compliance with Goal 7's provisions relating to coastal and riverine flood hazards if they adopt and implement floodplain regulations that meet the minimum NFIP requirements. See Goal 7, *supra* note 47, at 1–2. The Oregon Department of Land Conservation and Development (LCDC) has addressed natural hazards through other goals, as well, such as by

- establishing siting and fire safety standards for dwellings and other structures in forest zones under Goal 4 (Forest Lands) in order to mitigate the risks associated with wildfires. See Or. Admin. R. § 660-006-0029, and -0035-0040.)
7. Coordination – finally, state agencies must coordinate their disaster management programs with those of local governments and provide local governments with information and technical assistance. (As Goal 7 itself notes, such cooperation and coordination is also required under Or. Rev. Stat. § 197.180 and Goal 2 (Land Use Planning).)

This goal was adopted in 1974 (Goal 7, along with thirteen others, became effective in January of 1975. See LCD 1, filed Dec. 31, 1974, effective Jan. 25, 1975.) and has since undergone only one substantial revision, in 2001. The deficiencies of the original version, (The original proposal, then numbered as Goal 5, provided:

Areas Subject to Floods, Landslides & Other Natural Hazards

Development subject to damage or which could result in loss of life within the state, both public and private, shall not be located in known areas of natural hazards in order to protect life and property.

DEFINITIONS

Natural Hazardous Areas – Areas that are subject to natural events that can result in death or endanger the works of man.

Development – Means the performance of any building or mining operation, the making of any material change in the use or appearance of any structure or land, the division of land, or the creation or termination of rights of access.

LCDC Complete Public Hearings Binder, Comments to LCDC on Nov. 25, 1974, at 160 (on file with author).

In late 1974, LCDC responded to public comments in adopting the final version of the renumbered Goal 7:

To protect life and property from natural disasters and hazards.

Developments subject to damage or that could result in loss of life shall not be planned nor located in known areas of natural disasters and hazards without appropriate safeguards. Plans shall be based on an inventory of known areas of natural disaster and hazards.

Areas of Natural Disasters and Hazards - are areas that are subject to natural events that are known to result in death or endanger the works of man, such as stream flooding, ocean flooding, ground water, erosion and deposition, landslides, earthquakes, weak foundation soils and other hazards unique to local or regional areas.

LCD 1, filed Dec. 31, 1974, effective Jan. 25, 1975.) which lacked sufficient definitions, prohibited development in “known” hazard areas, and did not provide for natural hazard inventories (thus raising the specter of local government liability), were corrected during the public hearings process. (Public hearings on the first 14 goals were held on November 19 and December 13, 1974, resulting in their revision and eventual adoption on December 31, 1974. See Statewide Goal Hearing Binders (on file with author).) The resulting version was more efficient – albeit limited, cautious, and ad hoc in its effects – requiring response only to known

dangers. (Michael Rupp, a current FEMA and former DLCD employee who dealt with the adoption and implementation of Goal 7, has observed that:

Goal 7 was one goal that suffered from the lack of scientific evidence that could support comprehensive measures to protect or mitigate from the effects of natural disasters. As jurisdictions proceeded with complying with the Statewide Planning Goals through the development of their comprehensive plans and implementing measures, information on Oregon's natural hazards was lacking other than floodplain maps prepared by the National Flood Insurance Program.

Personal communication from Michael Rupp to author (Sept. 9, 2019) (on file with author). By 1986, all local comprehensive plans in Oregon were "acknowledged" as complying with the goals. Under the original 1973 legislation establishing the Oregon planning program, comprehensive plans would have been updated periodically thereafter. However, due to the time, expense, and local resistance to periodic review, that requirement was virtually eliminated in most parts of the state. The demise of periodic review has harmed the Oregon planning program in that comprehensive plans are updated with respect to Goal 7 only if DLCD provides notice or local governments act voluntarily. There is no general obligation for local governments to update their comprehensive plans in the face of new hazard information without notice from DLCD. Another substantial obstacle to the update of comprehensive plans is the "unfunded mandates" provision of the Oregon Constitution, which generally prohibits the state from imposing new programs on local governments without also providing the requisite funds. See Or. Const. art. XI, § 15.)

The 2001 revisions to Goal 7 were made in response to a gubernatorial executive order following a series of natural disasters in 1996 and 1997. The executive order called for a review of the goal itself, an examination of the hazard planning process in Oregon, an evaluation of how effectively the goal was implemented at the local level, and recommendations on how it could be better stated and applied throughout the state. (See Univ. of Or. Dep't of Planning, Public Policy & Mgmt. & Or. Dep't of Land Conservation & Dev., Implementation of Goal 7: An Evaluation and Discussion of Hazard Planning in Oregon 1 (1998) (on file with author) (concluding that the original version of Goal 7 was vague, inconsistently applied, and, with little state direction, difficult to implement and noting there was little information, expertise, funding, and, with the demise of periodic review, incentive for local governments to update their comprehensive plans). Other state agencies ramped up their responses to natural hazards after the series of 1996 disasters. See Or. Dep't of Forestry, Forestry, Landslides and Public Safety (2001), <https://www.oregon.gov/ODF/Documents/WorkingForests/landslidespublicsafety.pdf> (emphasizing probabilism, the need for research and information sharing, the impact of forest practices on other uses, and the role of planning and regulation to avoid land use conflicts and natural hazards).) The result was a shift away from the "known hazards" and "appropriate safeguards" approach to one that triggered local responses only if DLCD gave local governments notice of such hazards, based on its own evaluation of relevant information. (The 1998 report evaluating the original version of the goal, comments on the same, a draft of the revised goal, and the final revised version are on file with DLCD and the author. The impacts of these changes are apparent in Southern Oregon Pipeline

Project, Inc. v. Coos County, 57 Or. LUBA 44, 71–72 (2008).) This approach mollified local governments, as it put the burden on DLCD to impose any local obligations. Of course, such impositions by DLCD will likely still raise local government hackles, especially as to funding the planning and regulatory responses to the new hazards. (The state governments in Oregon and Washington recently published a report containing extensive information and resources for mapping and responding to landslides. See Wash. Geological Survey & Or. Dep’t of Geology & Mineral Indus., Homeowner’s Guide to Landslides for Washington and Oregon (2017), <https://digital.osl.state.or.us/islandora/object/osl:83498>. However, DLCD has not yet required that local governments in Oregon respond to these hazards.)

There has been remarkably little litigation involving Goal 7, much of which has dealt with the need for or adequacy of local government findings. (Findings are especially important in addressing Goal 7 and other goals relating to natural hazards. See Save Our Rural Or. v. Energy Facilities Siting Council, 121 P.3d 1141, 1158–59 (Or. 2005); City of West Linn v. Land Conservation & Dev. Comm’n, 119 P.3d 285, 294 (Or. Ct. App. 2005); Stevens v. City of Cannon Beach, 854 P.2d 449, 459–60 (Or. 1993); Norvell v. Portland Metro. Area Local Gov’t Boundary Review Comm’n, 604 P.2d 896, 900 (Or. Ct. App. 1979). Similarly, goals relating to natural hazards do not apply to actions that do not involve “development.” Or. Shores Conservation Coal. v. Lincoln Cty., 36 Or. LUBA 288, 314 (1999).) Other cases have turned on the allocation of responsibilities between state and local governments in addressing natural hazards, (See S. Or. Pipeline Project, Inc. v. Coos Cty., 57 Or. LUBA 44, 71–72 (2008) (holding that the county was not obligated to respond to tsunami information absent notice by DLCD to consider the same).) while still others have dealt with the applicability of Goal 7 where other goals conflict. (See Home Builders Ass’n of Lane Cty. v. City of Eugene, 41 Or. LUBA 370, 442–43 (2002) (holding that the city could not impose a discretionary geotechnical analysis obligation under Goal 7 on “needed housing,” which is exempt from discretionary standards under Goal 10 and other provisions of Oregon law). Coastal areas are subject to differently worded natural hazard protections than those under Goal 7. See Columbia Riverkeeper v. Clatsop Cty., 243 P.3d 82, 96 (Or. Ct. App. 2010); Borton v. Coos Cty., 52 Or. LUBA 46, 58–60 (2006); Edward J. Sullivan, Land Use Conflict Management in Beaches and Dunes Areas, 55 Willamette L. Rev. 93 (2019); Edward J. Sullivan, Shorelands Protection in Oregon, 33 J. Envtl. L. & Litig. 129 (2018). The real estate values inherent in coastal development sometimes conflict with regulatory schemes, causing controversy. Recently, the Governor of Oregon approved legislation repealing the state Department of Geology and Mineral Industries’ authority to prohibit construction in tsunami inundation zones, leaving that task to local governments, while simultaneously proposing new Oregon Structural Specialty Code standards in such zones, namely, the 2016 edition of the American Society of Civil Engineers’ Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7-16). See Act effective January 1, 2020, ch. 502, 2019 Or. Laws _____. The Oregon Seismic Safety Policy Advisory Committee, under the Oregon Office of Emergency Management, has recommended approval of the ASCE 7-16 standards. See 2019 Oregon Structural Specialty Code

Adoption, Or. Building Codes Division, <https://www.oregon.gov/bcd/codes-stand/code-adoption/Pages/2019-osscc-adoption.aspx> (last visited Oct. 14, 2019).) In cases concerning a local government's treatment of a particular hazard, such as floodplains or wildfires, the reviewing bodies have held the local government to the standards of the goal. (See *Jaqua v. City of Springfield*, 46 Or. LUBA 134, 163–64 (2004) (holding that development approval under revised plans that was conditioned on future compliance with city floodplain regulations and backed by a draft floodplain study complied with Goal 7); *Smith v. Douglas Cty.*, 37 Or. LUBA 801, 807–08 (2000) (holding that the imposition of conditions to ensure flood conflict resolution measures, including removal of homes when threatened with flooding, was sufficient under Goal 7); *Johnson v. Jefferson Cty.*, 56 Or. LUBA 25, 50–51 (2008) (holding that conditions requiring development to comply with regulations to mitigate fire risk, supported by testimony of adequacy from local fire protection authority, met Goal 7 requirements); *Johnson v. Jefferson Cty.*, 56 Or. LUBA 72, 108–09 (2008), aff'd, 189 P.3d 34 (Or. Ct. App. 2008) (similar).) Still, the cases involving natural hazards, planning, and land use regulation are remarkably rare compared to those involving governmental liability and insurance claims.

Conclusion

Natural hazard planning, risk evaluation, and consequent land use regulation are politically and fiscally difficult, but, in the long run, those difficulties pale in comparison with failing to undertake such efforts. (John Maynard Keynes' observation that “[i]n the long run we are all dead,” however it was meant, captures the short-term thinking of the political class. John Maynard Keynes, *A Tract on Monetary Reform* 80 (MacMillan & Co. 1924). But for every dollar spent on disaster prevention, there is a savings of 6 dollars. See Laura Lightbody and Matthew Fuchs, Every \$1 Invested in Disaster Mitigation Saves \$6, Pew Charitable Trusts (Jan. 11, 2018), [https://www.pewtrusts.org/en/research-and-analysis/articles/2018/01/11/every-\\$1-invested-in-disaster-mitigation-saves-\\$6](https://www.pewtrusts.org/en/research-and-analysis/articles/2018/01/11/every-$1-invested-in-disaster-mitigation-saves-$6).) The federal government provides some direct assistance for floodplain planning and regulation and indirect assistance for other natural hazard issues (i.e., grants to deal with, *inter alia*, coastal erosion, earthquakes, tsunamis, wildfires on federal lands, and overall hazard mitigation planning). (See *supra* Adam B. Smith, *2018's Billion Dollar Disasters in Context*, Climate.gov (Feb. 7, 2019), <https://www.climate.gov/news-features/blogs/beyond-data/2018s-billion-dollar-disasters-context>.) Some states have programs that provide local governments with similar assistance. However, most of the necessary work falls to local governments to undertake alone. As local governments are historically cash-strapped, this system perpetuates the blame game script that inevitably follows natural disasters, and long-term natural hazard planning often gets short shrift compared to other priorities with prospects for more immediate political gratification.

Outside of floodplain disaster response, where all states are potentially equal, the Oregon planning program works relatively better in that it calls for some state

involvement in natural hazard management instead of a complete delegation of land use controls to local government. Existing comprehensive plans provide the basis for the analysis requirements, standards, conditions, and prohibitions contained in local regulations. The state could require that local governments respond to new hazard information, including those dangers enhanced by climate change, in their planning and land use regulations. Thus, with regard to the natural hazards identified in Part I above, Oregon has in place a structure through which it can mitigate development impacts from those threats. The problem is that it does not exercise all of its powers.

To some extent, then, Oregon's difficulties mirror those of the rest of the nation. While the state has a responsive structure in place, local governments generally do not possess the requisite funds to incorporate new hazard information into their local plan policies and regulations, and the state has proven relatively unwilling to require that local governments take on those costs.

Thus, Oregon is both unique and the same. The state is capable of requiring local governments to meet its standards, but its refusal to do so and its fear of imposing unfunded mandates under Art. XI, § 15 of the Oregon Constitution. Create further obstacles to realizing good public policy in a relatively planning-friendly state.

Unfortunately, avoidance of the long-term costs of planning and regulation – as with any deferred maintenance cost – might well bring short-term political gratification, but it often results in significantly greater costs in the long run. For this reason, enhanced risks in the uncertain face of climate change, records that are often only a century old and therefore serve as inadequate predictors of future natural hazards, and the need for a margin of safety in planning and regulation all require immediate public attention.

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Oregon Revised Statutes Chapter 197

Oregon State-wide Planning Goals 2 and 7



Policy Options for Minimizing Wildfire Damage in the Western USA

33

Richard C. Box

Contents

Introduction	454
The Geography of Western Wildfire	456
Policy Options and Examples of Large-Scale Wildfires	458
Camp Fire: Insufficient Preparation	459
Thomas Fire: Comprehensive Preparation Program	461
Bootleg Fire: Testing Forest Management Options	462
Conclusion: Challenges and Opportunities in Reducing Wildfire Risk	465
References	466

Abstract

In recent years, wildfire has become increasingly prominent as a damaging phenomenon in the western portion of the United States. In populated areas, it is a hazard to life and property, and in forested areas it degrades habitat and commercially valuable trees. The increasing risk from wildfire results from a combination of urban-density development adjacent to undeveloped areas, environmental conditions related to climate change, and decades of fire suppression that have allowed the accumulation of burnable fuel. There are multiple options available to address wildfire risk, such as buffer areas around communities; defensible space around structures; fire-resistant building construction; and forestry techniques such as fire suppression, managed burning, controlled burning, and thinning. This chapter describes the geographic and institutional setting of wildfire in the western USA and uses examples of recent fire events to illustrate risk-reducing options, including discussion of differing perspectives on their application.

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Climate change · Defensible space · Fire suppression · Prescribed burning · Wildland-urban interface

Introduction

Wildfire has always been present as a feature of the American West. Historically, naturally occurring fires regularly burned portions of forests and grasslands and native peoples used fire to manage land for production of food and craft materials. Beginning in the late nineteenth century, fire suppression was used to protect human communities while fires burned uncontrolled in undeveloped areas (Wagtendonk, 2007). The western portion of the USA is especially susceptible to fire, with low humidity in much of the region and large areas of mountainous terrain, forests, mixed woodlands, and grasslands. Dealing with western wildfires has become more challenging because of “the warming and drying climate, the build-up of fuels, and the expansion of the wildland–urban interface (WUI; the zone where houses meet or intermingle with undeveloped wildland vegetation)” (Schoennagel et al., 2017: 4583).

An important element of wildfire in the western USA is that the pattern of settlement resulted in federal government ownership of significant portions of the landscape. For example, 45.4% of California is federal land, 52.3% of Oregon is federal, and 38.6% of Arizona is federal. These figures contrast with, for example, 1.7% of Indiana, 0.8% of New York, and 1.9% of Texas (Ballotpedia, n.d.). There is more than one way to define which states should be included in the West. Here, we focus on states with a large federal presence and frequent occurrence of wildfire. The US Census Bureau (2021) definition of the West is used, with the adjustment of leaving out Hawaii. Thus, there are 12 Western states for purposes of this discussion: Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

Because of these large areas of federal land, policy and practice in reducing the risk of damaging wildfires requires taking into account the several federal agencies involved in land management. The two that manage the largest percentage of federal lands in the West are the US Forest Service and the US Bureau of Land Management; the US National Park Service and the US Fish and Wildlife Service also have significant holdings. Wagtendonk (2007: 3) described the evolution of federal wildfire policy over more than a century:

When the Forest Service was established in 1905, fire suppression became its reason for being. . . . Fire suppression was the only fire policy for all federal land management agencies until the late 1960s when the National Park Service officially recognized fire as a natural process. Lightning fires ignited in special management zones in parks were allowed to run their course under prescribed conditions. The Forest Service followed suit in 1974 and changed its policy from fire control to fire management, allowing lightning fires to burn in wilderness areas.

Allowing fires to burn in some locations while suppressing them in most others has provoked policy debates over how to manage public lands in the West. This policy does not adequately address the accumulation of flammable fuels created by exclusion of fire from the landscape, an accumulation that can cause high-severity fires that kill trees and threaten communities. Policy debates about wildfire have become especially relevant in the context of a “megadrought” occurring in the western USA, a long-term period of dry weather that is believed to be the most severe in 1200 years (Hirsh, 2022). Predictably, climate change is thought to be a major contributor to the drought because higher temperatures result in drier air. This creates a context in which “Increasing heat, changing rain and snow patterns, shifts in plant communities, and other climate-related changes have vastly increased the likelihood that fires will start more often and burn more intensely and widely than they have in the past” (Borunda, 2020). Human activity is an aggravating factor, since naturally occurring wildfires are ignited by lightning, while approximately 85% of wildfires in the USA are human-caused, through carelessness, arson, and equipment use and malfunctions (US National Park Service, 2022).

Damaging wildfires have occurred often in the western states over the past several years, building public awareness of the increase in fire risk due to changing environmental conditions. Some of these fires involved fuel accumulation on federal lands, while others did not. In June 2012, the Waldo Canyon fire in Colorado Springs swept through neighborhoods on the western edge of the city, forcing evacuation of tens of thousands of people, destroying 346 houses, and killing two people. Weather conditions at the time included high temperatures and high winds (Encyclopedia staff, 2020). The fire was not especially large, burning over 18,000 acres (approximately 2.47 acres equal one hectare), much of which was national forest land, but the impact on a populated area was notable. In October 2017, the Tubbs fire in Napa and Sonoma counties of northern California made clear the vulnerability of urban areas to wildfires in areas of grass and oak woodland rather than forest, as it moved from dry hills into portions of Santa Rosa and adjoining suburbs, killing 22 people and destroying 5643 structures (Graff, 2018). Media coverage of the Camp Fire in the forested Sierra Nevada foothills of northern California gave the public a dramatic illustration of the dangers of wildfire in an era of climate change. The fire began on the morning of November 8, 2018, and by the next day it had destroyed a community of 27,000 people, killing 85 (National Institute of Standards and Technology, 2021).

The purpose of this chapter is to examine key preventive or risk management options in relation to wildfire in the western USA. Critical fire events can provide an empirical referent for policymakers in evaluating the potential effectiveness of specific options or combinations of options. Four categories of policy options that emerge from examination of wildfire events are the following: buffer areas around communities; defensible space around structures; standards for fire-resistant building construction; and forest management techniques such as fire suppression, managed burning, controlled burning, and thinning. Policy choices about adopting and implementing options depend on location, jurisdiction (federal, state, and local), and in some cases on debates about effectiveness and risk-involving practitioners, researchers, and the public.

Two limitations of this chapter related to research and terminology should be mentioned. First, examples have been chosen to highlight the policy options framework used in the chapter, but they are a small fraction of all wildfires. There are thousands of fires of varying sizes in the West each year; in California alone, in 2021 the statewide fire agency (colloquially, Cal Fire) recorded 8178 fire incidents, 2,496,204 acres burned, and 3560 structures destroyed (California Department of Forestry and Fire Protection, 2022). Second, the term “wildfire” can be somewhat misleading. It may seem to describe only fires that occur in unpopulated areas, burning through largely natural landscapes, but this is true of some wildfires and not others. Wildfires also occur in places exhibiting various combinations of woodland, brush, or grassland adjacent to rural settlements, urban development, or agricultural uses.

A geographic choice made in the scope of the chapter is important as well. Two of the examples of wildfire discussed here occurred in California and one in Southern Oregon, just north of the border with California. California is an integral part of the American West, and it offers a range of examples of the relevant wildfire types and policy options. It also offers graphic, powerful illustrations of the impacts of climate change and geography on the risks and dangers of wildfire in the western states.

The Geography of Western Wildfire

The geographic setting for this examination of wildfire, the western USA, is notable for its scope and variety. It includes temperate coastal rainforest, large areas of inland forest, oak woodland, grassland, desert, and remote wilderness, spreading over many elevations and latitudes. It also includes thousands of cities and small communities, along with sizeable metropolitan areas (all approximate figures) such as the Los Angeles metro with some 13 million residents, the San Francisco Bay Area (eight million), Phoenix, Arizona (five million), Seattle, Washington (four million), and Denver, Colorado (three million).

These metro areas are widely distributed across the West. To people living in other parts of the USA or in other countries, whose impressions of the western USA may be shaped by television and film, it could seem this is mostly an urban landscape that looks like Los Angeles or San Francisco. Instead, it is a complex mixture of urban and rural development, agricultural land, and extensive wildlands. California exemplifies this complexity despite, or perhaps because of, its status as the most heavily populated state in the West. The population of California in 2021 was approximately 39 million people. The population of the second most populous state in the West, Washington, was 7.7 million. Wyoming had the smallest population, with 579,000.

The complexity of California’s landscape becomes apparent with figures on land use in the state. The total acreage of California is 100,206,720. Of this total, 45.4%, or 45,493,133 acres, is land owned by the federal government (Congressional Research Service, 2020), while 34,006,800 acres (33.9%) are in agricultural uses (American Farmland Trust, 2022). This leaves 20,706,787 acres (20.7%) in other

land uses. Most of the federal land in the West consists of forests, grazing land, and national parks, as illustrated by agency holdings in California. The Forest Service in the Department of Agriculture owns 45.7% of the federal land in the state, followed by the Bureau of Land Management (BLM) in the Department of Interior with 33.2%, the National Park Service (16.7%), the Department of Defense (3.7%), and the Fish and Wildlife Service (0.65%) (Congressional Research Service, 2020).

To place the land use figures for California in broader national context, approximately 27% of all land in the USA is owned by the federal government. Total 92% of federal land is located in the 12 western states (Ballotpedia, n.d.), and almost 50% of land in these states is federally owned (Stowell, 2016). A portion of the federal properties in the western states consists of grasslands used for grazing or other purposes rather than forested land; this is especially true in Nevada, where approximately 85 percent of the land is federal (Stowell, 2016).

As a generalization, most of the grazing land is administered by the BLM, while much of the forested land is administered by the Forest Service. The Forest Service owns 166,819,068 acres in the West, 86.5% of its holdings. Almost all BLM land is in the western states, totaling 246,357,526 acres (Stowell, 2016). As is true in California, several other federal agencies own portions of western land, including the Fish and Wildlife Service and the Park Service. Together with the Forest Service and the BLM, these agencies oversee approximately 95% of the federal lands in the USA (Ballotpedia, n.d.).

Mountains are a key element in an examination of wildfire in the West. Many of the large, damaging fires occur either in the pine and fir forests of mountainous areas, or in mountains and hills with combinations of grassland, brush, or oak woodland. Three major mountain ranges traverse the western states in a north-south orientation. On the eastern side of the region, the Rocky Mountains extend from Montana, Idaho, and Wyoming in the north to Colorado and Utah, terminating in south in New Mexico. (A range called the Arizona/New Mexico Mountains lies to the south of the Rockies.) They are separated from the Cascade and Sierra Nevada Mountains to the west by the Columbia Plateau and the Basin and Range Province. The Rockies serve as a geographic dividing line between east and west in the USA, and they also present a key climatic distinction for the study of wildfire. Several hundred miles to the east of the Rockies, the relatively dry climate of the western part of the country transitions to the more humid climate of the eastern states. It is the combination of wildland terrain and vegetation with a dry climate that makes the West so vulnerable to wildfire.

Winter snow and summer thunderstorms are present in the Rockies. Temperatures are quite different from north to south, but a relatively dry climate and summer precipitation are common throughout the range. For example, Missoula, Montana, in the north has mild summers and cold winters, with annual precipitation of 14.1 inches/358 mm (Weatherbase, 2022a). At the southern end of the Rockies, Albuquerque, New Mexico has warm summers and cool winters, with annual precipitation of 9.5 inches/241 mm (Weatherbase, 2022b). In contrast with places farther west, both cities have significant rainfall during the summer months; the wettest month of the year in Missoula is June, and in Albuquerque it is August.

On the western side of the region and inland from the coast, the Cascade Mountains extend from Washington in the north through Oregon, into Northern California. The Cascades transition into the Sierra Nevada Mountains, which reach down the eastern part of California, terminating north of Los Angeles. Unlike the Rockies, which consist of a series of ranges that in places spread east-west over hundreds of miles, the Cascades and Sierras take the form of a narrower chain of volcanic origin in the Cascades and a geological fault uplift in the Sierras. The northern portion of the Cascades is relatively cool and moist on the western side and relatively dry on the eastern side. The Sierras experience heavy winter snowfall but long, dry summers. Colfax, California, in the Sierra foothills northwest of Sacramento, has annual precipitation of 45.3 inches/1151 mm and, especially relevant to fire hazard, dry summers with little precipitation from June through September (Weatherbase, 2022c).

The third mountainous area is the Pacific Coast Ranges, extending from the Olympic Peninsula of Washington in the north through Oregon and south to the Transverse Ranges north of Los Angeles. In parts of Washington, northern Oregon, and central California, coastal geography consists of mountains of relatively low elevation, but in southern Oregon and the northern part of California the coastal mountains merge into the Klamath Mountains, which are rugged and extensive, with large wilderness areas. In addition, portions of the Coast Ranges in the Olympic Peninsula of Washington and in the Transverse Ranges of southern California have considerable elevations and rugged topography. Northerly portions of the Coast Ranges and those in close proximity to the ocean are moist and cool, and southern parts are drier, especially during the summer.

The precipitation regime in large areas of the westernmost part of the West is important to wildfire hazard. As noted above with the Sierra foothills town of Colfax, during the summer there is little rainfall, with the exception of occasional thunderstorms in the mountains. By midsummer, grasslands, oak woodlands, and forests are extremely dry and highly flammable. Trees in large areas of forest lands are dying because high temperatures and inadequate rainfall weaken their resistance to invasive insects (this is occurring in several parts of the West). Significant rain may not arrive until November or December, and because of drought conditions the potential for serious wildfire is becoming a year-round phenomenon.

Policy Options and Examples of Large-Scale Wildfires

Many wildfire events could be useful in an examination of the application and effectiveness of disaster preparations. In this section, three wildfires are profiled to illustrate the effects of policy options related to wildfire risk. Specific application of these options varies depending on the geographic characteristics of a particular location, governmental jurisdiction (federal, state, and local), and in some cases on debates about effectiveness among practitioners and researchers.

Camp Fire: Insufficient Preparation

Disturbing scenes of burning forests, hillsides, and homes are an expected part of media coverage of disasters in the western USA. The Camp Fire, though, was different in kind, in its speed, deadliness, and the terror it caused. It is an extreme example of outcomes when dangerous weather conditions meet insufficient community preparation for wildfire.

The fire began in the early morning of November 8, 2018, with a malfunction in an electric utility's power line, 7 miles upslope from the rural community of Paradise, population 27,000, in the forested foothills of the Sierra Nevada mountains. Weather conditions were considered "red flag" for fire, "consisting of strong winds, low humidity, and warm temperatures" (California Department of Forestry and Fire Protection, 2019). Less than two hours later, portions of Paradise were being evacuated as the fire approached, and it was not long before evacuation became mandatory for the entire area.

Paradise had been threatened by several fires in past decades. Because it is a relatively small town that grew in a rural area with little planning, residential access streets are narrow, winding, and often dead end. Not only this adds to the secluded, wooded charm of the place, but it also contributes to the hazard to life during a fire emergency. Roads leading out of the town are adequate for ordinary traffic or an evacuation with sufficient time, but not for a rapid evacuation. The town had taken some preparatory actions in advance of the fire, such as designating evacuation routes which would become one-way outgoing roads in the event of an emergency. However, not much had been done to create vegetation-free defensible space around buildings, and the fire spread rapidly, as embers fell from the approaching fire and burning buildings ignited those nearby.

Residents had little warning or time to evacuate, so traffic jams developed on major roads. In some cases, people died in their cars as the fire swept over them, and there were instances of people fleeing on foot (Knox, 2018). Many people died in their homes, especially the elderly and disabled, because they were unable to evacuate (Tucker et al., 2018). Firefighters knew they could not control a fire moving so quickly: "The incident commander leading the emergency response recognized the fire's speed and intensity and ordered his personnel to abandon all firefighting efforts just 45 minutes after the fire arrived. 'Save lives, keep evacuation moving,' the incident commander said over the radio" (National Institute of Standards and Technology, 2021). The final death toll from the fire was 85 people, and most of the town was gone. By the time it was fully contained, the fire had destroyed more than 18,000 structures.

The history of wildfire in the region included fires in 2008 that had burned a significant portion of the area covered by the Camp Fire, so this disaster was not caused primarily by insufficient attention to removing excess fuels from nearby forest lands. Instead, the fire's aggressiveness was due to the weather in combination with flammable conditions in the town. The result was shocking but not surprising, given the red flag warning and the geographic characteristic of "autumn winds that

gain heat and speed as they blow from the interior down the state's mountain ranges" (Boxall & John, 2018).

There are several important issues connected with the Camp Fire, such as utility infrastructure safety and liability, land-use planning to facilitate evacuation, and finding housing for people who are displaced by fire. The focus here is on policies that may reduce the potential hazards from wildfire incidents, such as standards for fire-resistant building construction, defensible space around structures, and low-flammability buffer zones at the wildfire-urban interface (WUI).

In California, the California Department of Forestry and Fire Protection (Cal Fire) has designated areas of high fire risk in which new buildings and major remodels must conform to building code requirements for fire resistance. The requirements of the most recent version of the code in effect during the Camp Fire were adopted in 2008. It addresses materials and construction methods for roofs, siding, vents, windows, doors, decking, gutters, and so on. In Paradise, 86% of homes were built before 1990 – long before the adoption of wildfire-related codes – and only 11.6% of these homes survived the fire. As codes changed, so did rates of survival, so the rate for homes built from 1990 to 1996 was 20.6%, 34.3% for the period 1997–2007, and 43.0% for 2008–2018 (Knapp et al., 2021).

The difference in home survival rates by time period seems impressive initially, but 43% survival for homes built using the most recent version of the code means that 56% of the newer homes burned. Also, building according to the most recent standards represented only an 8.7% greater likelihood of survival over homes built in the immediately preceding period. There were complicating factors as well that make assessing the impact of building standards difficult, such as smaller lot sizes in older areas, so that structures were closer together and fire in one building was more likely to ignite adjacent buildings (Knapp et al., 2021). Overall, according to Knapp et al. (2021: 16), "proximities to neighboring burning structures and surrounding vegetation" were especially important elements of survivability in the Camp Fire, and "to maximize survivability, homes need to be designed and maintained to minimize the chance of a direct flame contact, resist ember ignition, and survive extended radiant heat exposure."

In the period following the Camp Fire, the Conservation Biology Institute, The Nature Conservancy, and the Paradise Recreation and Parks District "partnered to explore community design elements with the intention to test the concept that a community can be protected from ignitions from wildland fires with the use of Wildfire Risk Reduction Buffers (WRRBs) between the urban area and the wildlands" (Conservation Biology Institute, 2020: 3). Much of the commentary on the Camp Fire focuses on vulnerabilities within the developed area of the town, and fire ignition in Paradise was often caused by embers blown from a distance. Nevertheless, it was assumed there might be preventive benefit from creating defensible space on the boundaries of the community. Such spaces could include parkland, orchards, or other low-risk uses, along with wildland "managed for fire risk reduction" (3).

Project consultants used scenario modeling with technical data and community input to draft maps of fire vulnerability for parcels both close to the boundaries of Paradise and some distance away. They included recreation and conservation values

in the analysis, producing a complex set of recommendations involving purchase of high-risk parcels in private ownership, coordination with the BLM and Forest Service on treating their land to reduce fire hazard, and using conservation easements to encourage hazard reduction on private land. The community reception for these recommendations was positive, though study authors “concluded that the challenge lies not in convincing people that these planning measures would help, but in finding ways to overcome the barriers to accomplishing them” (Conservation Biology Institute, 2020: 6).

The Recreation and Parks District is anticipating federal funding to hire additional implementation staff and to acquire some of the prioritized parcels. People involved in the project understand “the limitations of the buffer: It should help protect lives and property, but it can’t prevent wildfires to begin with” (Smith, 2022). According to a project manager for The Nature Conservancy, “We’re assuming that [it] would slow the fire down enough to allow more time for evacuations, and allow more time for emergency services to muster and do what they need to do” (Smith, 2022).

Thomas Fire: Comprehensive Preparation Program

On Monday December 4, 2017, strong winds in Southern California caused power lines near the town of Santa Paula, northwest of Los Angeles, to explode in an electrical arc, igniting a fire that spread rapidly. Within a few hours, the fire disabled a power station, blacking out service to 100,000 homes and businesses including much of the city of Ventura, population 110,000. By the next morning, “the fire had grown to 40,000 acres and 150 buildings in Ventura had been destroyed including Vista Del Mar hospital” (Hill, 2019). Two days after the fire started, it had expanded to the north and west; some neighboring towns were evacuated, and a hazardous air quality warning had been issued. By December 8, “3,500 firefighters, 21 helicopters, 544 engines, 46 hand crews, and 26 bulldozers had been assigned to the now 132,000-acre fire that was only 10% contained” (Hill, 2019).

This level of resource allocation was possible because of a system of preexisting agreements with fire service organizations in surrounding parts of California and in other states. Nowell and Steelman (2019: 2) described the system as follows: “In the fire service, through a web of mutual aid agreements and resource ordering systems, thousands of personnel and equipment from local, state, federal, and international jurisdictions are routinely brought together into a unified operation that functions like a single organization under the direction of an incident commander and his/her command staff.” For the Thomas Fire, the National Guard contributed helicopters and Cal Fire requested “every last plane we could find in the nation.” C-130 aircraft came from the military, and “more than 290 fire engines came from Montana, Utah, New Mexico, Idaho, Arizona, Oregon and Nevada” (Spagat & Melley, 2017). As an example, lightly populated Montana is as far from Southern California as any part of the western states, some 1200 miles (1900+ km) distant, and they sent “three strike teams with 15 engines and 55 people from 14 agencies” (Associated Press, 2017).

The fire grew westward, moving away from Ventura and along the coastal mountains toward Santa Barbara (population 88,000). By December 9, mandatory evacuations were withdrawn for Ventura, but some 530 homes had been destroyed. On December 10, mandatory evacuation was ordered for coastal communities including the unincorporated town of Montecito, population 8600, and evacuation advisories were issued for eastern Santa Barbara (Hill, 2019). Montecito adjoins Santa Barbara on the east, and it is located on a coastal plain beneath the Santa Ynez Mountains, which have elevations in excess of 4000 feet (1200+ meters). The northern city limit is a five-mile (8 km)-long wildland-urban interface contiguous with the Los Padres National Forest.

On December 16, the Thomas Fire burned along the northern border of Montecito. In contrast with other areas in which many homes were burned, and despite the intensity of the fire and the length of the exposure to wildland, only seven residences were destroyed in Montecito. The Montecito area had historically experienced damaging fire events, so for two prior decades the Montecito Fire Protection District had worked to implement comprehensive preventive measures in preparation for the next major fire. These included the following: printed maps of fire attack routes for use by other agencies; building code measures such as prohibiting the use of wood shake roofs and siding; wider residential driveways to accommodate fire equipment; defensible space around structures; reduced flammable materials along roadways to prevent entrapment during a fire; and a buffer zone with fuel reduction treatments. Two of the seven residences lost to the fire were located near a gap in the buffer, and the others had fuels that were not cleared away from the buildings (Gabbert, 2019).

By late December, the fire had turned away from populated areas, though it continued to burn in backcountry. It was declared fully contained on January 12, 2018, after burning 281,000 acres and destroying 1063 structures. It had spread over 42 miles from east to west (Hill, 2019). Unfortunately, the Montecito story did not have an entirely satisfactory ending. It was clear to officials that the burned area on steep slopes above the town presented a mudslide hazard in case of significant rainfall, so they put in place a voluntary evacuation order for an area that appeared most at risk. Some residents, though, stayed in their homes (Karimi & Almasy, 2018). Early on January 9, 2018, a rainstorm caused a mudslide carrying large boulders that flowed into a portion of Montecito, destroying more than 100 homes and killing 23 people (California Governor's Office of Emergency Services, 2021).

Bootleg Fire: Testing Forest Management Options

The Bootleg Fire occurred in south-central Oregon northeast of Klamath Falls, on a high plateau approximately 5000 feet/1500+ meters in elevation at Sycan Marsh, discussed below. In contrast to the Camp and Thomas fires, the Bootleg Fire mostly affected forested federal and private land and a private nature preserve, though a number of structures in rural areas were also destroyed. It was caused by lightning and burned more than 400,000 acres in the period July 6 to August 15, 2021.

Because much of the land had been logged or burned for several decades and densely populated communities were not involved, this event can seem unremarkable compared to other recent fires. However, the presence of a large project modeling forest management techniques makes this fire particularly relevant to ongoing discussions about how to address the buildup of fuel loads in forests.

On one side of this issue is a cartographer who mapped forest conditions in the Bootleg Fire area, finding that it burned through areas of tree thinning and prescribed burning without slowing down. Another analyst found that commercial logging and livestock grazing caused the fire to move faster than it did in a federal wilderness area where the forest was undisturbed. Forest Service staff had a different perspective, arguing “that their prescribed fire and tree-thinning work successfully reduced the intensity of the Bootleg Fire” (Neumann, 2021). For the Forest Service, the important question was not how fast the fire moved, but whether fire intensity was so severe that it spread into the crowns of trees instead of burning only along the ground, killing trees in addition to clearing away fuel accumulation.

The practice of thinning forests has been controversial. Some researchers think thinning is merely a rationale for increased logging that benefits private industry and the budgets of federal agencies (Hanson, 2021). In addition, there is some evidence “that forests with the highest levels of protection from logging tend to burn least severely” (Bradley et al., 2016: 9), a finding that contradicts common understanding about the relationship between forest density and fire. Studies of tree thinning across many sites show a variety of results in relation to wildfire, involving factors such as heating and drying in a forest when the tree cover is reduced, and the amount of surface fuel remaining after the thinning process. Prichard et al. (2021: 10) wrote that, on balance, “the capacity for thinning alone to mitigate wildfire hazard and severity is not well supported in the scientific literature.” However, research indicates that thinning can be effective in reducing fire severity when used in combination with prescribed burning, so that: “although the efficacy of thinning alone as a fuel reduction treatment is questionable and site dependent, there exists widespread agreement that combined effects of thinning plus prescribed burning consistently reduces the potential for severe wildfire across a broad range of forest types and conditions” (10).

On the eastern side of the area burned in the Bootleg Fire is a 30,000 acre Nature Conservancy preserve in an area called the Sycan Marsh. It is a broad area of grasslands and forests that the Conservancy uses as a laboratory for fire management techniques, treating blocks of forest with combinations of controlled burning and thinning (McClain, 2021). For more than 15 years, they have worked collaboratively with “forest ecologists and fire practitioners, international researchers, scientists and Indigenous peoples” (Nature Conservancy, 2020) to improve wildfire management and make forests more resilient given the pressure of climate change.

There is a research station on the preserve that houses researchers and equipment, and when staff saw the Bootleg Fire approaching with flames shooting above the burning crowns of trees, they feared the station could be lost. When the fire came closer, though, it encountered treated areas of forest and its character changed, as

flame height dropped and the fire moved around the research station without damaging it (Fountain, 2022).

Periodic prescribed burning appears to be less controversial among the practice and research communities than thinning alone for reducing the severity of wildfires. Prescribed burning has been an accepted practice in states in the Southeastern USA for decades, and 11 states have established certification programs for people who supervise burns (Sommer, 2021). The situation in the western states is somewhat different, where the climate is dry, prescribed burning is not as well accepted, and using it at scale is difficult. Roughly 120 million acres are at risk from wildfire, but federal agencies have only been able to treat 2.5 million acres annually (Chabria & Wigglesworth, 2021). In addition, burns must be repeated periodically as new vegetation grows to replace what has been burned.

In the current setting of climate change, drought, and some prescribed fires burning out of control, the public in the western USA is becoming more sensitive to the practice. A large, damaging fire in New Mexico began in April 2022 when Forest Service personnel lost control of a prescribed burn. Later in the year, the Forest Service published a report analyzing the causes of the incident, finding that officials “underestimated the amount of timber and vegetation that was available to fuel the flames, the exceptionally dry conditions and the rural villages and water supplies that would be threatened if things went awry” (Associated Press, 2022). In a surprising recent event that highlights public resistance to prescribed burning, when a fire set by the Forest Service in eastern Oregon spilled over to burn several acres on private land, the landowner called the county sheriff. The sheriff arrested the federal officer managing the burn, on a charge of reckless burning that carries a potential jail term of 1 year and a \$6250 fine (Canon, 2022).

It is not only the policy option of prescribed burning that is challenging to implement in today’s political environment. The policy of most state fire agencies is to extinguish all reported fires as soon as possible. On federal land, the situation is more complex, in part because of resource limitations and in part because of the goal of using fire to reduce fuel loads. Fires occurring in remote wilderness areas and at high elevations are often left to burn out on their own, and in other areas they may be monitored to determine the potential for hazardous expansion. Fires occurring in areas in need of periodic burning can serve forest management objectives, provided they do not grow to the point of damaging valued land or communities. This is the policy of “managed fire,” determining in each case the probabilities of damaging fire expansion.

This policy is difficult to sustain when managed fires burn out of control. Two small lightning-caused fires were left to burn on Forest Service land in California in July 2022, but the weather changed and they expanded rapidly, destroying several dozen structures. This prompted the governor of California to ask the federal government to adopt a more aggressive fire response stance (Chabria & Wigglesworth, 2021). Commenting on use of managed fire in a time of public concern about fire spread, Davis et al. (2022: 916) suggested that, “In this context, the policy allowing managed wildfire and growing scientific consensus about its value appear insufficient to support its broader use.”

Conclusion: Challenges and Opportunities in Reducing Wildfire Risk

The frequency, intensity, and damage potential of fires in the western USA are likely to increase substantially in the next several years due to climate change, forest conditions, and continued development in the wildland-urban interface. There are several options available to decision makers working to reduce the danger from wildfire, so policies can be crafted to fit location-specific characteristics and assessment of tradeoffs between cost and risk. The examples of the Camp, Thomas, and Bootleg fires suggest that single-focus approaches such as prescribed burning or strengthened building code standards are often insufficient on their own. Instead, to offer a reasonable probability of effectiveness, an adopted policy will likely include a package of options, drawn from the concepts of buffer areas, defensible space around structures, fire-resistant buildings, and techniques of forest management.

To transition to a broader perspective, Schoennagel et al. proposed an “adaptive resilience” approach with the following four elements: “(i) recognizing that fuels reduction cannot alter regional wildfire trends; (ii) targeting fuels reduction to increase adaptation by some ecosystems and residential communities to more frequent fire; (iii) actively managing more wild and prescribed fires with a range of severities; and (iv) incentivizing and planning residential development to withstand inevitable wildfire” (2017: 4582). A parallel to this multifaceted approach is found in research from Calkin et al. (2014), who addressed the problem from the perspective of risk analysis. They also moved beyond sole focus on wildland conditions to include fire-resistant buildings, defensible space, and emergency response, stating that, “if the goal is to have fire-adapted communities, successful and efficient wildfire response, and resilient landscapes, an integrated risk-sharing approach is required” (751).

These are promising perspectives on the future of wildfire risk reduction, but there are also constraints on what might be accomplished. Fragmentation can make it time-consuming to formulate and implement a wildfire policy, as participants may include property owners, the general public, and local, state, and federal agencies. The project for creating buffers around the town of Paradise is an example, requiring sustained effort at coordination. Institutional complexity is a potential constraint, as large agencies respond to input from multiple internal and external sources. One of those inputs is public perceptions of risk. Property owners may focus on their individual circumstances without taking into account community-wide and longer-term goals; the local arrest of a Forest Service officer in Oregon is an example. Technical issues of implementation are important as well. Predicting weather conditions and the risks of fire spread could become more difficult with climate change and continued development adjacent to wildlands, thus complicating decision-making about prescribed and managed fires. Finally, resource availability and the cost of options included in a particular policy are potential constraints, as they are in many policy settings.

In sum, this is a long-horizon process operating at different levels, subject to changes in the physical and social environments that are difficult to foresee.

Schoennagel et al. (2017: 4588) captured the complexity of this setting well, suggesting it means that “embracing rather than resisting ecological change will require a significant paradigm shift by individuals, communities, and institutions and will challenge our conservation philosophies.”

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Part III

Emerging Technologies and Innovative Applications of AI in DRR



Introduction: Emerging Technologies and Innovative Applications of AI in DRR

34

Ferda Ofli and Muhammad Imran

Contents

Introduction	472
Conclusion	474
References	475

Abstract

In the last decade, the Artificial Intelligence (AI) revolution has led to significant advances in science and technology. AI algorithms have become proficient in recognizing faces, understanding speech, translating between hundreds of languages, retrieving relevant information in response to ambiguous queries on the Web, and beating humans at challenging games such as chess and Go. These advancements led to cutting-edge technologies such as AI-driven smart assistants, self-driving cars, housecleaning robots, and delivery drones. The disaster response and management domain has also benefited from these advancements. This chapter covers a wide range of tasks where AI's potential is evident, including remote sensing for flood mapping and monitoring, social media information for assisting relief operations, event summarization, and geolocalization of disaster impacts. The chapter also highlights the role of mobile devices in crisis communication and disaster management in general and discusses the role of unmanned vehicles for searching and mapping tasks during disasters.

Keywords

Artificial intelligence · Remote sensing · Social sensing · Disaster response and management · Disaster risk reduction

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Introduction

Artificial Intelligence (AI) provides new ways of approaching problems and serves as a tool to explore and address hard, unanswered questions. Technological advancements backed by AI-driven innovations are transforming many application areas, including drug discovery (Fleming, 2018; Stokes et al., 2020), disease prediction (McKinney et al., 2020; Mohan et al., 2019), medical image analysis (Litjens et al., 2017; Shen et al., 2017), autonomous driving (Levinson et al., 2011; Yurtsever et al., 2020), spoken language understanding (Levinson et al., 2011; Serdyuk et al., 2018), and sustainable development (Vinuesa et al., 2020; Weber et al., 2021). Similarly, AI-based technologies are playing an increasingly important role in disaster response and management and have the potential to help humanitarian organizations with enhanced early warning, situational awareness, and impact assessment systems (Sun et al., 2020). This section discusses the role and opportunities of AI and unconventional data sources, including satellites and social media platforms, for disaster risk reduction. Specifically, the section contains 12 chapters that cover different aspects of using emerging technologies and AI to build innovative applications for DRR.

Remotely sensed data, e.g., by satellites, can provide valuable information in all stages of disaster management cycle, i.e., reduction, readiness, response, and recovery (Boccardo & Giulio Tonolo, 2015; Joyce et al., 2009; Van Westen, 2000). That is, remote sensing analysis can (i) help to determine which areas are more vulnerable to hazards, (ii) enable monitoring of an ongoing disaster and organizing emergency operations, (iii) provide a quantitative base for relief operations in damage assessment and disaster aftermath, and (iv) assist in the organization of the damage-related information and the postdisaster census information as well as the evaluation of sites for reconstruction. ► [Chapter 39, “Remote Sensing Tools for Crisis Assessment in DRR,”](#) illustrates how humanitarian organizations such as United Nations Development Program (UNDP) and United Nations Satellite Centre (UNOSAT) employ such AI-enabled technologies in their operations including examples from the Bata explosion and the Timur Leste flood. Then, ► [Chap. 45, “Remote Sensing for Flood Mapping and Monitoring,”](#) takes a deep dive into a particular disaster type, i.e., floods, since they are the most frequent type of natural disaster and affect more people than any other natural disaster type. The chapter presents a comprehensive overview of remote sensing applications for flood management including flood detection, flood delineation of affected areas, and damage assessment and investigates existing products and services that currently provide useful insights about past or ongoing flood disasters to emergency response operations.

Social media has permeated in and become an integral part of everyday life, including before, during, and after emergencies (Reuter & Kaufhold, 2018; Simon et al., 2015). Hence, social media data presents unprecedented opportunities for DRR that also come with various computational as well as system design challenges (Imran et al., 2020). ► [Chapter 40, “Big Data and Multi-platform Social Media Services in Disaster Management,”](#) presents a multiplatform service for gathering big social data across different social media channels and analyzing the credibility and relevance of collected data through AI models. The chapter also discusses core challenges and potentials of such services, focusing on (i) the multiplatform

gathering and management of data, (ii) the mitigation of information overload by relevance assessment and message grouping, (iii) the assessment of credibility and information quality, and (iv) user-centered tailorability and adjustable data operations. Ideally, these systems must follow a systematic design to employ AI-assisted data processing that is (i) modular to create processing pipelines for different data types, including text, videos, images, and numeric sensor data; (ii) extensible to newer analytical capabilities; (iii) interactive for greater human control; and (iv) adaptable to dynamic human needs; all of which is achievable with the help of a human-centered approach. To this end, ► Chap. 35, “Citizen-Helper System for Human-Centered AI Use in Disaster Management,” introduces and illustrates different applications of human-centered AI system design in managing social media data to support use cases in different disaster management phases using an example of one such system called Citizen-Helper. The lessons learned from implementing Citizen-Helper facilitate an understanding of challenges and practitioner expectations for future research and development of human-centered AI applications within different phases of disaster management.

Humanitarian organizations have started relying more and more on social media data to initiate and assist rescue operations (Meier, 2015; Stephenson, 2005). However, there is no one-size-fits-all solution that can help all humanitarian organizations as their information needs vary greatly, from a general summary to specific needs (e.g., infrastructure damage, missing people, and injured or dead individuals). These high-level information categories may also contain several small-scale subevents that capture information from diverse dimensions. ► Chapter 42, “Role of Crisis Information Summarization Through Microblogs in Disaster Management,” addresses this challenge and covers details about subevent detection and summarization strategies such as identifying subevents as event-action pairs from social media posts (e.g., tweets) and jointly optimizing them into coherent event summaries in near real time. Social media data can prove useful for postdisaster relief operations, as well, where management of the distribution of emergency resources requires the knowledge of (i) resource-needs, i.e., what resources are required, and (ii) resource-availabilities, i.e., what resources are available in the disaster-affected region or potentially elsewhere. Since it is challenging to collect such firsthand information on the ground in real time, ► Chap. 41, “Role of Microblogs in Relief Operations During Disasters,” shows how reliable and automated computational methods can be developed for identifying and matching resource-needs and resource-availabilities from social media data during postdisaster situations. On the other hand, one of the weaknesses of social media data is the oftentimes unavailability of accurate geolocation information, which typically plays an essential role in disaster management as crisis maps allow affected people to share updates on their statuses and needs, which enable a rapid response, while they also allow response authorities to manage their response activities (e.g., routing rescue teams), and reduce the impact of disasters by planning future activities (e.g., evacuation). ► Chapter 44, “Role of Geolocation Prediction in Disaster Management,” focuses on this critical problem and links humanitarian organizations’ requirements with existing computational methods for geolocation inference and introduces the computational tasks that fulfill humanitarian organizations’ unmet needs.

Not only the textual content but also the visual content (i.e., images and videos) on social media has proved very effective in analyzing the scale of damage to infrastructures (e.g., roads, bridges, and buildings) as well as in understanding people's perceptions, emotions, sentiments, and responses to disasters. Assessing such aspects of disaster events requires effective and efficient computer vision methods to process the large amount of social media visual content. On this note, ► Chap. 38, “Role of Social Media Imagery in Disaster Informatics,” reviews state-of-the-art techniques and publicly available resources (datasets and models) and shows their utility in processing social media image streams during disasters for a diverse set of applications. Putting a different spin on the problem, ► Chap. 43, “Disaster Rescue Communication Using Mobile Devices, Social Media, and Artificial Intelligence,” focuses on how mobile devices, social media, and the use of AI in the form of AI-infused information technologies can meet the communication and information needs of crisis managers. In examining research on mobile phones, the chapter reveals the pivotal role they play in helping people participate in more conversations that can increase their chances for receiving help and for providing early alerts.

On the mechanical systems side, robots such as unmanned aerial vehicles (UAVs) and unmanned ground vehicles (UGVs), among others, can assist humanitarian organizations by searching, mapping, delivering supplies and medical treatment, and evacuating casualties (Murphy, 2014). To that end, ► Chap. 37, “Ultralight Platforms to Coordinate First Responders and Communications,” reviews the aerial technology available today, introduces a new solar-powered, propeller-driven, lighter-than-air architecture as an emerging technology, illustrates its potential use cases during disasters, and discusses existing regulations and support for emergency systems.

Taking a step further, ► Chap. 36, “Resilient Heritage Using Aerial and Ground-Based Multi-sensor Imagery,” proposes a methodology that combines geospatial information from satellites, drones, smartphones, and historical maps to increase cultural heritage resilience to various disasters such as earthquakes, wildfires, and floods. The chapter illustrates through real-world case studies that the proposed methodology can mitigate damage incurred by disasters, thanks to faster and more accurate data acquisition, and help preserve the identity and unique value of cultural heritage.

Conclusion

In summary, this section covers a wide range of areas where AI’s potential for DRR is evident, including remote sensing for damage assessment and monitoring, social media information for assisting relief operations, event summarization, and geolocalization of disaster impacts. In addition, it highlights the role of mobile devices in crisis communication and disaster management in general and discusses the role of unmanned vehicles for searching and mapping tasks during disasters. It is important to note that such potential benefits of AI for DRR must be contextualized

with the other sections of the handbook to warrant a transdisciplinary approach to disaster management.

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Citizen-Helper System for Human-Centered AI Use in Disaster Management

35

Yasas Senarath, Rahul Pandey, Steve Peterson, and Hemant Purohit

Contents

Introduction	478
Disaster Management and Information Needs	478
Computer-Assisted Information Processing for Disaster Management	479
Need for Human-AI Collaboration for Information Processing	481
Human-Centred AI System Design: Illustration of Citizen-Helper	483
Data Collection	485
Data Storage	486
Data Annotation	486
AI Model Training and Analytics Services	488
Interactive Visualization	489
Use Cases	490
Disaster Response and Mitigation Using Social Media Data Analytics	490
Preparedness via Practitioner Exercises and Multimodal IoT Data Analytics	492
Challenges and Future Research Directions	494
References	495

Abstract

Traditional approaches to aid disaster management practitioners during response and recovery require extensive effort to timely collect, process, and analyze semi-structured data for extracting relevant information from various sources. Similarly, training instructors rely heavily on manual tasks to collect and analyze trainee performance data during the mitigation and preparedness phases. Efforts to collect and analyze data can be partly attributed to the minimal integration of advanced information technologies in current disaster management practices. The

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growing adoption of sources like social media (SM) and Internet of Things (IoT) networks provides a unique opportunity to collect additional data to aid all disaster management phases. Artificial intelligence (AI) technologies present an unprecedented era to design information systems that can process data from SM and IoT sources at scale in real time to enhance disaster response processes and training performance analyses. They require a systematic design to employ AI-assisted data processing that has the modularity to create processing pipelines for different modalities, including text, videos, images, and numeric sensor data, extensibility to newer analytical capabilities, interactivity for greater human control, and adaptability to dynamic human needs. It is achievable with the help of a human-centered approach. This chapter introduces and illustrates different applications of human-centered AI system design in managing SM and IoT data to support use cases in different disaster management phases using an example of one such system called Citizen-Helper. The lessons from implementing Citizen-Helper use cases will facilitate an understanding of challenges and practitioner expectations for future research and development of human-centered AI applications within different phases of disaster management.

Keywords

Human-centered AI · Disaster management · Human-AI collaboration · Information processing · Citizen-Helper

Introduction

Disaster Management and Information Needs

Disaster management is essential to the safety and security of people and property before, during, and after disasters. Disaster management is primarily divided into four distinct phases, as identified in Fig. 1 (FEMA, 2013). Each phase plays an integral role in preparing for, responding to, and recovering from disasters.

The mitigation phase focuses on preventing or minimizing the impact of disasters on people and property. For example, reinforcing structures such as levees or fencing prone to damage in disasters is a form of mitigation, or conducting training for disaster responders is another form of mitigation. The preparedness phase focuses on taking readiness actions for responding to disasters. For example, disaster management agencies that conduct exercises and drills and community members creating disaster supply kits are different forms of preparedness. The response phase focuses on protecting life and property during and immediately following a disaster. For example, evacuating, assessing damage, and conducting search and rescue missions are forms of response. The recovery phase focuses on rebuilding following a disaster. For example, disaster victims seeking financial assistance and restoring power and communications are forms of recovery. Throughout all phases of disaster management, a common theme is the need to attain information. These information

Fig. 1 Disaster management phases



can range from extracting serviceable requests for help during response phases to collecting updates on recovery of roads/houses or to acquiring knowledge of the trainee responders' location during simulated training exercises. Thus, the field of disaster management could benefit from advancing technological capabilities to help prevent, prepare, respond, and recover from a disaster.

Disaster management agencies mitigate the risks and consequences of disasters by processing information from multiple sources in their decision-making. Disaster management agencies need timely access to relevant information to serve their community. Following disasters, these agencies also benefit from corrective action plans. These plans are developed to prevent the recurrence of challenges experienced during a past disaster.

Computer-Assisted Information Processing for Disaster Management

Traditionally, disaster management practitioners in agencies comprehensively examine the response to disaster events to learn what went right and what requires improvement for future disaster response. Thus, the practitioners, along with researchers, had to perform critical after-action analysis and extensive research through rigorous surveys, interviews, after-action reports, and ethnographic studies (DHS, 2013; Kapucu, 2008; Powell et al., 2012; Texas Department of State Health Services, 2018). Moreover, disaster management practitioners are involved in

analyzing data during disasters. However, much manual labor and time are required, and these methods are not scalable and are tedious for all disaster scenarios. Additionally, it is challenging for disaster management practitioners to analyze data during disasters, while concurrently making operational adjustments resulting from the disaster's impact. Further, traditional ways of finding and analyzing relevant information often rely on a limited number of experts who are trained specifically for that task (Plotnick & Hiltz, 2016; Reuter et al., 2016).

However, the development and deployment of systems for computer-assisted information processing have helped mitigate many limitations of traditional approaches (Imran et al., 2020; Senarath et al., 2021). These information processing systems have helped disaster management agencies organize and manage data collections from different events, while providing methods to process and manage them at scale (Careem et al., 2006).

Modern information systems can provide disaster management practitioners with the power of processing and ingesting relevant information from nontraditional data sources such as crowdsourced and social media data. Moreover, these collections of nontraditional data could be accessed and shared easily among different agencies or response teams to analyze data for enhanced, unified situational awareness (shared understanding of the environment (Endsley, 1988)). Thus, the actions to collect and process relevant information from various sources for decision support may now be completed in less time due to reduced manual labor.

However, there are some limitations to using computer-assisted information processing. The techniques to process nontraditional data may not be efficient due to the challenges of unstructured data, e.g., interpreting the relevance of noisy, ungrammatical, and user-generated content of social media (Purohit et al., 2018b). The features of an information system should be readily available to customize for adjustments such as updating the AI models to maintain their performance for extracting relevant information. This is required due to the dynamics of disaster events and the changing information needs of decision-makers during the response.

With the recent advancements in AI, researchers have developed techniques to efficiently process raw data (e.g., social media data, sensor data, etc.) to aid data analytics systems for decision support at disaster management agencies (Imran et al., 2015; Purohit & Peterson, 2020). Some examples of current AI-based data analytics systems for disaster management are Citizen-Helper (<https://citizenhelper.orc.gmu.edu/>) (Pandey & Purohit, 2018), AIDR (<http://aidr.qcri.org/>) (Imran et al., 2014), Dataminr (<https://www.dataminr.com/>), etc. (given the scope of this chapter is to focus on explaining human-centered AI design and its use cases, we recommend readers to check a detailed survey on various types of software systems for disaster management in Hiltz et al., 2020). However, most AI-based data analytics systems are still in the early stages of success for deployment at disaster management agencies at large and require various improvements based on the experience of disaster management practitioners from different places and working from local to global levels. This challenge demands consistent collaboration between technical teams and disaster management practitioners, as detailed in the next section.

Need for Human-AI Collaboration for Information Processing

Modern AI systems are designed to deliver a scalable processing and analysis of data to lead to accurate predictions for various tasks. However, they fail when the processing and analysis of complex data such as unstructured multimodal data require a high level of cognition and understanding of context changes that humans are generally capable of (Monarch, 2021).

This section describes the challenges of employing AI technologies to augment information processing without human supervision, which motivates the need to develop a collaborative approach of human-AI collaboration, i.e., a human-centered AI design (Shneiderman, 2020b) for information systems to support disaster management practitioners (see illustration of such a system in Fig. 2). We also cover the limitations of those modern AI technologies and the significance of human involvement in those systems.

Limitations of AI Technologies

The primary concerns with employing information systems in practice with fully automated solutions based on AI technologies include reliability and trustworthiness of computation (Shneiderman, 2016, 2020b). Recent research has shown the possibility of severe consequences when deploying AI technologies in high-risk environments without human involvement (Sambasivan et al., 2021).

AI technologies without human intervention can lead to poor performance for information processing due to the changing context and a lack of supervision (Monarch, 2021), especially during disasters that require time-sensitive decision-making. Moreover, building a one-size-fits-all AI system can be challenging for every situation in disaster management. Hence, the performance of AI systems must be monitored throughout its implementation for errors and biases to reduce the chances of ineffective decision support and, thus, prevent the risk of misleading

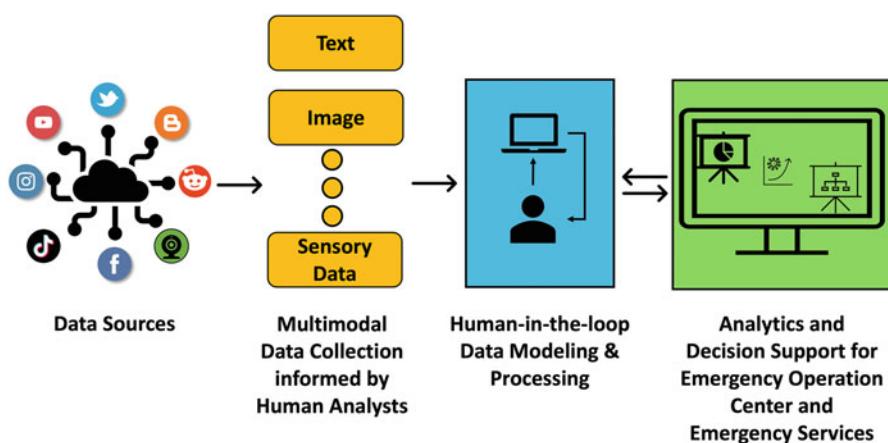


Fig. 2 Overview of a human-centered information processing system

disaster management practitioners. AI systems can carry inherent biases that should be carefully considered before implementation (Danks & London, 2017; Shneiderman, 2016).

Furthermore, real-world data is typically unstructured and noisy, making it hard for AI systems to understand the meaning intended in the content correctly (Bender & Koller, 2020; Purohit et al., 2018b). Hence, there is a need for external intervention in AI systems to make them more robust.

Recent years have shown that the general public and volunteers can serve as a valuable resource to disaster management agencies to help improve AI systems by, for example, providing data annotations or labels to develop and adapt machine learning models during the times of disaster events (Meier, 2015; Pandey & Purohit, 2018). These resources can help address the limitations of AI systems, while accounting for two existing gaps known in disaster management – limited human resources and their minimal time availability. However, a systematic collaboration approach between humans and AI systems is required to leverage such an additional resource for disaster management agencies. Such collaboration enables a feedback mechanism for the user to alter the behavior of the AI system processes at any stage. We further describe the need for involving practitioners in the system design to address the limitations of AI technologies next.

Significance of Practitioner Involvement in System Design Beyond Evaluation

As AI-based data analytics systems are limited by their ability to understand unstructured data accurately and make predictions using real-world data, humans can help in this process to make them better. While the involvement of practitioners is essential during the evaluation of an AI system's performance to cater to disaster management needs, it is also critical during the design and implementation of such systems (Shneiderman, 2016). The continual collaboration with practitioner end users can reduce the time for system improvements to adapt to evolving requirements of disaster management agencies.

Without the involvement of practitioners in the AI system design, there could be a loss in the performance or accuracy of a deployed AI model over time due to the changes in disaster situations, such as owing to data drift (Pandey et al., 2022). The developers and disaster management practitioners should carefully monitor the AI system's performance to prevent negative consequences resulting from inaccurate, partial, or stale labeled data over time.

Engaging with disaster management practitioners can provide invaluable feedback, such as characterizing their information needs during different disaster types to help define the relevant class labels to train AI models. This approach helps developers identify the correct requirements to build and implement an AI-based data analytics system. Moreover, human help is needed in annotating the data to build an effective AI system. While such systems can be developed without labeled data using unsupervised learning methods, it can be hard to evaluate them. The performance of those unsupervised learning methods could be lower than supervised

learning methods, which have the advantage of learning patterns from ground-truth labeled data.

Using AI systems for continuous streams of data poses additional challenges. There could be a potential change in the distribution of data over time, which requires dynamic updates of the decision boundaries of the AI models. Hence, to tackle this situation, human involvement needs to capture these changing decision boundaries in a feedback loop with the AI systems to manage data drifts (Monarch, 2021; Pandey et al., 2022). Moreover, the context of information needs will change over time as disaster management practitioners transition from disaster response to recovery. Hence, there is a need for constant monitoring of AI systems through a collaborative setup of developers and disaster management practitioners to update the system requirements and adapt the AI models for the evolving information needs.

The above scenarios help understand the significance of human involvement in different phases of AI system design and deployment. In this chapter, we illustrate the approach of human-centered AI design (Shneiderman, 2020b) using a system called Citizen-Helper that aims to address the above requirements of human involvement in different ways. The comparison of the performance of such systems and various AI systems for disaster management is beyond the scope of this chapter, given the focus is to explain the design elements and use cases of human-centered AI design. Citizen-Helper (Karuna et al., 2017; Pandey & Purohit, 2018) is a human-centered AI system for real-time data analytics over social media, web, and IoT data streams. Its design aims to incorporate aspects of the human-centered AI framework (Shneiderman, 2016, 2020b) to improve and provide modularity, extensibility, interactivity, and adaptability for analytics over time and across events to aid disaster management agencies. This chapter describes more aspects and characteristics that inspired the design of Citizen-Helper and informs the future design of such human-centered AI systems next.

Human-Centered AI System Design: Illustration of Citizen-Helper

Traditionally, the levels of autonomy of AI systems have primarily focused on one dimension, which emphasizes that autonomy decreases with increasing human control and vice versa. However, the human-centered AI system design suggests a two-dimensional view of human control and machine automation (Shneiderman, 2020b) for AI systems. The human-centered AI approach envisions computing systems that amplify human abilities, empower them, and ensure human control such that both humans and machines benefit from each other's performance (Shneiderman, 2020a). The human-centered AI system design can help minimize the drawbacks of the traditional method of AI system development by empowering the end users and developers with greater agency and control over the AI components of the system. This section will provide an overview of how such a system is designed and what design considerations should be adhered to when developing and deploying a reliable system for disaster management by focusing on the Citizen-Helper system as an example.

Citizen-Helper is composed of several connected components that can be integrated to provide the most suitable analysis of situations as desired by the practitioners of disaster management. The specific analysis output depends on the functionality needed by disaster management practitioners, which depends on the type of disaster and its scope and severity. The design and development of Citizen-Helper system emphasize some of the core concepts from software engineering based on the design lessons learned from the human-centered AI framework (Shneiderman, 2016, 2020b) and the literature on information systems for crisis management (Muhren & Walle, 2010):

1. **Modularity:** Citizen-Helper is designed as a modular software system consisting of several core components and standardized interfaces for connections between those components. The components could be modified independently without affecting the overall system as per the requirement of human experts or practitioners. Thus, modularity favors more human control, one of the core dimensions of the human-centered AI framework (Shneiderman, 2020b). Moreover, modularity helps the developer rapidly deploy a system instance focused on relevant functionalities and analytics for specific data modalities, such as sentiment and intent analysis over textual data during a disaster. Similarly, for example, the module related to event detection over IoT sensor data could be improved based on feedback from the practitioners for focusing on specific events of interest without changing other system components.
2. **Extensibility and customizability:** Human-centered AI systems should be extensible and flexible in their design to support a multitude of disasters, data sources, and different types of analytics for different practitioner roles. The modular design of Citizen-Helper helps it to be extensible and customizable with an ability to easily integrate external AI models and web services for analytics provided by partners. Additionally, customizability enables one to quickly adapt the system to new scenarios or use cases efficiently, which is much needed in a system deployed for disaster management where distinct practitioners from multiple agencies are involved.
3. **Interactivity and simplicity:** These concepts are employed to provide greater human agency and control for analytics through interactive visualizations, thus, improving upon one of the core dimensions of the human-centered AI framework (Shneiderman, 2020b). Disaster management teams and other end users of the system may not be tech savvy. Therefore, the Citizen-Helper system interfaces are kept simple to provide intuitive means for communicating insights visually and facilitating interaction with the system to perform analysis as needed on disaster data without the complexity of coding or programming. In the design of Citizen-Helper, the focus was on a specific dimension of simplicity measured by the number of interactions needed to perform a certain task or based on the time it takes to perform a task.
4. **Adaptability:** A human-centered AI system needs to adapt its AI models over time to meet the challenges of data drift and dynamic information needs in new situations, thus, improving upon the second dimension of the human-centered AI

design, which is enhancing the computer automation (Shneiderman, 2020b). Citizen-Helper includes human feedback-driven active learning techniques to dynamically update the AI models for analytics with retraining using new annotation feedback. Moreover, Citizen-Helper provides annotator agreement analysis to extract relevant and correct annotations for model building and updating. Such features enable the Citizen-Helper system to address the concept drift of information over different phases of disaster management, which, in turn, can improve the validity and timeliness of information extracted through the system for disaster management agencies.

While a software should follow the good software practices, the above principles should be emphasized during the design and development of a human-centered AI system. The Citizen-Helper system is an example of such systems, and it is designed with the modules summarized in Fig. 3 that are divided into six categories – data collection, data storage, data annotation, AI model training, analytics services, and interactive visualization. Each of these module categories is discussed in detail in the following subsections.

Data Collection

The first process in data collection is the selection of appropriate data sources. A data source is defined as the resources to find the data according to specific problem requirements. For example, it can be a social media site like Twitter (<https://twitter.com/>), Facebook (<https://www.facebook.com/>), or Reddit (<https://www.reddit.com/>).

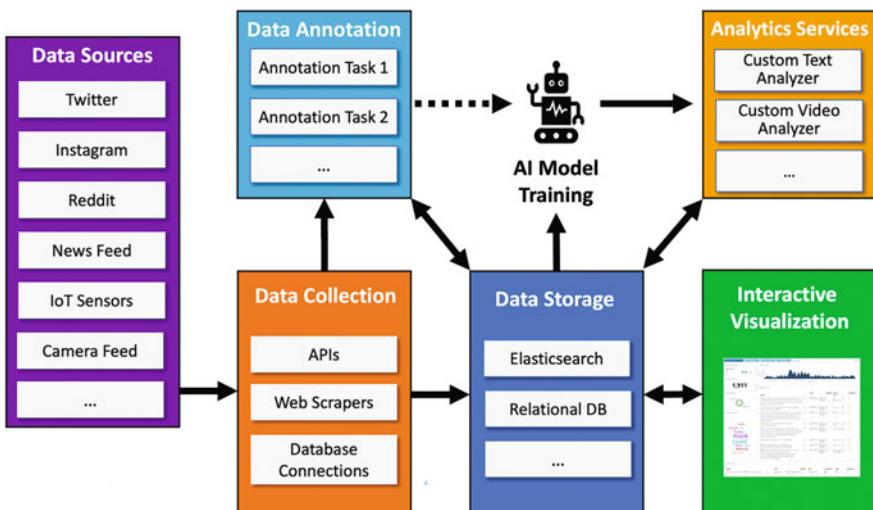


Fig. 3 Technical components of Citizen-Helper system

The source may contain data of a single modality such as text or multiple modalities (multimodal). The source may also provide data in different formats, and the process needed to collect the information may differ. One must consider the above factors when developing the data collection approach. Application programming interfaces (APIs), databases, knowledge bases, and direct sensor feed or streams are some mechanisms to collect the data from a source. It is important to note that the data collection approach should involve both developers and disaster management professionals since it requires the selection of data sources and filtering strategies appropriate for the operations of the concerned disaster management agency.

Data Storage

The collected datasets can be stored in a local server or the cloud, as per the disaster management team's requirements. Citizen-Helper uses file-based storage, relational database, and Elasticsearch (<https://www.elastic.co/>) to store data at different processing stages. It is helpful to note the use of different storage mechanisms, and it is to be carefully used when designing a human-centered AI system. For example, Elasticsearch is a full-text search engine based on Apache Lucene and NoSQL database for fast retrieving unstructured text data. Elasticsearch also has support for visualization with tools such as Kibana (<https://www.elastic.co/kibana/>) already, without any need for additional coding for rapid development and deployment of visual analytics dashboards during disasters. In contrast, using relational databases for storing the feedback provided by the end users is appropriate as it complies with ACID (atomicity, consistency, isolation, and durability) (Atzeni et al., 2013) properties of databases. Moreover, it could be beneficial to log all operations on databases to analyze them to improve the system functionality and use them for research purposes in the future.

Another aspect of data storage is the redundancy and backups to improve the availability of the systems at all times of critical stages. These options are often available through the cloud provider of the data storage services. Further, data security is another concern that needs to be carefully addressed to protect the integrity and privacy of user data, including the sources of data and system users. Data transmission must be performed using secure methods (e.g., using the Secure Sockets Layer (SSL) method), and data should be stored in access-controlled databases and servers. Only authorized users must have the required access to both the database and interactive visualization to prevent data breaches and unsolicited manipulations of the system behavior, especially for active learning techniques that update AI models.

Data Annotation

The inclusion of humans in the system design is significant in various stages of the human-centered AI approach. Citizen-Helper system design includes a module to

collect annotated data from expert and nonexpert human users to train and update AI models using supervised and semi-supervised learning methods. Before participating in data annotation tasks for creating the dataset, both practitioners and volunteers must be trained to effectively perform the desired annotation task (Senarath et al., 2021). It will reduce the risk of erroneous annotations, which could lead to low performance for the resulting AI models, leading to poor quality of analytical outputs and insights for practitioners at disaster management agencies. Training human users for data annotation tasks requires two critical components: a schema for class labels and a training guide for annotation.

Schema and annotation. The developers, with the help of disaster management experts and existing literature, must define the schema for labels of relevant information classes according to the expected analytical outcome and functionality of the system. However, developing the schema may not be one time and may require refinement due to the change in information needs of practitioners driven by the dynamics of disaster events and the analytical requirements of the disaster management agencies.

The trained human workforce is provided with one of the web interfaces of Citizen-Helper designed for data annotation tasks, which allows annotating single or multiple data items according to the defined schema, for instance, annotating a social media post by assigning a class label from a given set of labels – requesting help, offering help, and neither (Purohit et al., 2013). Interface design should be simple and easy for the users to annotate. Another important aspect is to track the annotation agreement among users, which is a well-known measurement approach for paid crowdsourcing platforms. The team leaders can leverage such performance metric analyses for future annotation task assignments or improve the human training curriculum. At the same time, the system developers can gain insights into the complexity of interpreting specific class labels and discuss the improvements for a schema with practitioners.

Human training. Presentations and tutorials have proven to be helpful for data annotation task training; furthermore, providing detailed and precise documentation is helpful to the annotators (Purohit et al., 2013). Additionally, incorporating a diverse set of annotation examples in the training curriculum can improve annotators' understanding of the task. A disaster management practitioner should conduct the training to ensure annotators understand the annotation schema's purpose, intent, and value to disaster management processes.

However, there can be significant challenges to efficient work output from humans. Other factors should be considered apart from human training for credible human annotation: fair pay if not volunteering, standardized tasks, and transparency. Depending on the type of annotators, these factors are adjusted for enhancing annotation results. However, there can be numerous factors accounting for the credibility of human training even after the initial training. For example, excessive annotation tasks conducted by an individual can affect the overall annotation quality for the data annotation. Moreover, the annotator's comprehension of the training guidelines and annotation task description also affects the quality of annotation. Large quantities of complex class label annotations might cause annotators to forget

the less frequent classes and provide erroneous annotations (Pandey et al., 2022). Quality assurance should be conducted by reviewing annotation agreements among annotators. Also, Citizen-Helper reduces the risk of erroneous annotations by including a relabeling feature on the visual analytics interface performed by a disaster management practitioner. This step is conducted before annotated data is passed to revise an AI model for predictive analytics, thus, avoiding poor quality of the outputs from the resulting system.

AI Model Training and Analytics Services

The Citizen-Helper system facilitates the customization of AI model specifications, from the type of algorithm used to build the model to the specific hyperparameters of the models. An intuitive programmable interface is provided to a developer to provide necessary AI model specifications to maximize the system's adaptability. Once the model specification is decided for a use case of the system, the following two essential components are utilized:

Supervised and unsupervised learning algorithms. Using the annotated and unlabeled dataset and the desired model specification for a machine learning task, the Citizen-Helper system activates the component for algorithmic modeling. The system trains a supervised/semi-supervised learning model when an annotated/labeled dataset is available; else, it relies on an unsupervised learning model. For instance, given the annotated social media posts with labels for the serviceable request for help (Purohit et al., 2018b) during a disaster, the system trains a classification model to detect such posts automatically. Similarly, given a time series of IoT sensor observations, the system trains an anomaly detection model to discover unexpected events.

Active learning paradigm. It is a human-in-the-loop machine learning setting (Monarch, 2021), which enables the querying of human feedback when an AI model is uncertain and updating the model with additional labeled data to make the model perform better. For instance, at the beginning of any disaster event, Citizen-Helper uses a classification model to filter out relevant social media posts (such as posts related to requests for or offers to help), trained on annotated posts from either prior similar event or a small subset of posts from current event labeled by an expert. However, the outputs of these predictive models sometimes include irrelevant posts or filter out relevant ones. Hence, it is hard to become utterly reliant on a fixed machine learning model only in such situations. Therefore, Citizen-Helper uses an active learning component that helps to improve this model over time (Pandey & Purohit, 2018). Through Citizen-Helper, a disaster management agency can collaborate with volunteer groups, where a volunteer can observe incorrectly classified posts and provide correct feedback for class labels. The feedback is stored to retrain the machine learning model dynamically to predict the erroneous labels correctly. Thus, the machine learning model becomes ever-evolving and can also handle data

drift (when the label concept definition changes over time) (Pandey et al., 2022), in order to maintain effective support for analytics to aid disaster management practitioners.

Interactive Visualization

Data visualization allows graphical representation of the data to provide an easier understanding to the disaster management practitioner. Easier access to the data and insights through visualization are critical for the end users who interact with the Citizen-Helper system. Thus, Citizen-Helper makes sure to reduce the cognitive load from the data presented to its user on the visual interface. Moreover, the tighter integration of the Elasticsearch database with the Kibana visualization interface helps the end users filter the data as required to provide a smooth and interactive user experience for Citizen-Helper. The following are some of the implemented visualization types that are useful in disaster management when analyzing online social data streams:

Temporal trends. Temporal trend is used to study the changes in different disaster-related variables over time. For example, the rate of social media posts about people who need help during disasters can aid in the management of disaster response resources.

Geographical activity. Geographical activity is a crucial visualization for localizing the effects of a disaster and aiding disaster management resource allocation efforts. Geotagging metadata with sensor observations, video feeds, and social media posts can be used to visualize geographical activity.

Content analysis. Content class labels such as topic, intentional behavior, or sentiment, as well as entity annotation, help understand the meaning of the content well. They help distinguish the patterns for relevant content from irrelevant content. For example, annotating and summarizing different entities of resource types related to disaster response in social media posts could help practitioners efficiently gain situational awareness of the demand for the resources and respond accordingly.

Interactive data tables. Data tables help study individual data records and their narratives in a simple, conventional format of tables for data analysis that practitioners are used to. For example, social media posts are presented in a table with multiple columns containing the body of the post and other metadata, including content class labels such as sentiment, intent, risk behavior, and relevancy. Moreover, the data table can facilitate a practitioner to provide feedback to the system for continuous improvement on the predicted class labels.

User demographics. Demographic features are inferred from user metadata of source data (e.g., author of a Twitter post), when available, to understand how people of different demographic backgrounds are voicing concerns and being affected during a disaster. This, in turn, aids in future actions for equitable disaster management and resource assistance.

Use Cases

Disaster Response and Mitigation Using Social Media Data Analytics

The significance of information systems that take advantage of social media data is well-known in the context of disaster management, as evident from the vast research literature generated in the last decade (Castillo, 2016; Imran et al., 2015; Purohit & Peterson, 2020). This section summarizes how such a system using the human-centered AI design approach can take advantage of social media data for disaster response and mitigation using a couple of applications of Citizen-Helper.

While it is possible to prepare a Citizen-Helper deployment for some disaster scenarios, it is not possible to anticipate and prepare for all disaster scenarios. The COVID-19 pandemic was one example where Citizen-Helper deployment was conducted from the ground up with extensive collaboration with human users, including disaster management practitioners and volunteer group members. Ground-up deployment was necessary due to the unavailability of pandemic-related data to train the AI models for desired analytics to support disaster management agencies. The developers and multiple disaster management practitioners had to collaborate and devise a set of requirements that would benefit disaster management and the overall community response (Peterson et al., 2021; Stephens et al., 2021). The specific problem was determined to identify societal risk and prevention behaviors related to the COVID-19 pandemic (Senarath et al., 2021).

The first step in building the AI system was defining the risk and prevention behavior schema for social media content that could inform disaster management agencies. Accordingly, keywords relating to that defined schema were identified to help initiate the data collection process. The system developers collaborated with a Certified Emergency Manager® (CEM) to gain valuable insights into disaster management that aided in the process to define and finalize the schema for relevant class labels. (The Certified Emergency Manager® designation is an internationally recognized professional certification for emergency managers offered by the International Association of Emergency Managers (<https://www.iaem.org/certification/intro>).) These class labels informed the development of a predictive model to recognize risk and prevention behaviors from social media posts.

Next, data were collected from Twitter to find insights about the social behavior of the public in a region. In particular, Twitter API was used to collect data using the keywords identified in the previous stage from March to September 2020. Then data annotation was required to train the machine learning models to recognize the presence of different classes of behavior in social media posts. The annotation task was performed in collaboration with members of eight community emergency response teams (CERTs) in the Washington DC metropolitan region. (The community emergency response team (CERT) program trains community members in basic disaster response skills, such as fire safety, light search and rescue, and disaster medical operations (<https://www.ready.gov/citizen-corps-partner-programs>)). The CEM conducted the training for the CERT volunteer members that resulted in high-quality annotations and ensured an understanding of desired goals and

objectives for disaster management from the data annotation tasks. The volunteer annotators were instructed to do the annotation task with a simple and intuitive web annotation interface provided by Citizen-Helper. Using active learning in the back end and after initial training of the predictive model, the system also showed the likely/predicted class labels for a social media post to an annotator and sought feedback on its decisions to improve the model.

The final step was to display the analytical insights on COVID-19 risk and prevention behavior-related social media content in a simple, easy-to-understand, and interactive format for disaster management practitioners. A web-based dashboard was created to ultimately facilitate situational awareness by time, geographical regions, and user demographics.

Figure 4 illustrates the visualization dashboard of the Citizen-Helper system. It illustrates tweets captured through a specific time range during 2020 through a temporal trend, where the user could select a specific slice for deeper analysis around peaks. It also shows an interactive data table with tweets and their metadata indicating the relevance of the tweets based on whether a risk behavior is expressed in the tweet. The data table provides a feature for practitioners with the expert user role to give feedback to the system for inaccurate model predictions. The geolocation analysis section of the dashboard includes a geographical heat map that shows the distribution of tweets in an interactive world map. This visual aid could help the system users intuitively understand the spatial data. Moreover, as indicated in the dashboard, the content analysis unit shows the behavior class distributions.

Additionally, the system users (practitioners at disaster management agencies) can interact with the interface using interactive controllers to filter out content by the relevance score provided by the AI models to obtain the content filtered by different degrees of relevance. This function on the interface offers practitioners greater



Fig. 4 Dashboard containing the visualizations in Citizen-Helper COVID-19 implementation

agency (a fundamental expectation for a human-centered AI approach). The system provided an ability to attain the most relevant information on risks and prevention behavior of the public in near real time without being obstructed by the large amounts of irrelevant data, thus helping the response and mitigation operations involving CERTs. The resulting system and analyses were presented at the regional and national level committees, as well as selected for presentation at the prestigious annual conference of the International Association of Emergency Managers (IAEM) in 2021 (Peterson et al., 2021).

Preparedness via Practitioner Exercises and Multimodal IoT Data Analytics

Recall from introduction that within the preparedness phase, the focus is given to preparing for different types and scales of disasters. An example of preparedness activities is community outreach events conducted by local disaster management agencies that educate people on how to prepare for potential hazards in their community. Also, during the preparedness phase, disaster management agencies conduct discussion-based and operations-based exercises. Agencies conduct the exercise(s) and identify strengths and areas for improvement based on exercise performance, leading to planning for process improvements through implementing corrective actions and ultimately validating the actions in subsequent exercises. It includes the practice of using training instructors' direct observation and radio-based audio communication to collect data on trainee behaviors and interactions (Pandey et al., 2020). These traditional methods are hard to scale, especially with several exercise participant teams. Moreover, the limited human resources in training debriefing result in the loss of information and the ability to personalize the experience of learnings for individual trainees.

However, there is a high potential for using the emerging AI technologies of computer vision and deep learning to address the challenge of training disaster management practitioners at scale. There is a high influx of valuable data streams when such training exercises are conducted, for instance, video streams through IP cameras, sensory information from wearable IoT devices, and simulated online microblog streams from social web platforms. It presents an opportunity to capture complementary and redundant information streams during simulated training exercises and enhance debriefing sessions for training instructors using insights extracted from the massive data streams using AI technologies.

Specifically, the Citizen-Helper system deployments included preparing for an active shooter training exercise (Pandey et al., 2020) and fire incident response (Bannan et al., 2020). The goal of such deployments was the scalable and real-time processing of nontraditional, multimodal data streams during training exercises of disaster management practitioners to augment trainees' learning experience during training debriefs immediately after the exercises. As stated in Fig. 5, there were four major components in the Citizen-Helper deployment for training exercises (in short, referring as Citizen-Helper training):

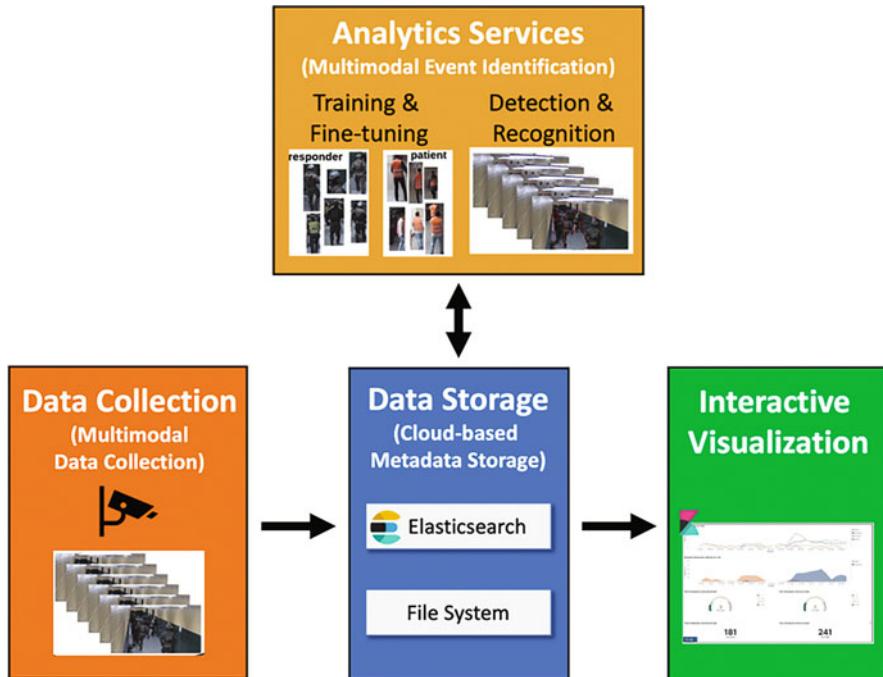


Fig. 5 The system architecture of the Citizen-Helper deployment for training exercises for video data processing for emergency preparedness and training debriefs

1. *Multimodal data collection:* The Citizen-Helper training system collects data from multimodal data streams from different sensing sources during a training exercise. These sensing technologies, including wearables, can be static at specific locations, such as IP cameras, occupancy sensors on walls, etc., or dynamic like drone devices and IoT sensors on equipment or tied to practitioners or other exercise participants, such as patients or victims.
2. *Multimodal event identification:* The system processes the collected semi-structured data in this component. The system tries to detect the events of our interests (defined with the involvement of practitioners in the design stage of the system) in the raw data that have been collected from different data sources using AI models corresponding to specific data modalities. For instance, in the active shooter response exercise, Citizen-Helper employed object recognition techniques to identify specific events such as the appearance of the wounded patient, person seeking rescue, first responder, etc. The system facilitates both supervised and semi-supervised learning algorithms to build and employ models for event detection.
3. *Cloud-based metadata storage:* The system stores metadata of interesting and nontrivial patterns of events that are continually detected by multimodal event detectors in a cloud-based database. We used Elasticsearch, as described earlier,

for faster search processing and retrieval of relevant information for an interactive visualization interface built using Kibana.

4. *Interactive visualization:* The system uses the interactive Kibana-based interface to visualize different insights for real-time performance analytics of trainees for training exercise instructors and incident commanders, for instance, patterns of time series for the specific periods, such as when interactions between a first responder trainee and a wounded patient happened and when trainees from different first responder teams met. Following the principles of human-centered AI design, the system provided interactivity and customizability for the training instructors in browsing the patterns. The system could efficiently handle different front-end interface changes per the user's filters when browsing such patterns on the dashboard interface in real time.

Overall, the Citizen-Helper system for training augments the learning experience of disaster management practitioners in the simulated training exercises by supporting instructors with multimodal data analytics for enhanced training debriefs. This presented application of the human-centered AI system design was demonstrated for specific AI technologies. However, the system design is extensible for data processing with other AI techniques, such as natural language processing to process audio communication of the exercise participants to provide more insights for enriching the training debrief discussions.

Challenges and Future Research Directions

We discussed in this chapter various ways in which humans can be involved in AI-based data analytics systems in disaster management. We identified several use cases of such a system that has been deployed in various real-world scenarios of disaster management phases. We used the Citizen-Helper system as an example to inform how human-centered AI system design can help mitigate the challenges across different scenarios for the requirements of practitioners. There are still many challenges in achieving the overall vision of human-centered AI system design to develop reliable, safe, and trustworthy systems. We identify three distinct challenges to inform future research directions to design and develop such systems for disaster management.

First, as noted in implementing Citizen-Helper for identifying risk and prevention behavior in the analysis of a pandemic, rolling out the implementation can take significant time due to the unavailability of the data to train the AI models. This delay should be minimized by adequately preparing for future disaster scenarios, and thus, preestablished collaborations with practitioners can be invaluable. It is crucial to collaborate with them in the system design process early on to inform the rapid adaptation of existing data processing pipelines from prior disasters in the case of a new disaster. One technical research direction to support this requirement for future work can be the exploration of rapid but interpretable domain adaptation methods (Krishnan et al., 2020).

Second, the previous use cases did not consider the ways to improve the quality of human inputs. In reality, humans can make errors, which gets reflected in the quality of the machine learning models trained in AI systems. Those errors are often caused due to either an incorrect or incomplete knowledge of the users (mistakes) or inattentiveness and memory decay of users for particular concepts (slips) (Pandey et al., 2022). As a result, the AI systems get induced by the errors made by humans, which results in poor performance overall. Thus, mitigating human errors is one of the promising future directions for research on human-centered AI systems for disaster management.

Third, due to the increased burst of data during an active disaster event, the disaster management practitioners might have limited time, however, a high workload to make sense of several events identified in the data. Consequently, it is essential to rank each event of interest in terms of its serviceability and decide on the optimal workload required given the limited time of practitioners, which does not hamper the overall recall of the events. Hence, there is a need to optimize both how many and how often the events need to be processed by disaster management practitioners to improve performance, while also taking care of the limited workload (Purohit et al., 2018a). Hence, we observe the necessity of creating more synergistic and collaborative approaches to jointly improve human and machine performance when designing human-centered AI systems.

To conclude, this chapter presented a detailed overview of human-centered AI system design and its advantages in disaster management by illustrating an example of Citizen-Helper system. Moreover, it discussed use case scenarios of a human-centered AI system design by taking several implementations of the Citizen-Helper as examples. Additionally, it described current limitations and challenges for future work on human-centered AI system design, which can help expand the use of the human-centered AI approach in future disaster management.

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Resilient Heritage Using Aerial and Ground-Based Multi-sensor Imagery

36

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Contents

Introduction	500
Resilient Cultural Heritage Using Information from Space to Ground	502
Multichannel Image-Based Data Acquisition	504
Digital Heritage Cube Based on Positional Information	505
Information Acquisition from Historical Map	506
Application of Resilient Heritage Cube to Real Cases	507
Forest Fire at Gangwon-do	507
Earthquake in Gyeongju City	510
Knowledge Acquisition from Recent Images and Historical Maps	512
Conclusion	514
References	515

Abstract

Recent geospatial information technology developments have prompted researchers to utilize multi-sensor data for decision-making in disaster situations. Cultural heritage needs to be preserved as it reflects local characteristics and the knowledge of its creators. Cultural heritage, which is difficult to restore to its original state when damaged, should be the first consideration in a disaster. This study proposes a method of how geospatial information from satellites, drones, smartphones, and historical maps can help to make cultural heritage resilient to various disasters, such as earthquakes, wildfires (including human-induced), and flooding. The method how to integrate geospatial information for resilient cultural heritage in a given disastrous situation is a very critical process. In this study, the core role of geospatial

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information for resilient cultural heritage is presented by applying the methodology presented here. The data acquired from multichannel imagery and historical maps can be formed into digital resilient heritage data, which enables timely access to decision-makers. Additional information can be derived from accumulated data through data integration processes and by extraction of the knowledge of ancestors encapsulated in cultural heritage. To verify this, we explored three Korean cultural heritage examples. We concluded that the proposed methodology is expected to contribute to maintaining the identity of cultural heritage and preserving its unique value by improving its resilience of cultural heritage.

Keywords

Cultural heritage · Cultural resilience · Multichannel imagery · Historical map

Introduction

Every country is continuously trying to protect its people and national assets from disasters. However, it is always difficult to respond to disasters in the initial stage. This situation frequently happens because it is difficult for decision-makers to access situational information when a disaster occurs. With the development of various sensors from space to the ground, the basis for obtaining any information from the disaster site is being ready. It can be said that the foundation for preserving important national assets via evidence-based decision-making has been provided (Abate et al., 2022). The remaining thing is implementing the framework for using various sensors in actual situational awareness.

In this study, a framework is provided on how to continuously protect cultural heritage, an important national asset, by using images from satellites and drones to terrestrial images such as smartphones and CCTVs. In addition, historical maps are another vital source of information that reveal the location of cultural properties in the past. This study also investigates how the resilience of cultural assets improves when such historical maps are combined with more recent imagery.

Cultural heritage connects us to the past, provides valuable insights into our identity and evolution, and can play an important role in economic growth, poverty reduction, and sustainable development (Stanton-Geddes & Soz, 2017). If these cultural heritages are damaged, they cannot be returned to their original state, and their value is difficult to convert into monetary value. For this reason, cultural heritage has recently been included on the international agenda of disaster risk reduction. The Sendai Framework for Disaster Risk Reduction (SFDRR) recognizes the linkages in different aspects of culture, risk reduction, and resilience and helps preserve culture by providing a basis and policy environment for mainstreaming disaster risk management (DRM) (Stanton-Geddes & Soz, 2017). Therefore, it is important to protect cultural assets, respond quickly in case of disaster, and restore them to their original state in case of damage to build cultural heritage resilience.

The concept of resilience was developed by Holling in 1973 and has since been defined as “the ability of a system to absorb, utilize, or even benefit from disruptions and changes in order to be able to continue without any qualitative change in the structure of the system” (MacKee et al., 2014). In climate change adaptation, resilience is defined as “the ability of systems and their components to predict, absorb, accommodate or recover the impacts of hazardous events in a timely and efficient manner, including ensuring the conservation, restoration or improvement of infrastructure and functions” (IPCC, 2012). The main activities for building resilience in cultural assets may include providing alarms to prevent damage to cultural properties when a dangerous situation occurs, quick response activities to minimize damage, and restoration to maintain the original shape. Understanding specificity is essential to build resilience, but a holistic approach is more critical. A resilient system requires integrating various types of knowledge for learning (Folke et al., 2002; MacKee et al., 2014). Therefore, to improve the resilience of cultural heritage, a multidimensional approach that integrates various geospatial information with the expertise of stakeholders is required.

To increase the resilience of cultural assets for disasters is being actively carried out from the individual cultural asset level to the entire country or an international level such as the United Nations. In Japan and the United Kingdom, cultural assets are included to establish national and regional DRM plans (Stanton-Geddes & Soz, 2017). The EU tried to promote the resilience of cultural heritage through the ResCult project (“Increasing Resilience of Cultural Heritage”) as a platform for cooperation between government and nongovernmental sectors, emphasizing the importance of data accumulation on a large scale (Colucci et al., 2022). UNDRR (2022) published the “Disaster Resilience Scorecard For Cities: Cultural Heritage Addendum” to support the development of cultural-based and people-centered disaster risk reduction and resilience strategies integrated with cultural heritage and development policies, and the importance of generating a complete database of exposure and vulnerability of cultural heritage was emphasized, considering possible changes that can occur over time through climate change. Research on how to prepare for disasters by introducing new technologies to cultural heritage has been actively conducted conceptually and practically. Many studies are being conducted to apply new technologies, such as satellites, drones, and ground laser scanning.

Agapiou et al. (2015) prepared a risk map for natural and anthropogenic risk factors using remote sensing and geographic information system (GIS) techniques to evaluate the risks to the area where the cultural heritage is located. The PROTection of European Cultural HERitage from GeO-hazards (PROTHEGO) project (PROTEHGO, n.d.) aims to develop and validate innovative methodologies using InSAR and GIS technologies for the detection and monitoring of European cultural heritage exposed to natural hazards (Spizzichino et al., 2017). This methodology was applied to the 339 UNESCO World Heritage Sites in Europe, and by integrating these data with an existing geographic risk database, the most important cultural heritage sites across Europe were identified and prioritized. Korumaz et al. (2014) analyzed the potential of drones in analyzing, interpreting, and managing cultural heritage through a case study. Risbøl et al. (2015) performed change detection through time series data using airborne LiDAR.

The EU's FIRESENSE project presents the framework for how to protect cultural heritage from wildfire (CORDIS, 2022). This project emphasizes the fact that the cultural properties of the Mediterranean region are most vulnerable to wildfire, resulting in a lot of destruction. In this project, a new cultural asset management and supervision system was developed by integrating visible and infrared images, 3D geospatial information, and meteorological information.

Existing research has been applied to cultural heritage management using only fragmentary information obtained from satellite, drone, and GIS technologies or has focused on specific disasters. This motivates to build a framework to promote cultural heritage resilience using multi-sensor image information. In the case of a fire that occurred in the Notre Dame Cathedral in Paris in 2019, even though a fire safety system was built inside the cathedral, the initial response was operated only after a person directly checked the fire and reported it, not being able to extinguish the fire within the prime time. This event teaches us a lesson that research is needed to efficiently manage cultural heritage by acquiring data from various sensors and integrating these data to improve the resilience of cultural heritage.

Although the importance of integrated utilization of multi-sensor data is being emphasized in order to manage cultural heritages efficiently, research on the overall management system is insufficient. Korea's Cultural Heritage Administration (CHA) has also introduced a digital approach to all areas of preservation, management, and utilization of cultural heritages in 2021. In addition, in order to integrate and manage the repair history of cultural heritages, the "Cultural Heritage Repair Information DB Establishment and Repair History Management Integrated BIM Modeling" project is in progress, and the main contents include building a database for the integrated collection and analysis of repair records of cultural heritages and building BIM modeling to manage the repair history of cultural heritages. Therefore, there is a need for a method for the integrated utilization of recorded data and new incoming data.

This study examines how geospatial information from satellites and drones to smartphones and historical maps can help to make cultural heritage resilient to various disasters, such as earthquakes, fires (including human-induced), and floods. By integrating multiple sensors for resilient cultural heritage, we try to identify what role geospatial information and past information play in actual disaster situation. This study tried to verify the framework by applying the methodology to the cultural heritage in the Republic of Korea (hereafter "Korea") and analyzed the areas that could be improved. Through case studies, it is expected that the resilience of cultural heritage will be improved if continuously developing geospatial information technology is applied to cultural heritage and a large amount of data is accumulated.

Resilient Cultural Heritage Using Information from Space to Ground

Multichannel imagery refers to all presently available images. Image is a valuable source that many people can intuitively use and provide. However, there is a limit to confirming the data collected according to the type of sensor (satellite, drone, CCTV, smartphone,

etc.), point of view, data acquisition conditions, and the agency in charge as an integrated form of information. Collected data can have different data formats and types of extractable information depending on the type of sensor, and information collected from a single sensor in an emergency cannot be sufficient for decision-making. Therefore, it should be possible to integrate data collected from various platforms and sensors and extract information necessary for decision-making based on the integrated data. In the following, a framework is presented to use many of these images, and a methodology is suggested how to use them to build cultural heritage resilience. In addition, the framework is intended to suggest a way to restore or preserve cultural heritage even if they are not protected and damaged. In order to build cultural heritage resilience, the stages can be divided into the process of acquiring multichannel image data, constructing a digital data cube for location-based images, and extracting indigenous knowledge from data that does not contain location information (e.g., old map). This process can contribute to the construction of cultural heritage resilience. Figure 1 represents the overall picture of how this process can be operated and provided to the decision-makers.

In order to support appropriate decision-making, it is important to display and confirm information based on location information. Data collected for cultural heritage management purposes, such as monitoring the condition of cultural heritage, can be continuously accumulated in cultural heritage archives. Data accumulated in cultural heritage archives can be used for risk factor identification and restoration activities in the future. Data collected in emergency situations can be checked in real time by decision-makers in the display system, and data can be expressed in a form that can support decision-making through analysis such as change detection with existing data accumulated in cultural heritage archives.

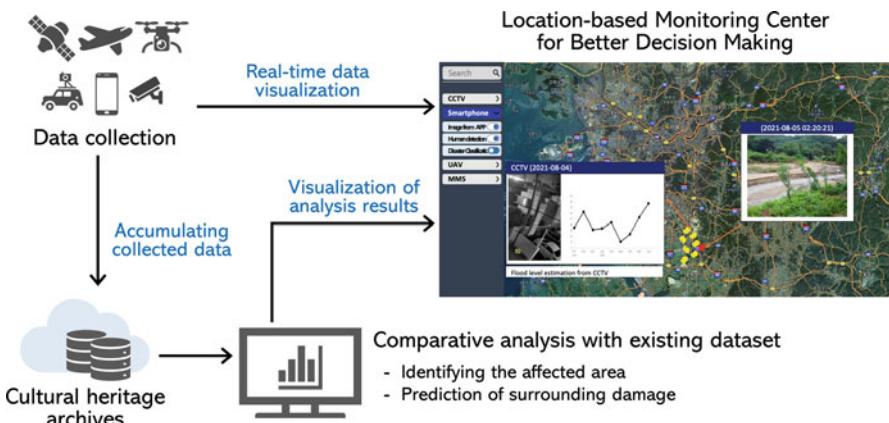


Fig. 1 Decision-making process using multichannel imagery

Multichannel Image-Based Data Acquisition

Multichannel can be divided into aerial sensors such as satellites, drones, and terrestrial image sensors. These multichannels have different characteristics and types of information acquired according to the sensor characteristics, as shown in Fig. 2. When using multichannel information, a hierarchical approach can be used. Through this, it is possible to acquire appropriate information according to the type (e.g., the size) of cultural heritage and the characteristics of the sensor. The hierarchical approach means that the received data is utilized according to the resolution of the provided image or information.

In general, satellite imagery can be effectively used for covering a wide area. However, there is a high possibility that the spatial resolution is likely to be low. Satellite images are generally defined in relation to their resolution, positional accuracy, aerial coverages, and spectral characteristics. Recently, there has also been an opportunity to quickly take images of the same area using geostationary orbit satellites or micro-satellites. To increase the usability of the satellite, it is necessary to develop an optimal operating technology that can acquire the same area quickly based on the characteristics and orbit of the satellite. Unmanned aerial vehicle (UAV, or drone) has the feature that it is possible to acquire information about the desired area rapidly. However, depending on the type of UAV, flight characteristics and types of mounted sensors are different. Therefore, it is important to consider the UAV platform first. In order to utilize the UAV in disaster situations, the first step is to define the overall specifications of the UAV platform and analyze the specifications of the latest platform.

UAV can be classified into various types such as multi-rotor, fixed-wing, and fixed-wing hybrid vertical takeoff and landing (VTOL). Various types of sensors such as camera, LiDAR, and RedEdge can be equipped on UAVs, and high-

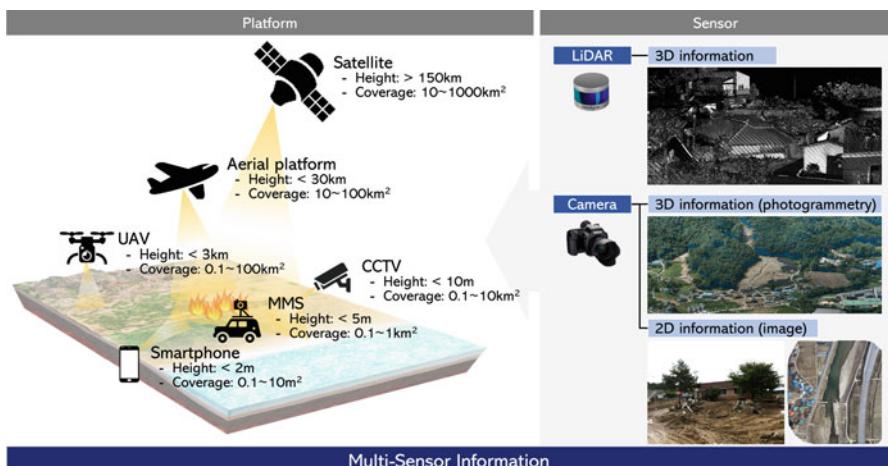


Fig. 2 Multi-channel image acquisition framework over a disaster site

precision orthoimages and 3D modeling are possible using photogrammetry techniques depending on the route plan. Research has been actively conducted to perform precise 3D modeling using data collected by UAV for major cultural heritages including UNESCO World Heritage Sites (Tache et al., 2018; Manajitprasert et al., 2019; Ulvi, 2021; Pepe et al., 2022).

Suppose satellite images identified the overall external force or situation for a spatially large area. The next step is to use a high spatial resolution and available spatial information acquisition method for a narrow area. According to the proposed framework, the initial situation is caught by using the surrounding CCTVs. At the same time, a drone is sent on-site to understand the overall situation. The field personnel can take images using a smartphone. The local government can dispatch Cultural Heritage Monitoring Vehicle (CHMV) to get detailed ground-based information about the site. CHMV can be equipped with sensors such as cameras, LiDAR, GNSS, and IMU, and through this, it can quickly collect precise data about the dispatched site. Compared to UAV, it has the disadvantage of being accessible only to places where vehicles can enter, but since the operating conditions are relatively less demanding and the operating time is longer, it is equipped with high-resolution sensors to quickly access the site and obtain precise data in an emergency.

Digital Heritage Cube Based on Positional Information

Information on the acquisition time, location, and acquisition sensor is required in collecting data. Based on this information, detailed analysis activities can be performed through monitoring of continuously provided on-site data. The amount of data acquired from the multichannel sensor in an emergency situation through periodic monitoring will be significant, but if proper management is not performed, it may be challenging to utilize the data. Therefore, the digital data cube for collecting location-based cultural heritage image data can be expressed as shown in Fig. 3. By accumulating and managing data according to the proposed digital data cube, it is possible for decision-makers to respond correctly and access desired data

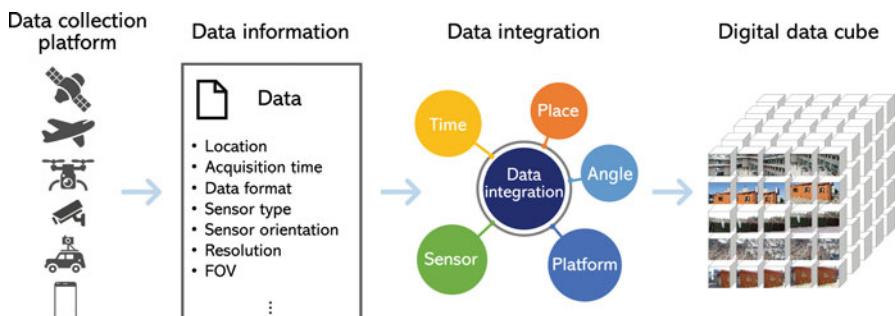


Fig. 3 Construction of digital data cube for resilient cultural heritage

in a timely fashion. Since the data accumulated based on the digital data cube includes location information, it is easy to integrate data obtained from various sensors. By periodically accumulating data on cultural heritage in digital data cubes, change detection analysis can be performed through comparison and analysis with previous data when an emergent situation occurs.

The digital data cube means organizing data composed of various formats collected from various platforms and sensors into one integrated form. Collected data has different formats, viewing angles, and resolutions depending on where, when, and how it was collected. Therefore, a process for integration is required to converge and utilize the data collected in these heterogeneous environments. The process of integrating data includes defining the collection location of collected data. For example, old maps recorded a long time ago may not have location information, and the types of sensor data collected, such as GNSS and IMU, can differ depending on the collection platform. In addition, since inaccurate location information can be collected depending on the data collection area, corrections may be required to secure accurate location information. Furthermore, to perform time series or comparative analysis between accumulated data, it is possible to accurately access and utilize the desired data only when the information on the acquisition time and acquisition location of the data is configured in the same format. Accordingly, the data integration process can include a process of converting collected data information such as location, time, and sensor information into a reference format. The digital cube built through this process can be defined mainly in three axes: time, location, and sensor.

Information Acquisition from Historical Map

Traditional knowledge systems embedded in cultural heritage can play an important role in disaster prevention and mitigation and thus contribute to more sustainable development (Jigyasu et al., 2013). In collecting data related to cultural assets, it is possible to discover knowledge about disaster damage, disaster preparation, prevention, and response included in historical records such as historical maps produced in the past. The historical map is representative visual data showing the appearance of the region and serves to represent the geographical knowledge of the time (Bae et al., 2019). In addition, the historical map contains various attribute information that can be used in the present or future. Figure 4 gives steps for incorporating historical maps with modern geospatial data based on location information (Bae et al., 2019).

Indigenous knowledge refers to local knowledge that is unique to a given culture or society, which serves as the basis for regional-level decision-making in agriculture, health, education, natural resource management, and other activities in the community (Boven & Morohashi, 2002). Sithole et al. (2015) state that regional knowledge is an essential factor that can increase the resilience of communities and should be complemented by measures to address the relevant human, social, and cultural factors that influence and render risks into disasters. Jha and Jha (2011) stated that integrating scientific or technologically enhanced methods with

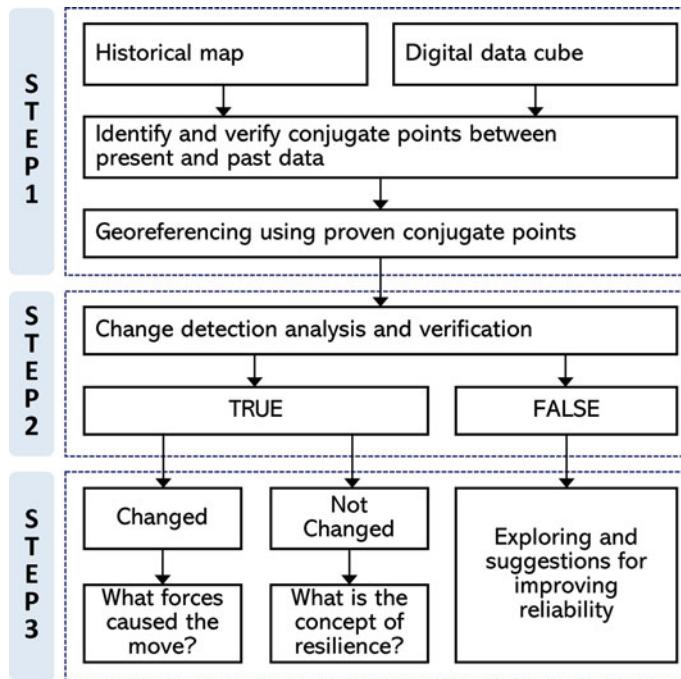


Fig. 4 Steps for incorporating historical maps and modern geospatial information

traditional knowledge provides a methodology for better disaster prevention and mitigation, preparedness, response, and recovery. Therefore, the digital heritage cube that was constructed with data both obtained from the multichannel sensors and the indigenous knowledge from historical records can provide an efficient framework for resilient cultural heritage.

Application of Resilient Heritage Cube to Real Cases

Forest Fire at Gangwon-do

The occurrence of wildfires has recently increased due to high temperatures throughout the year and an increase in the number of dry days in Korea. About 40% of the total forest area in Korea is coniferous forest, which occupies the most significant proportion, and is mainly composed of pine trees. Most of Gangwon-do's topography is mountainous, of which 43.4% is the mid-mountainous area between 500 m and 1000 m, with the highest proportion in the country. Good implications can be found by comparing the response to the forest fire in the past with the present response since this province suffers a lot of damage from frequent forest fires.

The forest fire in Gangwon-do, which occurred on April 4, 2005, caused a tremendous disaster due to continuous dry weather and strong wind. This causes to burn off 150 hectares of forest. To make matters worse, there was no information about the direction of spreading, causing Naksansa Temple and Dongjong of Naksansa Temple, National Treasure No. 479, to burn down. It took 1 year to investigate the damage to compensate the residents. However, in the case of the forest fire in Gangwon-do in 2019, active use of technologies such as satellite and drone imaging could contribute to rapid fire suppression.

It is worthwhile to compare the response to the forest fire of 2019 and that of 2005 at the same place and check how our proposed framework works. In the first stage of the framework proposed in this study, satellites, CCTVs, drones, and smart devices can be selected as usable sensors. It is difficult to predict the extent of the spread of forest fires, which depends on the influence of weather conditions, and thus continuous monitoring of a wide area is required. Since CCTV is continuously taking live images, it is easy to detect and analyze the spread of forest fire through continuous monitoring. Research has been conducted to apply deep learning techniques such as You Only Look Once (YOLO) (Redmon et al., 2016) and faster region-based convolutional neural network (Faster R-CNN) (Ren et al., 2015) to automatically and early detect a fire before it spreads based on CCTV images (Lee & Shin 2019; Lestari et al., 2019; Park et al., 2022), and Park et al. (2022) proposed a method of approximating the damaged area with weather data after detecting forest fire using an early fire detection model. In addition, damage can be reported through images taken with smartphones, which can enable damage analysis that cannot be detected by satellite and drones. As the use of social media has recently been activated, studies have been conducted to analyze disaster situations by crawling posts uploaded by citizens using smartphones (Alam et al., 2017; Wu & Cui, 2018; Fan et al., 2020; Belcastro et al., 2021). Disaster types can be classified using a deep learning model for images on posts, and the affected area can be estimated based on the location information of the classified images.

In the second stage, it is necessary to secure satellite imagery to determine the extent of damage in a wide area after receiving the report. At the same time, it is necessary to quickly approach the site by analyzing the fire truck access route through CCTV analysis. When deployed to the site, more detailed information about the damaged site can be obtained using drone images, and a fire suppression strategy can be established based on this. Studies have been conducted to identify the damaged area and severity using UAV images to detect collapse or cracks in structures or using UAV-based orthoimages for semantic segmentation based on deep learning technology (Kerle et al., 2019; Rahnemoonfar et al., 2020; Calantropio et al., 2021; Wang et al., 2022). In addition, the information acquired from the smart device makes it possible to acquire information in the blind spot. The CHMV equipment enables precise analysis of the damage after the fire is extinguished.

The third stage is to derive information for supporting decision-making by integrating the image information obtained from the multichannel sensors. Data acquired from satellites, drones, and CCTVs can show damage caused by forest fire from multiple perspectives. It is possible to analyze the damage status by

converging these data accurately. Precise data on the ground can be obtained using CHMV data for recovery, but in this case, it may not be easy to get information about the bird's-eye view. On the other hand, in the case of drones, since image is taken from above, information on the ground may be insufficient. In this case, it is possible to construct precise three-dimensional data on the damage by combining the two data. Chatzistamatis et al. (2018) removed all possible occlusions by fusing terrestrial LiDAR- and UAV-based 3D modeling to evaluate the damage to structures due to earthquakes. Cucchiaro et al. (2020) combined terrestrial LiDAR and UAV to better manage and protect agricultural terraced landscapes, an important historical heritage.

Improvements Through a Multichannel Approach

By coincidence, a large-scale forest fire occurred in Gangwon-do 17 years ago in 2005, and Naksansa Temple was destroyed by the Yangyang forest fire. Looking at the development process of the Yangyang forest fire, the fact that the process is quite similar to the wildfire that occurred in Goseong and other areas, along with the fact that the government has dealt with the crisis, can be compared in many parts. The difference between the two responses is as follows.

The first is to strengthen active collaboration between ministries. In the event of a forest fire, interministerial strategy meetings were held frequently, and a cooperation system among related departments was strengthened (MOIS, 2019). Second, the Korea Forest Service (KFS) sent a large helicopter resistant to strong winds to report the direction of the wildfire continuously and to evacuate residents quickly. Third, KFS requested satellite imagery of the forest fire area and announced the extent of damage and the degree of damage in a week (Fig. 5). This is the result of establishing an intelligent forest fire prevention and extinguishing system based on science and technology. Figure 5 is an example of analyzing regions damaged by the forest fire by comparing and analyzing aerial orthophoto or satellite images collected and produced before the event with drone images acquired after the event. Based on the image built before the forest fire, the changed area was identified in the drone image. Since forest

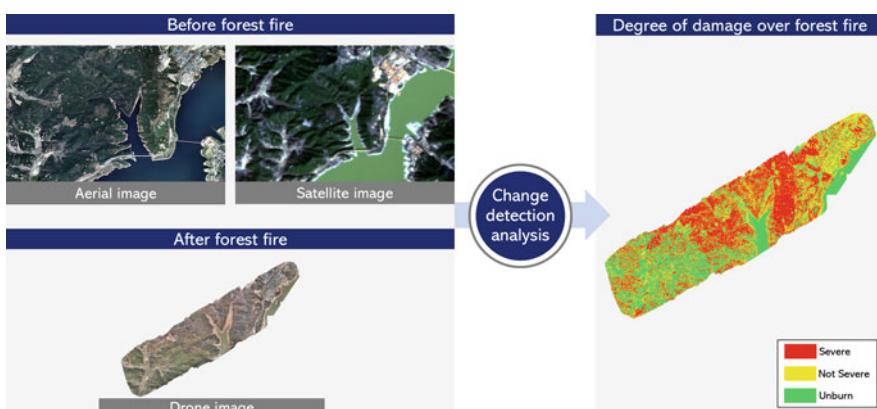


Fig. 5 Forest fire damage estimation from satellite, airborne, and drone imagery

fire prevention is crucial, the KFS has been promoting innovative forest fire prevention activities using forest drone monitoring teams since 2019. Smart CCTVs with sensors that automatically detect flame smoke are being distributed on the east coast of Gangwon-do, where there is a high risk of a large-scale forest fire.

Earthquake in Gyeongju City

The largest earthquake (magnitude of 5.8) ever to hit the Korean Peninsula occurred in Gyeongju at around 7 p.m. on September 12, 2016. Near the epicenter, Gyeongju City, and the surrounding areas, there were casualties; facility damage, such as cracks in and partial breakage of buildings; temporary communication disruptions; and minor damage to fences, roofs, and walls to 59 cultural properties. The significant cultural heritage impacts included the separation of the Jungjasuk of Cheomseongdae (Korean Treasure Number 31) and the fall of the stone Dabotap of Bulguksa. The cost of the damage to cultural properties was estimated at 5 billion won.

This was the largest earthquake to occur since the beginning of earthquake observation. This led to a review of comprehensive countermeasures for earthquake prevention to provide fundamental analysis and improvement plans for existing measures. The response to the impacts on cultural assets during the Gyeongju earthquake had four main aspects: information provision, initial and in-depth response, restoration, and acquisition of ancestors' wisdom.

When the earthquake occurred, accurate information on the situation could not be quickly communicated to the people. At the time of the Gyeongju earthquake, the website of the Ministry of Interior and Safety was out of order for 3 hours, and no disaster message was sent to the people until 9 minutes after the quake. Accurate and rapid information for not only decision-makers but also the affected population can contribute to appropriate response activities, such as evacuation.

Second, because of the risk of aftershocks, it is important to quickly identify the damage to cultural assets and take appropriate actions. Accurate measurements must be part of the initial response. However, in this case, the initial inspection was purely visual, and a meticulous inspection with precision measurement equipment was only performed later.

Third, the pre-event data constructed in advance can be used as essential data to restore cultural properties. For example, the Korea LX Corporation had acquired 3D data using terrestrial LiDAR and UAV after an earthquake hit Cheomseongdae on September 23, 2014. These data could be compared with 3D data using terrestrial LiDAR and UAVs after the 2016 Gyeongju earthquake. Analysis showed 0.4–3.4 cm differences in reference point coordinates, 3–5 cm in height values, and up to 1.6 cm in slope. When the type of damage can be expressed in a 3D-based quantitative manner, it is possible to calculate the 3D volume to facilitate recovery activities. This detailed quantitative analysis of the cultural asset damage played a crucial role in restoration decisions.

Fourth, acquisition and reflection on ancestors' knowledge can also aid the restoration. Cheomseongdae was built in the Silla era (AD 632–647) and was

designed with an excellent structural capacity to resist earthquakes. Specifically, it contained sand and gravel to absorb shocks. Advanced disaster response techniques were typically applied to cultural properties that have endured numerous disasters. Recognition and study of these historical techniques, drawn from the wisdom of our ancestors, can lead to further improvements supported by the greater precision and accuracy of modern data.

Improvements Through a Multichannel Approach

A better approach to an event such as the Gyeongju earthquake, based on multi-channel data and imagery, as described previously, would be as follows. In a situation where an earthquake occurs, damage mainly occurs in a wide area, and damage, such as the collapse of structures like roads and buildings, may occur. In this case, it may be challenging to obtain data on the site situation due to the difficulty of human access, and satellite and UAV images are highly utilized. Therefore, it is crucial to identify and manage risk factors before a disaster occurs using data collected on cultural properties and surrounding areas using satellites, UAVs, CCTVs, and 3D laser scanners. In addition, in the case of cultural heritage, changes may occur as they endure for a long time. It is possible to check for any changes in cultural properties and act appropriately by periodically collecting 3D laser scanner data. Lercari (2019) verified the usability of the surface change detection method using terrestrial laser scanner data acquired multiple times to monitor and preserve ancient buildings and confirmed that the change was detected with millimeter-level accuracy. Zaragoza et al. (2021) presented a method for performing change detection analysis by integrating a 3D model reconstruction using archive images and a 3D model measured using UAV.

When a disaster occurs, it is necessary to recognize the type of disaster and the damage situation quickly. CCTV installed for monitoring cultural heritage sites and smartphone images collected through citizen reports can be used first. After that, the damage range can be estimated using satellite and UAV images, and response activities can be supported based on precise field situation information. Appropriate response strategies should be established to minimize damage by integrating the characteristics of the affected area with the cultural properties located in the area. In an earthquake situation, unpredictable events, such as aftershocks, building collapse, or the spread of hazardous materials, can occur after the main quake. Therefore, continuous on-site monitoring is needed. In particular, it is important to anticipate where additional risk exists.

After the disaster is over, it is necessary to confirm the damage to the cultural property and determine the need for recovery or restoration activities. First, the damage range can be estimated in a wide area through displacement analysis using SAR satellites, and then precise damage information can be extracted using CHMV and 3D laser scanners. Such data can contribute to the accurate detection of damage, especially in areas with high potential for collapse, and support appropriate recovery or restoration activities by fusion with risk analysis and risk assessment results.

Knowledge Acquisition from Recent Images and Historical Maps

The overall methodology for studying the resilience contained in cultural heritage through linkage with historical maps and time series geospatial information was presented in Fig. 4. In the first step, geometric correction is performed on the historical map of the 1870s and the time series geospatial information after 1917 for comparative analysis. Since the primary purpose of this case study is not an in-depth analysis of geometric correction, polynomial rectification was used for two-dimensional linear affine transformation. The second step is to determine whether there is a change in cultural heritage that was actually located on the past map through the analysis of the numerical results of geo-referencing. At this stage, it is determined whether the cultural heritage location is changed or not. If there was a change in position or loss, it was judged that some external force would have occurred on the cultural heritage, and the cultural heritage could not have endured it. In the third step, knowledge of what external forces (e.g., earthquakes, floods, etc.) have occurred is tracked through historical facts, and if such external forces have not changed, we try to find out what lessons the cultural heritage can give us.

The area to be studied is Gongju, Chungcheongnam-do, and various designated cultural heritages such as treasures, historical sites, and scenic spots are located in this area. In this study, the historical map of Gongju (Gyujanggak, 10405), which is believed to have been produced in 1872 by King Gojong, was used to extract geospatial information using a historical map (Yoon, 1995). The location (address) data of the cultural property was used to confirm the location of the cultural property, and the data used as a reference point to perform geometric correction of the public notice map was used as an orthogonal image produced in 2016.

In the late Joseon dynasty, two types of maps were developed, such as a plan type and a painting type, and it can be seen that the accuracy is higher than that of the current map (Lee & Cho, 2014). The oldest data used in this study is the map of Gongju-mok, a local map created in 1872 in a pictorial manner (Fig. 6). In the case of a map written in a pictorial style, the accuracy is much lower than that of actual measurement, but there is an advantage that the entire town can be viewed as a picture map on one side. Local painters were mainly mobilized to create the pictorial map, and although they were not able to produce the map well to the actual scale, it can be seen that they did an excellent job of depicting the landscape and humanistic image of the entire village by utilizing their skills in real-world landscape painting.

Figure 7 represents the time series of major cultural heritage adjacent to the Geum River. All data except for the 1872 historical map were downloaded from the land information platform operated by the National Territory Information Platform (2019). The historical map of 1872 was downloaded from the website of the Kyujanggak Institute for Korean Studies. Other data sets were an aerial image of 1:20,000 without geo-referencing taken from 1966 (studied every 10 years from 1966) and an aerial image of 1:5,000 produced in 2016 for use as a reference point. Also, 1:25,000 topographic maps were also used after 1966, which were made with

precision using aerial images. Through this, time series data were integrated around the same map coordinate system, and the map change according to time at the same location can be confirmed.

In Fig. 7, the parts marked in red highlight the nationally designated cultural heritage. Area A is Gongsanseong Fortress designated by the state No. 12, area B is Gomanaru (Cultural Heritage No. 21), area C is Songsan-ri tomb group (tomb of King Muyeol, tomb of King Muryeong, Cultural Heritage No. 13), and area D is the



Fig. 6 Map of Gongju-mok. (Source: Gyujanggak)

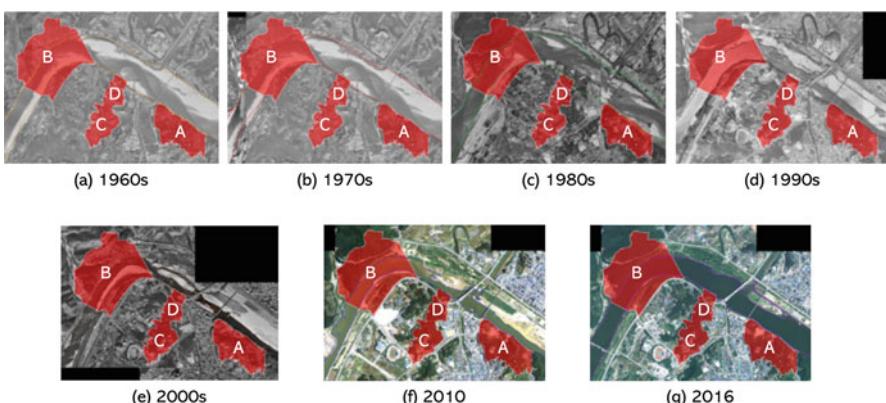


Fig. 7 Major cultural heritage locations overlaid with aerial images after the 1960s

ruins of Mt. Jeongji (Cultural Heritage No. 474). In the case of a historical map, it is helpful in understanding cultural heritage and the local conditions in the past. From time series, it is possible to distinguish between lost cultural heritage and preserved one. The Korean Peninsula has suffered a lot of damage from typhoons almost every year. Infrastructures around large rivers have suffered a lot of damage. As such, if cultural heritage remains in its old location over time and is preserved to this day, it can be said that the site has resilience. This insight gives the wisdom of our ancestors about disaster resilience in the past.

Conclusion

With the recent development of technology, the necessity for cutting-edge technology is increasing in disaster and cultural heritage management. Once damaged, cultural heritage is complicated to restore its original form. Thus, it is essential to manage cultural heritage well through periodic monitoring and a well-designed framework. However, most cultural heritage is monitored using a single sensor, causing a limitation to protect cultural properties in emergencies. In this study, a framework for improving the resilience of cultural heritage was proposed based on multichannel imagery and traditional knowledge in terms of disaster management.

The framework proposed in this study is divided into three steps. First, selecting a proper sensor for the given situation is necessary since each sensor has different characteristics. Second, we need to determine at what stage of disaster management the selected sensor should be utilized and what kind of information should be acquired using the selected sensor. Third, the data obtained from a single sensor needs to be integrated with other available information. Since each sensor provides different pieces of information, more diverse and accurate information can be obtained by integrating multiple data sets.

This three-step framework was applied to three cases of the actual Gyeongju earthquake, the Gangwon-do forest fire, and the use of historical maps in Korea to verify the possibility. Recently, various sensors have been used to respond to disasters with the rapid development of technology. However, a framework that utilizes appropriate sensors at the right time based on an analysis of available multichannel sensors needs to be selected and applied. In fact, it is confirmed that rapid response activities can be carried out compared to similar cases in the past. Damage can be reduced through faster and more accurate data acquisition when the framework proposed in this study is applied.

The proposed framework is expected to contribute to maintaining the identity of cultural heritage and preserving its unique value by improving its resilience of cultural heritage. The multi-sensor data collected on cultural heritage during normal times and disaster situations can also be further applied to various applications, such as cultural heritage exhibitions and training simulations.

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Ultralight Platforms to Coordinate First Responders and Communications

37

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Contents

Introduction	520
Aerostats	521
Beamed Power Application	522
High Altitude Long Endurance (HALE) Vehicles	523
The Flying Leaf Architecture	524
Regulations and Support for Emergency Systems	526
Conclusions	527
References	528

Abstract

Tethered aerostats typically reach 4000 m above ground level. They are affected by winds. With waveguides in tethers of antenna-bearing aerostats, emergency power can be beamed in relays from other aerostats or ground stations. Free-flying aerodynamic High Altitude Long Endurance (HALE) vehicles offer faster response. Solar-powered Flying Leaf (FL) aerodynamic HALE platforms enable meteorology, remote sensing, and solar reflection planet-wide, with potentially unlimited endurance. This new capability complements tethered aerostats and self-propelled lighter-than-air platforms. FLs fly continuously between 20 km and 32 km altitudes, with imaging and broad area coverage, able to stay well above weather. Some sensors can see through clouds and rain. Autonomous and navigating using satellites, the FL system stays up 24-7 and serves as a network connectivity platform. It can see into deep valleys or to a 500 km horizon over oceans. Production launch and monitoring sites are spread worldwide, so they are readily available. Given the wide range of operations, international collaboration is integral to FL architecture, with ground observation and data channels pre-cleared. Essential points have been proven in simulation, ground and flight tests. This chapter

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explains the technology, explores sensor and communication payloads, and considers relevance to disaster cases. Both Aerostats and FLs also enable other vehicles to bring aid swiftly and accurately.

Keywords

Aerostat · HALE · LTA · Flying Leaf · Glitter Belt · Power Beaming · Tether Waveguide

Introduction

The January 15, 2022 explosion of Hunga Tonga volcano in the south Pacific Ocean poses a challenge test case to emergency response capabilities. The shock wave from the explosion reached Hunga Ha'apai island shortly after 5:19 PM through the ocean, probably killing most sea-life on the way. The shock in air reached a few seconds later, flattening many buildings, causing concussion and burst eardrums to many who were not injured by falling debris. The tsunami arrived at Tongatapu by 5:30 PM, the water level rising 2–3 m (Schäfer et al., 2022). Wave heights up to 17 m completely inundated some islands. Many buildings were destroyed. Numerous islanders, already stunned by the shock wave, were swept into the ocean beyond, while others were pulled back into the ocean by the backwash. One disabled islander, swept off the tree to which he had clung for safety, swam for 27 h and got back to land. Although the explosion was seen from Space and reported within minutes, triggering Tsunami warnings all over the Pacific Ocean, it was over 48 h before the first airplane arrived for initial damage assessment. Satellite imagery over islands as far as 100 km away, where towns were devastated, came 4 days after the event, with no other communications. Much later the airport runways were cleared, allowing cargo planes to bring help.

The Indian Ocean tsunami of December 2004 also caused similar devastation and swept many people out to sea. Some were able to survive. The Indian Navy responded very fast and saved many lives near mainland India and Sri Lanka; but such help was not possible in Car Nicobar island 1000 km away, and near the epicenter in Indonesia.

The two concepts explained in this chapter address our ability to bring useful help much faster in such disasters. The Powered Aerostat is a relatively old concept. The modern aerostat has enough propulsion to maintain station in moderate winds, and floats as high as 4000 m. Solar photovoltaic-powered High Altitude Long Endurance (HALE) aerodynamic platforms are able to fly free and stay aloft for long periods. A variation on HALE is the Flying Leaf vehicle architecture. They fly free between 30.5 km and 20 km above sea level, and can counter winds of up to 50 knots. While neither aerostats nor HALE vehicles can directly deliver rescue supplies, they can reach disaster areas within hours if not minutes, and stay on station, using high-resolution sensors and wideband communications to facilitate timely rescue. They can guide smaller UAVs swiftly and accurately to deliver rescue and aid. Operational

knowledge and regulations are already in place for aerostats, while HALE vehicles are now routine in military reconnaissance and law enforcement. The FL architecture is compatible with existing Air Traffic Control and Space Law, so that Disaster Response functions can be naturally integrated with its control infrastructure.

Aerostats

Aerostats are Lighter Than Air (LTA) vehicles that float in air due to buoyancy. The term merely means that lift is due to buoyancy as opposed to aerodynamics, not that it stays in one place. A subset is vehicles tethered to stay above one location. The term aerostat is now reserved for these, as opposed to airships that travel. Even tethered aerostats use some aerodynamic propulsion and lift generation to counter winds. Today's aerostats include balloons, but most are much larger than hot air balloons: they have semi-rigid structure and a shape that reduces drag and even generates lift in winds. Tethers, typically 3 to provide position stability, are Kevlar-covered flexible tubes that carry power and the gas used to fill the gas envelope. Since aerostats do not carry humans, hydrogen can be used rather than more expensive and heavier helium. Electric power operates propellers, enabling aerostats to counter winds without unduly stressing tethers. These propellers can also move an aerostat between locations. Figure 1 shows an aerostat moored at the ground.

Aerostats find use in warning about impending avalanches (Raina et al., 2009) and mudslides as well as continuously monitoring areas and low-altitude airspace (Sangole et al., 2006). They have been used in India as inexpensive, re-locatable wireless communications platforms (Gawale et al., 2008), with 7.5 km useful signal radius and half the cost of a communication system based on towers. Aerostats have also been used for aerial imaging (Kanoria, 2010), remote sensing (Vierling et al., 2006), radar (Chang-sheng & Pan-feng, 2007), visual and infrared monitoring



Fig. 1 Tethered Aerostat Radar System. TARS. Courtesy US Government, Customs and Border Patrol

(Ram & Pant, 2010), traffic monitoring and control (Peterson, 2005), relaying electromagnetic signals (Relekar & Pant, 2002), generating wind power (Lansdorp & Williams, 2006), and collecting solar power from above the cloud layer. Solar power generation above the cloud layer using aerodynamic kites (Williams et al., 2008) may also be used with aerostats at larger scale regardless of winds.

Large aerostats are used in the United States Tethered Aerostat Radar System since 1980, by the US Customs and Border Protection force, Air Force and Coast Guard. These include aerostats tethered as high as 4600 m with a single tether, and those that can carry 1000 kg payload. An upper chamber carries helium and a lower chamber is pressurized with air. The hull is made of polyurethane coated Tedlar fabric. A diesel electric generator with a 100-gallon fuel tank powers a propeller. Volume is as large as $12,000 \text{ m}^3$, tether 7600 m long, payload 1000 kg and look-down radar has a maximum detection range of 400 km. At present, aerostat usage in the USA is coordinated with detailed operational information (Security, 2013) by the Department of Homeland Security.

An important variation of aerostats is the emerging cargo transport system using airships. Such vehicles enable delivery of rescue and relief supplies and equipment to areas where aircraft runways, road and rail service are unavailable. A vehicle developed circa 2000 called Cargo Lifter CL160, was 260 m long, 65 m in diameter, 82 m high and cruised at 90 kmph, carrying 160MT of cargo. It was intended to carry items that were too large and heavy items too unwieldy for highway transport, upto 10,000 km. One anticipated use was to carry enough food for 25,750 people for 14 days. It used 8 turboshaft engines each driving a 6 m propeller; 4 for cruise and the rest for maneuvering. Other designs are being developed by the US Armed Forces (Manikandan & Pant, 2021) and for humanitarian relief (Dorn et al., 2018).

Beamed Power Application

A proposed variation is to use the gas envelopes of aerostats to house receiver and transmitter antennae. Electric power converted to high-frequency microwave (or millimeter wave) beams is sent up to an antenna through waveguides to an altitude of roughly 4000 m, transmitted across to other antennae in aerostats, and sent down to the ground via their tethers. Such an architecture has been proposed in (Komerath et al., 2012) for emergency response. The converter equipment and other emergency tools would be carried as a slung load as the aerostat travels to the disaster area, at speeds of up to 100 kmph. Once over the site, the payload is winched down along with tethers. Once moored, beamed power is received through the antenna and conveyed through the waveguide in the tether. Alternatively, conversion equipment could be installed inside the aerostat, and a small amount of power transferred at line frequency through wires. Beamed transfer at above 4000 m altitude incurs little loss in the 145GHz and 200–220 GHz bands. The US Air Force has adopted such a concept to supply power to forward bases, avoiding ground transit of diesel generator fuel over hostile terrain.

Power beaming is still its infancy. Experiments in the 1980s demonstrated powering toy helicopters using beamed power, but scaling up faces 3 hurdles. Firstly, the diffraction-limited product of diameters of the transmitting and receiving antenna is proportional to the square of the distance between them, and to the wavelength of the beamed radiation (or inversely proportional to frequency). A small transmitter requires a large receiver and *vice versa*. The diameter of an antenna that can capture up to 94% of the incoming beam is given by the Frees equation:

$$D = \left(10.4 \frac{Rc}{f} \right)^{\frac{1}{2}} \quad (1)$$

A second problem is that vibrational transitions of water vapor molecules absorb microwaves at 10.3 GHz and its harmonics. This forces choice of beaming frequency to be well below 10 GHz, while avoiding frequencies reserved for Mobile Phone communications. The antenna size becomes too large in this range for any significant beaming distance. At frequencies above 10GHz, scattering and absorption by Oxygen and Nitrogen becomes large, but there are a few windows of high transmissivity (Liebe & Hufford, 1989). The window between 200 and 220 GHz is an ideal one. Astronomical observatories located at altitudes of 3000 meters and higher, have shown transmission through dry air of over 90% of that in Space. Line-of-sight horizontal transmission at 4000 m is therefore quite efficient, over dozens of kilometers. Aerostat-based power reception on a large scale will become attractive when Space Based Solar Power systems are brought on line.

A third problem is the inefficiency of conversion by present technology, to and from millimeter wave frequencies such as 30–300 GHz. The above discussion of beam size might suggest going to optical frequencies offered by lasers. Conversion to infrared laser beams can be as efficient as 39% from direct sunlight or from wall plug power, but conversion back to line frequency or DC awaits research breakthroughs. Present international laws restrict the use of high-powered lasers in Space.

Aerostat design is driven by tether mass and weight of the propulsion system needed to counter drag on ethers and aerostat at design wind speed. Aerostat drag coefficient C_D based on maximum frontal area is estimated using empirical expressions given by Konstantinov (2003), validated against a wide historical variety of LTA craft. In Eq. 2, L is aerostat length, A is slenderness ratio and U_∞ is wind speed relative to the aerostat:

$$C_D = \left(0.5354 + 0.0305(A - 5.55)^2 \right) (U_\infty L)^{-0.21} \quad (2)$$

High Altitude Long Endurance (HALE) Vehicles

A new class of vehicles has been enabled by the advancement of solar photovoltaic (PV) power generation technology. HALE vehicles are generally heavier than air and supported by aerodynamic lift. Nearly all successful designs so far are fixed-wing

monoplanes, with PV cells covering much of the wing upper surface. The requirement of long endurance dictates the use of high Aspect Ratio. If the wing span (distance between wing tips) is b and the planform area of the wing is S , the Aspect Ratio AR is defined as

$$AR = \frac{b^2}{S} \quad (3)$$

Where the wing is rectangular, AR is simply the ratio of the wing span to the wing chord. High AR means long span and small chord, which makes such vehicles susceptible to bending and twisting oscillations. The requirement to fly at high altitudes at fairly low speeds forces these vehicles to be built with extremely low-weight materials. During the daytime, solar power is adequate to keep the vehicle aloft. Night-time flight uses some form of power storage, which may use hydrogen fuel cells. While HALE vehicles have demonstrated continuous flight for up to 3 months, they cannot claim indefinite endurance because of the use of some form of expendable substance such as hydrogen.

HALE vehicles enable quick response in emergencies if they are located in proximity. They can carry optical and other sensors and serve as communication platforms. Staying at high altitude, they do not interfere with other air traffic. Griffin (2000) studied application of HALE vehicles to emergency response in the context of Canada. They found applications in several aspects: “As remote sensing or surveillance platforms that can stay in a local region for a long time, (aerodynamic HALE vehicles) can perform high-resolution, high-continuity observation and surveillance of emergency situations.” HALE vehicles carrying search and rescue transponders can also coordinate search and rescue. They can also serve as navigation/ radio location platforms.

The Flying Leaf Architecture

Earth’s atmosphere is retaining heat at approximately 2.92 Watts per square meter of surface area. Concern about this warming trend drives the urgency of collecting data over the entire planet. The Flying Leaf (FL) architecture summarized here is a growing approach to satisfy the need for such data. It consists of solar photovoltaic-powered, ultralight, aerodynamic lifting surfaces that float at low speeds between 20 and 30.5 kilometers MSL, able to stay up indefinitely. The same vehicles will also provide a rapid scale-up option when approved, to directly reduce solar heat input to the atmosphere in a controlled, reversible manner. This satisfies all concerns expressed by the US National Academy of Sciences (NAP, 2021) about projects that reflect sunlight. FLs provide a capability to respond quickly to disasters over parts of our planet that are far from industrial centers. It is part of the Glitter Belt architecture proposed to respond to Climate Change and sea level rise (Komerath et al., 2021).

A Flying Leaf (FL) is a solar photovoltaic (PV) propeller-driven flying wing (HALE) aircraft, with a large ultralight reflector sheet that is stretched and supported by its own aerodynamic lift. A crucial feature is the ability to stay above controlled Class E airspace (18,288 m or 60,000 ft. above MSL) through a night of at least 12 h duration without storing power for propulsion. This is possible when the Wing Loading, defined as the ratio of vehicle weight to its lifting planform area, is not greater than $1.25N/m^2$ nor the zero-lift drag coefficient above 0.02. The former is achieved by ensuring that the majority of the lifting surface is comprised of ultra-thin sheets, nominally of 25-micron thick Aluminized Mylar. To avoid reflecting nighttime radiation downwards, the bottom surface is black. The frame that holds the sheets is made of carbon fiber composites. Present designs (Komerath et al., 2021) show Flying Leaf vehicles with 752 m span and 32 m chord, supported by 3 solar-PV powered Flying Leaflet biplanes, each of 32 m span.

With such dimensions the FL cannot be launched or retrieved in assembled form. The deployment cycle shown in Fig. 2 is as follows: Flying Leaflets (FLTs) take off from small clearings at speeds on the order of 5 m/s on calm summer mornings. They climb to 30.5 k (100,000 feet) MSL within 8 h. As an FLT rises above the weather, it partially extends the rolled-up Mylar sheet carried as the upper wing of the biplane, along a 32 m x 32 m frame. Along the way to 30.5 km, each FLT carries out rendezvous with 10 others, forming an FL. The 11 sheets are fully extended to 32 m. Eight of the 11 FLTs then detach, leaving the upper frame supporting the FL sheet, and return in a swift dive to landing before dark.

The requirement to stay up without power through a 12-h night, comes from the anticipated Summer Follower missions. FLs are anticipated to operate in swarms, maintaining position and communication with each other, with spacecraft, and with ground stations where possible. Each one carries up to 3 instrumentation payloads,

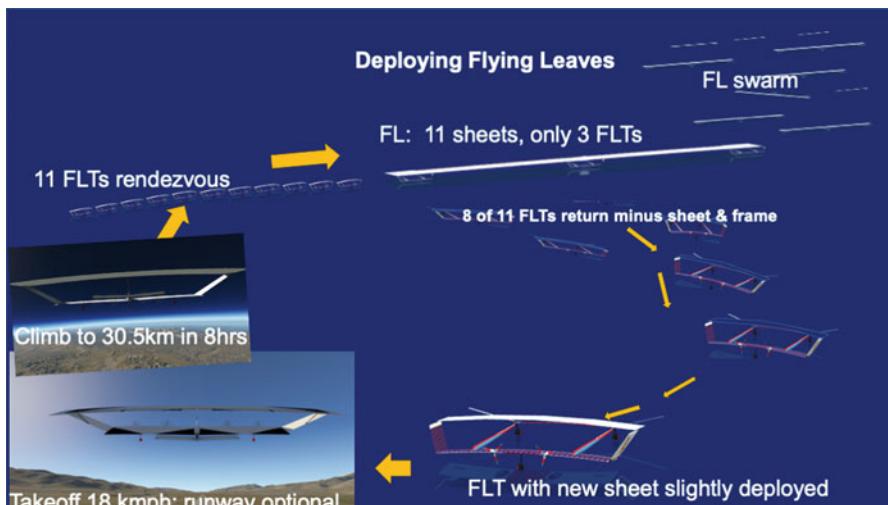


Fig. 2 Deployment of a Flying Leaf swarm. By permission of authors

slung by tethers and/or carried above a supporting FLT. In addition, antenna structures are woven into the sheets, to acquire data from above and below. From 30.5 km, the horizon is over 500 km away; however data may be relayed between FLs or between FL swarms with much higher bandwidth through the thin upper atmosphere, before being transmitted to ground stations.

Regulations and Support for Emergency Systems

Aerostats are included in the list of authorized equipment (FEMA, 2022) of the US Federal Emergency Management Agency under “03OE-07-STAT - Aerostat, Tethered (Balloon).” Key components are “a balloon, semi-rigid or rigid structure filled with lighter-than-air gas, a means for transporting the system, such as a truck and/or trailer; a mooring station for controlling the inflated aerostat envelope prior to launch; a launching/ mooring platform; tethers for mooring the aerostat envelope to ground equipment and transmitting power and data; winches for letting out, pulling in, and adjusting tether tension; and automatic or manual deflation devices. A variety of mission-oriented and tactical equipment include: high-resolution video cameras, electro-optical/infrared (EO/IR) sensors, communication/network repeaters, acoustic detectors, and radar. Tethered aerostat products may also include a ground control station for media storage, data transmission, and system management functions.”

In 2020, the Wabash Heartland Innovation Network (WHIN) announced a rural broadband communications network using aerostats at 1500–2000 feet (500–670 m) above ground level. In 2019 AT&T Inc. announced FirstNet, an emergency communication system would add 55-foot aerostats flying at 1000 feet (330 m) in winds up to 50mph (80 kmph) for up to 2 weeks.

Aerostat tethers pose a hazard to other craft, requiring a 2–3 nautical mile (3.65–5.47 km) flight restriction around a moored aerostat, from the ground to 4600 m above mean sea level (MSL). Small UAV rescue operations within this region may be permissible under special circumstances.

Flying Leaf vehicles are expected to be subject to the same regulations as other ultralight craft and High Altitude Long Endurance (HALE) aircraft. They do not nominally require Air Traffic Control permission once over Flight Level 600, which is 18.8 km (60,000 feet) above Mean Sea Level. However a new set of regulations is expected to be formulated by the United Nations to enable operation above the terrain of different nations, modeled similarly to Space Law. Regulation is expected through the International Civil Aviation Organisation.

ICAO’s Upper Airspace Working Group (UAWG) is an industry organization within the Aerospace Industries Association (AIA). They recommend (Hansell, 2019) the following key principles to develop risk- and performance-based regulatory initiatives:

1. Uniform airspace organization and management principles everywhere and at all levels of density, with consideration of traffic;

Table 1 Comparison of aerostats, lighter-than-air cargo transports, HALE craft with expendables, and Flying Leaf vehicles

Technology	Aerostat	LTA Cargo	HALE with expendables	FL
Altitude, km	4000 m	2-Jan	20–25	20–31
Speed	0–30 m/s	0–30	0–30	0–30
Operation Range, km	200	10,000	200	Indefinite
Endurance, hrs	Days	Hours	Months	Indefinite
Optical Horizon, km	400	200	400	500
Communications	Antenna inside	GPS, aircraft	Antenna	Antenna array
Payload Delivery	Initial package	Large	0	0
Deployment Difficulty	Low	Moderate	Runway; cal sunny	Field; calm sunny morning
Regulatory Agencies	Tether hazard		ICAO Above 60 K feet	ICAO Above 60 K feet
Comments/Future	Beamed Power Relay	Military Logistics lead		Meteorology; remote sensing; Solar heat Reflection

2. Airspace management to accommodate and optimize diverse and dynamic flight trajectories;
3. Complexity of operations may pose limit flexibility; equitably minimize impact of segregation of vehicle types by airspace organization;
4. Monitor airspace use to accommodate varying requirements;
5. For operations over 24 h, airspace reservations planned, with changes made dynamically. Like today, accommodate unplanned requirements;
6. Structured route systems only where required to enhance capacity or avoid limited-access and hazardous areas. Flexible as practical (Table 1).

Conclusions

Aerostats are established and growing in capabilities. They have the important advantage of being able to deliver aid to the ground while staying aloft for rescue imaging. In some cases it may even be possible to lower lifelines to people to keep them afloat until other help arrives. Even as they arrive, aerostats can be looking ahead for survivors, reporting damage and coordinating assistance. However, they are very susceptible to weather. In the Tonga volcanic eruption case, ash fall would have rapidly degraded and perhaps downed aerostats. In addition, their range of operation is limited, and it is unlikely that aerostats will be up and ready to approach a disaster area within a few hours.

The value of aerodynamic HALE vehicles in emergency response is already recognized. However, most HALE craft are limited to a few weeks of endurance at best. Thus, it is hard to imagine that sufficient numbers of HALE aircraft can be fielded all over the planet, to provide swift assistance in any area.

FLs are a new capability under development, with expected potential in disaster avoidance and response. They are uniquely able to loiter and travel over remote ocean areas that are inaccessible to meteorological airplanes, while traveling much slower, and much closer to the ground, than spacecraft. In the two case studies mentioned at the top of this chapter, availability of FLs would have made a big difference in saving lives and accurately directing delivery of aid. Such disasters may be expected to occur in future. As sea level rises, island communities are increasingly at risk even from major weather events, not just seismic events. The ability to suspend sensors from FLs while staying above weather and ash clouds puts even more important life-saving tools in the hands of rescuers. In clear weather and with air traffic control clearance, FLs can come down much below 18 km altitude temporarily.

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Role of Social Media Imagery in Disaster Informatics

38

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Contents

Introduction	532
Related Work	534
Resources, Models, and Systems	535
Datasets	535
Models and Systems	539
Applications	540
Shared Tasks	544
Challenges and Open Research Issues	547
Conclusions	547
References	548

Abstract

The recent literature reports several practical and important use cases of social media informatics where artificial intelligence (AI), machine learning (ML), and other relevant technologies are employed to analyze human sufferings and infrastructure damage in natural disasters. While the textual content of social media platforms conveys relevant and useful information during a disaster, social media imagery content has also been proven very effective in analyzing the scale of damage to infrastructures such as roads, bridges, and buildings. Moreover, disaster-related visual content could also be analyzed to extract people's

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perceptions, emotions, sentiments, and responses to disasters, which can help different stakeholders, such as humanitarian organizations and policy-makers. Assessing such aspects of disaster events requires effective and efficient image processing methods to process a large amount social media content. This chapter reviews state-of-the-art techniques and shows their utility in processing social media image streams during disaster response for a diversified set of applications. It also highlights the key applications, challenges, available shared resources (datasets and models), tasks, and future research directions. This chapter will provide a ground for future research and a good starting point for the researchers in the domain.

Keywords

Natural disasters · Social media · Disaster management · Image retrieval · Floods · Earthquakes · Deep learning applications · CNNs

Introduction

During emergencies, social media platforms have been widely used for information dissemination, damage assessment, and monitoring rescue operations. These platforms provide instant feedback to different stakeholders, such as public authorities, news agencies, volunteering/humanitarian organizations, the general public, and policy-makers on the scope of the damage. On one side, their ability to have access to a wide range of audiences worldwide makes these social media platforms a better choice for information dissemination more quickly to a larger population. On the other side, they allow citizens to post and share updated reports in the form of multimedia content from the ground. This concept of crowdsourcing and public journalism has been widely explored in emergency situations where news agencies and public authorities are unable to collect and report information (Said et al., 2019). The information from citizens is extremely beneficial to first responders, decision-makers, and practitioners who could exploit this exhaustive and widespread data to better assess the situation and guide the decision-making process (Alam et al., 2018a). As social media content has proven to be effective in facilitating diverse stakeholders, there has been growing research interest in developing computational methods and systems to better analyze and extract actionable information from social media content (Alam et al., 2019). The literature already reports several such systems deployed during disaster events (Imran et al., 2014). For example, AIDR (Imran et al., 2014) (<http://aidr.qcri.org/>) system has been used during major disaster events to collect tweets, classify them, and provide a visual summary.

Among different social media platforms, Twitter has been widely used due to instant access to timely multimodal information (i.e., textual and visual), which is crucial for different stakeholders especially government and nongovernment humanitarian organizations (Said et al., 2019). The earlier research efforts in crisis informatics are mainly focused on textual content analysis, which includes classification

of tweets, clustering them to group similar tweets, visualizing into timelines to show trends, geotagging them onto maps to look at the impacts, and visualizing topics, sentiments, and other aspects over time (Said et al., 2019). Lately, there has been a growing interest on the imagery content analysis (Alam et al., 2020; Nguyen et al., 2017b; Weber et al., 2020). The key applications for disaster-related social media imagery include severity assessment and identification of damage (Nguyen et al., 2017b), filtering humanitarian information (Alam et al., 2018a), crisis incident detection (Weber et al., 2020), and detecting disaster events (Alam et al., 2020). However, the amount of resources is limited compared to the NLP resources that can help to develop powerful image-based predictive models (Imran et al., 2020). One of the main reasons of less progress in image-based solutions for disaster analysis is the lack of annotated benchmark datasets. To overcome this limitation, several interesting image datasets have been collected for different applications. Some prominent datasets for disaster imagery content analysis include damage assessment dataset (Nguyen et al., 2017b), crisis multimodal dataset (CrisisMMD) (Alam et al., 2018a), crisis incident dataset (Weber et al., 2020), crisis image benchmark dataset (Alam et al., 2020), and MEDIC (Alam et al., 2022). Moreover, to promote the research in the domain, several shared tasks have also been organized in the past years as detailed in section “[Shared Tasks](#).”

Despite being less explored, compared to textual information, social media imagery has been used for several critical applications to respond to disasters by developing information/task-specific classification models. These include several classification tasks such as (i) disaster types, (ii) informativeness, (iii) humanitarian, and (iv) damage severity assessment (Alam et al., 2021). Other important and relevant classification tasks include sentiment analysis from disaster-specific social media images (Hassan et al., 2019), road passability (Bischke et al., 2017b), and identification of flooded regions (Bischke et al., 2017a). The literature reports that to monitor real-time disaster events and extract information that are related to humanitarian responses, such types of classification models are needed (Alam et al., 2017, 2018b).

Even though studies suggest that the information posted on social media can help increase situational awareness, inform rescue operations, and save lives (Enenkel et al., 2018), the utility of such information has not been widely used. For example, Villegas et al. (2018) reported that during Hurricane Harvey, the FEMA (<https://www.fema.gov/>) missed 46% of the critical information posted by affected people on Twitter and CrowdSource Rescue (<https://crowdsourcerescue.com/>) volunteers, and thus, many areas heavily impacted by the hurricane were missed from the original damage estimates provided by FEMA. Authors highlighted that Twitter and crowdsourced sites can be used to make response and recovery more robust during disasters, which FEMA has missed.

To facilitate such stakeholders during disaster response, there have been efforts to develop real-time systems to crawl, index, and categorize social media content in real time (Alam et al., 2018b). However, such efforts are still limited and require more attention to deal with large-scale social media data that can benefit the first responders in their operational decision-making process. This book chapter

discusses the applications, challenges, and potential of social media imagery in disaster informatics. In detail, it provides an overview of the research effort for social media imagery content analysis. Specifically, a detailed report of the publicly available datasets, methodologies proposed in different studies, and systems built to facilitate first responders is provided. The chapter also highlights possible use cases (i.e., applications), shared tasks that create a scientific community and advance the field. Finally, an overview of current challenges and future research opportunities is provided.

Related Work

Over the last decade, social media emerged as an instant source of communication and information and a widely accessible forum for discussion on societal and environmental challenges (Said et al., 2019). The literature already reports several interesting applications of information shared in social media platforms in coping with societal and environmental challenges, such as water and air quality analysis (Ahmad et al., 2022; Zheng et al., 2019). Social media platforms are also widely explored for natural disaster detection, aftermath analysis, and its impact on the environment and infrastructure (Said et al., 2019). Its ability to engage a large volume of the audience makes social media a preferred choice for communication, information dissemination, and several other interesting and critical tasks in disasters and emergency situations. Depending on the nature of social media platforms, useful information is generally available in different forms including textual, visual, and geo-location information. The geo-location information helps in obtaining localized and relevant textual and visual information for different applications of disaster informatics. The literature already indicates the potential of both textual and visual information in different applications of natural disaster-related social media content. However, the scope of the chapter is limited to visual content only, and it covers the literature based on the utility of social media imagery in natural disasters only.

Thanks to the recent development in artificial intelligence (AI)-based systems and computational technologies, useful insights and actionable information can be extracted from disaster-related social media imagery (Nguyen et al., 2017b). For instance, several efforts have been made to automatically analyze flood-related social media imagery for the identification of passable routes in a flooded region (Bischke et al., 2019). Other relevant studies include monitoring the rehabilitation activities after natural disasters and estimating flood level in social media imagery (Chaudhary et al., 2019). More recently, disaster-related social media imagery is analyzed to extract and perceive observer's (i.e., social media users) sentiments and emotions for different stakeholders, such as news agencies and humanitarian organizations (Hassan et al., 2020). Some other key applications of disaster-related social media imagery include news disambiguation, quantification of a disaster event, and information gathering and dissemination.

A vast majority of the literature focus on flood events, in which flood-related imagery is analyzed for a diversified set of applications. The tendency toward floods

is mainly due to their higher occurring frequency compared to other types of disasters, such as wildfires, earthquakes, landslides, and floods. Moreover, data on flood events is easily available compared to some rare events, such as landslides. Flood event detection and analysis in social media imagery have also been part of several benchmark competitions as detailed in section “[Challenges and Open Research Issues](#).” The literature also reports some interesting works on other types of natural disasters. For instance, Ahmad et al. (2018) collected and analyzed social media imagery related to seven different types of natural disasters including floods, earthquakes, landslides, wildfires, cyclones, thunderstorms, and snowstorms. However, very few attempts have been made for analyzing social media imagery for these types of natural disaster events. The literature still lacks a large-scale dataset covering social media imagery from several types of natural disasters that could be used for training and evaluation of AI-based systems for different relevant tasks. This chapter discusses such challenges to research community in exploring the full potential of social media imagery in disaster analysis.

Resources, Models, and Systems

Datasets

This section provides an overview of some of the publicly available social media imagery datasets reported in the current state of the art (Table 1).

MediaEval 2017 dataset (Bischke et al., 2017b). The MediaEval 2017 shared task introduced two datasets to address two different tasks namely (i) disaster image retrieval from social media and (ii) floods detection in satellite imagery. The images for the first subtask are collected from the YFCC100M dataset using the keywords including *flooding*, *flood*, and *floods*. The curated dataset consists of 6,600 images. The label (*yes* vs. *no*) for each image is defined based on the evidence of a flooding event. The dataset is released in two different sets: (i) development set and (ii) test set. The development set contains 5,280 images, and the test set contains 1,320 images. The dataset for the second subtask consists of satellite image patches derived from Planet’s 4-band satellites.

Damage assessment dataset (DAD) (Nguyen et al., 2017b). This dataset consists of ~25 K images labeled with damage severity levels, which include *severe*, *mild*, and *little to no damage*. The images have been collected from two different sources: (i) Twitter (Tweets are collected during four natural disasters using AIDR tool (Imran et al., 2014). The disaster events include Typhoon Ruby in 2014, Nepal Earthquake in 2015, Ecuador Earthquake in 2016, and Hurricane Matthew in 2016.) and (ii) Google. The data collection process required to crawl data from Google. In order to do so, authors used the following keywords: *damage building*, *damage bridge*, and *damage road*. The collected images have been manually annotated using Figure Eight crowdsourcing platform (<https://appen.com/figure-eight-is-now-appen/>).

Table 1 summarizes key features of the datasets

References	Dataset	Modality	Data source	Dataset size	# of T	Tasks name	# classes	Domain	Year	License
Weber et al., 2022	Incidents	Image	Web, SM	1 M	1	Incident	43	Incidents	2022	MIT
Alam et al., 2022	MEDIC	Image	Web, SM	71,198	4	DT, Info, Hum, DS	DT, 7; Info, 2; Hum, 4; DS, 3	Disaster	2021	CC-NC
Weber et al., 2020	Incidents	Image	Web, SM	446,684	1	Incident	43	Incidents	2020	MIT
Alam et al., 2020	CrisisBench	Image	Web, SM	DT: 17,511 Info: 59,717 Hum: 16,769 DS: 34,896	4	DT, Info, Hum, DS	DT, 7; Info, 2; Hum, 4; DS, 3	Disaster	2020	TOU (https://crisisnlp.qcri.org/terms-of-use.html)
Hassan et al., 2020	VisSenti	Image	Twitter, Flickr, and Google	Sentiment: 3,697 Emotion 1: 14,312 Emotion 2: 21,125	3	Sentiment, emotion 1, emotion 2	Sentiment, 3; emotion 1, 7; emotion 2, 10	Disaster	2020	CC
Alam et al., 2018a	CrisisMMD	Image, text	SM	18,082	3	Info, Hum, DS	Info, 2; Hum, 8; DS, 3	Disaster	2018	TOU (https://crisisnlp.qcri.org/terms-of-use.html)

Mouzannar et al., 2018	DMD	Image, text	Web	5,878	1	Damage	6	Disaster	2018	Academic research
Benjamin et al., 2018	MediaEval	Image	SM	1,654 patches	1	Image retrieval, segmentation	Ranking, classification: 2		2018	NA
Nguyen et al., 2017a	DAD	Image	SM	25,000	1	DS	3	Disaster	2017	TOU (https://crisisip.qcri.org/terms-of-use.html)
Bischke et al., 2017b	DIRSM	Image	SM	T1: 6,600 images; T2: 462 patches	1	Image retrieval, segmentation	Ranking, classification: 2	Disaster	2017	CC
Hassan et al., 2020	VisSenti	Image	Web, SM	4,000 images	3	Classification	Binary classification: 2; multi-classification, 7 and 10	Disaster	2020	CC

A summary of disaster-related image datasets. SM, social media; DT, disaster types; Info, informativeness; Hum, humanitarian; DS, damage severity; VisSenti, visual sentiment dataset; # of T, number of classification tasks

MediaEval 2018 dataset (Benjamin et al., 2018). The MediaEval 2018 shared task released two datasets for two different subtasks, namely, (i) flood classification from social multimedia and (ii) flood detection from satellite imagery. The dataset for the first task is composed of more than 10,000 tweets with associated images. The dataset is provided in two different sets. The development set consists of 7,387 tweets with accompanying images, while the test set is composed of 3,683 tweets and images. The tweets have been collected using the keywords *flooding*, *flood*, and *floods* during the three major hurricane events (i.e., Harvey, Irma, and Maria) back in 2017. The annotation consists of two hierarchical labels: (i) evidence of road passability based on the image of the tweet (0 = no evidence vs. 1 = evidence) and (ii) based on the decision (i.e., showing evidence of passability) of the first label; another label is introduced for actual road passability (0 = not passable vs. 1 = passable).

The dataset for the second subtask consists of 1,664 satellite image patches (with a spatial resolution of 512 x 512 pixels). The image patches were extracted from DigitalGlobe’s WorldView satellite (<http://worldview3.digitalglobe.com/>). The image patches have a ground-sample distance of about 0.5 m and were collected during Hurricane Harvey in 2017 from the Houston area. The label for the image patches is *flooded* vs. *unflooded*. Image patches also have two additional binary labels: *yes* and *no* for the road passability between the two given points/locations. It consists of 1,438 and 226 image patches for the development and test sets, respectively.

CrisisMMD (Alam et al., 2018a). It is a multimodal (i.e., containing tweet’s text and image) dataset, which consists of 18,082 images collected from Twitter during 7 different natural disaster events, using the AIDR system. The annotation targeted multiple tasks including (i) informativeness with binary labels, *informative* and *not informative*, (ii) humanitarian categories with seven class labels, and (iii) damage severity with three labels.

Damage multimodal dataset (DMD) (Mouzannar et al., 2018). This is another multimodal dataset, in which images are collected from Instagram and Google. The authors crawled the images using more than 100 hashtags, which are based in the crisis lexicon (Olteanu et al., 2014). The manually annotated dataset consists of 5,878 images with 60 class labels. The *non-damage* images include irrelevant information, such as cartoons, advertisements, and information that is not relevant or useful for humanitarian tasks.

VisSenti (Hassan et al., 2020). This dataset consists of 4,003 disaster-related images labeled with 4 different sets of labels. The first set of labels consists of three sentiment polarity labels such as *positive*, *negative*, and *neutral*. The second set of labels consists of *relax/calm*, *normal*, and *stimulated/excited*. The third set, which aims at multiclass multi-label image classification, of labels consists of seven emotion categories including *joy*, *sadness*, *fear*, *disgust*, *anger*, *surprise*, and *neutral*. The final set consists of more fine-grained emotional episodes, such as *anger*, *anxiety*, *craving*, *empathetic pain*, *fear*, *horror*, *joy*, *relief*, *sadness*, and *surprise*. The images are crawled from Twitter, Flickr, and Google using relevant keywords, such as *floods*, *hurricanes*, *wildfires*, *droughts*, *landslides*, and *earthquakes*.

Crisis image benchmark dataset (Alam et al., 2020). The images in this dataset are collected from Twitter, Google, Bing, Flickr, and Instagram. A large portion of the images have been collected from Twitter, which were mainly collected during major natural disaster events. Similarly, relevant keywords are used to collect images from Google, Bing, Flickr, and Instagram. The dataset has diverse characteristics in terms of (i) number of events (more than 15 events), (ii) different time frames covering 4 years, (iii) natural vs. man-made disasters, and (iv) events that occurred in different parts of the world.

Incident dataset (Weber et al., 2022). The incident image dataset consists of manually annotated images with 43 different incidents across a variety of scenes. The annotation has been done in a multi-label setting. The dataset has been released in two phases and the last release consists of 1 M images.

MEDIC (Alam et al., 2022). The MEDIC dataset is the largest social media image dataset for humanitarian response task. It consists of 71,198 images that are associated with 4 different tasks annotated and designed for multitask learning. These tasks include (i) disaster type (seven labels), (ii) informativeness (binary labels), (iii) humanitarian (four labels), and (iv) damage severity (three labels).

Models and Systems

This section provides a brief overview of publicly available tools, systems, and methods that have been proposed in the current literature.

Models

Most of the early efforts in the domain aim at classical approaches. In these methods, generally, handcrafted features, such as SIFT, SURF, ColorSURF, ColorSIFT, and Bag of Words (BoW), are used for image representation. Then, classical algorithms, such as support vector machine (SVM), are used for classification purposes. However, the later approaches mostly rely on deep learning (DL) models. The DL models are used in different ways including transfer learning (i.e., fine-tuning the pretrained CNN models for domain-specific tasks), retraining, and using the models as feature extractors (Ahmad & Conci, 2019).

The literature reports better performances for the DL-based solutions compared to the classical approaches. For instance, Nguyen et al. (2017b) compared BoW (i.e., classical approach) and transfer learning approaches (i.e., DL-based solution) and demonstrated that the domain-specific fine-tuning outperforms BoW-based techniques. Given that DL solutions in general and transfer learning, in particular, have shown promising results for various image classification tasks, currently, it has been widely used in the literature (Said et al., 2019). In disaster informatics, two different types of pretrained models are mostly exploited: (i) pretrained on the ImageNet dataset (Deng et al., 2009) and (ii) pretrained on the Places dataset (Zhou et al., 2017). The models pretrained on ImageNet extract object-level information, while the models pretrained on the Places dataset extract scene-level features. A diverse set of CNN architectures pretrained on these datasets have been used

in the domain. Most notable ones include VGG16 (Simonyan & Zisserman, 2014), ResNet18, ResNet50, and ResNet101 (He et al., 2016). Moreover, the object detection-based approach has also been used in several studies. For example, Asif et al. (2021) used YOLO to analyze disaster-related images and detect disaster types. Despite being very effective in different tasks, several limitations of CNNs have been in the literature. For instance, the max-pooling operation results in the loss of critical information about the location and frequency of relevant features. To address such limitations, a capsule network-based approach has been proposed in the literature (Sabour et al., 2017). There are also several works relying on the fusion of multiple DL models, such as the solutions presented in (Ahmad et al., 2017c).

Table 2 reports the most recent studies – presenting dataset, task addressed, models used, and their performances. Overall, across the tasks, the models' performances are above 60% with a maximum of 99%. The performances of the solutions depend on the complexity of the applications and the nature of the problem (i.e., binary vs. multiclass classification settings).

Systems

Some of the research efforts in the domain also resulted in the development of systems/tools that are deployed in real-world applications. For instance, recently Alam et al. (2018b) developed a crisis-related social media image processing system/tool. The tool provides a complete pipeline including all the essential components ranging from image collection, removing duplicates and irrelevant images, and finally classifying them on the basis of damage severity. The system has been deployed in many real-world disaster events. A recent example is the deployment of the system during Hurricane Dorian as reported in (Imran et al., 2022). The system has deployed for 13 days, and it collected ~280 K images. The crawled images are then classified using the models proposed in (Ofli et al., 2020). The classified images are then used by a volunteer response organization (MCCERT:<https://montgomerycert.org/>). Another system is proposed for the detection of disaster-related damage in the cultural heritage sites (Kumar et al., 2020). Very recently, a similar system has been proposed for landslide image detection, which monitors social media platforms and detects landslide images (Ofli et al., 2021). Ahmad et al. (2017b) developed a system, namely, JORD for the detection of natural disasters in social media and satellite imagery. The system is able to automatically retrieve a list of the recent disaster from the EMD dataset and starts collecting relevant imagery from several social media outlets and satellites (Google Earth).

Applications

This section provides an overview of some of the already explored key applications of natural disaster-related social media imagery. These applications include the following:

Table 2 A summary of the state-of-the-art models for disaster analysis in social media contents

References	Dataset	# of I/T	CL	C/T	Task	Proposed models	Data split	Acc	P	R	F1
Offi et al., 2020	CrisisMMD	11,400/ 12,708	2	B/U	Info	VGG16	Train/dev/ test	83.3	83.1	83.3	83.2
Offi et al., 2020	CrisisMMD	11,400/ 12,708	2	B/M	Info	VGG16	Train/dev/ test	84.4	84.1	84.0	84.2
Offi et al., 2020	CrisisMMD	7,216/ 8,079	5	M/U	Hum	VGG16	Train/dev/ test	76.8	76.4	76.8	76.3
Offi et al., 2020	CrisisMMD	7,216/ 8,079	5	M/M	Hum	VGG16	Train/dev/ test	78.4	78.5	78.0	78.3
Mouzannar et al., 2018	DMD	5879	6	M/U	Event	InceptionNet	4 folds CV	83.98±1.72	—	—	—
Mouzannar et al., 2018	DMD	5879	6	M/M	Event	InceptionNet	4 folds CV	92.62±0.89	—	—	—
Agarwal et al., 2020	CrisisMMD	18,126	2	B/U	Info	InceptionNet (V3)	5 folds CV	—	82.0	82.0	82.0
Agarwal et al., 2020	CrisisMMD	18,126	2	B/M	Info	InceptionNet (V3)	5 folds CV	—	99.0	99.0	99.0
Agarwal et al., 2020	CrisisMMD	18,126	2	B/U	I/De	InceptionNet (V3)	5 folds CV	—	92.0	92.0	92.0
Agarwal et al., 2020	CrisisMMD	18,126	2	B/M	I/De	InceptionNet (V3)	5 folds CV	—	99.0	99.0	99.0
Agarwal et al., 2020	CrisisMMD	18,126	3	B/U	DS	InceptionNet (V3)	5 folds CV	—	95.0	94.0	94.0
Agarwal et al., 2020	CrisisMMD	18,126	3	B/M	DS	Attention fusion	5 folds CV	—	96.0	96.0	97.0
Abavisan et al., 2020	CrisisMMD	11,250	2	B/U	Info	DenseNet	Train/dev/ test	81.6	—	—	81.2

(continued)

Table 2 (continued)

References	Dataset	# of I/T	# CL	C/T	Task	Proposed models	Data split	Acc	P	R	F1
Abavisan et al., 2020	CrisisMMD	11,250	2	B/M	Info	SSE-BERT-DenseNet	Train/dev/test	89.3	—	—	89.4
Abavisan et al., 2020	CrisisMMD	3,359	5	B/U	Hum	DenseNet	Train/dev/test	83.4	—	—	87.0
Abavisan et al., 2020	CrisisMMD	3,359	5	B/M	Hum	SSE-BERT-DenseNet	Train/dev/test	91.1	—	—	91.8
Abavisan et al., 2020	CrisisMMD	3,288	3	B/U	DS	DenseNet	Train/dev/test	62.9	—	—	66.1
Abavisan et al., 2020	CrisisMMD	3,288	3	B/M	DS	SSE-BERT-DenseNet	Train/dev/test	72.7	—	—	70.41
Ahmad et al., 2017a	DIRSM	6,600	2	B	Flood	Fusion	Train/test	—	95.11	—	—
Dinani & Caragea, 2021	CrisisMMD	18,126	2	B	Info	CapsuleNet	Train/dev/test	—	—	—	79.9
Ahmad et al., 2019a	FCSM	6,600	2	B	Flood	Fusion	Dev/Test	—	—	—	63.6
Ahmad et al., 2019a	FDSI	1,437	2	B	Flood	Fusion	Dev/Test	—	—	—	62.3
Alam et al., 2022	MEDIC	71,198	2	B	Info	Train/dev/test	84.9	85.3	84.9	85.0	
Alam et al., 2022	MEDIC	71,198	4	M	Hum	Train/dev/test	81.0	79.9	81.0	80.1	
Alam et al., 2022	MEDIC	71,198	7	M	DT	Train/dev/test	81.0	80.2	81.0	79.6	
Alam et al., 2022	MEDIC	71,198	3	M	DS	Train/dev/test	81.3	79.4	81.3	79.9	

of I/T, number of image/text; # CL, number of class labels; C/T, classification task setting; B/U, binary/unimodal; B/M, binary/multimodal; M/U, multiclass/unimodal; M/U, multimodal; Info, informativeness; Hum, humanitarian; DS, damage severity; ID, infrastructural damage; SSE, stochastic shared embeddings; * model, used several pretrained models

- **Disaster event detection and information dissemination:** In the modern world, social media has emerged as an important channel for communication and information dissemination, especially in emergencies. The literature reports the effectiveness of social media outlets in several situations where the conventional sources and news agencies failed to provide relevant information about natural and man-made disasters in time or at all due to several reasons, such as lack of reporters in the area (Said et al., 2019).
- **Flood severity estimation:** Natural disaster-related social media imagery could also be used for the estimation of disaster severity. In this regard, in the literature, flood-related images are mostly used to estimate flood level. To this aim, different strategies are used. For instance, in a recent benchmark challenge, participants were asked to develop binary classification frameworks able to predict whether the water level is above the knee of a person standing in floods. Despite some initial successful attempts, flood-level estimation from social media imagery, which is generally captured through RGB cameras, is very challenging. The complexity of the application is also apparent from the lower performances of the solutions proposed for the task in a benchmark competition (Bischke et al., 2019). However, there is a big potential in the application, and the performance of the solutions could be improved by incorporating complementing sources of information, such as IR imagery, metadata, and crowdsourced data.
- **News disambiguation:** Natural disaster-related social media imagery could also be used for the verification of disaster event-related news articles' content. Some irrelevant news articles may also contain disaster-related keywords, such as "floods of flowers." In such circumstances, the images associated with news articles can be used to identify whether the articles are representing a disaster event or not. The literature already reports some efforts in this direction. For instance, Ahmad et al. (2019b) proposed a fusion-based framework for differentiating relevant and nonrelevant articles based on the associated images.
- **Identification and classification of needs of affected individuals:** The identification and categorization of the needs of affected people are of great interest to humanitarian organizations. This information helps them to deploy their resources accordingly. The literature also reports some efforts in this direction. For instance, Alam et al. (2020) explored the possibility of automatically identifying four different categories of images, which include (i) affected people, (ii) infrastructure and utility damages, (iii) rescue volunteering or donation effort, and (iv) not humanitarian (images showing cartoon, advertisements, etc.).
- **Monitoring and facilitating rescue and reconstruction operations:** Social media imagery could also be used for monitoring the rehabilitation process and rescue operations. Though very few attempts have been made, there is a lot of potential in this application. Such monitoring schemes and analyses could be used for different purposes. For instance, Yan et al. (2017) used geotagged social media data for monitoring and assessing post-disaster tourism recovery. Moreover, social media imagery could also be used to encourage people for the donation.

- **Quantification of disasters' impact on the infrastructure:** The application was recently introduced in a benchmark competition and aims at analyzing floods' impact on infrastructure. The challenge in the competition was limited to road passability, where participants were asked to predict whether a road in a flooded region is passable with common means of transport or not. However, the application can be extended to several other tasks, such as monitoring communication cables, gas pipelines, electricity, and water networks after different types of natural disaster events, such as floods, earthquakes, snowstorms, landslides, and wildfires (Bischke et al., 2017b).
- **Visual sentiment analysis:** Sentiment analysis of disaster-related social media images is a relatively new and less explored area. The application is recently introduced by Hassan et al. (2019) by providing a detailed overview of the problem, applications, potential stakeholders, opportunities, and associated challenges. The potential beneficiaries of the application include news agencies, humanitarian organizations, and the general public. For instance, it can help news agencies to collect disaster-related information from different perspectives (Hassan et al., 2020). Similarly, it can also help humanitarian organizations to disseminate information on a wider scale by providing images that best demonstrates the evidence of a disaster. However, several challenges are associated with the application. For instance, disaster-related imagery generally contains several objects and background information and is hard to analyze and extract emotions and sentiments. Moreover, in such complex and subjective applications, defining the sentiment categories and annotation of images is also a tedious job.

Shared Tasks

Disaster analysis in social media content has also been part of several benchmark initiatives. In this regard, MediaEval (<http://www.multimediaeval.org/>), which is a benchmarking initiative offering challenges in the form of shared tasks, is leading by offering the task for the last 5 years. In the benchmark competition, each year a different application is explored. A brief overview of some of the shared tasks aiming at disasters analysis in social media imagery is provided below.

- **The multimedia satellite task at MediaEval 2017** (Bischke et al., 2017b): The goal of the task is to categorize flood-related images that are collected from social media and satellite. To this aim, two different subtasks including (i) disaster image retrieval from social media (DIRSM) and (ii) flood detection in satellite imagery (FDSI) were introduced. The first task aims to analyze and retrieve flood-related images collected from social media, while the second task focuses on images collected from the satellite. The second task is out of the scope of the chapter, and we will cover the details of the first task only. For DIRSM, a total of 11 teams participated. The participants were allowed to submit a total of five different runs, which were evaluated in terms of precision at different cutoffs, $k = 50, 100, 200, 300, 400$, and 500. The majority of the proposed solutions were based on CNNs, where mostly existing pretrained models were fine-tuned on the

dataset provided for experiments. Several interesting early and late fusion strategies were also employed. Overall encouraging results were reported on the task.

- **Emergency response for flooding events at MediaEval 2018** (Benjamin et al., 2018): The main goal of this task is to analyze and identify the impact of floods on the infrastructure. Similar to the previous year, the task is divided into two subtasks, namely, (i) flood classification from social multimedia (FCSM) and (ii) flood detection from satellite imagery (FDSI). The first task, which is relevant to the chapter, aims to analyze and retrieve social media images providing direct evidence for road passability through conventional means of transport, such as cars (i.e., “no boats, off-the-road vehicles, farm equipment, etc.”) (Benjamin et al., 2018). To this aim, the participants were asked to propose image classification frameworks able to differentiate images of possible and non-passable roads. A total of nine teams participated in the task, where each team was allowed to submit up to five different runs/solutions. Moreover, the proposed solutions were evaluated in terms of average F1-score.
- **Multimedia satellite task flood severity estimation at MediaEval 2019** (Bischke et al., 2019): The main goal of the task is the estimation of flood severity in social media and satellite images. The task is mainly composed of three subtasks. Two of the subtasks are based on social media, while one of the tasks aims at analyzing satellite imagery. In the social media-related subtasks, two different applications, namely, (i) image-based news topic disambiguation and (ii) multimodal flood-level estimation, are covered. In the first subtask, the participants were asked to propose binary classification frameworks able to predict whether an image associated with an article represents flood events or not. In the second task, the participants were asked for further analysis of flood-related images by identifying the images containing *at least one person standing in water above the knee*. In total, 12 teams participated in the task. The participants were allowed to submit up to five different runs/solutions, which were evaluated in terms of F1-score. Overall, lower performance was observed on each task.
- **The flood-related multimedia task at MediaEval 2020** (Andreadis et al., 2020): This task aims at the identification/detection of flood events in a particular area in ambiguous Twitter posts. The participants were provided with a large collection of flood-related tweets along with the associated images and were asked to develop a multimodal classifier able to predict whether the tweets represent flooding events in a specific area (i.e., the Eastern Alps district in Northeastern (NE) Italy) or not. In total, five teams participated in the task, and similar to the previous editions, each team was allowed to submit up to five different runs/solutions. Similar to previous editions, the majority of the teams proposed late fusion-based multimodal frameworks combining classification scores obtained with the models trained on textual, visual, and metadata. Overall poor performances, in terms of F1-scores, were reported for all the teams, which indicates the complexity of the task.
- **Visual sentiment analysis – a natural disaster use case at MediaEval 2021** (Hassan et al., 2021): This task explores a completely different and interesting

aspect of natural disaster analysis in social media. The task aims at sentiment analysis of disaster-related images posted on social media. The task consists of three different subtasks, which include one single and two multi-label image classification tasks. In the first subtask, the participants were asked to differentiate between three different categories of emotions, *positive*, *negative*, and *neutral*. In the second subtask, the participants had proposed a multi-label image classification framework to differentiate among seven classes, such as *joy*, *sadness*, *fear*, *disgust*, *anger*, *surprise*, and *neutral*. The third subtask consists of ten classes including *anger*, *anxiety*, *craving*, *empathetic pain*, *fear*, *horror*, *joy*, *relief*, *sadness*, and *surprise*. A total of five teams participated in the task. Similar to previous tasks, the majority of the proposed solutions was based on pretrained models, which were fine-tuned on the new dataset. Overall, better results were reported on all three subtasks (Table 3).

Table 3 Provides a summary of the shared tasks on the topic in terms of the number of teams that participated, evaluation metrics, and the score of the best-performing team

References	Year	#T	Metrics	Top system	Top score	Task overview
Bischke et al., 2017b	2017	11	Precision at $k = 50, 100, 200, 300, 400, 500$	Ahmad et al., 2017c	0.957	Aims at retrieval of flood-related images from social media by covering two classes relevant and nonrelevant. Also provides access to metadata associated with the images
Benjamin et al., 2018	2018	9	Avg. F1-score	Moumtzidou et al., 2018	0.665	Aims to analyze and quantify the impact of floods on the infrastructure by proposing solutions for road passability through conventional means of transport
Bischke et al., 2019	2019	12	F1-score	Quan et al., 2019	0.883	Aims at flood severity estimation by introducing two subtasks relevant to social media where two different applications, namely, image-based news disambiguation and flood-level estimation, are introduced
Andreadis et al., 2020	2020	5	F1-score	Nikolaopoulos et al. (Nikolaopoulos & Wolff, 2020)	0.541	Aims at the identification/detection of flood events in a particular area in ambiguous twitter posts
Hassan et al., 2021	2021	5	F1-score	Pham et al. (Bang-Dang et al., 2021)	0.771	Focuses on visual sentiment analysis by introducing three subtasks with a diverse set of sentiment labels/categories

A summary of the shared tasks on the topic. # Teams, number of teams

Challenges and Open Research Issues

This section highlights some of the key challenges and open research issues in the domain. These challenges include the following:

- **Data collection and annotation:** Data collection and annotation are the key challenges to develop models and extracting actionable information from disaster-related imagery for different tasks. Although several interesting datasets aiming at different applications have been collected and shared. However, there remains many problem settings where new dataset needs to develop. In addition, each application of natural disaster-related imagery analysis requires its own annotated dataset, and the challenges associated with data annotation vary from application to application. For instance, the annotation of data for certain applications, such as sentiment analysis of disaster-related images, is more challenging to compare to others (Hassan et al., 2021).
- **Relevance and authenticity:** Despite being proven effective in a diverse set of applications, the relevance and authenticity of social media content are very challenging. To retrieve relevant social media imagery, the majority of the solutions relies on state-of-the-art AI, ML, and image processing techniques to automatically analyze natural disaster-related imagery shared in social media platforms. However, the existing literature lacks frameworks and solutions dealing with the authenticity of natural disaster-related imagery shared in social media (Said et al., 2019). We believe that additional measures (such as disinformation detection), ensuring that the retrieved imagery is authentic and genuine, need to be incorporated in the analysis of disaster-related social media images.
- **Copyrights issues:** The social media data may also be subject to copyrights. Under such circumstances, it is not possible to use and share the data with the community for training and evaluation. In fact, it is important to make sure the social media imagery is licensed for public use. This restriction poses challenges to the collection and sharing of benchmark datasets in the domain.
- **Missing geo-location information:** To fully explore the potential of natural disaster analysis by extracting actionable information, geo-location information is crucial in several ways. For instance, geo-location information along with other information extracted from imagery can help rescue teams and aid agencies to deploy their resources accordingly. However, the literature suggests that social media imagery generally lacks geo-location information due to several reasons (Ahmad & Conci, 2019). In this regard, some image localization solutions could be employed to deal with missing geo-location information.

Conclusions

This chapter discusses how social media imagery content has been used during disasters for actionable information with a particular focus on the challenges, available datasets to develop AI-based models, and already deployed systems. It

also highlights possible applications/use cases that can be deployed during such disaster events and how such applications can facilitate different stakeholders, crisis responders, or emergency response teams. There are already sincere efforts for finding suitable solutions to deal with the large amount of social media content, which resulted in several shared tasks on the topic in the past few years. However, there are still several challenges that need to be tackled to explore the full potential of social media imagery in disaster informatics.

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Remote Sensing Tools for Crisis Assessment in DRR

39

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Contents

Introduction	554
Conceptual Framework for the Use of Remote Sensing in Crisis Response	556
UNOSAT Satellite Image Processing Services	557
Spatial Sampling	559
Spatial Sampling Methodology Matrix	560
Multidimensional Vulnerability Index	562
Nighttime Lights	564
Conclusion	569
References	570

Abstract

The utilization of remote sensing tools gained a relevant role in the assessment of impact of natural and human-made disasters. These tools tend to integrate field primary data collection with the availability of timely big data. Data analysis from satellite images can be utilized to design a sample strategy when no up-to-date census data are available or to identify and prioritize disaster-affected communities and their respective assets. Remote sensing products can also provide new information around socioeconomic indicators to either corroborate the existing primary data or generate new knowledge in the phases of relief, reconstruction, and recovery.

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Introduction

In the aftermath of a disaster, to make crucial decisions on effective response and recovery, policymakers and international organizations need information that is rapidly available, accurate with a preference for georeferenced, and, to the extent possible, granular and hyper-localized. Optimally, this information should come from primary data collection in the location where the disaster occurred. Unfortunately, oftentimes, such locations are not easy to reach in a short period of time in the aftermath of the disaster due to logistics constraints, an ongoing conflict, or political instability. Big data from non-traditional sources such as social media images, text analysis, or satellite images can rapidly provide actualized and localized data to integrate official statistics (Vacarelu, 2016). Multiples are the advancement in collecting and analyzing big data to provide a prompt intervention. Remote sensing combined with telecommunication call records, processed by machine learning, has been used successfully to deploy a mobile cash distribution in Togo (Marchenko & Chia, 2021) in support of families living in extreme poverty and impacted by COVID-19. The triangulation of data coming from multiple sources is a critical success factor in tackling vulnerability. By analyzing power electricity network distribution, the use of big and thick data and a combination of the two in Ukraine helped in unpacking vulnerability complexities and finding new policy options and solutions to tackle the rising inequalities, new forms of poverty, and social exclusion, among others (Vasilescu et al., 2021). Big data is used on a regular basis by the Crisis Bureau at UNDP for early warning and horizon scanning for the fragile crisis. The CRD (Crisis Risk Dashboard) helps UNDP anticipate and respond to risks at global, regional, and country levels by providing easy access to timely and relevant data visualizations and analysis, but, most of all, by telling clear and compelling data stories and effectively communicating key trends and risks (Corrado Scognamillo & Gutschke, 2021). Finally, the work for disaster detection and analysis in the UN system is empowered by UNOSAT. A collaboration between UNITAR-UNOSAT and UN Global Pulse has developed a methodology that allows to quickly map flooded areas using artificial intelligence (AI) and remote sensing (Nemni et al., 2020). Its application makes it possible to better geo-sampling for in-depth primary data collection and organize logistics and ground-truthing validation processes with data in the aftermath of disasters affecting large areas. As time is crucial in crisis response, automating damage detection and mapping plays a fundamental role in informing the decision-making process to help optimize the disaster response, and it also has the potential to significantly reduce loss of life and mitigate structural damage. The Surge Data Hub (SDH, n.d.-a, b) collects mainly primary data through field assessments. The data collected

validate and serve back to train algorithms for automated damage assessments. Through the Household and Building Damage Assessment (HBDA) and Socio-Economic Impact Assessment (SEIA), it is possible to assess damages to buildings or infrastructure, and household needs, and to map vulnerability at a multi-dimensional level. In the aftermath of natural or manmade disasters, assessing both building and infrastructure impact along with economic and livelihood assets and household needs and vulnerabilities, at a granular level, gives a more comprehensive picture of a shock impact. Because of their timely availability and limited cost, remote sensing tools have become a convenient way to collect information. In the various phases of disaster management, i.e., prevention, preparedness, relief, and reconstruction, remote sensing data are utilized (Van Westen, 2000). Remote sensing tools have become increasingly important for disaster management due to their cost-effectiveness, short temporal orbiting, and large areas of coverage. First, remote sensing and GIS can help to determine which areas are in danger. Second, remote sensing allows monitoring the event during its occurrence and organizing emergency operations accordingly. Then, it can provide a quantitative base for relief operations in damage assessment and aftermath monitoring. Finally, it assists in the organization of the damage-related information and the post-disaster census information and the evaluation of sites for reconstruction.

This chapter focuses on remote sensing tools and provides an overview of their applications in crisis response and disaster assessment. Remote sensing tools constitute a fundamental resource in crisis and disaster assessments. Read and Torrado (2009) define remote sensing as follows: “*it provides information about objects at or near the surface of the Earth and atmosphere based on radiation reflected or emitted from those objects. The information is usually captured at a distance from above in the form of image data. Such data allow us to determine the composition and nature of the Earth’s surface and atmosphere from local to global scales and assess changes by analyzing images captured at different points in time. In this sense, remote sensing is useful in providing spatial information that is otherwise difficult or impossible to obtain. In the social sciences, remote sensing is useful for visualizing (providing alternative and synoptic views) and classifying human environments.*” Here are the lessons learned by combining theoretical knowledge and hands-on experience in the application of remote sensing in disaster and risk reduction. Data obtained from the elaboration of satellite images, such as flooded land and damaged buildings, increase the level of precision of an intervention. While planning data collection in the field, high-definition data on population and building distribution support more efficient sampling strategies. Moreover, remote sensing data can provide insightful information on socioeconomic outcomes beneficial to assessing the potentially vulnerable population.

The following sections explain how remote sensing tools integrate with the UNDP crisis response framework. The first section exposes how organizations like UNDP have been adopting UNOSAT data, like in the case of the Bata explosion and the Timor-Leste flood. The second section, in the case of Guatemala, explains how high-definition population distribution data can support the design of a survey when

up-to-date or localized data are not available. The third section elaborates on how remote sensing tools can support the calculation of more traditional measures of vulnerability, namely, the multidimensional vulnerability index (MVI). The fourth section discusses the use of nightlight satellite images to measure the economic impact of a crisis, like in the case of Afghanistan, where the research opens great opportunities to use the same methodology for more disaster-related cases. Finally, the chapter concludes and opens the discussion to further developments and ways forward.

Conceptual Framework for the Use of Remote Sensing in Crisis Response

The complexity of crises requires coordinated action to assess their impact and put in place adequate recovery policies. UNDP has recently developed a conceptual framework that use remote sensing tools to better address this issue. This framework consists mainly of three phases:

Phase 1: It is triggered as soon as a natural disaster occurs and consists in using UNOSAT satellite imagery to have a first information on the areas affected by the disaster and an approximation of the number of affected houses.

Phase 2: It is divided into two parts. The first part involves the use of remote sensing in the traditional primary data collection to assess the impact of the disaster on buildings and households. This is done by using the satellite data produced by UNOSAT or population data generated from satellite data to conduct a “spatial sampling,” which consists of selecting the households and buildings to be surveyed to ensure that the data are representative. Primary data collected through spatial sampling leads to the calculation of a multidimensional vulnerability index to identify the most vulnerable groups and the dimensions on which they are most affected. Although this traditional methodology presents several advantages, it can be difficult to implement especially when the affected areas are not accessible. Therefore, the second part consists of using new approaches with remote sensing to assess the impact of disasters. In this case, satellite imagery on nighttime electricity and population density is used to assess the impact of disasters on economic activity. Depending on the context, both methodologies can work either as substitutes or as complements.

Phase 3: This phase consists of a synthesis of phase 2, drawing out the information needed to develop recovery policy. Thus the areas where economic activity has been most affected by the disaster can be determined, and the groups that have been most vulnerable to the crisis can be identified. This allows for prioritization in the overall post-crisis recovery strategy.

Each of the following sub-sections addresses remote sensing tools’ role in the conceptual framework phases and will present an example of its application in the context of various recent crises.

UNOSAT Satellite Image Processing Services

In the aftermath of natural disasters, time and resources to collect reliable data to inform decision-making are scarce. Conducting a full-scale *in situ* assessment to identify the impact on households and damages can be dangerous or just not feasible; remotely sensed secondary and/or primary data can be used to identify those areas that are affected by the natural disaster or other sorts of human-made crisis. Even when primary data collection is conducted at the field level, e.g., household surveys, many are the benefits from remote sensing data, such as to prioritize areas to be assessed and guide field assessment teams.

UNITAR's Operational Satellite Applications Programme (UNOSAT) rapid mapping service provides satellite images, maps, georeferenced data (e.g., flood extents, damage assessments), statistics, and reports. It is activated in the case of floods, earthquakes, storms, landslides, volcanoes, oil spills, chemical waste, refugee and internally displaced person (IDP) camp mapping, conflict damage assessment, and situation analysis. The flood rapid mapping tool is a machine learning-based tool developed by UNOSAT. Data are derived by UNOSAT analysts from various satellite images acquired by multiple sensors. UNOSAT analysts then extracted water bodies and inundated lands from these images using a hybrid unsupervised and supervised classification followed by visual review and manual correction. This almost fully automated process permits to complete satellite-based analyses and related mapping in rapid times.

UNOSAT data can be employed to facilitate data collection after a natural or manmade disaster occurs, for example, the Bata explosion, in Equatorial Guinea, where a series of six explosions created severe damage to households and infrastructure in a 3-km radius affecting 1900 buildings. By using as a first layer the UNOSAT geospatial analysis, the damages in private buildings and households' needs were assessed, giving detailed evidence, cost estimation for damage recovery, and community resilience. Another case is represented by the Timor-Leste flood in April 2021 (UNDP, 2021) where the heavy rains that followed Tropical Cyclone Seroja afflicted Timor-Leste from March 29, 2021, to April 4, 2021. The state of calamity was declared by the government on April 8, 2021, in Dili for a period of 30 days, and international assistance was requested. Even in this case, UNOSAT data were employed to identify the geographic scope of the Housing and Building Damage Assessment (HBDA).

The geographical scope concerns the five worst impacted municipalities in Timor-Leste, i.e., the municipality of Dili, which includes the capital city, Liquica, Manatuto, Baucau, and Ainaro. Different methodologies were applied for Dili municipality and for the other four municipalities' area, because of the varied nature of available baseline and secondary data, as well as limited resources and information needs on the populations of interest. The most affected areas in the municipality of Dili were identified using maps of satellite-derived imagery from UNOSAT, which pinpointed potentially affected structures (purposive sampling) as shown in Fig. 1. Subsequently, a random sample was then generated within each of these affected areas to identify individual buildings to be assessed, using the GPS

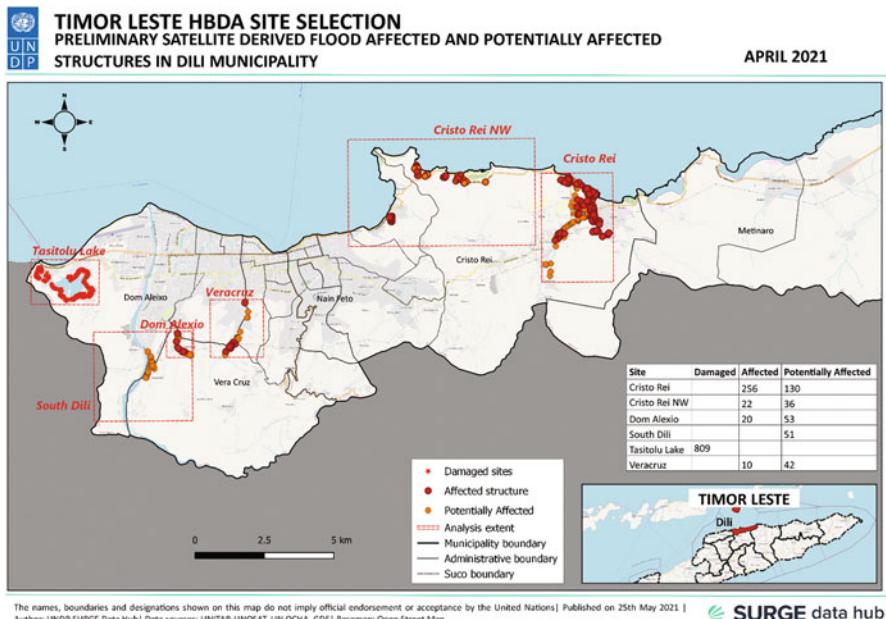


Fig. 1 Timor-Leste HBDA site selection

coordinates from UNOSAT's data. The size of the sample was calculated by applying a 95% level of confidence and 5% margin of error, using the number of structures identified by UNOSAT in each "affected area."

In the four municipalities outside of Dili (i.e., Liquica, Manatuto, Baucau, and Ainaro), potentially affected areas were identified using data on the estimated number of affected buildings and households based on the multi-sector rapid assessment by the Secretary of State for Civil Protection. Therefore, only a purposive sampling method was employed. Field teams traveled to the identified areas and then selected households for assessments in close cooperation with the local authorities, including municipal authorities, village and sub-village chiefs, and municipality statistics office staff. Contrary to the municipality of Dili, sample units (buildings/households to survey) were identified while in the field rather than prior.

Consequently, representative data was collected in the most affected areas within Dili municipality, while indicative data was collected in the four municipalities outside Dili. A summary of the data collected in this assessment can be observed in Fig. 2. This exercise emphasizes the need to adapt sampling strategies under available information, which may come in differing formats and data types. Nonetheless, the availability of UNOSAT processed satellite images allowed for a more representative analysis and a cost-effective approach.

In future studies, a few considerations in the use of these data and methodologies should be taken. First, UNOSAT damaged buildings are obtained from the observation of satellite images, and despite being often the most accurate data available, they

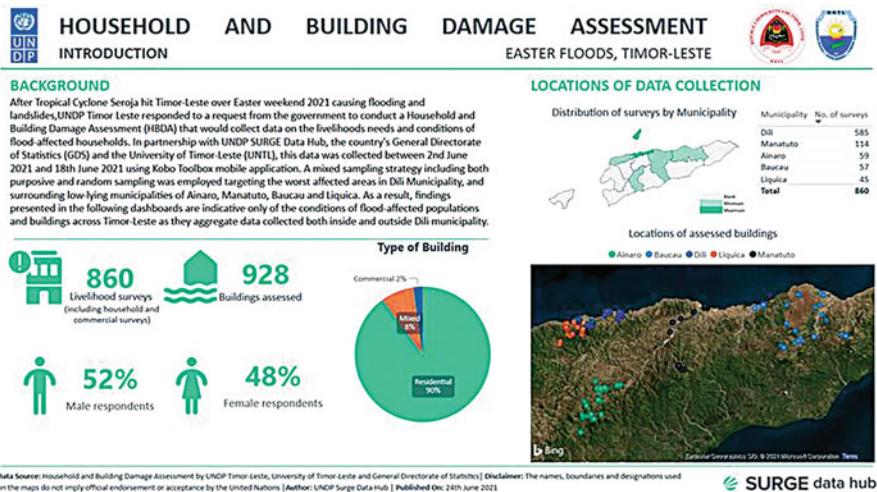


Fig. 2 Timor-Leste HBDA

may be subject to measurement error. The assessment of the level of damage is extrapolated from a view of the building roof, and this information may be not completely revelatory of the damage magnitude as it would be observing the building in the third dimension. For such reason, it is relevant that future studies could utilize UNOSAT data on damaged buildings as a benchmark to identify the affected areas to assess but also to combine them with other methods to increase our knowledge of this potential measurement error.

Spatial Sampling

Many low- and middle-income countries – especially those that are most in need of household surveys to guide data-driven decision-making in a crisis situation – lack precise and up-to-date information about their population impacted by a disaster. Some crises trigger population movements that add to seasonal patterns of internal or inter-country migration that make even more arguable the use of sample frames based on earlier population data. The standard approach to overcome this problem is to use a two-stage sampling design in which primary sample units (PSU) are selected with probability proportional to the population size estimated from the census and then a listing and a random sampling are conducted in the selected primary sampling units. A critique of this methodology is that the most vulnerable population is most likely to be left out of the survey. For example, the low-income population is the one growing faster and therefore may be underestimated by using the census and mobile population. For example, pastoral communities and refugees can be undercounted or signed as not respondents in between the listing phase and the interview phase. Furthermore, the SDGs are emphasizing the need for more disaggregated estimators,

especially in small areas, and census data may not have this geographical precision in a specific timeframe.

The most common approach to address representability in large-scale household surveys is to use a stratified two-stage design. In the first stage, census enumeration areas are set as the primary sampling unit (PSU) and selected with probability proportional to population size. In the second stage, a household listing operation is performed in the chosen PSUs, and households are selected using a simple random sampling. This approach allows using even outdated census data in the first stage, as long as a high-quality listing operation is done in the second stage to select the households to survey. Using out-of-date census data as a measure of size in PSU selection will result in estimates that are inefficient but still unbiased (Eckman & Himelein, 2020). Although this method is considered to be the best from a statistical point of view, it can present a high cost of implementation. A sample strategy that allows for reducing the cost of conducting a complete enumeration is the multi-stage cluster sample. In a multi-stage cluster sample, small areas are randomly selected from the geographical area of interest, usually with a probability proportionate to the population size. In this case, recent census data are needed, and then, a complete enumeration of all the households living in the selected small areas is conducted. Ultimately, households to interview are randomly selected from within the enumerated clusters (Miller et al., 2020).

Remote sensing data can be extremely useful to build a data frame when there are no available up-to-date data about the population distribution. There are a few methodologies that adopt technological advances in geospatial data and permit overcoming high costs, limited capacity, and difficulties in supervision and sample selection that often occur when using second-best or nonprobability approaches.

Spatial Sampling Methodology Matrix

One-stage sample	Two-stage sample
<ul style="list-style-type: none"> • Locate dwellings • Random draw 	<ul style="list-style-type: none"> • Sample PSUs with probability PPS • Conduct listing and interview
One-stage cluster sampling	Two-stage cluster sampling
<ul style="list-style-type: none"> • Cluster random sampling • Interview all households in the selected clusters 	<ul style="list-style-type: none"> • Cluster with probability PPS and replacement • Conduct listing and interview

The one-stage sample design locates dwellings using satellite images and then randomly selects the dwelling to be interviewed (Eckman & Himelein, 2020). The two-stage sample design draws primary sampling units with probability proportional to the georeferenced population estimates for each unit and then conducts listing and interviews (Kondo et al., 2014; Eckman & Himelein, 2020).

The one-stage cluster sampling randomly selects clusters with equal probability and then interviews all the household in the selected clusters (Yu et al. 2020), while

the two-stage cluster sampling draws clusters with replacement and with probability proportional to population size till the sample size is reached and then conducts listings and interviews (Miller et al., 2020).

The one-stage has the advantage of eliminating the time between listing and interview, while the two-stage reduces enumerators' mobility, but it may be less statistically efficient due to cluster homogeneity; in other words, people that lived in the same cluster may share similar characteristics. The one-stage cluster is the most efficient in eliminating enumerator mobility and the time between listing and interview, but it is at risk of cluster homogeneity and of overrepresenting rural areas that usually cover a larger portion of the land. The two-stage cluster instead is statistically efficient but at the same time requires covering a larger geographic area. Given potential limitations in resources and time, each of these designs may be better suited for different situations.

Here, the sample design that was customized for the province of San Rafael las Flores in Guatemala is proposed as an example. The municipality of San Rafael las Flores is divided into five micro-regions: San Rafael las Flores, Las Nueces, Media Cuesta, San Rafaelito, and San Juan Bosco. These micro-regions were used to stratify the sample and define the minimum population to survey for reaching representability with a 90% confidence interval. Once the number of questionnaires to collect in each micro-region was defined, the households to be interviewed had to be randomly selected. In the presence of a list of addresses for the entire population, a number of addresses equal to the required sample size could have simply been drawn. The municipality of San Rafael las Flores is composed of a mix of urban agglomerates and rural dispersed dwellings. In the absence of a list of registered households, a different sample strategy was employed. Using distribution population maps and GIS tools, a cluster sample method was adopted, with small geographical units to minimize the clustering bias but also reduce the movement cost for the enumerators' team.

As mentioned above, in this particular application, no list of registered households was available, and a stratification of the sample over five micro-regions was required, i.e., very small geographic units. Finally, cost efficiency was a key requirement. We decided then to use a one-stage cluster sample strategy. A grid of squares with sides of 0.03 radius (approximately 300 m) was generated, as shown in Fig. 3, and the population living in every cluster was calculated according to the high solution population density maps produced by the joint effort between Facebook, Columbia University, and the World Bank (Tiecke, 2017). The high-resolution population density maps issue estimates of human population distribution at a resolution of 1 arc second (approximately 30 m) for the year 2018 (University, Facebook Connectivity Lab and Center for International Earth Science Information Network (CIESIN), Columbia, s.d.). Commercially available satellite images and general population estimates based on publicly available census data and other population statistics are combined with machine learning to generate this extensive database. A cluster size was chosen to balance the trade-off between enumerators' mobility cost and cluster homogeneity (while those clusters that were estimated to contain zero households were excluded.) Then clusters were sampled progressively till the sum of the estimated population reaches the sample size. For example, to



Fig. 3 San Rafael las Flores, Guatemala, high-definition population distribution and 300×300 m grid cropped by the five sub-provinces' borders

sample 350 households, a first cluster would be drawn, and the number of the household contained counted, for example, 20, then a second cluster, counting 5 households, and continuing in this way until the cumulative counting reach 350 households. Additional clusters can also be selected precautionary if the response rate is inferior to 100%. As mentioned before, this method is cost- and time-efficient and allows to consider those households that don't live in stable dwellings, but it has the disadvantage of potentially oversampling rural areas (a smaller concern since this province doesn't contain major urban areas).

Multidimensional Vulnerability Index

The multidimensional vulnerability index (MVI) constitutes an important tool in informing targeted assistance to the most vulnerable households and businesses in the aftermath of crises in the sense that it summarizes the multiple deprivations that they face as the result of the crisis. Its calculations require solid and representative primary data collected just after the crisis. The representativeness of the data is achieved using either the geospatial sampling explained above, which is innovative, costless, and efficient in the case of natural disasters, or other classical sampling methodologies. With a solid sample, data is collected through face-to-face interviews using digital tools. After the data collection phase, datasets are cleaned by looking at duplicates, response errors, and missing values. Then, it becomes possible to calculate the MVI and disaggregate it by households' and businesses' socio-demographic characteristics.

The empirical calculation of the individual MVI for Afghanistan is based on the multidimensional approach developed by Alkire and Foster (2011). The rationale for choosing this methodology is that it is accessible to policymakers. It gives relevance to the joint deprivations faced by individuals, households, or businesses with regard to the indicators that compose the MVI. The MVI is an adjusted headcount ratio index designed to measure vulnerability and can be broken down into incidence, intensity, and dimensional composition.

The indicators included in the calculation of the MVI align with the framework of exposure-sensitivity-adaptive capacity in the case of businesses. Regarding households, although the MVI follows the same framework, the names of the dimensions were adapted to the MPI dimensions to allow comparisons between the two indexes.

Following the COVID-19 outbreak in Afghanistan, UNDP combined satellite imagery and primary data collection to understand the vulnerability of households and businesses in five provinces, Kabul, Balkh, Nangarhar, Kandahar, and Herat. Data were collected in two waves.

Figure 4 shows that businesses were particularly affected and vulnerable in Balkh and Kabul on both waves. Although Kandahar and Herat were the least affected, it can be highlighted that the businesses' vulnerability has more than doubled from wave 1 to wave 2 (Fig. 5). However, by focusing on households, it can be seen that Nangarhar and Kandahar are the provinces with the highest rate of households' vulnerability following the COVID-19 pandemic (UNDP, 2021).

Not only it is possible to take advantage of remote sensing products to optimize the sampling process by accessing up-to-date information about the population distribution or the location of the damages. It is even possible to use remote sensing to guide our research questions. With a pre-analysis based on rapidly accessible secondary data, the target of our assessment can be selected with more precision. This can help us identify more precisely the elements of vulnerability that require a deeper study.

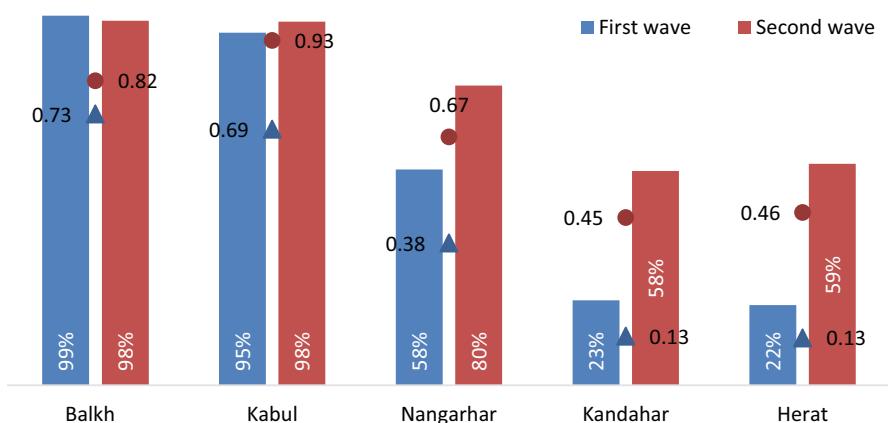
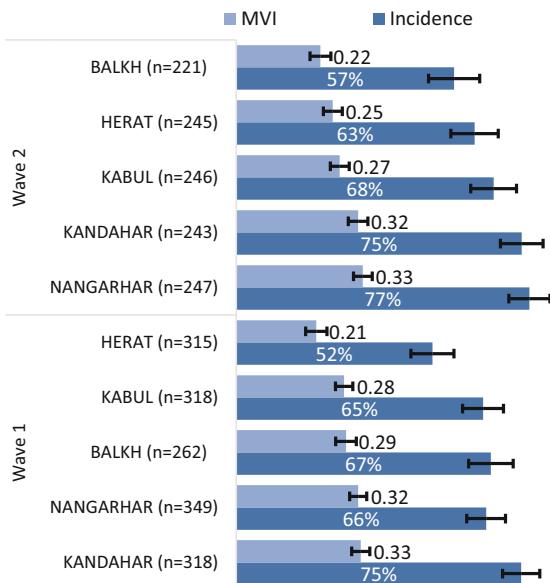


Fig. 4 Incidence and MVI for businesses by regions, both waves. Note: Columns represent incidence, dots and triangles stand for MVI

Fig. 5 Households' vulnerability by provinces



Nighttime Lights

Nighttime lights can improve the monitoring of disaster impacts, at a spatial and temporal resolution that provides ready and localized disaster for the disaster. For instance, nighttime lights are used by Román et al. (2019) to assess electricity restoration efforts in Puerto Rico after Hurricane Maria. They used daily satellite nighttime light data to estimate spatially disaggregated power outages by tracking electricity restoration efforts after the disaster strikes. Nighttime lights can even support monitoring of displacement via satellite-derived observations along with a short message service (SMS)-based emergency survey, like in the case of Cyclone Idai had made landfall in Beira, Mozambique, in March 2019 (Enenkel et al., 2020). In fact, under certain conditions, the spatial extent of power outages can serve as a proxy for disaster impacts and a potential driver for displacement. Moreover, nighttime light can detect changes in the extent of economic activities.

The use of satellite imagery in socioeconomic studies, particularly nighttime lights, has grown in popularity in the last 20 years. Nighttime light intensity captured through remote sensing is used as a proxy for different socioeconomic indicators. An increase in nighttime light may be interpreted as an actual increase in artificial lighting, which is, in turn, caused by an increase in electricity consumption. Therefore, an increase in nighttime lights can be the product of an increase in the intensity of economic activity or other socioeconomic indicators such as population density and quality of life. The use of night lights has many advantages: they can be used as a proxy for economic activity at temporal and geographic scales that are often not

available for traditional data; nighttime lights are available near real time and cheap to obtain; and, finally, they provide a proxy for aggregate economic activity including those that are illicit, providing so more comprehensive information about the economy of a region (Galdo et al., 2020).

Numerous studies have confirmed a robust relationship between nighttime lights and economic activity at the country level. In cross-sectional analysis, nighttime lights show a stronger relationship with GDP than population. Elvidge (Elvidge et al., 1997) finds an R² of 0.97 in the relation between GDP and NTL for 21 countries. In small geographic units, NTL are also a good proxy for human development. Anna Bruederle and Roland Hodler (2018) find that the georeferenced indicator of indicators of household wealth, education, and health, which they built from the Demographic and Health Surveys (DHS), is positively associated with nighttime lights. Their study suggests that the variation in nighttime lights can explain a substantial share of the variation in these socioeconomic indicators. And Pfeifer et al. (2018) use satellite data on nightlight luminosity at the municipality and electoral district level as a proxy for economic activity. They show that infrastructure investments for the 2010 FIFA World Cup in South Africa have a positive effect on economic activities, particularly in the rural areas.

The introduction of Visible Infrared Imaging Radiometer Suite (VIIRS) data has increased the possibilities in socioeconomic research. First, VIIRS nightlight data is more accurate, especially for less aggregated spatial units (Gibson et al., 2021). More specifically, it can detect NTL at higher spatial and radiometric resolutions than DMSP-OLS and sensibly eliminates three critical problems that beset the heritage satellite program: saturation, blooming, and a lack of on-board calibration (Bennett & Smith, 2017). Second, VIIRS nightlight data are a better proxy for local economic activity than are the more widely used DMSP data. VIIRS was proved to predict economic activities also in rural areas of Colombia with even better performance (Pérez-Sindín et al., 2021) and to study the economic impact of the 2015 earthquake in Nepal, violent conflict outbreaks in Afghanistan, and the 2016 demonetization in India (Beyer et al., 2018). The daily, monthly, and annually NTL are available almost in real time with a definition of 15 arc seconds from the NASA Black Marble project. The Nasa Black Marble is a daily adjusted, calibrated, and validated product. It removes cloud-contaminated pixels and corrects for vegetation, atmospheric, snow, topography, and lunar effects in Visible Infrared Imaging Radiometer Suite (VIIRS) (Wang et al., 2018).

Having access to data available at a hyper-local geographic definition and at a daily time interval allows for investigation in spatial and temporal dimensions. Below two methodologies applied to the 2021 Afghanistan institutional crisis are presented: the synthetic control method and the Night Light Development Index. The first is an econometric method to evaluate the effect of an event by comparing affected and non-affected countries over time. The second is an index to measure inequality distribution potentially at a very small geographic definition. VIIRS/NPP Lunar BRDF-Adjusted Nighttime Lights Monthly were employed and all grids that were low-quality flagged were discarded.

Afghanistan suffered a decrease in light intensity after the Taliban takeover. This can be observed in the exemplificative figure below. The province of Kabul presents

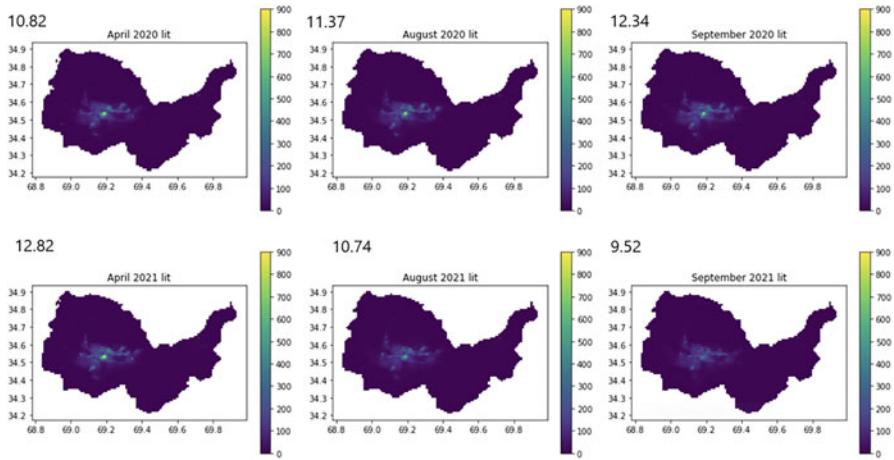


Fig. 6 Kabul province nightlight intensity. Average value of light intensity is shown in the top-left corner

a decrease in light intensity from April 2021 when the conflict started to September 2021. A critic can argue that the difference in light intensity may be due to seasonal effects, but this doesn't appear to be the case as there is not much difference comparing April and September 2020 (Fig. 6). Average light intensity is higher in September 2020 than in April 2020, while in 2021, the trend is the opposite. Moreover, the maximum light intensity per 15 arc seconds grid in September 2021 is 374.5 which is way below its value in the past months.

The synthetic control method, first presented by Abadie and Gardeazabal (2003) and Abadie et al. (2010), is a statistical method used to evaluate the effect of an intervention in comparative case studies. The fundamental idea behind this method is that a combination of units in the donor pool may approximate the characteristics of the affected unit substantially better than any unaffected unit alone. The synthetic control is calculated from a weighted average of the units that form the donor pool. The synthetic control method is a widely applied method in econometrics of policy evaluation. Abadie and Gardeazabal (2003) use a synthetic control approach to assess the impact of terrorism on the GDP per capita of the Basque country from 1955 to 1977. They define that day per capita GDP in the Basque countries declines by 10% relative to the control region without terrorism. Pfeifer et al. (2018) apply synthetic control methods for estimation using satellite data on nightlight luminosity at the municipality and electoral district level as a proxy for economic activity. They find significantly positive, short-run effects before the 2010 FIFA World Cup in South Africa tournament, corresponding to a reduction of unemployment by 1.3 percentage points.

First, the time dimension of the nightlight intensity was analyzed by computing the average light intensity over the entire Afghan territory for every month from 2016 to 2021. As shown in Fig. 7, projecting this trend (blue line in the image below), it can be seen that there is a seasonal effect on the light intensity; indeed,

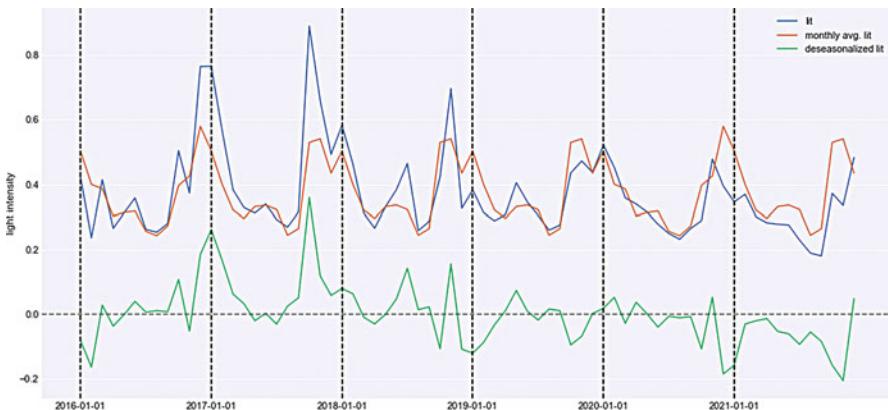


Fig. 7 Nighttime light intensity observed values, monthly average, and deseasonalized values

nightlight intensity decreases during the summer months (the orange line represents the average light intensity by month). By subtracting the monthly average (orange) from the actual data (blue), the deseasonalized light intensity (green) that reveals a decreasing trend was calculated. Particularly 2021 presents values below the average annual values.

Then a synthetic control was built using as donors Central Asian countries (Pakistan, Iran, Turkmenistan, Uzbekistan, Tajikistan, Kyrgyzstan, Mongolia, Myanmar, Syria, Iraq, Kazakhstan, Oman, Yemen, and Bhutan) that weren't directly affected by the institutional shock, and it was compared with the Afghanistan trend. The synthetic group is trained using nighttime light intensity monthly collected for 1 year before the Taliban officially took over the government. Using a synthetic control method, it can be observed in Fig. 8 that the trend after August is increasing for the observed and the synthetic series, probably because of an increase in electricity demand during the winter months. It can also be noticed that such an increase is less intense compared to the estimated trend (red dotted line) in the absence of the Taliban suggesting that the Taliban takeover may be the cause of electricity consumption inferior to the expected value.

This study should be considered preliminary as more advanced studies might be conducted in order to find a correct pool of countries to better approximate the Afghanistan pre-crisis trend. Moreover, while selecting the donor pool, the fact that these neighboring countries may have been indirectly exposed to the Afghan crisis should have been kept in account, for example, by the migration from Afghanistan. Therefore, more variables should be included in the model to balance the contribution of the units in the donor pool.

The “Night Light Development Index” (NLDI) measures inequality in the distribution of nighttime lights per capita. This index doesn't require data on monetary income, and it provides a spatial depiction of differences in development within countries. The spatial inequality is obtained by computing the Gini index of the distribution of nighttime light intensity divided by population. Like

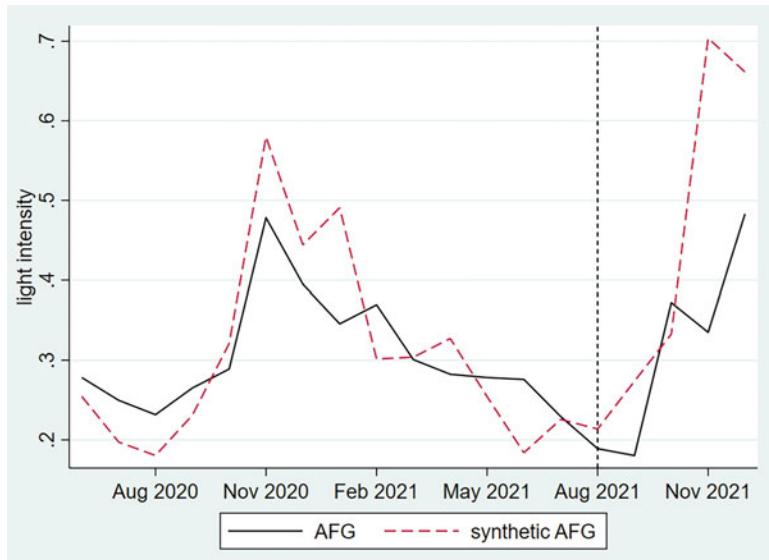


Fig. 8 Synthetic control method

the Gini index, the NLDI is used to measure the dispersion of a variable across a population, region, or nation in order to determine the inequality distribution, and it takes values in a range from 0 (equality in distribution) to 1 (Elvidge et al., 2012). One of the advantages of this measure is that it can be computed at the country, subregional, and grid levels. By using national-level NLDI, Elvidge et al. (2012) found strong correlations with the Human Development Index, electrification rates, and poverty rates, while the NLDI does not correlate with the traditional income Gini. They conclude, in fact, that NLDI is a form of development index rather than a monetary index. Ivan et al. (2020) found that the NLDI calculated from nighttime light (NTL) satellite images proved to be a good proxy for the real-time measuring of economic output in Romania. Levin and Zhang (2017) by analyzing the Central Asian countries of Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, and Turkmenistan discovered that per capita lighting is related to per capita GDP.

The NLDI takes values 1 when inequality is at its maximum. Overall, a decrease in inequality was detected during conflict months, followed by an increase in inequality from October onward (Fig. 9). A plausible interpretation suggests that the conflict had a larger impact on relatively wealthier areas, while under the Taliban regime, poorer areas have seen a decrease in light intensity per capita, thus increasing inequality. At the district level (Fig. 10), it can be observed that from April to September 2021, the light intensity distribution in the central and central-east areas becomes more unequal (this can be seen as a shift to darker red in Fig. 10).

Despite empirically observing that the variation in NTL is different in the year of the conflict with respect to the previous year, further investigations should be

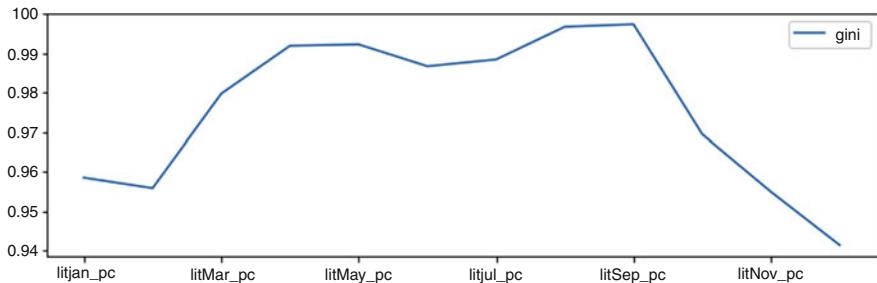


Fig. 9 Gini index at the country level for January–December 2021

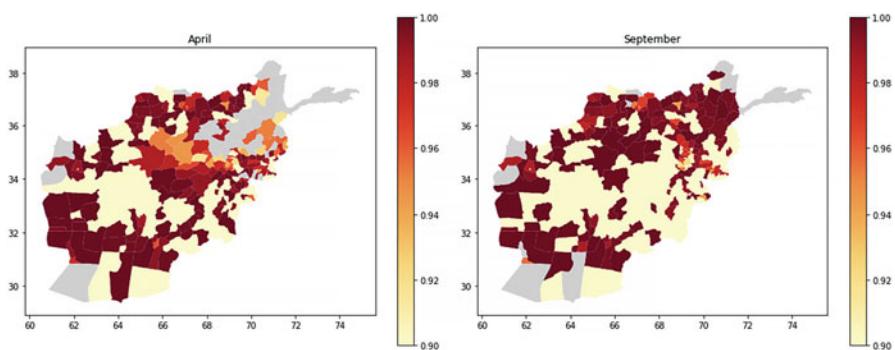


Fig. 10 Gini index measures the inequality distribution among sub-provinces (Administrative level 2) comparing April and September 2021

conducted to exclude the seasonal effect as a possible cause of the NLDI variation, for example, comparing annual data that are free from seasonal effects.

Conclusion

In this chapter, it was examined how different remote sensing tools play a role in relief, reconstruction, and recovery support after a natural or human-made disaster. Starting with satellite images and UNOSAT damages classification, it was discussed how remote sensing tools help to identify the most affected areas. Indeed, knowing where is optimal to address the disaster assessment efforts can save time and costs and produce tangible benefits for rapid and effective decision-making for relief and recovery. Moreover, having precise information about the location of the buildings makes it easier to identify those that are damaged. Even when it is not feasible to collect information for every damaged building or afflicted household, this information can support an effective random sampling to obtain a representative analysis. Population estimates generated by satellite images are another way to obtain a representative sample, especially when a study on the socioeconomic impact of a

disaster lacks of an up-to-date sample frame. High-definition population distribution maps can tell us about the distribution of the population and build representative samples to support primary data collection. Finally, it was observed how elaboration of satellite images, like nighttime lights, can provide data about socioeconomic factors in the case of the impact of institutional instability in Afghanistan. Such data have the advantage of a high geographic definition and timely availability. On the one side, there is a benefit from almost real-time hyper-localized indicators, but we must also consider the implicit assumption that the use of such remote sensing tools implies. For example, the use of nighttime lights is founded on the thesis that nighttime lights change along with socioeconomic indicators. Even if the correlation between nighttime lights and economic activities is well accepted by the academic community, nighttime lights remain a proxy for socioeconomic outcomes, and other unobserved causes can concur to a variation in nighttime lights. For this reason, traditional data collection plays an essential role in corroborating unconventional data applications. Remote sensing tools can provide rapid information to coordinate the intervention and in a second moment optimize the data collection plan, while primary data collection can integrate and verify the results obtained from the remote sensing data acquisition.

All considered, it is undeniable that remote sensing is a crucial tool in damage and socioeconomic assessments. Not only it is cost- and time-effective, but it also opens new frontiers to the exploration of data and methodologies that can shed light on critical events that afflict developing countries. The low cost of acquisition, standardization in data production, global availability, and robustness of validity allow to conduct multiple analyses and provide a well-rounded description of a natural or human-made disaster. For instance, an event can be studied in its temporal and spatial dimensions, observing how economic activities, emissions, and population movements reacted. In conclusion, there is an expectation that the increasing adoption of remote sensing generated data will find more applications in contexts where several inexpensive – although uncertain – measures can substitute single expensive measures.

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Big Data and Multi-platform Social Media Services in Disaster Management

40

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Contents

Introduction	574
Related Work	575
Architecture and Deployment of a Multi-platform Social Media API	577
Scenario I: Coordination of the Emergency Response in Volunteer Communities	578
Scenario II: Improving the Interaction between Emergency Services and Volunteer Communities	580
Scenario III: Enhancing the Situational Awareness of Emergency Services	582
Discussion of Challenges	584
Multi-platform Gathering and Management of Social Media Data	585
Mitigating Information Overload by Relevance Assessment and Message Grouping	586
The Context Dependency of Credibility and Information Quality Assessment	587
User-Centered Tailorability and Data Operations	588
Conclusion	588
References	589

Abstract

The use of social media today is not only ubiquitous and an integral part of everyday life but is also increasingly relevant before, during, or after emergencies. Data produced in these contexts, such as situational updates and multimedia content, is disseminated across different social media platforms and can be leveraged by various actors, including emergency services or volunteer communities. However, the dissemination of several thousand or even millions of messages during large-scale emergencies confronts analysts with challenges of

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information quality and overload. Hence, crisis informatics as a research domain seeks to explore and develop systems that support the collection, analysis, and dissemination of valuable social media information in emergencies. This chapter presents the social media API (SMA), which is a multi-platform service for gathering big social data across different social media channels and analyzing the credibility and relevance of collected data by the means of machine learning models. Based on the lessons learned from both the implementation process and user-centered evaluations in multiple emergency settings, this chapter discusses core challenges and potentials of the SMA and similar services, focusing on (1) the multi-platform gathering and management of data, (2) the mitigation of information overload by relevance assessment and message grouping, (3) the assessment of credibility and information quality, and (4) user-centered tailorability and adjustable data operations.

Keywords

Big social data · Social media · Crisis informatics · Information refinement · Multi-platform services

Introduction

As of today, social media are not only well established for a variety of purposes in everyday situations (Robinson et al., 2017) but are also used during natural and man-made crises and conflicts as a valuable source of information (Reuter & Kaufhold, 2018; Riebe et al., 2021). Social media services coupled with smartphone technologies offer a permanent opportunity to create and gather valuable information, such as situation updates, eyewitness reports, multimedia files, or public mood information, anywhere at any time in large quantities. Thus, the multidisciplinary field of crisis informatics has combined knowledge, methods, and theories from computer and social science to investigate the effective usage and development of information and communication technology for the mitigation, preparedness, response, and recovery regarding critical situations (Palen & Anderson, 2016). Even though the emerging *big social data* (Olshannikova et al., 2017) has the potential to enhance emergency services' situational awareness (Vieweg et al., 2010) and establishes new bidirectional communication channels with both citizens and volunteer communities (Kaufhold & Reuter, 2016), the adequate deployment or implementation of *social media analytics* still presents a challenge (Stieglitz et al., 2018). Not only is relevant data scattered across numerous social media platforms (Hughes et al., 2014; Reuter et al., 2015a), but also technical or business-oriented restrictions limit data access (Reuter & Scholl, 2014), and the analysis of data must conform with the data exchange formats used (Reuter et al., 2016b). Furthermore, issues of chaotic use, serious information overload, and low information quality arise during emergencies and thus reduce potential contributions to emergency managers' situational awareness (Kaufhold, 2021; Kaufhold et al., 2019; Plotnick & Hiltz, 2018).

This chapter introduces related work on the challenges and potentials utilizing big social data by the means of social media analytics in the multidisciplinary field of crisis informatics. Based on this, it presents the architecture and development of the social media API (SMA), which is a multi-platform service for the gathering, processing, storage, and querying of social data from Twitter, Facebook, Flickr, Instagram, Reddit, Tumblr, and YouTube. The SMA has been deployed over several years in various application scenarios of the crisis management domain to evaluate its practical applicability, potentials, and limitations. Thus, this chapter continues with a discussion of our experiences and findings with respect to both the gathering of social media data across multiple platforms and their subsequent preparation for analysis. The results highlight that conversion and processing of heterogeneous social data into a unified data format are feasible (specification), although some metadata must be computed for comparative analysis if it is not provided by the source platform (comparability). It is shown how machine learning can be utilized to identify credible and relevant emergency information (classification), even though the context-dependent and highly individual character of information quality must be considered when analyzing social data (interpretability). In order to align tools with end-user objectives, sufficient search options and filter parameters (tailorability) using logical query operators (queryability) are required. Still, our findings show that social media platforms are subject to continuous change. Thus, frequent adjustments of social media tool implementations are required (adjustability).

Related Work

The increasing dissemination of mobile devices and the growing use of social media, such as Facebook or Twitter, led to the emergence of the term of *big social data*, which “is any high-volume, high-velocity, high-variety, and/or highly semantic data that is generated from technology-mediated social interactions and actions in digital realm, and which can be collected and analyzed to model social interactions and behavior” (Olshannikova et al., 2017). In addition to the regular usage of social media platforms, a variety of application programming interfaces (APIs) render the automatic retrieval and processing of large quantities of data feasible. In response, social media analytics has emerged as a novel research field, which is concerned with the process of collecting, analyzing, and interpreting social media data with regard to involved actors, entities, and relationships (Choi et al., 2020; Stieglitz et al., 2014). To achieve these goals, different methods and tools are combined, enhanced, and modified for the analysis of big social data (Fan & Gordon, 2014; Holsapple et al., 2018; Lee, 2018; Stieglitz et al., 2018). Especially against the background of large-scale emergencies that result in the dissemination of vast quantities of messages on social media (Reuter et al., 2019), this research area becomes increasingly important as emergency services are faced with the issues of severe information overload and poor information quality. Information overload can be induced by a number of issues, including personal factors; characteristics and parameters of information, tasks, and processes; organizational design; or particular information technologies

Table 1 Overview of existing mitigation techniques for information overload during emergencies, crises, or disasters

Technique	Description
Keyword search engine	Execution of simple keyword searches or complex searches using Boolean operators such as “AND,” “OR,” and “NOT,” either in embedded web interfaces or by using search APIs (Imran et al., 2015)
Metadata filtering	Filtering of information by different types metadata, e.g., social media platform, language, time, or location, often in combination with search functionalities (Kaufhold et al., 2020b)
Interactive visualizations	Usage of interactive visualizations, e.g., timelines, charts, maps, or word clouds, that enable a reduction of the displayed data to a particular subset using a specific gesture (Onorati et al., 2018)
Message classification	Application of supervised machine learning models for the classification of information in terms of relevancy (Mohanty et al., 2021) or according to humanitarian categories (Alam et al., 2020)
Message clustering	Categorization of similar text documents into groups utilizing similarity metrics and unsupervised machine learning techniques (Bayer et al., 2021; Fahad et al., 2014; Huang et al., 2021)
Information summarization	Use of automated and real-time algorithms based on extraction or abstraction techniques to generate comprehensive information summaries of individual disaster events (Rudra et al., 2018, 2019)

(Eppler & Mengis, 2004; Roetzel, 2019). In light of the characteristics of information and technology, information overload can be defined as “[too much] information presented at a rate too fast for a person to process” (Hiltz & Plotnick, 2013). Research has identified numerous potential consequences of information overload (Bawden & Robinson, 2020), including the risks of getting distracted by data material irrelevant to the current task, as well as of processing and presenting data in an inappropriate way (Keim et al., 2008).

Past research in crisis informatics studied and developed multiple techniques and artifacts for the mitigation of information overload during large-scale emergencies (Table 1). An initial and intuitive step for the identification of relevant (and the exclusion of irrelevant) information is the utilization of *search engines* that enable searches with basic keyword-based or complex Boolean queries. Whereas these are directly accessible to regular users of social media platforms, platform search APIs enable developers the integration of acquired results into more advanced third-party applications (Imran et al., 2015). These types of applications frequently enhance search engines with the option to *filter information* by different types of metadata, including social media platform, language, time, or location (Kaufhold et al., 2020b). Furthermore, *interactive visualizations* (e.g., timelines, charts, maps, or word clouds) facilitate the reduction of the displayed data using specific gestures (Onorati et al., 2018).

Furthermore, machine learning algorithms may offer assistance for the identification of relevant information after data collection. For instance, supervised machine learning techniques are often applied for *message classification* tasks, such as the binary classification of information relevancy for a specific type of emergency (Habdank et al., 2017; Mohanty et al., 2021) or the classification of information

according to humanitarian categories, including infrastructure and utilities, donations and volunteering, affected individuals, sympathy and support, caution and advice, other types of useful information, or not applicable (Alam et al., 2020; Burel & Alani, 2018; Pekar et al., 2020). Still, these techniques are often not universally applicable (i.e., designed for specific events), and their performance is dependent on the time-consuming labeling of data as well as the adequate training of models. In contrast, *message clustering* techniques categorize similar messages into groups utilizing similarity metrics and unsupervised machine learning techniques, thus not requiring labeled data for training (Bayer et al., 2021; Fahad et al., 2014; Huang et al., 2021). Existing research found that the “chunking” of messages from social media by distinct tools can have a positive effect on the disposition of emergency managers to utilize social media in emergencies (Rao et al., 2017). Since clusters often are not self-explanatory, they require a useful summary of the clusters’ contents or a descriptive labels (Gründer-Fahrer et al., 2018). Thus, automated and real-time algorithms using extraction or abstraction techniques for *information summarization* can be applied to generate summaries of entire datasets or subsets of events (Rudra et al., 2018, 2019).

Besides the rich availability of techniques to deal with issues of information overload and quality, a market study of 45 tools for social media analytics (Kaufhold et al., 2020b) highlights that most solutions are designed for commercial purposes and thus are not tailored for the objectives of the emergency management domain. Although they often provide multi-platform capabilities for communication and monitoring, they lack algorithms for detecting credible or relevant information in emergencies. While expert tools such as AIDR permit the annotation of data, enable the classification of disaster-relevant information in Twitter (Imran et al., 2014), and can be combined with an interactive monitoring dashboard to enhance situational awareness (Aupetit & Imran, 2017; Onorati et al., 2018), it still requires multi-platform tools – tested in user-centered evaluations – to support (I) the coordination of emergency response in volunteer communities, (II) the interaction between emergency services and volunteer communities, and (III) the situational awareness of emergency services.

Architecture and Deployment of a Multi-platform Social Media API

The SMA enables the gathering and processing of big social data. Using the underlying social media platforms as foundation, it comprises several services that can be leveraged by different client applications. Though initially intended as an enabling technology for emergency management, its design enables the support of a multitude of use cases in different application domains. To facilitate the acquisition of big social data and subsequent analysis, our initial step was the specification of a service for the gathering and processing of social media content. *Gathering* in this context refers to the capability to conduct one-time searches or to continuously aggregate social media activity (e.g., posts, news, or photos) from multiple platforms (Twitter, Instagram, Facebook, Reddit, Flickr, YouTube, and Tumblr) in a uniform

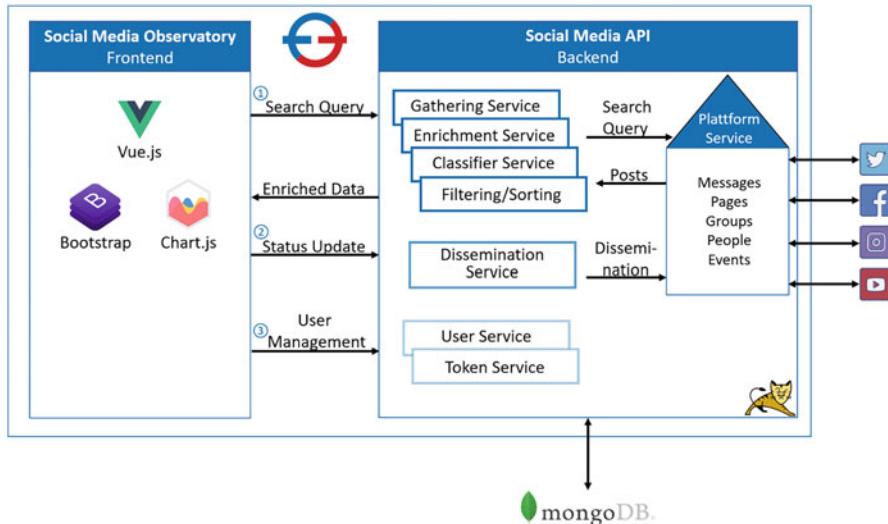


Fig. 1 Social media API architecture in conjunction with the Social Media Observatory client application. (Kaufhold et al., 2020a)

manner leveraging multiple search queries or filtering criteria. Moreover, *processing* refers to the SMA's capability to access, manipulate, enrich, store, and disseminate social media activities.

The SMA is implemented as a web-based application following a service-oriented architecture (Fig. 1). Designed as a Java Tomcat application, it utilizes the Jersey Framework for REST services and the MongoDB database for document-oriented data management. The underlying social media platform APIs, such as the Twitter Search API or the Facebook Graph API, are integrated by means of multiple libraries. To accommodate the diversity of data access and structures, the Activity Streams 2.0 Core Syntax (AS2) is used to process and store all gathered social media activities. Moreover, the SMA leverages Java interfaces that enable standardized implementations of additional social media, provided their APIs offer suitable data access. Although there are multiple service templates, developers must apply the *message service interface* as the basic template, which requires the implementation of four methods to search for multiple messages as well as to get, modify, or delete a single message. The SMA serves as foundation for multiple client applications which were deployed for three different scenarios.

Scenario I: Coordination of the Emergency Response in Volunteer Communities

Independently of the actions taken by official emergency services, volunteer communities often spontaneously emerge and complement relief efforts by performing tasks such as dike building and the distribution of material donations (Kaufhold & Reuter, 2016).

These tasks are increasingly coordinated across multiple social media. Therefore, a Facebook application named XHELP was developed allowing users to gather and disseminate information across media (e.g., Twitter and Facebook) and across channels (e.g., Facebook pages and groups) (Reuter et al., 2015a). It is specifically designed for digital moderators in emergency contexts who coordinate volunteers and material resources by providing an overview of their own joined groups, liked pages, and published posts. The central dashboard “My Posts” (Fig. 2) displays an overview of the user’s communication threads, comprising not only posts created with XHELP but also comments and posts set up on the source platform. The user has the options of (1) collapsing or expanding comments on a communication thread, (2) responding to any or deleting own comments, and (3) removing or finalizing own communication threads. The finalizing functionality offers the user the opportunity to draft a posting to notify relevant groups, media, and pages (e.g., if an emergency-related problem is solved). Subsequently, the post will disappear from the central dashboard but will still be accessible from the navigation bar. In addition, the cross-media search enables looking for publicly and privately (e.g., if the user belongs to a closed Facebook group) shared Facebook and Twitter posts and filtering them by time, geolocation, and radius. Due to the Social-QAS integration, the user may also sort their search results according to particular evaluation criteria.

Despite the content management features of XHELP, it is often hard for volunteer communities to find high-quality information that is tailored according to their specific situational needs. A social quality assessment service (Social-QAS), which strives to facilitate the assessment of social media content through the customizable weighting of information quality criteria, was developed and integrated into the

The screenshot shows the XHELP application interface. On the left is a sidebar with navigation links: SEARCH, MY POSTINGS (Create new Posting, Exemplarisch Gesuch), PRIVATE MESSAGES (Other Messages), GROUPS (Privates Helfer- und Hilfenn..., HJA Uni Siegen, Test der Applikation Freiwi..., Orkan Xaver - Hilfe um Laue..., Testgruppe 2014-02-04, UNI SIEGEN, Hochwasser Magdeburg - Hilf..., Hochwasser 2013 Helfen, spe..., HochwasserNiedersachsen - B..., Risiko Evolution), PAGES (Gemeinschaft unabhängiger T..., Hochwasser Niedersachsen), and SETTINGS. The main area is titled 'DESCRIPTION' and contains text about the application's purpose and features. Below this is a section titled 'MY POSTINGS' which lists several posts with their details and status indicators (green checkmark, red X, blue arrow).

Post Details	Status
Marc-André Kaufhold (Exemplarisch Gesuch) Ein exemplarisches Gesuch! Sun, 09 Mar 2014 10:38:39 GMT published in: Orkan Xaver - Hilfe um Lauenburg, Testgruppe 2014-02-04, Twitter	
Georg Watzke: Eine Rückfrage. Sun, 09 Mar 2014 10:41:07 GMT in Orkan Xaver - Hilfe um Lauenburg!	
Marc-André Kaufhold: Ja genau! Sun, 09 Mar 2014 10:42:20 GMT in Orkan Xaver - Hilfe um Lauenburg!	
@DietWendehals: @SoMeFreiwKoord Eine Antwort! Wed, 23 Apr 2014 11:47:07 GMT in twitter	

Fig. 2 Social Media Volunteers-Coordination (XHELP) for community interaction and dissemination of social media messages

SMO to mitigate these issues (Reuter et al., 2015b). Since the diverse circumstances of emergencies necessitate differing methods of assessment, the opportunity to combine these techniques could contribute to the improvement of quality assessment practice (Ludwig et al., 2015a). The concept encompasses 15 methods for the assessment of social media content, subdivided into four groups: metadata (author frequency, temporal proximity, local proximity, followers/likes, media files), content (frequency of search keywords, stop words), message classification (sentiment analysis, negative and positive sentiment, named entities, emoticons, slang), and scientific methods (term frequency-inverse document frequency, Shannon information theory). Social-QAS allows end users to determine the subjective information quality by selecting and weighting several evaluation methods. As part of an exemplary implementation in XHELP, users have the option of searching for information based on various quality parameters in order to conduct a quality assessment (Fig. 3). For this purpose, users can select and weigh assessment dimensions by the means of sliders.

Scenario II: Improving the Interaction between Emergency Services and Volunteer Communities

Although volunteer communities have the potential to make valuable contributions to crisis response, the sometimes chaotic and dangerous activities of citizens initiated via social media may lead to an increased complexity of tasks, uncertainty, and

The screenshot shows the 'SOCIAL MEDIA VOLUNTEERS-COORDINATION' interface. On the left, there are sections for 'SEARCH', 'MY POSTINGS', 'PRIVATE MESSAGES', 'GROUPS', 'PAGES', and 'SETTINGS'. The 'SEARCH SETTINGS' panel on the right contains fields for 'Search Term' (set to 'Pege'), 'Set Networks' (Facebook, Twitter checked), 'Define Period' (2013-12-02 00:00 - 2013-12-09 00:00), 'Select Location' (Hamburg, Deutschland), 'Search Perimeter (km)' (50.0), and a 'Search' button. Below these are sections for 'Evaluate Message Metadata', 'Evaluate Message Content', 'Evaluate Message Classification', and 'Evaluate with Scientific Methods', each with a slider from 'nonrelevant' to 'relevant'. At the bottom, the 'SEARCH RESULTS [54]' section shows two entries: 1. A tweet from @welt about a flood in Hamburg. 2. A post from Xaver (@orkantief_Xaver_aktuell) about a flood in St. Pauli.

Fig. 3 The social quality assessment service (integration in XHELP) for tailorabile data assessment during gathering and post-processing

pressure for emergency services (Perng et al., 2012). Thus, it is of utmost importance that the activities of both emergency services and volunteer communities are well-aligned. In an effort to improve their interaction, the web application CrowdMonitor (Fig. 4) was designed to enhance the meaningfulness of spontaneous volunteers' activities for emergency services during emergencies (Ludwig et al., 2015b). One challenge in crisis management is to gain awareness of activities of spontaneous volunteers and to coordinate these activities with those of the formal emergency services. To this end, the tool combines collective processes tracked through social media by the SMA with individual activities sensed by mobile devices. First, CrowdMonitor applies the SMA to allow responders the passive collection and display of information from social media (generated by ordinary people without their knowledge). Second, requests for specific information or targeted alerts can be created, which subsequently can be sent to users of a corresponding mobile app (within a specified area). Thus, CrowdMonitor combines the potential of a synchronized view of mobile-gathered data and information acquired on social media with additional capabilities to interact with people in order to provide situation pictures and reports during emergencies.

In long-term and large-scale emergencies (e.g., forest fires or floods), a large number of volunteers come together to help those affected. On the one hand, the helpers coordinate online within social media, but on the other hand, they travel physically to the site, where a number of local activities are also required. While CrowdMonitor is an interface designed for emergency services, important information about the ongoing event as well as current offers and requests for help must be disseminated to both the affected population and volunteers on-site. To this end, the public display application City-Share (Fig. 5) maintains a robust infrastructure for

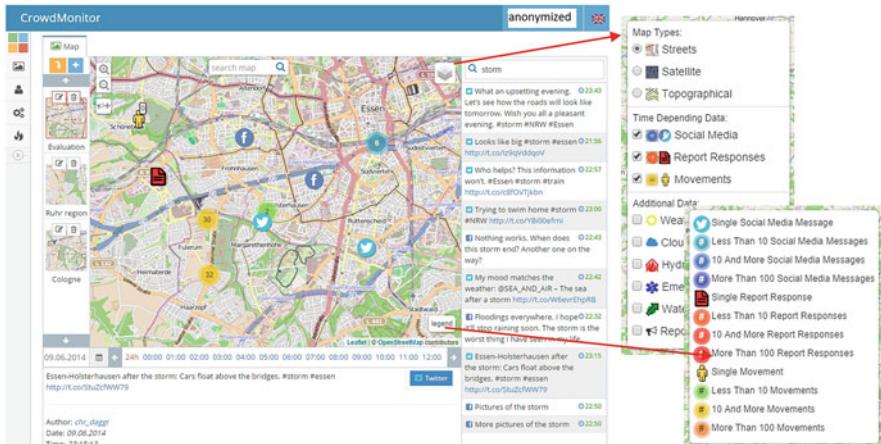


Fig. 4 The CrowdMonitor interface for combining social media content and emergent civil on-site activities

News

Fahrradlieb mit Widerstand
Polizisten haben Montagnacht einen Fahrradlieb in der Innenstadt auf frischer Tat ergrappt und festgenommen.
21.06.2016 um 10:25

Mysteriöser Einbruch in die Kieler Ansagarkirche
Entsetzen in der Heiligengeist-Gemeinde. Dreiste Diebe brachen in der Nacht zum Dienstag durch ein Seitenfenster in die Ansagarkirche in Kiel ein, hebelten dann mit massiver Gewalt ein Panzerglasfenster in einer Kirchenaußenwand auf und stahlen...
22.06.2016 um 08:13

Angebote & Nachfrage

Nachfrage

von Declan Bailey
17.05.2017
um 19:09

34 Helfende
2 Kommentare

#9

Hilfe bei Zeltaufbau benötigt

Willkommen! we're a group of microsatellite farmers next level distillery microdosing. Drinking vinegar chillwave kombucha, crucifix elixir you probably haven't heard of them. Review our website for more information about subway tile gluten-free ethical, pickled schlitz keytar. Rap pok pok thundercats, brunch twice viral food truck jandalis toso slow-carb hashtag banh misrule paroxysm hedonist.



02.07.2016 um 09:34

Angebot

von Libby Morris
17.05.2017
um 09:32

6 Kommentare

#10

Biete helfende Hände

Barley, jalapeño, hibiscus, eric crucifix wajitoat willkommend small batch helvetica big four dollar toast next level distillery microdosing. Drinking vinegar chillwave kombucha, crucifix elixir you probably haven't heard of them. Review our website for more information about subway tile gluten-free ethical, pickled schlitz keytar. Rap pok pok thundercats, brunch twice viral food truck jandalis toso slow-carb hashtag banh misrule paroxysm hedonist.



Hotspots

Gefahrenbereich: Bahnhof
Aufgrund einer akuten Terrorwarnlage bitten die Bundespolizei um weitläufige Meidung des Bereichs Siegen Zentrum, insbesondere Hauptbahnhof.



02.07.2016 um 09:34

CityShare LiveFeed

#Niederrottenhausen:
Akutlage nach Dammbruch auf 20 Metern

10:17
17.05.2017

Fig. 5 The City-Share application for managing the tasks of spontaneous volunteers through public displays

communication and additionally incorporates situated crowdsourcing mechanisms to manage offers and requests related to on-site activities (Ludwig et al., 2017).

In this process, relevant information from social media is displayed based on the SME and is used to help coordinate volunteers. At the same time, important location-related information, such as warnings or assembly points, is provided. City-Share helps to improve disaster resilience in communities, particularly in terms of a collaborative type of resilience that emerges at the local level between official actors and spontaneous volunteers or involved citizens.

Scenario III: Enhancing the Situational Awareness of Emergency Services

Thousands of potentially relevant messages may be disseminated during an emergency, which can result in information overload. The Emergency Service Interface (ESI) was developed to improve emergency managers' situational awareness and decision-making by “transferring high volume, but unclear information content into low volume and rich content suitable for emergency services” (Moi et al., 2015). The central dashboard (Fig. 6) combines *app alerts*, which are received from a separate mobile emergency application (Kaufhold et al., 2018), and *social media alerts*, which are computed based on the data provided by the SMA (Kaufhold et al., 2020b; Reuter et al., 2016a), in a map and list view. Social media alerts consist of a set of classified messages with a similar context, which is determined by event type, platform, language, keywords, relevancy, quality, time, and location. Each alert

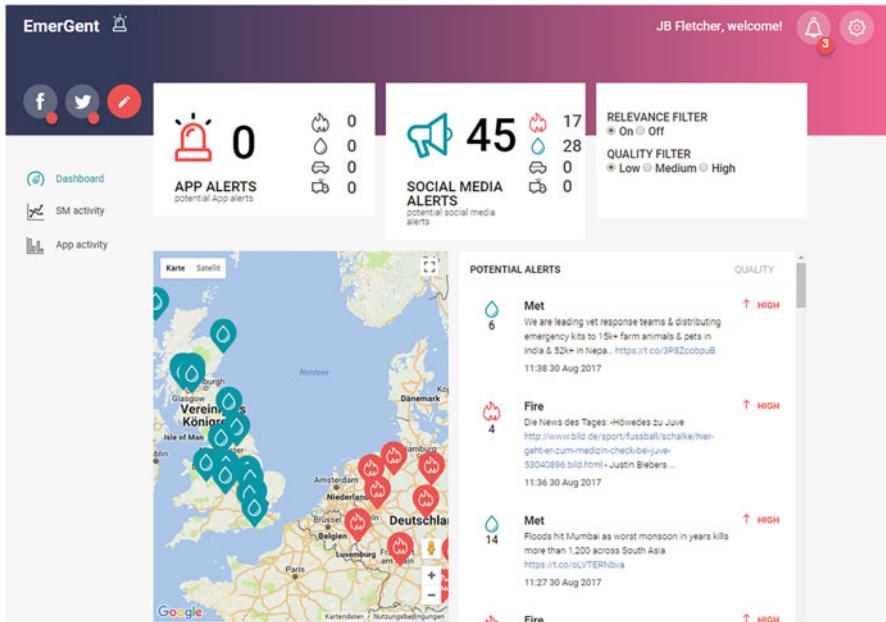


Fig. 6 Emergency Service Interface (ESI) for mobile and social media alerts

consists of multiple messages from different social media if they belong to the same setting. However, several steps are conducted before messages are grouped into alerts. After an initial data gathering and keyword-based filtering, relevance classifiers (e.g., for fire and flood scenarios) are used to reduce irrelevant information. Then, an information quality component measures the believability, completeness, relevancy, timeliness, and understandability of the remaining messages before they are grouped into social media alerts and directed to the interface. On the interface level, emergency managers can enable or disable both the relevance and quality filters and also click on alerts to investigate the individual messages.

Despite the generally positive reception of the ESI by involved emergency services, the tool lacked the capability to configure and tailor the analysis according to end-user requirements (Kaufhold et al., 2020b). The Social Media Observatory (SMO) is an interface that enables end users to monitor, analyze, and classify social media messages (Kaufhold et al., 2020a). More specifically, it facilitates the creation of social media datasets (based on one-time or continuous searches of the SMA), management of SMO users (e.g., to create, edit, or delete users), creation of machine learning classifiers, and dissemination of messages. In its first version, the SMO was simply an interface for the SMA to create and manage social media datasets (Reuter et al., 2016b). Now, its central feature is a real-time capable dashboard (Fig. 7) that displays characteristics of the loaded dataset (e.g., number of results, post frequency, sentiment, media, and language) besides visualizing posts on a map and in social feeds. If no exact location (green markers on the map) is given, named entity

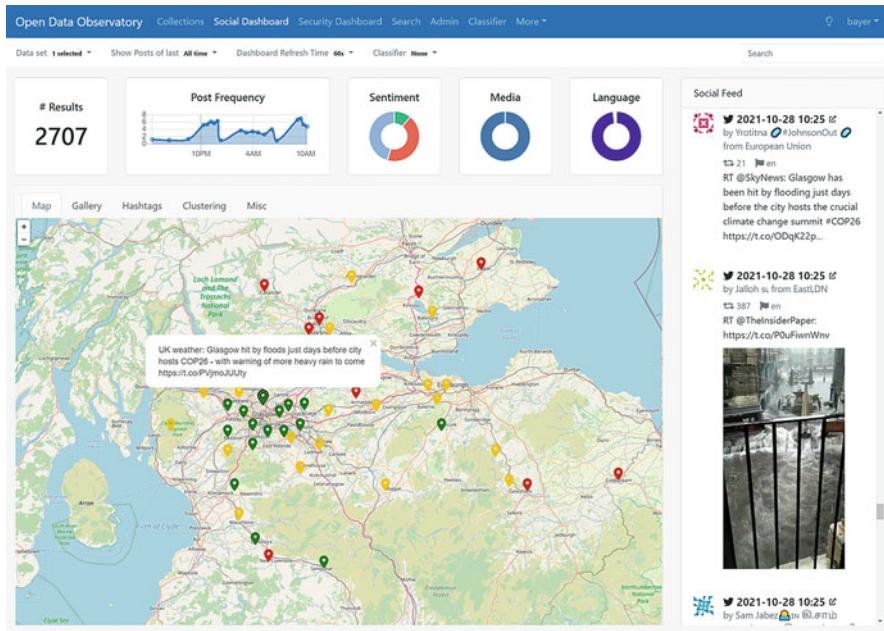


Fig. 7 Social Media Observatory (SMO) dashboard with interactive charts, feed, and list view

recognition is used to attempt extracting location information from either the individual post (yellow markers) or the author's profile (red markers). However, posts without a location will be displayed in the social feed only. Alongside with some basic settings (e.g., dashboard refreshing time), the dashboard supports visual interactive filtering (e.g., by clicking on the red part of the sentiment pie charts, only messages with negative sentiment are displayed in the interface). Furthermore, the SMO features an annotation tool to create datasets for machine learning classifiers. In this way, classifiers for credibility and relevance assessment can be designed and used to filter out unreliable and irrelevant information from the dashboard view. Additionally, the interface allows emergency services to correct algorithmic misclassifications to improve the classifiers' accuracy.

Discussion of Challenges

In order to evaluate these client applications individually, cognitive or scenario-based *walkthroughs* requesting participants to “think aloud” (Nielsen, 1992) were combined with follow-up semi-structured *interviews* to encourage the reflection on the evaluation procedure. For the results of both the walkthroughs and interviews, audio recordings and transcripts as material for a subsequent “open coding” analysis (Strauss & Corbin, 1998) were created. The evaluations’ philosophy followed the

Table 2 Key evaluation topics for client applications of the social media API

	Multi-platform usage	Information overload	Information quality	Tailorability
XHELP (N = 20)	×			×
Social-QAS (N = 20)	×	×	×	×
CrowdMonitor (N = 28)			×	
City-Share (N = 27)	×	×		×
Emergency Service Interface (N = 33)	×	×	×	
Social Media Observatory (N = 12, D = 2)	×	×	×	×

notion of “situated evaluation” (Twidale et al., 1994) drawing on qualitative methods and the involvement of domain experts to derive conclusions about real-world technology usage. Furthermore, machine learning algorithms for credibility and relevance assessment were evaluated with regard to accuracy, precision, recall, and time (Kaufhold et al., 2020a, 2021a). In both cases, the most suitable models were integrated into the SMO. Based on the lessons learned, the upcoming section presents potentials and obstacles of the multi-platform gathering and analysis of social media data (Table 2).

Multi-platform Gathering and Management of Social Media Data

Keyword parameters represent a problem for querying data across multiple social media platforms since the APIs of different platforms support various differing notations and types of logical query operators, such as OR, AND, NOT, parentheses, or phrases. Thus, there is a necessity for a uniform query language and layer that facilitates the translation of the uniform parameters to their platform-specific equivalents. Whereas Twitter and YouTube employ a uniform query syntax for basic logical operators with their API, Instagram’s API does offer a functionality for searching individual tags within media descriptions instead of keyword-based searches, and Facebook’s Graph API is restricted to the AND operator. For both platforms, this necessitated a downstream implementation of logical operators using the parser generator ANTLR. For example, the conjunction OR was transformed into several individual requests to the API. However, this resulted in a faster quota limit exhaustion (Reuter & Scholl, 2014) due to the greater quantity of sent requests (OR) and the acquisition of irrelevant data (NOT). Particularly in the case of quota-limited APIs, such downward implementations can reduce the access to available data.

The diverse social media platforms not only provide numerous information types such as multimedia files text and metadata (e.g. the number of retweets or interactions) but are often subjected to differing standards (e.g. tweets are restricted to a maximum of 280 characters). During our research on a common and standardized

approach for the representation and storage of gathered social media information the AS2 format in combination with MongoDB was found to be best suited for the task. While the flexibility of MongoDB's document-oriented approach enables the storage of clearly structured documents with a varying quantity of attributes AS2 follows an interoperable specification for the storage of attributes. However the possibility to compare and analyze social media activities is constrained with regard to diverging metadata. As it was impossible to map all attributes to the AS2 specification it was necessary to implement a custom class with divergent attributes for the mapping of platform-specific metadata such as the number of likes or retweets.

Besides, there exist two further valuable data types apart from publicly available data. First, data that is restricted to a distinct social media platform can be computed for the others. For example, there is the possibility to extract embedded mentions, hyperlinks, or tags from social media activities if not provided by metadata. Second, individual social media platforms lack some data required for quality assessment operations. Thus, the SMA is capable of manually computing classification attributes (slang conversion, emoticon conversion, positive or negative sentiment), content attributes (number of words, number of characters, words-to-sentences ratio, average length of words, entropy, number of syllables per word, number of punctuation signs), and metadata attributes (media files, location, tags, hyperlinks, language). Nonetheless, there are limitations to standardization, as it is uneconomical to map all available metadata attributes across all social media platforms into a singular specification. Against this backdrop, the storage of the native format as a string attribute per activity could be a feasible approach. This may also facilitate the transfer of data to client applications that support only certain native data formats.

Mitigating Information Overload by Relevance Assessment and Message Grouping

The presented client applications demonstrate several measures to reduce information overload during emergencies. For instance, a sophisticated information processing pipeline was established in the backend of ESI, which first gathers social data by keywords and metadata, then filters out irrelevant and incredible information using machine learning, and finally groups the remaining messages into social media alerts. By reducing social media content into alerts, the amount of displayed information on the ESI was reduced significantly. In their base implementation, social media alerts combine messages from all implemented platforms that are only connected by geographic and/or chronological proximity (i.e., Euclidean distance) since a more sophisticated clustering approach could not be realized within the scope of the project. A click on the alerts allows the user to inspect details on demand, i.e., to show the individual messages grouped into an alert. However, since the focus of the project was a human-centered evaluation of the tool, the used relevance classifiers were based on naïve Bayes, and the same classifier, which only achieved moderate classification accuracies, was applied to all implemented social media platforms (Kaufhold et al., 2020b). While the use of weak-performing classifiers

might result in the overlooking of important information by emergency managers, another challenge lies in the time-consuming nature of annotating machine learning datasets – in our case, ideally for a high-classification performance across multiple platforms – under the time-critical constraints of emergencies.

To address these issues, first, a random forest algorithm with good performance during relevance classification that incorporates social media metadata into a batch learning approach and, second, a novel relevance classification approach that includes active, incremental, and online learning to achieve a reduction of the required amount of labeled data and a correction of algorithmic misclassifications using feedback classification were developed (Kaufhold et al., 2020a). With the second approach, a well-performing classifier was created that requires only a quarter of the labeled data in comparison to the conventional batch learning approach. Still, since the classifiers were trained based on data from a single social media platform, further research is required on how well these perform on multi-platform data or how to design classifiers based on annotated multi-platform datasets. Furthermore, based on an improved relevance filtering, the grouping of similar messages into alerts could be further improved by more efficient (e.g., based on word embeddings) clustering algorithms (Bayer et al., 2021).

The Context Dependency of Credibility and Information Quality Assessment

The evaluations revealed issues of credibility and overall information quality on different levels and for most emergency scenarios. For instance, it was questioned whether the content of a post is actually relevant to a specific situation, whether a social media post's author is credible, or whether the location attached to a posted message has a sufficient level of detail. Furthermore, the context dependency and highly subjective character of information quality notions became apparent. Therefore, it can be concluded that the “fit of information to specific tasks is more important than generic assessments of information quality” (Ludwig et al., 2015a). The credibility of social media data is one key dimension of information quality. The dissemination of false information and a varying credibility of authors frequently pose challenges for the analysis of social media messages. It is often challenging for inexperienced users to decide whether a social media message is reliable, trustworthy, and relevant.

Thus, a multi-platform service that gathers and analyzes social media data should provide more contextual information by enriching existing data. This could be determined, for instance, by measuring retweets or likes (e.g., as in Social-QAS). Based on an analysis of relevant contextual data, three deep learning models for the real-time credibility assessment of Twitter posts, all performing well during evaluation, were designed within the scope of the SMO (Kaufhold et al., 2021a). However, if the data collected via multi-platform services is not sufficiently contextual or if the information is untrustworthy (e.g., because an author lacks credibility or the location is too narrowly defined), there must be additional means to validate the (semi-)automatically processed information. This could be achieved by means of individualized reports

from the scene that broaden the knowledge base of situation awareness practices. The trustworthiness and quality of information can be increased by the implementation of preprocessed ranking and filtering of social media messages gathered across platforms as well as by the provision of advanced options for additional validation.

User-Centered Tailorability and Data Operations

Considering some SMA client applications (particularly SMO and Social-QAS), it also became apparent that a completely automated processing of big social media would not be sufficient to fulfill the end-user requirement of tailorability. Due to the subjective character of situational assessment, the SMA must possess a tailorability that allows the selection of relevant source platforms and quality assessment criteria. As a consequence, factors such as experience, personal feelings, and the situation itself have an impact on the information requirements. When gathering or analyzing information and developing information systems to support these tasks, one key question always arises: how can information systems be designed that, on the one hand, allow for automatic selection of relevant data and, on the other hand, give end users the freedom to customize this automation to enable a tailorable quality and relevance assessment in accordance with their requirements? This becomes even more important when application scenarios and work contexts vary and user practices evolve with time. Thus, concepts such as Social-QAS can facilitate the articulation of end users' requirements (Reuter et al., 2015b).

Providing suitable service endpoints with adequate filter parameters that remain consistent across heterogeneous social media is one major challenge. To some extent, the provided APIs determine the flexibility of filtering: whereas filtering by location (YouTube, Twitter) or time (YouTube, Twitter, Facebook) is supported by some social media APIs, this must be implemented manually for other platforms. Furthermore, social media platform APIs are subject to permanent development and a steady adaptation to changes is needed. Whereas minor and early announced changes, such as the temporary need for a Google+ account when using YouTube, can be accommodated more easily, others exert a significant influence on implementation. Major issues occurred due to Facebook's removal of the public post search (2015), which severely limited access to public data, as well as the shutdown of the Google+ service and YouTube's reduction of API request quota (2019). The progressively growing restrictions of researchers' data access are a constant challenge for developing and maintaining multi-platform social media services and were thus also labeled as an "APIcalypse" (Bruns, 2019).

Conclusion

Without doubt, social media are of great significance and interest to various stakeholders involved in emergencies, including official emergency services and communities of voluntary helpers. This chapter discusses the challenges and opportunities for utilizing big social data in emergencies and presents the development of an extensible

Table 3 Summary of the identified challenges for multi-platform social media services in emergencies

ID	Challenge	Description
C1	Specification	Most, yet not all, social media metadata can be stored in accordance with an interoperable specification, e.g., Activity Streams 2.0
C2	Comparability	The extraction or computation of metadata is sometimes necessary for cross-platform comparisons of (big) social data
C3	Classification	The creation of social media classifiers is time-consuming despite the time-critical constraints of emergencies, and classifiers must perform well on multi-platform datasets
C4	Interpretability	Interpretations of evaluative metadata, e.g., trustworthiness and information quality, are context-dependent and highly individual
C5	Tailorability	To address end users' objectives, the gathering of social data requires sufficient filter parameters (e.g., by location or time), which sometimes require a downstream implementation
C6	Queryability	Official social media APIs support a variety of logical query operators (e.g., AND, OR, and NOT), and the emulation of such operators often results in a high quota consumption
C7	Adjustability	Frequent modifications of official social media APIs, e.g., the Facebook or Instagram API, require corresponding adjustments or can cause the loss of data access

and standardized social media API (SMA), which supports the gathering, processing, and retrieval of acquired data from multiple social media platforms. The SMA has been deployed and evaluated in three scenarios to assist volunteers across social media (XHELP), facilitate the tailored quality assessment of social data (Social-QAS), combine social media with movements of volunteers for emergency services (CrowdMonitor), manage the tasks of spontaneous volunteers through public displays (City-Share), create social media alerts for emergency services (ESI), and filter for credible and relevant social data (SMO). Although the challenges for such multi-platform services are mostly determined by the research goals, client applications, and use cases, Table 3 outlines some of the challenges encountered in the evaluations.

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Role of Microblogs in Relief Operations During Disasters

41

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Contents

Introduction	596
Utilizing Social Media for Post-Disaster Resource Management: Opportunities and Challenges	597
Identifying Social Media Posts Informing About Needs of Resources or Availability of Resources	598
Understanding Social Media Posts That Inform About Need or Availability of Resources	600
Matching Resource Needs with Appropriate Availabilities	602
Conclusion	604
References	605

Abstract

Management of the distribution of emergency resources is a key requirement in the midst of any disaster. This task is especially challenging because of the lack of relevant firsthand information in real time. From discussions with professionals engaged in post-disaster relief operations, we understand that two specific categories of knowledge are crucial in a post-disaster situation – (i) resource-needs, i.e., what resources are required, and (ii) resource availabilities, i.e., what resources are available in the disaster-affected region or potentially available from elsewhere. The key question is how to get such information in real time in a post-disaster scenario. Online social media are renowned repositories of vital real-time information during disasters. Nevertheless, reliable and automated methods are needed to extract this important information which is usually hidden

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amid thousands of conversational posts. We have developed natural language processing-based methods for automatically identifying social media posts that inform about resource needs and resource availabilities and for understanding the semantics of such posts. We have also developed a method for matching resource needs with the resource availabilities that can potentially fulfill the needs. This chapter summarizes the methods we have developed for identifying and matching resource needs and resource availabilities from social media during post-disaster situations.

Keywords

Disaster · Online social media · Twitter · Resource management · Natural language processing · Neural models

Introduction

Due to the ubiquity of smartphones and handheld devices across the globe and availability of Internet connectivity during most of the disasters, relief workers as well as the affected population nowadays make frequent use of online social media (OSM) during disaster situations. Several recent studies have proven that OSM provides firsthand information from the affected population in real time during any mass emergency (Imran et al., 2015; Nazer et al., 2017; Li et al., 2017; Alam et al., 2018; Ghosh et al., 2018; Reuter et al., 2018, 2019). However, in OSM, often the presence of misinformation and conversational contents like prayer or sympathy for affected population and victims are more prevalent than the critical situation information. Thus, several studies focused on extracting various trustworthy critical information from the OSM, such as identification of situational information (Rudra et al., 2015, 2018; Zade et al., 2018), location extraction and tracking from social media posts during emergencies (Karimzadeh et al., 2013; Lingad et al., 2013; Paule et al., 2018), detection of rumors and fake news from social media posts (Mondal et al., 2018; Wang & Zhuang, 2018), detection of important events and event-specific actionable tweets from OSM during a disaster (Hasan et al., 2018; Laylavi et al., 2017), and use of social media in the diffusion of critical information during mass emergency (Kim et al., 2018). Social media has been shown to be useful in disseminating disaster information among the volunteers (Abedin & Babar, 2018) as well as in reaffirming the roles of various stakeholders (Liu & Xu, 2018).

In this chapter, we focus on utilizing OSM for post-disaster resource management during the relief operation. To ensure efficient management of resources using social media posts during a relief operation, we consider three related research problems in this chapter – (1) identifying social media posts informing about needs of resources or availability of resource, (2) understanding the posts that inform about need or availability of resources, and (3) matching the posts informing about resource needs with posts that inform about appropriate resource availability.

For the first problem of identifying resource need posts and resource availability posts, we experimented with unsupervised retrieval and pattern matching methods,

as well as supervised classification methods. For the second problem, we developed a natural language processing-based methodology to understand the semantics of resource need and resource availability posts. Finally, we developed a method for matching resource need posts with resource availability posts, considering both resource similarity and geographical distance between where the resource is needed and where it is available. We applied our proposed methods to tweets posted during several real-world disasters (e.g., an earthquake in Nepal, an earthquake in Italy, and floods in the city of Chennai, India) and observed that our methods work satisfactorily on such real-world data. We describe these works briefly in this chapter; further details are available in our prior works (Basu et al., 2018, 2019; Dutt et al., 2019).

Utilizing Social Media for Post-Disaster Resource Management: Opportunities and Challenges

When a natural disaster strikes, to save human life, the rational and efficient distribution of the emergency resources in real time becomes utmost priority. According to the World Disaster Report 2018, however, critical resources are *not* reaching millions of victims of natural disasters. To understand the challenges faced by responding authorities in distributing resources in the aftermath of a disaster, we consulted NGOs such as SPADE (<http://www.spadeindia.org/>) and Doctors For You (<http://doctorsforyou.org/>) who work in disaster-prone areas on a regular basis. The NGOs pointed out *the lack of real-time information on the need and availability of resources* as the major reason behind the fact that resources are frequently dispersed on an ad hoc basis without understanding how much resource is actually necessary or where it is needed. Hence the key question is from where such real-time information can be obtained.

Online social media (OSM), such as Facebook, WhatsApp, and especially microblogging sites like Twitter and Weibo, have been demonstrated to be repositories of critical real-time information during disasters (Imran et al., 2015; Li et al., 2017). Hence it is natural to investigate if such information (as stated above) can be extracted from OSM. There are three key challenges in effectively using social media posts (e.g., tweets) for post-disaster resource management. We briefly describe these challenges here.

- (1) **Identifying social media posts informing about needs of resources or availability of resources** – the main challenge is that such critical information is often hidden among thousands of conversational/opinion posts. Hence automated methodologies are needed to identify posts containing these critical information.
- (2) **Understanding the need or availability of resources** – it is essential to understand the posts that inform about need/availability of resource. Specifically, it is necessary to extract some important information from these posts, such as the particular resource name, the quantity that is needed/available, the location where the resource is needed/available, and so on. It is challenging to extract

such information, since social media posts (especially tweets) are often written informally, without obeying the rules of natural languages. Hence traditional natural language processing and information extraction methods often do not perform well on such posts.

- (3) **Matching resource needs with appropriate resource availabilities** – once the needs and availabilities are identified, the next challenge is to match the need for a particular resource with an availability of the same resource. It must be noted that, during a post-disaster scenario, resources may be available at some selected places (e.g., prominent locations that are close to an airport/rail station), whereas resources may be needed at many distinct places. Also, need locations (where resources are needed) may be at different distances from availability locations (where resources are available). If an availability location is far away from a need location, it may take several days to transport relief material. However, during disasters, urgent requirement of critical resources like medicines, food, and water must be catered quickly. Thus the matching of resource needs with resource availabilities should consider both the similarity between the resource needed/available and the geographical proximity between the location where a resource is needed and the location where the resource is available.

We have developed methodologies to address the challenges mentioned. We have specifically focused on Twitter due to the ease of data collection and the real-time nature of Twitter conversations. Our works are summarized in the rest of this chapter.

Identifying Social Media Posts Informing About Needs of Resources or Availability of Resources

The first step in managing relief activities during a disaster is to determine what resources are required and available in the affected region. To this end, we developed methods to detect the two categories of tweets – **(1) need tweets** that include information regarding the requirement of various critical resources, such as food, tent, medicine and medical resources, etc., and **(2) availability tweets** that report the availability of such resources.

Dataset. In most of our works, we applied our methods over tweets that were posted following two earthquake events – (i) the Nepal earthquake in 2015 (https://en.wikipedia.org/wiki/April_2015_Nepal_earthquake) and (ii) the Italy earthquake in 2016 (https://en.wikipedia.org/wiki/August_2016_Central_Italy_earthquake). The Twitter Search API (<https://dev.twitter.com/rest/public/search>) was used to collect English tweets posted during the 7-day period immediately after each event. Then human annotators were appointed for identifying all need tweets and availability tweets from the datasets (which comprised of the gold standard). Some sample need tweets and availability tweets that were posted during the Nepal earthquake are reported in Table 1. Further details of these datasets are available in our prior works (Basu et al., 2018, 2019; Dutt et al., 2019).

Table 1 Examples of need tweets and availability tweets posted after the earthquake in Nepal in 2015 (from one of our datasets). Each need tweet is shown alongside a matching availability tweet, and the matching resource(s) in the two tweets are highlighted in bold

Need tweet	Availability tweet
Lack of electricity and drinking water aggravating problems for the locals specially for Earthquake Victim	@AmeriCares We would like to offer solar powered 500 l and up water filtration systems
Chirayu hospital has been evacuated after cracks after #NepalQuake, ishan hospital treating patients on the road	Four planes to leave for #Nepal tmrw carry meds, med team, 30-Bed Hospital , rescue experts, dry food, tents
People are searching for tent , at BICC area. No foods, no water	#ArtofLiving Nepal Centre providing shelter to hundreds of ppl. Volunteers providing food and water

Methods. We conducted an extensive analysis of two types of methods for detecting OSM posts that report about resource requirement/availability during an ongoing disaster event – (i) unsupervised pattern matching and retrieval methods and (ii) supervised classification methods.

(1) **Unsupervised pattern matching and retrieval methods:** During an ongoing disaster, preparation of ground truth in real time often becomes expensive. Thus, unsupervised methodologies are preferred in such situations as labeled training data is not required. We considered two pattern matching techniques – (i) Purohit et al. (2013) presented a set of regular expressions to identify tweets indicating donation requests/offers of different resources, and (ii) Temnikova et al. (2015) provided a large number of patterns (EMTerms) to match various categories of critical information contained in tweets posted during a disaster situation. We utilized these patterns to identify need/availability of resources; details are available in Basu et al. (2019).

We also employed language model-based information retrieval (search) methodologies. We also experimented with a variety of neural network-based models, such as models using word-level embeddings (e.g., Word2vec (Mikolov et al., 2013)), models that incorporate both word-level and character-level embeddings (Chen et al., 2015), and models that employ a combination of such embeddings with attention (Cao & Rei, 2016). We also proposed two models combining word-level and character-level embeddings – details are available in our prior work (Basu et al., 2019). These IR methods start with a base query for preliminary retrieval (e.g., the terms “need” and “require” are used to construct the base query for need tweets) and then perform *query expansion* for the final retrieval.

(2) **Classification methods:** We employed an assorted set of classical and deep learning classifiers to categorize tweets into three classes: need tweets, availability tweets, and other tweets (the class containing tweets that are neither identified as need tweets nor identified as availability tweets by the annotators). Traditional classifiers like gradient-boosted decision trees (GBDT), support

vector machines (SVM), and naive Bayes (NB) were used, along with neural classifiers such as convolutional neural networks (CNNs); details are available in Basu et al. (2019). Since it is impractical to label large amounts of training data during an ongoing disaster, the only practical option is to train models on data collected during past disasters. Thus, we employed classifiers in *cross-domain* settings, i.e., classifiers were trained on a dataset of tweets related to a preceding disaster event and then applied on tweets related to the ongoing (unseen) disaster event.

Comparing performance of various methods. We used standard metrics such as precision, recall, and F-score to compare the performance of various methodologies. Among unsupervised methods, pattern matching methods achieved high recall but very low precision, thus resulting in low F-scores. The retrieval methods achieved reasonable results. Among supervised methods, CNN-based methods were found to perform better than other classifiers in most cases.

Our experiments led to the following practically useful insight. The quality of data used to train classifier models has a substantial impact on the performance of the model. Supervised classifiers should be preferred for recognizing need tweets and availability tweets, if adequate training data from a similar disaster event is available. On the other hand, unsupervised retrieval strategies may be favored if there is a scarcity of high-quality training data from previous disasters.

Understanding Social Media Posts That Inform About Need or Availability of Resources

Once the need tweets/availability tweets have been identified, the next important task is to automatically understand these tweets and to extract some critical information from such tweets that would later help to match resource needs with resource availabilities.

According to the recommendations of the humanitarian aid workers with whom we discussed, we focused to extract five specific information from a given need tweet/availability tweet – (i) the specific *resource* that is required/available, (ii) the *quantity* of resource required/available, (iii) the *location* of resource need or resource availability, (iv) the *source* of the resource offerings, and (v) *contact* details (e.g., email, phone number) of the source or the victim requiring the resource. We developed an unsupervised approach in order to obtain these five kinds of information from a need/availability tweet. Our method, detailed in Dutt et al. (2019), does *not* require labeled data for training (which is difficult to obtain during an ongoing disaster).

Standard preprocessing techniques were employed on the tweet texts to remove URLs, mentions, emoji brackets, “RT” (retweet marker), and non-ASCII characters (such as “#,” “&,” ellipses, etc.). Next, CamelCase words and combined alphanumeric phrases were also split into separate terms (e.g., “Nepal2015” was split into

“Nepal” and “2015”). Then the five types of information stated above were extracted as follows.

Extracting resources. The algorithm performs *dependency parsing* on the pre-processed tweet text to construct a dependency tree for a tweet. From this dependency tree, some specific words were identified as *head words*, e.g., terms frequently used to express need (e.g., “require,” “need”) and availability (e.g., “available,” “distribute,” “donate”). Then the dependencies of the child nodes of these head words were observed. As resources are mostly nouns, only those words that had been tagged by a part-of-speech (POS) tagger as a common/proper noun were considered as *possible* resources. Next, these possible resources were compared to a list of resources designated by the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA) as being often required in disaster situations, and the matching words/phrases are finally identified as resources.

Extracting geographical locations. An unsupervised methodology was adopted for detecting location inference from tweet text. The steps of the algorithm are as follows – (i) a statistical word segmentation algorithm (Norvig, 2009) is used for hashtag segmentation, (ii) proper nouns were identified using a POS (part-of-speech) tagger and a list of common suffixes of location names (e.g., “street,” “city,” “NW,” “SE”) were utilized to recognize potential locations from among these nouns, (iii) regular expression match is used to recognize phrases that encompass one of some common suffixes or prefixes of locations (e.g., “street,” “avenue”), (iv) dependency parsing of need tweets and availabilities is employed. Noun phrases were extracted from the dependency graph, and then a named-entity recognition (NER) tagger was used to identify potential locations. (v) Finally, among the extracted list of potential locations, those which correspond to real-world locations were retained using a gazetteer (OpenStreetMap) (<https://geocoder.readthedocs.io/providers/OpenStreetMap.html>). For further details of the algorithm, readers are requested to refer to our work (Dutt et al., 2019).

Extracting quantities. The method examined if the resource names (already identified, as described above) are prefixed by a numeric token in the tweet text. In addition to checking for numeric tokens, we also checked if such a token corresponds to a real number orthographically (e.g., “5000”) or semantically (e.g., “100”). If a token of any of these types is found to precede a resource name, that token is identified as a quantity.

Extracting sources. As stated earlier, we constructed a dependency tree for a tweet. From this tree, subjects of the corresponding head words which were also tagged as proper nouns were extracted. Note that proper nouns corresponding to locations, persons, and organizations had already been identified from the tweet text. The words which had been identified as resources or locations were filtered out, and the rest are identified as viable sources. As an example, from the tweet text “ArtofLiving distributes food for 1000 victim at Kathmandu,” the algorithm identified “food” as a resource using the steps described above. Since “ArtofLiving” is tagged as a proper noun and is a nominal subject (nsubj) to the verb “distribute,” it was then identified as a source.

Extracting contact. We applied common regular expressions on preprocessed tweet text to identify email IDs and phone numbers as contact information.

Performance evaluation of the above method. We considered 50 need tweets and 50 availability tweets that were randomly selected from the two datasets described in section “[Identifying Social Media Posts Informing About Needs of Resources or Availability of Resources](#).” Thus, 200 tweets were randomly selected from the two datasets combined, 100 being need tweets and 100 being availability tweets. Next, the five aforementioned important fields were extracted by the proposed algorithm from each of the selected tweets. The same tweets were also given to human annotators, to identify the same pieces of information. The information extracted by the human annotators comprises of the gold standard. Comparing the gold standard with the information extracted by the algorithm, we computed (i) precision, (ii) recall, and (iii) F-score, separately for each of the five fields.

We observed that our approach is capable of extracting the five categories of information with reasonably high precision and recall. In extraction of resource, location, and contact fields, our proposed approach achieved F-score values greater than 0.8 for both Nepal-quake and Italy-quake datasets. Our method also worked fairly well at retrieving source and quantity information with F-score value greater than 0.7. Further details are available in our previous study (Dutt et al., [2019](#)).

Matching Resource Needs with Appropriate Availabilities

We presume that the methods discussed in section “[Identifying Social Media Posts Informing About Needs of Resources or Availability of Resources](#)” have been used to identify a set of need tweets and availability tweets. Then the important fields in these tweets have been identified by employing the method discussed in section “[Understanding Social Media Posts That Inform About Need or Availability of Resources](#).” Now, the challenge is to match a need tweet with appropriate availability tweets from among the ones identified. A few examples of need tweets and matching availability tweets have been given in Table 1.

The few previous studies that attempted to match resource needs with resource availabilities solely looked at the resources (Purohit et al., [2013](#)), with no attempt to comprehend other characteristics of need tweets and availability tweets that are important for realistic matching. In contrast, we utilized some of the specific information that are extracted from need tweets and availability tweets using the methodology depicted in section “[Understanding Social Media Posts That Inform About Need or Availability of Resources](#).” We proposed two techniques for matching needs with availabilities based on the extracted data: one that considers only resources and the other that takes into account both resources and the proximity of the location where the resource is needed (need location) and the location where the resource is available (availability location). We briefly describe these methods below.

Matching algorithms considering resource similarity. We propose two categories of algorithm based on resource similarity.

- (i) *Matching based on resource names:* We identify if there are common resource names mentioned in a need tweet and an availability tweet. We observe what fraction of the resources mentioned in a need tweet is also mentioned in an availability tweet.
- (ii) *Matching based on resource embeddings:* Typically, different tweets may refer to semantically similar resources but use different terminology (e.g., the need for “shelter” and the availability of “tents”). We employed word embeddings to find such matches because it can capture the semantic context of terms. To this end, we proposed two different models; the first model uses the local Word2vec (Mikolov et al., 2013) embeddings learned over the collection of tweets relevant to the present disaster (e.g., the Nepal-quake and Italy-quake datasets), and the second model employed Word2vec embeddings pretrained over tweets posted during a large number of past disaster events (provided by Imran et al. 2014).

Matching based on resources and location proximity. We proposed a method for matching tweets that considered both the resources and the geographical locations specified in the tweets. Given a specific need tweet and an availability tweet (both of which mention resources and locations), resources and locations were extracted from both using the methodology described in section “[Understanding Social Media Posts That Inform About Need or Availability of Resources](#).” Then the following similarity scores between the two tweets were computed.

Resource similarity score. We utilized the cosine similarity of the resource vectors generated from the two tweets using pretrained Word2vec embeddings, to determine the level of similarity between the two resources referenced in the tweets.

Proximity score. The distance between a need location (obtained from a need tweet) and an availability location (obtained from an availability tweet) was computed from the geographical coordinates of the two locations. A bounding box around the country/city where the incident happened was used to normalize the distance and thus get a proximity score.

The final matching score between a need tweet and an availability tweet is calculated as a weighted sum of the resource similarity score and the proximity-score. The two scores are given equal weighting of 0.5.

Performance evaluation. Each matching method (as described above) generates a ranked list of availability tweets for a particular need tweet. We used each matching method to find five top-matching availability tweets for each need tweet. These matching need-availability tweet pairs are examined by human annotators to ascertain if the matchings are appropriate, i.e., if both tweets mention the same resources and if the availability location is sufficiently close to the need location. The following evaluation metrics are then used to assess a matching method – (i) *precision of matching*, the fraction of tweet pairs that are accurately matched (according to the human evaluators) by a matching methodology is called precision. Essentially, we calculated Precision@5 (since we considered five top-matching availability tweets for a particular need tweet). (ii) *Recall of matching*, the percentage of all need tweets for which a method is able to locate at least one accurate match (based on the annotators’ judgment) is called recall. (iii) *F-score of matching*, finally, a matching method’s F-score is the harmonic mean of recall and precision.

Table 2 Performance of methods for matching need tweets and availability tweets. Results reported here are over the dataset related to tweets posted during the 2015 Nepal earthquake. (Reproduced from our prior work (Dutt et al., 2019)). Highest values marked in boldface

Need-availability matching method	Precision	Recall	F-score
Based on common resource names	0.79	0.92	0.85
Based on local embeddings of resources	0.75	0.88	0.81
Based on pretrained embeddings of resources	0.84	0.96	0.89
Based on pretrained embeddings of resources and location proximity	0.73	0.91	0.81

Table 2 reports the result of several matching methods for the Nepal-quake dataset. It can be observed that our proposed methods for resource-based matching attain a precision of more than 80% and recall of higher than 95%, outperforming baseline methods by a significant margin (details are available in our prior work (Dutt et al., 2019)). Our proposed matching method that takes into account both resources and geographical proximity is also quite effective. This algorithm can identify availabilities that are geographically close to the location of the need for more than 90% of need tweets that include a location.

Note that the evaluated result of the matching method based on pretrained resource embeddings only (F-score 0.89) is slightly higher than that of the method based on both resource embeddings and location (F-score 0.81). Since we considered a threshold for the distance between the location of demand and the availability (e.g., 100 km), some matches in terms of location and resources were not deemed to be correct in the final evaluation if the distance between the two locations was higher than this threshold.

To our knowledge, the Dutt et al. (2019) study was the first effort to build techniques for matching resource needs with available resources, while taking into consideration critical factors like geographical proximity (which was not taken into account in previous studies).

Conclusion

Management of the allocation of emergency resources from where they are offered to where they are needed is a vital requirement in the midst of any disaster. Given the shortage of resources during a disaster, this distribution must be done in a sensible and efficient manner. Because there is a dearth of real-time knowledge on resource needs and availability, this task is extremely challenging. In this chapter, we look at social media services (particularly, the Twitter microblogging site) as potential sources of real-time information in the aftermath of a disaster. Various techniques are presented to develop a holistic framework for resource distribution in a post-disaster scenario.

Future directions. There are several possible future directions of research extending the works described in this chapter. We briefly mention a few possible extensions.

-
- (i) The methods for identification and matching of resource need with resource availabilities described in this chapter consider only tweets in English. However, it has been observed that during disaster events in various parts of the world, a lot of information is also posted in local/regional languages (such as Hindi in case of disasters occurring in the Indian subcontinent) (Rudra et al., 2018; Basu et al., 2017). Hence the methods can be adapted to handle tweets in both English and local/regional languages, as well as code-mixed tweets (in which many languages are utilized in the same tweet).
 - (ii) The works in this chapter consider information collected from one social media (Twitter) only. However, when a disaster strikes, information is scarce and critical; hence, for a comprehensive analysis of the situation, responding authorities frequently need to identify resource needs and resource availabilities by integrating data from multiple social media channels such as Twitter, Facebook, WhatsApp, Telegram, etc. There are several challenges in analyzing such heterogeneous data sources simultaneously, which should be explored.

Any attempt toward developing a comprehensive framework for utilizing social media for post-disaster resource management should explore these challenges in the future.

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Role of Crisis Information Summarization Through Microblogs in Disaster Management

42

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Contents

Introduction	608
Related Work	609
Dataset and Humanitarian Category Identification	612
Subevent Detection	612
Summarization Algorithm	614
Experimental Setup and Results	616
Evaluation of DEPSUB	617
Evaluation of SCC	619
Conclusion and Future Directions	624
References	625

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Abstract

Reliance on social media has become quite prevalent to initiate and assist rescue operations for humanitarian organizations. Their information needs vary greatly, from a general summary to specific needs (e.g., infrastructure damage, missing people, and injured or dead individuals). These humanitarian classes also contain several small-scale subevents that cover information from diverse dimensions. Recent methods tried to identify subevents as an event-action pair from tweets. Further, such subevents are jointly optimized with informative words, humanitarian classes using an integer linear programming framework to generate the summaries. This chapter covers the details about such subevent detection and summarization strategies. Extensive evaluation over three diverse disaster events shows that such strategy performs 6–30% better than the state-of-the-art approaches. The entire subevent and summarization framework is optimized to generate summaries in near real time.

Keywords

Humanitarian categories · Subevent identification · Summarization

Introduction

Volunteers and crisis responders can use information reported by people on the ground via social media to get an overall idea of the situation. However, they would prefer summaries of tweets due to information overload (Imran et al., 2015). Furthermore, the need of different stakeholders varies a lot. Some are looking for a generic report for a particular day (**high-level information need**). In contrast, others look for class-specific updates (e.g., “**infrastructure damage**,” “**missing person**”) or personal updates about missing family members.

In general, the information posted during a crisis event is scattered into different humanitarian classes/categories such as “infrastructure damage,” “injured or dead people,” “shelter service,” “volunteer and donation supplies,” etc. Imran et al. (2014) proposed a classification system AIDR that can classify the tweets into aforementioned classes. Further, to get a concise view of the situation, summarization of the tweets is one of the requirements of the agencies. Crisis-related summarization algorithms portray a general view of the situation (Kedzie et al., 2015; Rudra et al., 2015, 2016; Nguyen et al., 2015). However, in most of the cases, it does not address the multidimensional information needs of different stakeholders such as field experts, NGO agencies, rescue workers, etc.

A long-ranging natural disaster such as earthquake, flood, typhoon, cyclone, etc., consists of many small-scale subevents containing updates like “toppling of buildings,” “shutdown of airport,” “dispatching of medical aid,” etc. Apart from information summarization, identification of such subevents is also necessary for the responders. Such subevents are basically event-action pairs that help agencies to detect actionable information, and based on that they can initiate rescue operations

on ground. These subevents are also helpful to boost the performance of the summary and make the summaries more comprehensive.

In some classes (e.g., “missing people,” “injured or dead”), the information frequently gets updated. For example, at time instant t_1 , there are reports of x injured people, but at $t_1 + \epsilon$ there are updates about more than x injured people (Rudra et al., 2015). Hence, the additional challenge is to make the summaries factually consistent over time. Along with that, explainability of the models is also a crucial factor. This provides a real hindrance in the deployment of the models in real-life applications. In recent times, interpretability of the models gain a lot of attention (Zhang et al., 2021). This is really useful in the automated decision process such as *dispatch of relief material*.

So far, existing approaches deal the subevent detection problem through the lens of topic discovery (Blei et al., 2003; Yan et al., 2013). However, such approaches have significant limitation in terms of comprehensibility. Recent approaches (Badgett & Huang, 2016; Rudra et al., 2018b) focused on the pos-tag information of the words and the dependency relations among them. Subsequently, these short snippets are also used to improve the quality of the summary by jointly optimizing them along with the informative words. Such strategies are able to boost the summarization performance by 6–30% in terms of ROUGE-1 F-score. In this chapter, such methods are covered in detail.

The organization of the chapter is as follows. An overview of existing approaches and comparison of the trade-offs of different strategies are reported in section “[Related Work](#).” Finally, we select one of the recent methods and elaborate its functionality in next sections. Section “[Dataset and Humanitarian Category Identification](#)” provides the data statistics. The method details are explained in sections “[Sub-Event Detection](#)” and “[Summarization Algorithm](#).” Performance of the selected approach is highlighted in sections “[Evaluation of DEPSUB](#)” and “[Evaluation of SCC](#).” Finally, section “[Conclusion and Future Directions](#)” concludes this chapter with some future directions.

Related Work

Vulnerable communities post real-time updates in the aftermath of a disaster (Sakaki et al., 2010; Varga et al., 2013). This information is a useful resource for disaster responders and NGOs (Imran et al., 2015; Castillo, 2016).

Subevent detection during crises: Several approaches extract subevents from crisis-related tweets (Abhik & Toshniwal, 2013; Pohl et al., 2012). Recent methods tried to detect subevents/topics from tweet streams evolving during disasters (Meladianos et al., 2015). Most existing methods tried to form clusters from the tweets using different approaches (latent dirichlet allocation (Blei et al., 2003), self-organizing map (Pohl et al., 2012), and biterm topic modeling (Yan et al., 2013), etc.), and further, some highly frequent words from each cluster are chosen as subevents or topics.

End users find it difficult to comprehend a bag of words as a representative topic. For example, a topic is represented by traditional biterm topic models using most probable terms such as “relief,” “material,” “to,” “Nepal,” “NDRF,” etc. However, if the subevents can be identified in a more structured way such as “building topple,” “people strand,” “medicine supply,” etc., it will provide useful information for the responders. They can easily understand and operationalize their resources. We tried to avoid bag-of-words and clustering-based subevent identification strategies and designed more meaningful, user-friendly, and comprehensible subevent detection strategies that rely on noun-verb pairs that are useful in disaster scenarios. For example, a subevent like “building topple” is easy to understand than a collection of words such as “building, work, field, topple,” and users could easily understand that it is related to the destruction of buildings based on the immediate context.

Recently, Badgett and Huang (2016) proposed a dependency parser-based strategy to detect subevents from news articles that rely on sentential cues. This method also explores the dependency relations present in a sentence. However, their strategy, designed for formal text, is not able to capture dependencies from noisy tweet texts. Additionally, their method works in an iterative fashion, i.e., it starts with a small set of sentences and adds new sentences that contain subevents to the existing set in an incremental fashion. The iteration continues until the convergence of the method and may have a severe impact on the running time. Hence, for large datasets, this method fails to produce output in real time. Recent approaches also extend this idea toward tweets and develop methods to detect meaningful subevents from crisis-related tweets (Rudra et al., 2018b; Arachie et al., 2020; Chen et al., 2018). Specifically, Belcastro et al. (2021) developed a subevent detection approach, SEDOM-DD, to identify the subevents and their associated areas.

Tweet summarization: The evolving nature of Twitter makes the summarization method more difficult compared to standard static document summarization. Researchers tried to incorporate important situational updates from tweets to generate summaries to generate crisis-related summaries. Some of these approaches focus on topic detection, pagerank-based strategies (Nguyen et al., 2015), and multi-objective optimization (Saini et al., 2019) whereas others focus on ILP-based optimization strategies (Rudra et al., 2015, 2018a). Real-time general tweet summarization approaches are also proposed (Shou et al., 2013; Olariu, 2014). Shou et al. (2013) used clustering to find similar tweets and finally apply LexRank (Erkan & Radev, 2004) to retrieve extractive summaries. Apart from extractive methods, Rudra et al. (2016, 2019) proposed an abstractive summarization method for crisis events that build bigram-based word graphs and combine information from multiple related tweets. Kedzie et al. (2015, 2016) proposed an extractive summarization strategy over news articles that computes the saliency score of sentences using an affinity clustering-based setup. More recently, BERT-based sentence similarity strategies have been used for better representation learning and summarization (Zheng & Lapata, 2019). Li and Zhang (2021) proposed semantic terms and a graph network-based Twitter event summarization approach.

Neural approaches have shown significant improvement in both extractive and abstractive document summarization. Most of these models exploit the power of large pretrained language models (e.g., BERT, BART) and provide effective summaries for CNN/DailyMail, Gigaword, X-sum datasets (Zhang et al., 2020; Zhong et al., 2020). A major drawback of such models is the requirement for a large amount of annotated data. This hinders the application of such models toward evolutionary tweet streams. It will be an interesting direction to apply self-supervised and semisupervised learning strategies to overcome labeled data scarcity issues for tweet summarization.

Big Data Management During Crisis: Song et al. (2022) presented an overview of big data and emergency management and highlighted technologies and applications across six different categories (e.g., remote sensing, resilient communication networks, etc.). They also highlight the need for mathematical models for evacuation-oriented optimized scheduling, resource allocation optimization model, etc. Xia et al. (2019) measured spatiotemporal accessibility to emergency medical services through GPS data. Methods were also proposed to process actionable information from the incident tweet streams (McCreadie et al. 2019). Recently, TREC is also organizing the task for crisis-related fact summarization TREC (2022). Along with text, image analysis also gained a lot of attention. Disasters also cause damages to the heritage sites and buildings. Kumar et al. (2020) developed a method to detect such damages from social media images. Lots of benchmark datasets are also made available to the research community to make progress in multimodal analyses of crisis images (Alam et al., 2020, 2021a, b). Prior studies showed that actionable updates are more necessary than situational updates (Zade et al., 2018; Kropczynski et al., 2020). Coche et al. (2021) proposed a model that embeds the concept of actionable information into Endsley's model of situational awareness (Endsley, 2017). Chassera et al. (2021) extracted concept-instance relations from the disaster-related text to populate the crisis-specific ontologies. Such kind of unsupervised knowledge-based construction will be helpful for future crisis-related event summarization.

This chapter primarily covers the unsupervised subevent and summarization approach proposed in Rudra et al. (2018b). It also proposed the ideas for processing actionable information. The methods were developed based on the following observations – (i) a disaster consists of several small-scale subevents, and the final summary can be improved by including such subevents; (ii) different stakeholders have multidimensional needs such as rescue agencies, NGOs, government, etc. They proposed an approach to generate summaries at various granularities and satisfy the needs of different end users; and (iii) some updates are time critical, and it should be processed separately along with the generic summarization.

The performance of the method is evaluated for three disasters: the 2015 Nepal earthquake (1.87 M), the 2014 Typhoon Hagupit (0.49 M), and the 2014 Pakistan flood (0.25 M). The approach shows comparatively better performance over state-of-the-art subevent detection (Abhik and Toshniwal (2013), Badgett and Huang (2016), Pohl et al. (2012), Yan et al. (2013) and summarization Kedzie et al. (2015), Rudra et al. (2015, 2016), and Nguyen et al. (2015)) approaches.

Table 1 Dataset description for three disaster events. NA indicates that a specific class is absent for an event (i.e., no labeled data or very few tweets are present in the class (≤ 500))

Category	NEQuake	Hagupit	PFlood
Missing, trapped, or found people	10,751	NA	2797
Infrastructure and utilities	16,842	3517	1028
Donation or volunteering services	1530	4504	27,556
Shelter and supplies	19,006	NA	NA
Caution and advice	NA	25,838	NA
Displaced people and evacuations	NA	18,726	NA

Dataset and Humanitarian Category Identification

AIDR (Imran et al., 2014) is used to collect the disaster-related messages from Twitter posted during three major disaster events – **(1) Typhoon Hagupit (Hagupit):** Around 0.49 million tweets are collected between 6 and 8 December 2014 by searching via keywords such as “TyphoonHagupit,” “TyphoonRuby,” “Hagupit,” etc.; **(2) Nepal Earthquake (NEQuake):** Around 1.87 million tweets are collected between 25 and 27 April 2015 based on different keywords (e.g., Nepal Earthquake, NepalQuake, NepalQuakeRelief, etc.); and **(3) Pakistan Flood (PFlood):** Related tweets are collected using different keywords (e.g., pakistanflood, PakistanFlood, Pakistanflood, etc.) on September 7–8, 2014. This dataset contains around 0.24 M tweets.

Humanitarian organizations such as UNOCHA and UNICEF identified that tweets are scattered in different humanitarian categories/classes (Vieweg et al., 2014). Such classes may vary across different disasters (Castillo, 2016). AIDR (Imran et al. 2014) system is used to classify the tweets into different humanitarian classes. AIDR system was trained on manually annotated tweet sets over diverse disaster events (Imran et al., 2013, 2016). Detailed data statistics of three events are reported in Table 1.

Subevent Detection

A humanitarian class such as “infrastructure damage” contains information about subevents such as “building collapse,” “airport shut,” etc. Latent topic distribution approaches (Blei et al., 2003; Yan et al., 2013) may be used to generate such subevents, but they represent subevents as a collection of most probable words. However, domain experts at the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) identified that such subevents are very generic and not that useful in decision-making process (Vieweg et al., 2014).

A thorough analysis of a few hundred tweets from web sources (Telegraph, 2015) was performed to understand the pattern of subevents. Broadly, subevents comprising of two nuggets – (a) entity (noun): the main topic/entity of an event (e.g., person,

Table 2 Popular subevents learned from the first day of the Nepal earthquake (Apr 25, 2015)

Class	Subevents
Infrastructure	“Airport shut,” “service affect,” “building collapse,” and “road crack”
Missing	“Tourist strand,” “family stuck,” and “database track”
Shelter	“Medicine carry,” “aircraft deploy,” and “emergency declare”

organization, place, etc.), (b) action-part (verb): describes the occurrence of an incident on the given entity.

Some examples of such subevents from different classes are reported in Table 2. These subevents are from the Nepal earthquake, and they represent short and important information snippets. The objective is to generate such noun-verb pairs (e.g., “family stuck”) automatically.

Identifying noun-verb pairs: Twitter POS tagger (Gimpel et al., 2011) is used to extract nouns and verbs present in each tweet. The next task is to associate the corresponding nouns and verbs which is a nontrivial task. For example, in the tweet: ANI says relief material dispatched for Nepal, both “dispatched” and “says” were marked as action verbs. The term “dispatched” is related to the noun “material,” but “says” is not associated with the corresponding noun (“material”). It is not always necessary that nouns must appear prior to or adjacent to the verbs in a tweet. Earlier, dependency grammar-based subject-verb evaluation in formal sentences is proposed by Cai et al. (2009). Such strategy is also followed to extract and make the appropriate association of a noun to a verb (Kong et al., 2014).

Ranking subevents: The number of subevents identified based on the approach proposed above is quite large. Apart from that, some of the associations are not appropriate mostly due to the noisy nature of tweets and the limitation of the dependency parser. Hence, the subevents are ranked based on different factors described below. A subevent, i.e., a noun-verb pair (e.g., “road,” “cracked”) is important if the probability of the separate occurrence of the constituent words in the pair is less. This indicates that the noun-verb pair together covers different contexts like “road cracked” in multiple places. Finally, the weight of a subevent $S(N, V)$ is computed using Szymkiewicz-Simpson coefficient (Sharma & Singh, 2016) (Eq. 1):

$$\text{Score}(S) = \frac{|X \cap Y|}{\min(|X|, |Y|)} \quad (1)$$

where X and Y indicate the set of tweets containing N and V , respectively.

However, the frequent and infrequent occurrence of subevents cannot be discriminated based on Eq. 1. Hence, a discounting factor δ (Pantel & Lin, 2002) is applied to Eq. 1 to reduce the score of infrequent events.

$$\delta(S) = \frac{|X \cap Y|}{1 + |X \cap Y|} * \frac{\min(|X|, |Y|)}{1 + \min(|X|, |Y|)} \quad (2)$$

We compute the weight of a subevent S as follows:

$$\text{Weight}(S) = \text{Score}(S) * \delta(S) \quad (3)$$

The subevents are ranked based on their weights. This DEpendency-Parser-based SUB-event detection approach is referred as **DEPSUB** (Rudra et al., 2018b).

Summarization Algorithm

The information needs of different humanitarian organizations are quite different. Summarization frameworks should be able to satisfy such a diverse set of needs. For example, some may only be interested in high-level summaries of the situation whereas others are looking for class-specific summaries. A good disaster-specific summarization strategy should contain the following components: (i) presence of highly ranked subevents for each of the classes; (ii) information about humanitarian classes; and (iii) coverage of important content words (numerals, nouns, and verbs). Prior studies showed that content words (third criterion) play a significant role in generating disaster-specific summaries (Rudra et al., 2015; Nguyen et al., 2015). All such criteria can be combined and jointly optimized using an integer linear programming (ILP) framework. The tf-idf weight (with sublinear tf scaling) (Manning, 2008) represents the importance of the content word, and Eq. 3 presents the weight of subevents.

This subevent-based category-specific content words summarization method is termed as SCC.

ILP Formulation: Following ILP, objective function (4) is used to obtain a summary of L words that returns highest scoring *tweets* as the summarization output. The ILP problem is solved using the GUROBI optimizer (Gurobi, 2018). After solving this ILP, the summary is represented by the set of *tweets* i such that $x_i = 1$. Table 3 explains the symbols used in the following equations.

$$\begin{aligned} \max & \left((1 - \beta_1 - \beta_2) \cdot \sum_{i=1}^n x_i \cdot ICL(CL(i)) \right. \\ & + \beta_1 \cdot \sum_{j=1}^m \text{Con_Weight}(j) \cdot y_j \cdot \max_{i \in TC_j} (ICL(CL(i))) \\ & \left. + \beta_2 \cdot \sum_{k=1}^p \text{Sub_Weight}(k) \cdot z_k \cdot \max_{i \in TS_k} (ICL(CL(i))) \right) \end{aligned} \quad (4)$$

The scores of the content words and subevents are normalized in the [0–1] range to represent them in same scale. A content word or subevent may be part of different information classes. Hence, the weight of the highest informative class is multiplied to the scores of content words and subevents. For example, “building” is part of both “infrastructure” and “shelter” classes. The weight of “building” gets multiplied by either infrastructure or shelter class whichever possesses higher informative score.

Table 3 Notations used in the summarization technique

Notation	Meaning
L	Required length of summary (word count)
n	Total tweets count for summarization
w, m	Count of distinct subevents and content words in the n tweets
q	Humanitarian classes considered for summarization (each tweet belongs to some class)
i, k, j, b	Represents the tweets, subevents, content words, and classes
x_i	Binary indicator for tweet i (1 for tweet i that is part of summary, otherwise 0)
y_j	Indicator variable for content word j
z_k	Indicator variable for subevent k
$\text{Length}(i)$	Word count for tweet i
$\text{Con_Weight}(j)$	tf-idf weight of content word j
$\text{Sub_Weight}(k)$	Weight of subevent k
$ICL(b)$	Class b informative score
TC_j	Set of tweets where content word j is present
S_i, C_i	Set of subevents and content words present in tweet i
TS_k	Set of tweets where subevent k is present
$CL(i)$	Class of tweet i
TCL_b	Set of tweets belonging to class b
β_1, β_2	Tuning parameter – relative weight for content word, and subevent score

The objective function 4 is optimized with respect to the following constraints (Eqs. 5, 6, 7, 8, 9, 10, and 11).

$$\sum_{i=1}^n x_i \cdot \text{Length}(i) \leq L \quad (5)$$

The objective of the length constraint (Eq. 5) is to ensure total words present in the summary should not exceed the desired user-specified length L .

$$\sum_{i \in TC_j} x_i \geq y_j, j = [1 \dots m] \quad (6)$$

$$\sum_{j \in C_i} y_j = |C_i| \times x_i, i = [1 \dots n] \quad (7)$$

The goal of Eq. 6 is to ensure the coverage of content word. If $y_j = 1$, i.e., content word j is selected in the summary, then at least one tweet covering this content word must also be selected. Equation 7 ensures that all the content words of a tweet are present in the summary if a tweet is chosen to be part of the summary.

$$\sum_{i \in TS_k} x_i \geq z_k, k = [1 \dots w] \quad (8)$$

$$\sum_{k \in S_i} z_k = |S_i| \times x_i, i = [1 \dots n] \quad (9)$$

Similar to content words, Eqs. 8 and 9 guarantee the coverage of the subevent.

$$\sum_{b=1}^q ICL(b) = 1, b = [1 \dots q] \quad (10)$$

Equation 10 ensures that the sum of weight/importance of all the classes is 1.

$$\sum_{i \in TCL_b} x_i \geq \rho, b = [1 \dots q] \text{ if } ICL_b > 0 \quad (11)$$

As the summarization involved multiple classes, representative tweets from each class should be present in the summary. Equation 11 ensures that at least ρ tweets from each class having importance > 0 are present in the summary.

Scenario-specific summarization: As mentioned in section “Introduction,” the requirements of different agencies scatter a lot. Hence, the constraints need to be adjusted accordingly in Eq. 4.

High-level summary: Equal importance is given to each class, and the minimum tweet coverage from each class (ρ) is set to value 2.

Class-based summary: To summarize information from a specific class, the weight of the desired class is set to 1 and weights of others are set to zero.

Missing person summary: It is observed that relatives of the victims post information about their missing relatives, friends, during a crisis. The missing class contains such types of updates and is hidden within other information such as helpline number, launching of tools, etc. Ground-level rescue workers look for personal information like the name, last location, contact number, etc. of the victims.

Content words (nouns, verbs, and numerals) and subevents are missing from such tweets, and “name” and “relation” of the missing person carry the most important information. It is a special case of class-specific summarization. The weight of the missing class is set to 1, and others are set to 0. Subevents have no role. Hence, β_2 is set to 0.

Tweets of this category contain personal details such as the name of the missing person, and the relation of the missing person (e.g., “brother,” “wife,” “son,” etc.), to the user who posted the tweet. An example of such a tweet is “Missing my friend **Azhar**. 23 years age. Last location Sindhupalchok. Pls help.” The proposed summarization method is customized to consider name, relation, as content words.

Experimental Setup and Results

The accurate identification of the underlying subevents (DEPSUB) plays a major role in the success of the summarization scheme (SCC). Hence, the performance of DEPSUB is evaluated before SCC. Table 1 provides details about the three datasets:

(i) Nepal Earthquake (NEQuake), (ii) Typhoon Hagupit (Hagupit), and (iii) Pakistan Flood (PFlood). The tweets are further divided by date: NEQuake (25–27, April, 2015), Hagupit (6–8, December, 2014), and PFlood (7–8, September, 2014). NEQuake and Hagupit contain 4 classes and 3 days, hence, total $3 \times 4 = 12$ instances. Similarly, PFlood contains $3(\text{class}) \times 2(\text{day}) = 6$ classes. In total, there are 30 instances.

Evaluation of DEPSUB

Automatically identified subevents are evaluated both qualitatively and quantitatively using standard metrics (e.g., accuracy).

Baseline approaches: Following NLP and cluster-based subevent detection approaches are considered as baselines.

- (a) **Two-phase approach (TWS):** Badgett and Huang (2016) proposed a subevent detection approach for news articles that relies on dependency relations. Some adjustments are applied to make it applicable to tweets.
- (b) **COS-clustering:** Abhik and Toshniwal (2013) proposed a clustering-based subevent detection approach. Twitter-specific tags are discarded using a Twitter POS tagger. Finally, the top four words having the highest frequency from each cluster represent that cluster.
- (c) **LDA-clustering:** Blei et al. (2003) proposed a latent dirichlet allocation-based topic detection approach. The top four words having the highest probability of belonging to each topic cluster represent that subevent/topic cluster.
- (d) **BTM-clustering:** Biterm topic modeling (Yan et al., 2013) approach is designed for small informal texts (e.g., tweets). Clusters of related tweets are formed, and representative terms from each cluster are chosen as topic words.
- (e) **SOM-clustering:** uses a self-organizing map (SOM)-based strategy to detect the subevents (Pohl et al., 2012).

Evaluation methodology: The utility of identified subevents is measured both qualitatively via CrowdFlower (<http://www.crowdflower.com/>. Now known as Appen) and quantitatively using the ground-truth subevents.

- (a) **Evaluation using CrowdFlower workers:** Six lists of 15 subevents, one from each competing methods, are provided to the crowd workers. DEPSUB and TWS provide top 15 subevents based on their scores. For COS and SOM, clusters are ranked based on the number of tweets they contain. Finally, for LDA and BTM the number of topics is set to 15 and the top four representative words are chosen from each cluster. The crowd workers are instructed to go through the lists and choose the best one out of the six lists for the following three questions:

(Q1) Which of the six methods is able to identify most number of relevant subevents?

Table 4 Crowdsourcing-based evaluation of subevents for proposed approach DEPSUB and baselines

Datasets	Method	Evaluation					
		(a) Fraction of instances where a method wins			(b) Fraction of users voted for a method		
		Q1	Q2	Q3	Q1	Q2	Q3
	DEPSUB	0.58	0.75	0.68	0.43	0.38	0.38
	COS	0.17	0	0.08	0.13	0.12	0.23
	TWS	0	0.25	0	0.17	0.23	0.07
NEQuake	SOM	0.17	0	0.08	0.13	0.13	0.03
	BTM	0	0	0.08	0.05	0.07	0.15
	LDA	0.08	0	0.08	0.08	0.07	0.13
	DEPSUB	1	0.50	0.83	0.40	0.37	0.50
	COS	0	0	0	0.10	0.10	0.20
	TWS	0	0.50	0.17	0.23	0.30	0.17
PFlood	SOM	0	0	0	0.03	0.13	0
	BTM	0	0	0	0.13	0.03	0.06
	LDA	0	0	0	0.10	0.07	0.07
	DEPSUB	0.42	0.50	0.75	0.28	0.28	0.42
	COS	0.08	0.08	0	0.12	0.12	0.03
	TWS	0.17	0.17	0.08	0.23	0.17	0.25
Hagupit	SOM	0.17	0.17	0	0.17	0.18	0.05
	BTM	0	0.08	0.08	0.07	0.13	0.10
	LDA	0.16	0	0.08	0.13	0.12	0.15

(Q2) Which of the six methods summarizes the situation (through subevents) in disaster region well?

(Q3) Which of the six methods helps the crisis-responders most in assessing the situation in the disaster region?

Table 4 (columns [3–5]) reports the statistics showing the fraction of times a technique has won. Similarly, columns [6–8] present the fraction of user votes received by a particular method. DEPSUB performs significantly better for Q1 and Q2, i.e., crowd workers find our subevents are most useful and least irrelevant. TWS is the second best, and it shows that methods that do proper association of words (DEPSUB, TWS) could help in better understanding of the subevents.

(b) Evaluation using gold standard subevents: Apart from qualitative evaluation, performance of DEPSUB is also evaluated against the ground truth in terms of precision, recall, and F-score.

Establishing gold standard subevents: Three human volunteers independently prepared noun-verb pair-based subevents for each of the instances (6 for PFlood and 12 for both Hagupit, NEQuake). The Fleiss κ score is 0.67, and it itself depicts the

complexity of the task. Finally, subevents that were selected by at least two volunteers are included in the ground truth. Performance of DEPSUB and TWS is measured due to their similarity in the output format. Some of the identified subevents of TWS contain more than two words, but such subevents are dropped because most of them are of poor quality. This also ensures a fair comparison with DEPSUB.

Overall, DEPSUB achieves average F-score 0.75, 0.76, and 0.77, and TWS gets average F-score 0.53, 0.55, and 0.46 for NEQuake, Hagupit, and PFlood, respectively. On average, DEPSUB performs 30% better than TWS. The performance of TWS is heavily dependent on the accurate identification of dependency types (e.g., “amod,” “ccomp,” etc.), but the Stanford parser does not work well for Twitter. On the other hand, DEPSUB identifies subevents as a simple pair of entity (noun) and the action (verb) taken on that entity. However, some spurious pairs (“afternoon fly,” “terminal flee”) also get selected in the process. Twitter dependency parser is used to identify the noun-verb association, but it suffers from the noisy nature of tweets. The precision of the system gets affected by $\approx 30\%$ due to these shortcomings.

Evaluation of SCC

In this section, the performance of SCC is compared with other state-of-the-art disaster-related summarization strategies, and results are reported for different scenarios.

Establishing gold standard summaries: Altogether, there are 30 instances over three different datasets. Three volunteers independently identify 200-word summaries for each of the instances. A moderate agreement is observed in the selection process (Fleiss Kappa = 0.77). Finally, the tweets that are chosen by all the volunteers are considered for the ground truth summary of a specific instance. Next, the tweets that are selected by majority of volunteers are chosen until word limit of 200 is reached. For high-level summaries, volunteers chose tweets for each day from all the available classes, and finally the same approach is followed to generate 200-word-length summaries.

Baseline approaches: The following four state-of-the-art crisis-related summarization approaches are chosen as baselines.

1. **COWABS.** is an abstractive disaster-specific summarization approach that optimizes both tweets and paths (Rudra et al., 2016).
2. **COWTS.** is an extractive summarization approach that maximizes the coverage of content words (Rudra et al., 2015).
3. **TSum4act.** is a crisis-specific approach that relies on topic detection and pagerank-based weighting scheme (Nguyen et al., 2015).
4. **APSAL.** is an affinity-clustering-based strategy designed to summarize disaster-related news articles (Kedzie et al., 2015). In our case, this is applied over clean tweets.

Evaluation metrics: Quantitative evaluation is performed using ROUGE (Lin, 2004) metric. Specifically, ROUGE-1 F-score is chosen due to the noisy nature of tweets. System summaries are generated each of length 200 words to compare their performance with the ground-truth summaries. Different values of δ_1 and δ_2 for SCC are chosen, and the best weights are fixed based on the ROUGE score. $\delta_1 = 0.5$ and $\delta_2 = 0.5$ are the best weights for NEQuake. Weights for the Hagupit and PFlood are $\delta_1 = 0.5$, and $\delta_2 = 0.3$.

Performance Evaluation of Class-Based Summarization

The ILP method selects the tweets that comprise the extractive summary for a specific disaster class. It is important and effective to highlight a subevent in a tweet if it plays a role in selecting that tweet in the summary. Further, a qualitative analysis is also performed via CrowdFlower to judge the human comprehensibility of SCC summaries.

Evaluation using gold summaries: ROUGE-1 F-scores of SCC are reported in Table 5. It shows the scores for the five algorithms for 24 instances from all three datasets. It is evident that SCC performs better than the baseline approaches. The average improvement of SCC over COWTS, APSAL, and TSUM4act are 6%, 24%, and 30%, respectively, in terms of ROUGE-1 F-score. SCC also performs better around 20% than COWABS (Rudra et al., 2016) which is an abstractive summarization technique.

Evaluation using crowdsourcing: Apart from ROUGE-based evaluation, crowd-based qualitative evaluation is performed to judge the human understandability of the summaries generated by SCC and four baselines. The results are reported in Table 6.

Given the summaries and their topic, the following four questions are asked to the workers: **(Q1)** Which method covers most of the information? **(Q2)** Which method covers less amount of redundant information? **(Q3)** Which summary is most effective in quickly understanding and comprehending the situation? **(Q4)** Do highlighted topics help in understanding the summaries over the nonhighlighted version?

Q1. Information coverage captures the content richness of a summary. A summary is considered better in terms of information coverage if it covers more crisis-related informative sentences. It is clear from Table 6 that SCC is able to capture better information over the baselines (50% of the cases). The performance of other baseline methods varies across events; hence, there is no second-best strategy that consistently performs well.

Q2. Summary understanding tries to capture the comprehensibility aspect of the summary. Volunteers are asked whether the given summary helps them in understanding the situation and the actions that could be taken at that instant. It is observed that SCC facilitates users to get a quick grasp of the situation.

Q3. Diversity captures the redundancy aspect of the summary, i.e., the variation of information in the summary. Our proposed SCC framework tries to maximize the coverage of highly ranked content words in the summary (Eq. 4). Equation 4 considers the weight of each of the content words and subevents only once (y_j and z_k are binary indicators). We observe a significant variation in the performance of

Table 5 Summarization results (ROUGE-1 F-scores) for the proposed method (SCC) and the baselines (COWABS, COWTS, TSUM4act, and APSAL) on the same situational tweet stream for each day, for each class, and for each dataset

Date	ROUGE-1 F-score (NEQuake)										Shelter						
Infrastructure					Missing					Shelter					APSAI		
	SCC	COWABS	COWTS	TSum4act	APSAI	SCC	COWABS	COWTS	TSum4act	APSAI	SCC	COWABS	COWTS	TSum4act	APSAI	APSAI	
25/04/2015	0.4966	0.3866	0.4842	0.3758	0.3691	0.5407	0.3082	0.5353	0.1901	0.3162	0.5503	0.4548	0.5165	0.4742	0.4513		
26/04/2015	0.3719	0.3496	0.2387	0.3071	0.3848	0.3034	0.3066	0.3694	0.3496	0.3689	0.3387	0.3674	0.3610	0.3275			
27/04/2015	0.4971	0.3352	0.3631	0.3765	0.3657	0.3574	0.3275	0.3494	0.2825	0.3478	0.4573	0.3922	0.4340	0.3631	0.3238		
Date	ROUGE-1 F-score (PFlood)										Volunteer					APSAI	
Infrastructure					Missing					Volunteer					APSAI		
	SCC	COWABS	COWTS	TSum4act	APSAI	SCC	COWABS	COWTS	TSum4act	APSAI	SCC	COWABS	COWTS	TSum4act	APSAI	APSAI	
07/09/2014	0.7306	0.6762	0.7232	0.7191	0.6894	0.6039	0.5705	0.6039	0.5769	0.5787	0.3651	0.3459	0.3378	0.2092	0.2646		
08/09/2014	0.7235	0.6926	0.7206	0.6315	0.6781	0.4758	0.4436	0.4758	0.4498	0.4705	0.3844	0.3227	0.2865	0.2631	0.2105		
Date	ROUGE-1 F-score (Hagupit)										Caution					APSAI	
Infrastructure					Missing					Caution					APSAI		
	SCC	COWABS	COWTS	TSum4act	APSAI	SCC	COWABS	COWTS	TSum4act	APSAI	SCC	COWABS	COWTS	TSum4act	APSAI	APSAI	
06/12/2014	0.6200	0.5364	0.6190	0.5655	0.4946	0.4658	0.4259	0.4498	0.3566	0.2922	0.3989	0.3676	0.3955	0.2558	0.2881		
07/12/2014	0.6177	0.4702	0.6173	0.4852	0.4339	0.3663	0.3333	0.3303	0.3281	0.3202	0.3718	0.2905	0.3585	0.2307	0.2500		
08/12/2014	0.4857	0.4637	0.4857	0.4413	0.3891	0.4175	0.3147	0.4169	0.4125	0.3803	0.4277	0.4144	0.4277	0.3812	0.3376		

Table 6 Comparison of qualitative evaluation results for class-based summaries generated by SCC and baselines. Table values indicate fraction of times crowd workers prefer a method for a particular question (NA indicates the question is not valid for a method)

Datasets	Method	Q1	Q2	Q3	Q4
	SCC	0.42	0.58	0.33	0.83
	COWABS	0.25	0.25	0.17	NA
NEQuake	COWTS	0.25	0.17	0.17	NA
	TSum4act	0	0	0.08	NA
	APSAL	0.08	0	0.25	NA
	SCC	0.50	0.83	0.83	0.83
	COWABS	0.17	0	0	NA
PFlood	COWTS	0.33	0.17	0.17	NA
	TSum4act	0	0	0	NA
	APSAL	0	0	0	NA
	SCC	0.58	0.59	0.50	0.92
	COWABS	0.25	0.25	0.42	NA
Hagupit	COWTS	0	0.08	0.08	NA
	TSum4act	0	0	0	NA
	APSAL	0.17	0.08	0	NA

SCC. SCC performs well in 33%, 50%, and 83% cases for NEQuake, Hagupit, and PFlood, respectively.

Q4. Necessity of subevent highlight tries to measure whether the comprehensibility of the summaries gets improved due to subevent highlighting. From Table 6, we found that a significant majority of respondents (NEQuake-83%, Hagupit-92%, and PFlood-83%) admit that highlighting subevents helps to get a quick grasp of the summary.

Discussion on performance: APSAL is a clustering-based summarization strategy that creates clusters of related tweets and selects an exemplar tweet from each cluster. This method is designed for news articles, and the importance of sentences is determined based on its position in a document, pos tag of words, probability of a word belonging to an event based on language model, etc. However, most of such features are missing for tweets. Some of the features are noisy because tweets are not written in a formal way. TSum4act also maintains a cluster of information, but it assumes equal importance for each cluster. This assumption does not always hold, and summaries could be improved by providing more importance to some clusters. SCC also performs better than the abstractive summarization method COWABS and COWTS. COWABS builds a bigram-based word graph and generates paths from the related tweets. However, bigram nodes reduce the probability of combining similar tweets. Hence, some important tweets might be dropped because such tweets cannot be combined with others to form a path. On the other hand, subevents play an important role in the summarization (section “[Sub-Event Detection](#)”), and SCC outperforms COWTS which relies only on the content words.

Effect of content words and subevents: Content words and subevents are both optimized by the SCC framework. Hence, it is important to judge the influence of individual components on the overall performance. F-scores (averaged over 3 days) of SCC are compared with those obtained in the absence of one of these components.

Table 7 Comparison of ROUGE-1 F-scores for high-level summaries of SCC and the four baseline methods

Datasets	Day	SCC	COWABS	COWTS	TSum4act	APSAL
NEQuake	25/04/2015	0.4117	0.3413	0.3662	0.3241	0.2215
	26/04/2015	0.3055	0.2087	0.2896	0.2666	0.3055
	27/04/2015	0.3853	0.3353	0.3726	0.3087	0.2866
	07/09/2014	0.4524	0.3316	0.4141	0.3014	0.2016
PFlood	08/09/2014	0.4145	0.3575	0.3085	0.2030	0.1823
	06/12/2014	0.3223	0.3204	0.3008	0.2460	0.1943
Hagupit	07/12/2014	0.4124	0.2832	0.3569	0.2492	0.2314
	08/12/2014	0.3475	0.3315	0.3002	0.2359	0.2128

Dropping of subevents reduces the F-score by 7%, 1.5%, and 3.6% for NEQuake, Hagupit, and PFlood, respectively. Similarly, dropping of content words hampers the performance by 13%, 25%, and 7% for NEQuake, Hagupit, and PFlood, respectively.

Performance Evaluation of High-Level Summary

SCC method also generates a high-level summary, and it contains the following components: (i) selected tweets, (ii) classes are mentioned from which tweet gets selected, (iii) subevents present in a tweet, and (iv) distribution of tweet classes in the summary. For example, NEQuake's high-level summary on 26 April contains 30%, 20%, 15%, and 35% tweets from infrastructure, missing, shelter, and volunteer classes, respectively. Crowdsourced experiment suggests that such metadata information helps in improving the comprehensibility of the summary.

Performance: ROUGE-1 F-scores for SCC and baselines for the three datasets over different days are reported in Table 7. SCC not only outperforms other baselines but also its performance is much better than class-based summaries (Table 5). One of the benefits of SCC is that it can proportionately select tweets from different humanitarian classes. This is ensured via Eqs. 10 and 11. On the other hand, the baseline methods take the entire data as input, but the class information is missing, and such strategies do not explore that information.

Performance of Missing Person Information

Existing class-based and high-level summarization methods do not capture such specific needs. Hence, separate ground truth is prepared and coverage of the proposed approach is measured.

Establishing gold standard summaries: This kind of information is sparse in nature. Hence, a different strategy is adopted to generate the ground truth. There is no restriction on the word limit of ground truth summary. The objective is to capture all such tweets. Ground truth summary contains the tweets that are unanimously selected by all (three) volunteers. Finally, summaries of 30, 305, and 130 words are created for 3 days (25–27 April) for the NEQuake event, respectively. For PFlood

event, summaries of 110 and 80 words are prepared for the 7 and 8 September, respectively. SCC also generates summaries of the same length as the ground truth.

Evaluation: Since such events are time critical, coverage of all such information is essential. The primary focus is on the coverage/recall score of ROUGE-1. 100%, 82%, and 87% scores are obtained for NEQuake over 3 days (25–27 April), respectively. Similarly, for PFlood, recall scores for 7 and 8 September are 81% and 83%, respectively. In some cases, the method is not able to capture some related tweets. This is because sometimes (in 25% of cases) only a relationship is mentioned, e.g., *My brother is missing*. Apart from that, spelling mistakes and the use of shorthand expressions (doughter, bro, etc.) also affect the performance of the system.

Conclusion and Future Directions

During interaction with disaster responders, NGOs reveal the need of identifying small-scale subevents and summarizing the tweets from different perspectives. Accordingly, the proposed perspective-based summarization approach can generate summaries in different scenarios. This chapter has shown three different scenarios: (a) generating summaries for individual humanitarian classes, (b) high-level summaries, and (c) missing person summarization. The proposed subevent detection algorithm DEPSUB is able to identify more relevant and useful subevents. Further, such subevents help to identify important tweets in the summaries generated by SCC. It increases the diversity and understandability of the summaries. SCC performs better than the other summarization baselines by 6–30%. The importance of different humanitarian classes also varies over days. For example, infrastructure damage is more prevalent in the first couple of days whereas shelter- and volunteer-related updates become essential afterward. The proposed approach SCC can capture this and make the necessary adjustments to address those needs.

Future Direction: There are three open directions as follows:

- (i) Existing crisis-related subevent detection and summarization methods do not consider geographical information in the framework. However, spatial updates are also important along with the temporal direction. It will be useful to develop spatially aware subevent detection and summarization methods.
- (ii) Interpretability and fairness are other important aspects of model development. Existing crisis-related subevent detectors, humanitarian classifiers, and summarizers do not consider such aspects. As a disaster covers information from heterogeneous sources and multiple classes, it is important to ensure that all kinds of information get a fair representation in the final level of output.
- (iii) The actionability nature of the tweets is more important than normal situational updates. It helps responders and rescue agencies to take prompt actions based on the current requirements. Identifying and ranking actionable information is an important task.

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Disaster Rescue Communication Using Mobile Devices, Social Media, and Artificial Intelligence

43

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Contents

Introduction	630
Mobile Phones and Disasters	631
Mobile Alerts and Warnings	631
Integrating Mobile Health	632
Coordinating Search and Rescue	632
Challenges Faced When Mobile Phones Cannot Be Used	633
Mobile Infrastructure and Reliance	633
Accessibility and Overcoming Global Disadvantages	633
Mobile Phones and Social Media	634
Social Media and Getting Help	635
Social Media and Emergency Managers	635
Using People to Help Identify Meaningful Data	635
Crowdsourcing and Disasters	636
Rise in Using AI-Infused Information Technologies	637
Leveraging Textual Content	637
Leveraging Image Content	638
Geo-referencing Information	638
Network Data	639
Privacy Issues	639
Future Research on ICTs and Disasters	640
Conclusion	641
References	642

Abstract

ICTs are key to effective disaster response and recovery. This chapter focuses on how mobile devices, social media, and the use of artificial intelligence (AI) in the form of AI-infused information technologies can meet the communication and

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information needs of crisis managers. In examining research on mobile phones, the chapter reveals the pivotal role they play in helping people participate in more conversations that can increase their chances for receiving help and for providing early alerts. But during disasters, power goes out and Internet connections can be lost, revealing fragile infrastructure and inequities, and underpinning current disaster communication. Mobile phones also provide a primary avenue to access social media, an important communication channel for people to share their calls for help. The chapter discusses the vast quantity of data generated by social media and how scholars are using textual, visual, geo-referenced, and network data to train machines to provide meaningful situation awareness for crisis managers. As AI-infused information technologies are being developed, often by incorporating human expertise, they are making progress toward being an integral partner in disaster response and recovery. The future of research on using ICTs to bridge some of the existing gaps includes considering additional methods, expanding to consider cultural variables, and including disaster practitioners on even broader interdisciplinary research teams.

Keywords

Mobile phone · Social media · Artificial intelligence · Communication · Disaster rescue

Introduction

During disaster response and recovery, it is common for people to need help. Whether they need to be rescued, lack basic supplies to recover, or have lost property, the past two decades have seen a serious rise in the role information and communication technologies (ICTs) play in and around disasters such as earthquakes (Bean et al., 2021b; Chaoxu et al., 2019; Meier, 2012), hurricanes (Imran et al., 2020; Nieves-Pizarro et al., 2019), floods (Stephens et al., 2020), tornados (Imran et al., 2013), and fires (Meier, 2012). Furthermore, the increased accessibility of various ICTs has been linked to saving lives (e.g., Meier, 2012; Toya & Skidmore, 2015) as well as helping in thousands of rescues (Stephens et al., 2020). ICTs are also facilitating increased volunteer efforts around coordinating and providing help (Hughes, 2019; Palen & Hughes, 2018; Smith et al., 2021). Simply put, ICTs have become lifelines during disasters.

This chapter hones in on these technologies by focusing on mobile devices, social media, and the use of artificial intelligence (AI) in the form of AI-infused information technologies, and it describes what these technologies offer for crisis managers. The first part of the chapter examines why mobile phones have the potential to positively influence disaster response and recovery. It also discusses the challenges and gaps faced when mobile phones cannot be used due to infrastructure failure and digital divide issues that still marginalize many people. Next, the connection between mobile phones and social media is explained now that myriad forms of

data can be generated by social media. The chapter also compares concepts similar to one another that include humans in the loop when helping identify meaningful data. Finally, the chapter elaborates on the rise of using AI-infused information technologies to process more data and begin to assist emergency responders and disaster managers and discusses privacy concerns. The chapter ends with suggestions of key areas for future research that can bridge the gaps between these technologies and the needs of crisis managers.

Mobile Phones and Disasters

During a disaster situation, it is essential for people to communicate their need to be rescued. The global diffusion in mobile devices has greatly impacted how people use them during times of crisis and disasters (Chaoxu et al., 2019; Stephens et al., 2020), as well as during preparedness drills (Stephens et al., 2022). Maintaining effective communication like knowing what information to share, with whom, and through which channel is a pressing issue for individuals facing an emergency. The increased availability and usage in mobile devices, such as smartphones, tablets, and wrist watches, have provided people with the ability to take an active role in their own rescue (Stephens et al., 2021).

Prior to the availability of mobile devices, disaster rescue communication heavily depended on either official emergency personnel receiving information or people located in close proximity providing assistance. People who owned or had access to a two-way radio that could receive and transmit information communicated that way, but these devices were rarely used by anyone other than military personnel (Farnham, 2006). Aside from limited usage of two-way radios, people in communities with a working one-way radio or those within close proximity to the disaster were able to hear updates, and if sirens were broadcast, they also provided an auditory warning. Researchers studying local radio broadcasting during a tsunami in Indonesia found that one-way radios were important communication devices that allowed people to mitigate disasters and provided key information for preparedness, especially for under-resourced and underrepresented communities, but it depended on information being sufficient, accurate, and owning a radio (Romo-Murphy et al., 2011).

Mobile Alerts and Warnings

Mobile and cellular devices have improved from one-way communication systems to large-scale applications of alerts and warnings through text-based messaging. In the United States, Wireless Emergency Alerts (WEAs) are short emergency messages that crisis managers can send to people's mobile or cellular devices without the need to (a) live in the area of the emergency (i.e., geo-targeting); (b) the requirement to download an extra app; or (c) subscribe to a new service (FEMA, 2020). The emergency alerts issued through WEAs are short 360-character messages and have

recently added support for Spanish language alerts, although how this feature is used depends largely on the capabilities of authorities translating and distributing the messages (FEMA, 2020). WEAs are not unique to the United States; countries such as Japan also use alerts and messages through mobile or cellular devices to communicate emergency information (Bean et al., 2021a, b).

Automated emergency alerts through mobile phone communication allow quick delivery of potential or ongoing emergency events. As a result of geo-targeting on mobile phones, many people can receive alerts and warnings pertinent to their active current location. The effectiveness of WEAs is largely contextual, and lack of environmental or social cues to gauge the urgency of an emergency may delay rescues in disaster situations (Kim et al., 2019). In addition to understanding the limitations of reduced contextual cues, it is important to consider the political and cultural differences based on location (Bean et al., 2021b). Including a combination of features like newsfeeds commonly found in social media and/or the ability to mark individual safety through alert notifications may help improve the utility of the technology and better meet the information needs of crisis managers (Dijl et al., 2019).

Integrating Mobile Health

Public emergency alerts like WEAs are also being applied to contexts outside of weather-related disasters. Mobile health communication, or mHealth, better understood as “medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices” (WHO, 2011, p. 6) can also be effective in helping people prepare and respond quickly to imminent threats (Bean et al., 2021b). mHealth alert systems have promising findings in helping slow the spread of infectious diseases (Bean et al., 2021a) and deliver support in resource-poor disaster settings (Callaway et al., 2012).

In hospitals, the use of mHealth mobile communication has increased practitioner’s efficiency by providing more timely and accurate patient assessments and improving response to patients in disaster scenes (Yarmohammadian et al., 2015). Experimentation with technologies in health settings has facilitated the implementation of mHealth in regions like Southeast Asia, the Americas, and Europe, but knowledge insufficiency, conflicting health system priorities, and lack of support from policies remain notable challenges (WHO, 2011).

Coordinating Search and Rescue

The coordination processes used during search and rescues have also experienced a change with the integration of mobile phones into disaster communication. Before, emergency personnel had to wait to receive distress signals through one-way communication channels prior to planning and enacting search and rescue missions

(Farnham, 2006). Now the affordances of mobile phones allow them to assist with the coordination and planning process by providing rescue information to crisis managers in real or near to real time. For example, emergency personnel in search and rescue teams are able to better know where clusters of people are located before and after a disaster, and they can track emergency personnel movement in the disaster area through the use of mobile phone location services (Chaoxu et al., 2019). Wireless search technologies also assist crisis managers in detecting and locating disaster victims even when phones are out of order (Hamp et al., 2014). This type of timely location data helps the planning and coordinating of search and rescue victims during critical emergency events.

Challenges Faced When Mobile Phones Cannot Be Used

Mobile Infrastructure and Reliance

The integration of mobile devices into daily activities has created a dilemma: people are so dependent on these devices for their day-to-day interactions that they also expect them, and their related cellular or Internet services, to be available during disaster events (El Khaled & Mcheick, 2019). When mobile infrastructures fail, the reliance on mobile devices creates new challenges both for the public in need of help and for crisis managers who provide assistance. In the United States, the collapse of mobile infrastructure was felt throughout Puerto Rico during Hurricane Maria in September of 2017. This made one- and two-way communication through mobile devices difficult and, in some instances, impossible due to power outages and loss of cellular connectivity (Nieves-Pizarro et al., 2019). Even in disasters, such as Hurricane Harvey in Houston, Texas, USA, where complete service was not lost, diminished service and the inability to recharge cellular devices change how people communicate their needs for help and rescue (Stephens et al., 2021). Although infrastructure failures impact everyone in the disaster area, they are felt most adversely by people already under-resourced and underrepresented, further impacting social and digital inequalities (Madianou, 2015).

Accessibility and Overcoming Global Disadvantages

While not everyone has access to a mobile device and the quality of Internet connection varies, around the globe, over 59% of people do have access to Internet services, and over 92% of this global population accesses the Internet through a mobile device (Johnson, 2021). In developing areas where opportunities to access the Internet are limited due to a lack of communication infrastructure, technology leapfrogging (i.e., the adoption of modern systems by companies or organizations allowing emerging countries access to modern technologies, such as mobile phones, without going through a lengthy infrastructure process) has provided a way to gain connectivity making cellular service more accessible (Tan et al., 2018). As mobile

Table 1 Mobile device possibilities and challenges during disasters

Mobile devices helpful during disasters	Challenges of relying on mobile devices during disasters
Accessibility:	Lack of mobile device access: <ul style="list-style-type: none"> Under-resourced individuals and communities may not have mobile devices.
<ul style="list-style-type: none"> Use devices to text, call, and post on social media. Access documents/information on websites. Communicate disaster help needs. 	Lack of access to power for the mobile device: <ul style="list-style-type: none"> The two-way nature of communication is not possible, and people must rely on radios or waiting to receive help.
Connectivity beyond the device:	Uncertain reliability of connectivity: <ul style="list-style-type: none"> Mobile infrastructure collapses—No cell service and no ability to get help. The two-way nature of communication is lost, and sharing requests for help is no longer possible. Help options are only possibly from face-to-face interactions.

devices have become more affordable, locations such as Asia and Africa have been able to increase mobile usage and connectivity by utilizing leapfrogging techniques in areas that previously lacked the necessary sustainable mobile infrastructure (Cilliers, 2021). China saw an impetus of leapfrogging digitalization in digital industries and applications brought forth by technology demands during the rapidly evolving COVID-19 pandemic (Xiong et al., 2021). Having greater accessibility to mobile devices in areas that previously lacked strong mobile infrastructure connectivity can be lifesaving when seeking help during a disaster.

Table 1 provides a summary of how mobile devices have created helpful ways to communicate during disasters, as well as what happens when social and economic inequities make them unusable or unusable and when infrastructure breaks down. Over time, leapfrogging has helped expand the number of people with access to digital devices, but that access is fragile and dependent on having access to power and ways to transmit signals (Stephens et al., 2020).

Mobile Phones and Social Media

This chapter uses the term social media to mean more than just social network sites. They are communication platforms where people “consume, produce, and/or interact with streams of user-generated content provided by their connections on the site” (Ellison & boyd, 2013, p. 158), as well as discussion forums and platforms such as Twitter, Facebook (Meta), WhatsApp, WeChat, and private platforms such as Nextdoor. Public, semipublic, and private social media platforms play important roles during disasters. Next, this chapter discusses how people use them to seek help,

how they are used by volunteers and crisis managers, and how they function to provide an important data source for situational awareness during response and recovery.

Social Media and Getting Help

Mobile phones with Internet capability can provide people with direct access to social media, and when people need help during a disaster, these platforms provide an effective way to make their rescue needs visible. For example, people can take photos to show the seriousness of their situation, they can post a call for help that can be forwarded to others, and they can have their friends and family post messages on their behalf if they are unable to recharge a failing mobile device (Stephens et al., 2020). Social media can also be used to connect people to sources of volunteer help and to coordinate the delivery of help resources (Palen & Hughes, 2018; Smith et al., 2021). Having platforms that connect people are important because there are often limits to the type of help official disaster responders can provide.

Social Media and Emergency Managers

While social media of many different forms have infiltrated most parts of everyday life, crisis managers are underutilizing social media in their decision-making (Lachlan et al., 2018; Peterson et al., 2019). The biggest reasons they are reluctant to use social media are policies that are unclear or forbid them to use social media, a lack of staff and skills to monitor and respond, and concerns around trustworthiness and the sheer volume of messages generated through social media platforms (Plotnick & Hiltz, 2016). When people need help during a disaster and emergency personnel are not providing the public with timely responses, they turn to public platforms, like social media, to share their stories and request help (Seeger & Sellnow, 2016; Stephens et al., 2020).

Using People to Help Identify Meaningful Data

As the prevalence and accessibility of mobile devices have increased, so has the use of social media. As more people use social media, vast quantities of text, image, and geo-location data are being generated (Alam et al., 2018; Qazi et al., 2020). Social media platforms—e.g., Twitter and Facebook (Meta)—provide content including posts related to requests for help, offers of help, locations where help is needed, and contextual information that can be leveraged to benefit disaster response (Li et al., 2019; Murthy & Gross, 2017; Stephens et al., 2020). These data can be collected and studied in myriad ways, including analyzing the content posted on social media, examining user interactions with one another, and tracing behaviors like joining groups or following/linking to another user or web pages (Senarath et al., 2021). By

analyzing social media content, public behavior during disasters can be characterized, which can enhance disaster-related decision-making.

Crowdsourcing and Disasters

Considerable research in the area of crisis informatics has identified the roles that volunteers play during and after disasters (e.g., Palen & Hughes, 2018). Research studying the use of social media during Hurricane Harvey in the United States identified specific types of rescue roles that volunteers play ranging from physically rescuing others to locating transportation and food, as well as coordinating responses for people in need (Smith et al., 2021). Additionally, these scholars found that volunteers used many different publicly available platforms beyond just social media—e.g., shared Google docs, mapping apps, radio apps, and websites—that allowed them to connect people who needed help to resources, including other volunteers who rescued people stranded on the roofs of their homes (Smith et al., 2021).

Some of the biggest problems for crisis managers with the data being generated by social media are sorting through it and finding the meaningful posts in a sea of irrelevant information (Murthy & Gross, 2017). To address this, one solution has been to include volunteers to assist in searching through the data, and thus they have become a vital part of disaster response. For example, during the Haiti earthquake in 2010, a live crisis map was launched to map out citizen's locations. Volunteers from the community were recruited and trained to process the large amount of location information received from citizens. The Haiti crisis map aided the disaster rescue and saved hundreds of lives (Meier, 2012). In the same vein, other disaster rescue teams employ a trusted group of volunteers as the backbone of disaster rescue efforts, such as Community Emergency Response Teams (CERTs) and Virtual Operation Support Teams (VOSTs) (Senarath et al., 2021).

Crowdsourcing is another approach to describe the contributions from a large, often undefined network of people, which has become an important method of processing social media data during disasters (Kirilenko et al., 2017). Crowdsourcing can be understood as lying at the intersection of a crowd (of people), outsourcing (labor), and advanced Internet technologies (Saxton et al., 2013). Platforms such as Amazon's Mechanical Turk are often used to pay people to perform crowdsourced disaster work (Kirilenko et al., 2017).

With the rise of employing volunteers and crowdsource workers to assist disaster management, a key concern has been the quality of workers' contributions. Researchers have found that volunteers and crowdsourcing workers are willing to devote more time to their tasks and produce higher-quality work when they are excited to participate and the tasks are perceived as meaningful (Tang et al., 2021). Studies have also found that crowdsourcing workers can be more efficient compared to employing volunteers, but the accuracy of the processed data warrants high-redundancy design, which leads to higher expense, therefore, to improve the accuracy. Kirilenko et al. (2017) suggest limiting the workers' pool to countries where the

research topic is actively discussed by the public. In an effort to overcome some of these quality concerns, Pandey et al. (2022) have found that while humans can make mistakes due to lack of attention or incomplete knowledge, AI-infused ICTs can help people identify the systemic sources of the mistakes they make. Therefore, by pairing humans with machines, there may be ways to further enhance the performance of identifying important information for disaster response and recovery.

Rise in Using AI-Infused Information Technologies

With more artificial intelligence (AI) technologies and machine learning practices being developed to aid in disaster rescues and management, the demand for efficient ways to process large amount of data that can be used to train AI-infused technologies is on the rise. Situational awareness refers to the understanding of the “big picture” in an emergency situation that allows for interpreting situations, making decisions, and predicting future outcomes (Vieweg et al., 2010). Scholars have demonstrated various technological capabilities to obtain situational awareness and assist crisis management efforts by leveraging different types of social media content and putting humans in the loop of processing this data. Existing technological systems, such as Artificial Intelligence for Disaster Response (AIDR) and CitizenHelper, use visual displays that provide a summary of social media content during the crisis according to temporal, spatial, and thematic aspects (Imran et al., 2015; Imran et al., 2020; Karuna et al. 2017). Some of these systems are being further developed to more fully leverage AI (Pandey et al., 2022; Senarath et al., 2021). Furthermore, with the advancement of artificial intelligence, researchers can build models not only to successfully classify social media disaster content but also to enable the training of real-time classification of social media with a smaller training dataset than in the past (Johnson et al., 2020). Regardless of the system being developed, they often rely on textual content, visual image analyses, and geo-location data.

Leveraging Textual Content

Given the importance of on-topic social media messages for situational awareness, AI-infused technologies are helping to extract relevant information from social media. Imran et al. (2013) describe a system that automatically extracts information nuggets from Twitter messages and uses machine learning techniques to effectively classify messages by creating structured information from unstructured textual content. Similarly, other researchers have developed various machine learning models by using social media textual data that are labeled with relevant and classified behavior types (e.g., Purohit et al., 2018). These models can assist decision-making during disasters and serve specific purposes such as automatically inferring risk behaviors from social media posts (Senarath et al., 2021) and discovering and ranking serviceable requests posted on social media (Purohit et al., 2018).

In addition, to accommodate automated systems functioning in environments where information is posted in various languages, researchers have built disaster-specific multilingual terminology resources and language-specific natural language processing (NLP) tools to support language translation of social media messages and cross the language barriers (Bügel & Zielinski, 2013).

Leveraging Image Content

Social media allows users to easily share information with more detail by providing ways to post images during disasters. Visual content can provide more information about the severity and extent of damage caused by a disaster than texts alone and offer more detailed understanding of the situation (Imran et al., 2020; Robertson et al., 2019). Researchers have explored how various AI techniques, such as NLP, machine learning, advanced data visualizations, and human computation, can move beyond textual content and leverage visual content generated during disaster events (Alam et al., 2018; Imran et al., 2020; Robertson et al., 2019). For example, Imran et al. (2020) launched an automatic image processing system during Hurricane Dorian to collect tweets relevant to the disaster and identify images useful for decision-makers responding to the disaster. The damage reports identified by the system were assessed by experts, who determined that the classifications were fairly accurate. Further investigations found ways to improve the models that included incorporating more training data on flooded and strong wind scenes (Imran et al., 2020). In addition, imagery content can be combined with textual content for damage analysis to enhance or complement the information contained in a single modality (e.g., text). This practice has led to studies on multimodal social media content, consisting of both images and text with the goal of improving the overall model performance (Alam et al., 2018; Mouzannar et al., 2018; Sosea et al., 2021).

Geo-referencing Information

In addition to textual and image content, geo-referencing information can provide an additional layer of data for analysis. Social media data with geo-referencing information—defined as identifiable location data—can be used to create an interactive map-based visualization that provides additional geographic context for analysis. This can be used to better identify social media users who are geographically vulnerable to impending disasters and make rescue decisions (Anderson et al., 2019). During a pandemic, location data are essential for many tasks such as disease tracking and predicting (Brennan et al., 2013). For example, during the COVID-19 pandemic, researchers collected a large-scale, multilingual, geo-located Twitter data and employed computational models to gain a better understanding of how societies are collectively coping with the unprecedented pandemic (Qazi et al., 2020). This can inform the development of AI-based systems to forecast disease outbreaks, which depend on having geographic data incorporated into their forecasts.

Network Data

A final type of data that could be useful in a disaster is network data, ties among social media users that can be utilized to create a more complete view of crisis-related information posted on social media. For instance, researchers used a network-filtering method for social media data collection and discovered that by combining this approach with location and keyword-based methods, their models can contribute significantly more insight into disaster situational awareness (Grace et al., 2019). However, getting complete network data can be a real limitation of this method, especially considering that so many people limit access to their location information, often due to privacy concerns.

Privacy Issues

Since the data fed into disaster-related AI technologies is most often social media data, several characteristics of this data must be considered. Because social media content is directly created by end users, it can carry personally identifiable information, something that raises privacy concerns. For example, geo-location may reveal users' exact location which can be used to rescue people (Stephens et al., 2020), but it can also be used for surveillance purposes (Qazi et al., 2020).

Due to the typical time-critical nature of disaster response, privacy is often not prioritized during active disaster management (Löchner et al., 2020), yet retaining data and using personally identifiable data can be an important privacy concern. For example, social media users may share their personal information publicly on social media platforms to receive timely rescue during a disaster, and then once they are safe, they may try to delete their post afterward. However, the post may not be fully deleted because it can remain as a copy in a dataset downloaded and stored by a third party. Such data retention opens the risk of possible abuse, theft, and accidental public exposure (Miller, 2020). While many researchers are trying to tackle this issue, one team has developed a method to store and process data from any social media service in a privacy-aware fashion by immediately splitting data into its atomic pieces upon data collection and dissolving direct relations between data (Dunkel et al., 2020). While such an application cannot eradicate privacy issues associated with collecting publicly available social media data, it provides a basis for a better integration of privacy considerations in disaster management.

The integration of geo-referencing data into crisis analysis also entails challenges. For example, there are distinctions between different forms of geo-referenced data such as geo-coordinates (latitude, longitude), place field, and content field (Qazi et al., 2020). Geo-coordinates are received from social media platforms' geo-location service if enabled by users, and these geo-coordinates offer the most accurate user location information. Place field provides location information tagged by users, which may or may not reflect users' actual location. In addition, users may indicate explicit or implicit location information in the content field using text, which often entails ambiguity about geo-/non-geo-information (Imran et al., 2015). A

geo-/non-geo-ambiguity can create confusion for a person or a computer when trying to understand and label social media data. For instance, in the message “Let’s play Texas hold ‘em,” the word, “Texas,” does not refer to a location in the state of Texas in the United States; Texas hold ‘em is actually the name of a game that people play, and thus this geo-/non-geo-ambiguity can create serious data issues (Imran et al., 2015).

Future Research on ICTs and Disasters

ICTs are changing, and their capabilities are increasing almost daily, yet people cannot be separated from the study of ICTs since they will ultimately decide how and when they use these technologies. This invites a host of research opportunities centered around mobile devices, social media, and AI-infused technologies. This chapter provides several directions forward as scholars continue taking cues from practitioners and people experiencing disasters.

While there is a growing body of research trying to understand how mobile devices are used to seek and provide help during disasters, there are still opportunities to better grasp the role that images play in helping people get rescued. It is also important to study the range of capabilities when people only have access to low-bandwidth Internet and thus must rely on text-based options or applications that work in lean bandwidth conditions. This is often the case in disasters; therefore dialing down the range of communication options could provide some of the most wide-reaching, helpful research. Using mobile device capabilities to deliver early warnings also is promising, but moving forward, scholars need to consider culture as well as how to use language to motivate people to action (Bean et al., 2021b). Messages delivered in brief formats need to be designed for maximum impact; therefore, experimental designs testing actual messages can provide insight into what will motivate people to action.

Social media data can be very helpful during disasters, yet several big challenges can impact the usefulness of this form of data. Data privacy and access issues are very real considerations during disasters, and scholars should further explore these. Another challenge that needs considerably more research is identifying mis- and disinformation and separating these from actionable situational awareness data. Not only is this a challenge for people needing help during a disaster, but it can undermine the trust that crisis managers have in using social media data. While it is difficult to get access to private social media data, in the few studies that have researched, it appears people try to provide accurate information, but even with good intentions, people can mistakenly post incorrect information and can be influenced by their own personal beliefs (Li et al., 2019; Stephens et al., 2020).

AI-infused technologies offer considerable promise, but scholars need to better understand the limits of these technologies and where other research methods might reveal richer or more accurate data. For example, Robertson et al. (2019) compared

human-coded content analysis and supervised machine learning results and found that unique disaster experiences are not always captured through machine-learned methods. There are likely times when hand-coding data will yield the best results, but that will likely be in smaller datasets where the manual task is possible. Qualitative research methods can also capture many more narratives around disaster research and response (e.g., Stephens et al., 2020, 2021), as well as serving as a method useful in tandem with AI technologies to provide richer insight into AI findings.

Scholars studying AI-infused technologies in disaster contexts are increasingly working with emergency practitioners (e.g., Pandey et al., 2022; Peterson et al., 2019), and this is vital to understanding the needs of official emergency response communities. Around the globe, the emergency and disaster response communities need more resources than they often receive (e.g., Peterson et al., 2019), and with the proliferation of social media data, they can rarely capitalize on using this data for situational awareness. Yet making the leap from using AI-infused technology for research to getting it into the working operation of crisis managers is difficult. This will require expanding research teams to include experts in user-centered design and human-AI teaming and communication, along with improving the accuracy of machine learning. It will also be important to have crisis managers on the team with researchers, because they can help overcome another challenge: getting the broader emergency response community to trust these automated systems and when to keep humans in the loop. This interdisciplinary endeavor is important to advance the meaningfulness of this research area.

Conclusion

ICTs play a pivotal role in disaster response and recovery because their features can meet the information and communication needs of crisis managers. People who have mobile devices are capable of participating much more broadly in conversations that include social media and thus increase exposure to their calls for help. As more people use social media during disasters, this creates new data volume and quality issues for crisis managers, gaps that disaster scholars are actively trying to bridge. AI-infused technologies offer one solution, but for the near term, keeping humans in the loop will be essential because their local knowledge can fill gaps that machines cannot comprehend. Not all solutions to these disaster data challenges involve technologies, but quite often ICTs open additional possibilities as we improve situational awareness for official disaster responders and save more lives.

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Role of Geolocation Prediction in Disaster Management

44

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Contents

Introduction	648
Response Information Needs and Computational Tasks	650
Location Mention Prediction	654
Location Mention Recognition	655
Task Formulation	655
LMR-Specific Challenges	657
Literature Review	658
LMR Evaluation	664
Location Mention Disambiguation	666
Task Formulation	666
LMD-Specific Challenges	667
Literature Review	668
Evaluation	670
Challenges	671
Twitter Stream Challenges	671
Task-Specific Challenges	672
Future Directions	672
Conclusion	673
References	674

Abstract

Once a disaster occurs, the common practice nowadays is that people check social media platforms, where the news usually breaks, to find out up-to-the-minute situational updates. In fact, news agencies do likewise, not only individuals. Among the important information that is needed during disaster events is

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geolocation information (e.g., where the disaster event has happened, where affected people are situated at that moment, etc.). Such information plays an essential role in disaster management for affected people and also for response authorities such as the Intergovernmental Organizations (IGOs) and Non-governmental Organizations (NGOs). It helps affected people to share accurate updates on their status, their needs, and the emerging incidents, which enable a rapid response. Furthermore, the geolocation information allows response authorities to manage their response activities (e.g., routing rescue teams), and reduce the impact of disasters by planning future activities (e.g., evacuation). This chapter links stakeholders' requirements with existing computational methods for geolocation inference and introduces the computational tasks that fulfill the stakeholders' unmet needs. It also discusses the Location Mention Prediction (LMP) task due to its key role for tackling all geolocation tasks. Moreover, it discusses different categories of challenges associated with LMP subtasks, reviews the existing solutions for each and their drawbacks, and sheds light on a few future directions.

Keywords

Crisis maps · Geolocation inference · Location Mention Prediction · Location Mention Recognition · Location Mention Disambiguation · Twitter

Introduction

Disaster response authorities rely on *Crisis Maps* built using situational and actionable information gathered from heterogeneous data sources to activate response efforts, ideally, within the first 48–72 h of a disaster (Five essentials first 72 hours disaster Ziemke, 2012). Crisis maps leveraging situational information provide the big picture of a mass emergency and help response organizations understand various impacts of the disaster event in different geographical areas (Vieweg, 2012), for example, the cities that are most affected after a severe hurricane, the areas with high flood inundation, or the parts of a city with electricity outage. In all these cases, although at the coarse level, the geolocation information plays a critical role for authorities to understand affected geographical areas. Actionable information, on the other hand, refers to a particular type of information that contains a specific request that demands actions from a particular response authority (Zade et al., 2018). One important factor that makes such requests actionable is the location information specifying where the request is needed (Zade et al., 2018). Examples of crisis maps with actionable information include urgent needs of items such as food, water, and shelter in a specific area, location of a site where some people are trapped, areas where urgent medical assistance is required, or reports mentioning severe damage to critical infrastructure such as bridges, roads, and hospitals.

Crisis or disaster mapping refers to the real-time acquisition, analysis, and visualization of relevant information during a crisis (Ziemke, 2012). The process

of crisis mapping leverages multiple heterogeneous data sources such as mobile and web technologies, hotlines, volunteering, crowdsourcing, and physical surveys, to generate different types of maps useful for response organizations for timely decision-making and actions. However, during large-scale disasters, relying on traditional sources to perform real-time crisis mapping becomes challenging. As an alternative, several studies demonstrated the effectiveness of nontraditional data sources such as social networking sites and remote sensing to acquire real-time crisis information (Weber et al., 2021). For instance, the use of Twitter, which is a microblogging social media site, during disasters has been proven as a useful information source to gather time-sensitive situational and actionable data directly posted by the affected people (Hughes & Palen, 2009).

This work explores the use of Twitter to acquire different types of geolocation data to generate different types of crisis maps. Specifically, we analyze location information shared via Twitter messages during disasters to understand its effectiveness for crisis mapping. To determine the usefulness of location information present in tweets, we list down several response tasks and their information needs, specifically in terms of geolocation information, and discuss corresponding computational tasks useful to extract location information from Twitter messages to fulfill stakeholders' information needs. Although the chapter states several computational tasks, two of them, i.e., Location Mention Recognition and Location Mention Disambiguation, are discussed in detail.

The contributions of this chapter include an attempt toward linking stakeholders' requirements with existing computational tasks around geolocation inference tasks. Moreover, it defines new computational tasks that fulfill stakeholders' unmet needs. Lastly, it focuses the discussion on the *Location Mention Prediction (LMP)* task due to its vital role in all geolocation tasks and the entire emergency response pipeline. It describes the current status from the literature, associated challenges, and future directions. We refer the reader to the thorough survey of Zheng et al. (2018) for studies on *Tweets and User (or Home) Location Prediction* tasks. We are not aware of surveys for the remaining geolocation tasks. Additionally, a large body of existing studies tackle the LMR task in different data (e.g., news articles, research articles, etc.) and task domains (e.g., POI recommendation, traffic monitoring, etc.). However, this chapter is restricted to the research that has been conducted over Twitter in emergency scenarios.

The rest of the chapter is organized as follows. Section “[Response Information Needs and Computational Tasks](#)” links stakeholders' requirements and existing computational tasks. Section “[Location Mention Prediction](#)” provides an overview of the *Location Mention Prediction* task. Sections “[Location Mention Recognition](#)” and “[Location Mention Disambiguation](#)” discuss the *Location Mention Recognition* and *Location Mention Disambiguation* tasks, respectively, in detail including the problem formulation, associated challenges, existing literature, and evaluation tools. Section “[Challenges](#)” discusses further the Twitter- and emergency domain-specific challenges that have to be taken into account when developing LMP systems. Section “[Future Directions](#)” emphasizes limitations and shapes a few future

directions toward achieving the responders' requirements. Section “Conclusion” concludes with a brief summary of the chapter.

Response Information Needs and Computational Tasks

To model the stakeholders' information requirements into real-time computational tasks, this section elaborates on the specifications of their needs and formulates the problems accordingly.

Different experts in the disaster domain have participated in a study conducted by Hiltz et al. (2020) to understand the information needs of response authorities that can be supported by computational tasks. Their responses to surveys manifested the need for situational and actionable information accompanied by geolocation information.

What makes Twitter content invaluable is that witnesses to incidents do usually mention fine- (Kropczynski et al., 2018) and coarse-grained (Grace et al., 2018) locations while reporting incidents or stating needs. Several successful real-world examples of exploiting Twitter for disaster response are inspiring the responders from around the globe to cope with the new tools at hand, for instance, the deployment of the Ushahidi platform ([The ushahidi platform](#)) to map geotagged tweets during the Port-au-Prince earthquake in Haiti, 2010 ([Innovative uses of social media in emergency management](#)). Similarly, the geolocation information was used to map damages and requests during Typhoon Haiyan in Southeast Asia, in 2013. Furthermore, Fairfax County in Virginia, USA, offers an excellent case in point when they explored the usefulness of employing the Geofeedia platform to monitor and aggregate data from various social media platforms including Twitter. The platform is no longer available. Nevertheless, Twitter announced removing the geotagging feature in tweets, in June 2019.

There are different geolocation tasks defined in the literature over Twitter as follows:

- *Location Mention Prediction* (LMP): extracting toponyms from the tweet's text (Location Mention Recognition) and pinning them on the map (Location Mention Disambiguation) (Zheng et al., 2018). Bold text in tweets in Fig. 1 refers to the location mentions that have to be extracted and resolved.
- *Locational Focus Prediction*: inferring the most probable locational focus of a tweet, if multiple locations are mentioned (Yin et al., 2014). For example, the fourth tweet in Fig. 1 mentions multiple locations where different floods happened. The locational focus of this tweet is “Chennai” as the user is listing the number of donations by a celebrity for the Chennai floods among other floods.
- *Tweet Location Predicting*: estimating the geotags from where a tweet is posted (Zheng et al., 2018). Tweets in Fig. 1 are not geotagged by the user (the geotags feature had been removed by Twitter), hence this task should assign a location to every tweet. These locations could be mentioned within the tweet text or not.

Name

@username

Company manager

📍 Chennai 🕰 Born November 5 📅 Joined January 2012

75 Following 10K Followers

Not followed by anyone you're following

Tweets **Tweets & replies** **Media** **Likes**

Name @username Dec 3, 2015
Mom and relatives at **24/113.kothaval chavadi st(near mosque st), Saidapet**. Please help. @ChennaiRains @RU_Balaji @Chinmayi #ChennaiRainsHelp

8 34 6

Name @username Dec 3, 2015
Dear, Pl help by sending boat to **54 and 58, Vivekananda Nagar Street, Nesapakkam, Chennai**. Pl give concern phone number to inform this.

2 34 10

Name @username Dec 3, 2015
Please donate on chennaifoods.ketto.org/save-chennai remember every penny counts! Chennai really needs your compassion and support 🙏🙏🙏

59 430 743

Name @username Dec 3, 2015
#Prabhas ❤️

AP Floods - 1cr
Hyderabad floods - 1.5cr
Kerala floods - 1cr
Chennai floods - 15 Lakhs

<https://www.indiatoday.in/story/prabhas-donates-rs-1-5-crore-to-telangana-cm-relief-fund-for-floods>

Prabhas Donates Rs 1.5 crore to Telangana CM relief fund for ...

21-Oct-2020 — BA Rau, a notable PRO and producer from South film industry, announced that Prabhas has contributed Rs 1.5 crores to the Hyderabad

<https://chitraseema.org/prabhas-donates-rs-1-cr-for-ap-flood-relief>

Prabhas Donates Rs 1 Cr For AP Flood Relief - Chitraseema

hour ago — Prabhas Donates Rs 1 Cr For AP Flood Relief ... Telugu state, Andhra Pradesh, has been witnessing heavy spells of rainfall since last week...

<https://www.telugus360.com/prabhas-donates-a-bomb-for-kerala-floods-telugu360.com>

Prabhas donates a bomb for Kerala Floods - Telugu360.com

04-Sept-2018 — Prabhas for kerala floods, Kerala Minister Kadakampally Surendran praises prabhas, Prabhas donates 1 cr for Kerala floods

<https://www.filmibeat.com/news/chennaiRains-Baahubali-Prabhas-donates-15-Lakh-Rupees>

1-Dec-2018 — Baahubali Prabhas announced an a rupees 15 Lakhs for Tamilnadu CM relief fund, amidst the chaos caused by Chennai floods.

2 209 460

Fig. 1 Synthetic user profile example during floods in Chennai

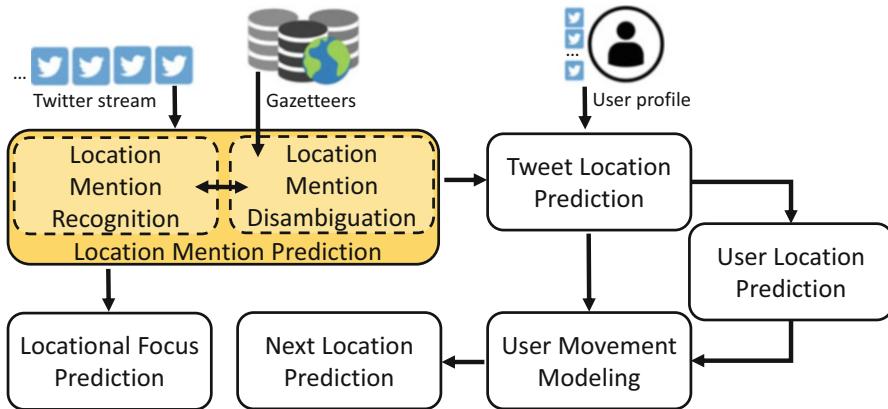


Fig. 2 Geolocation tasks and the interactions between their output

- *User (or Home) Location Prediction*: inferring the exact location where a user is living (Zheng et al., 2018). As shown in Fig. 1, the user set his location to “Chennai” which typically indicates his coarse-grained home location. This task is concerned with predicting the home (empty or ambiguous locations) or the current location of the user that could be outside her homeland.
- *User Movement Modeling*: mining the pattern of a user movement over time. People tend to write tweets while traveling over time.
- *Next Location Prediction*: forecasting the next place where a user might go (Wang & Gerber, 2015).

Figure 2 illustrates six geolocation tasks and the interactions between them.

The underlying usage of these six tasks enables responders to operate effectively and efficiently through several real-time applications such as disaster-specific routing, geographical-based recommendation, and geographical tracking based on social sensing. The usage of these real-time applications is delivered to stakeholders through different types of maps that are discussed below:

- **Situational awareness maps**: High-level situational awareness helps response organizations understand different types of impacts to different geographical areas (Vieweg, 2012). Situational maps assist response authorities in identifying the most affected areas, and the most vulnerable people, among other information that could be observed and acted upon such as planning evacuations ahead of upcoming developments. To map the disaster using Twitter data, a geolocation system should extract informative tweets about the disaster, perform *Locational Focus Prediction* on informative posts, and encode this information in *choropleth maps* that depict the aggregated information based on their locational focus in different geographical levels (e.g., state, city, street, etc.). The *locational focus* was not sufficiently studied in literature (Yin et al., 2014), and crisis mapping was studied in the aftermath of disaster events (Middleton et al., 2014) using different types of maps. Therefore, more attention has to be paid to this research direction.

- **Disaster development and impact maps:** Pinning different incidents on the map, especially the destructive ones, helps response authorities manage relief activities. Generally, disaster events cause infrastructure damages, power outages, airport closures, transportation outages, etc. Locating the consequences through choropleth and heat maps helps response authorities assess the impact to plan for recovery. Dynamic disruption maps (Roy et al., 2020) can present the severity of the disaster impact after applying statistical analysis of the information (e.g., the frequencies of locations could be an indication). This indeed aids in the planning of relief activities, for example, changing routes of responders to avoid damaged roads and bridges. Up to our knowledge, *disaster-specific routing systems* are not explored in the literature. To map the incidents and consequences during disaster events, a geolocation system has to detect on-topic tweets about incidents, perform *Location Mention Recognition* and *Disambiguation*, and put them on the map. In cases where the locations of incidents and consequences are not mentioned, the system could perform *Tweet Location Prediction* to understand whether the user is talking about a location he is currently visiting or living in to increase the reliability.
- **Eyewitnesses and resources maps:** Locating eyewitnesses, first responders, and resources are important to support assessing urgent needs. Visualizing eyewitnesses is needed to determine potential first aid treatment performers, for example. Linking the people in need to the first responders is a potential activity that could be achieved through specialized *real-time geographical-based recommendation systems*. Similarly, resources could be mapped using *proportional symbol and dot-density maps* to identify their status, shortage, adequacy, or abundance. Resources include human resources (e.g., volunteers and expert responders), facilities (e.g., shelters), funding (e.g., donations), and supplies (e.g., food and water), among others. To locate eyewitnesses and resources, a geolocation system may simultaneously perform *Tweet* and *User Location Prediction* tasks supported by content-based analysis and *Location Mention Prediction*.
- **Population mobility maps:** When a disaster event occurs, people living in the affected area have to evacuate in most cases which requires tracking their mobility and behavior. People displacement impacts the resource allocation and recovery plans; thus, *real-time geographical tracking systems based on social sensing* using *animated time-series maps* are of great support to trace the movement of the affected people. Also, modeling the user movement requires applying *User Movement Modeling* component that requires *Tweet Location Prediction*, *User Location Prediction*, and *Next Location Prediction*. Current studies rely on mobile Call Detail Records (CDR) but not on social media data. Additionally, modeling the dynamics and flow of evacuation is important during disaster events.
- **Response planning maps:** To plan relief activities, a major aspect to manage is the transportation of relief personnel from their location to the location of people in need. The planning maps could support various relief activities such as rescuing trapped people, tracing missing people, providing first aid for injured people, etc. While the subsequent incidents and consequences are mapped

already, performing the relief activities would be safer when responders are aware of and can avoid dangerous or out-of-service areas in their routes. *Real-time development-aware routing algorithms* that are up-to-date concerning the mapped incidents and consequences are required. The areas of incidents and consequences have to be avoided in planning the routes (Refer to the *Disaster development and impact maps*). Moreover, the routing algorithm has to collectively apply all geolocation tasks as applicable to decide the starting point, the multiple stop points, and the destination point.

As it turns out that the Location Mention Prediction (LMP) task is intrinsic to the other geolocation tasks that require content analysis of tweets to perform the prediction and modeling, this chapter focuses on the LMP task.

Location Mention Prediction

To articulate the role of an LMP module in the emergency management domain, a high-level computational response pipeline is depicted in Fig. 3. While the Twitter are noisy and shared at a very high rate, the responders demand high-quality situational reports and actionable tweets to make decisions and deploy relief activities accordingly. Hence, prefiltering modules have to be implemented – upstream tasks are shown in Fig. 3.

Among these tasks are (i) relevance filters: to discard all irrelevant content to the target disaster event; (ii) qualification filters: to filter out spam, rumors, bot-generated content, etc.; and (iii) informativeness filters: to filter out sympathy, opinions, criticism, etc. The prequalified tweets continue to the LMP module that constitutes two main components for (i) Location Mention Recognition (LMR) to extract toponym spans from the text of tweets, and (ii) Location Mention

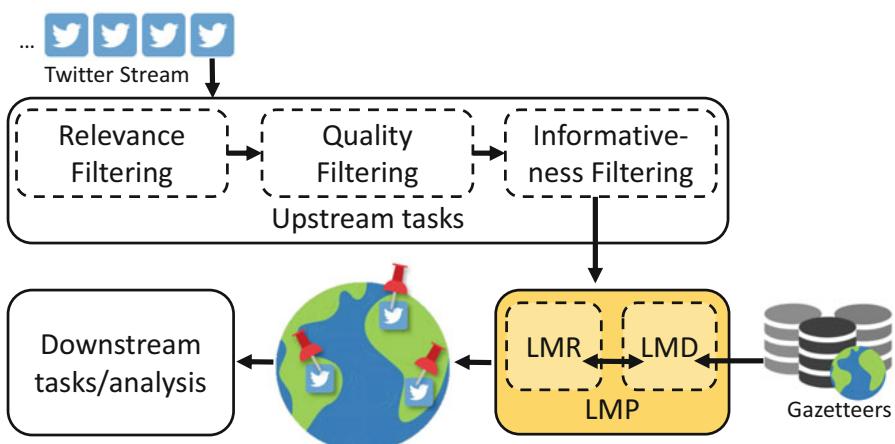


Fig. 3 Locating the LMP task in the disaster response pipeline

Disambiguation (LMD) to link the potential-extracted LMs to existing toponyms in a geo-positioning database (i.e., gazetteer). The output of the LMP module can be then directly used by the disaster response authorities, or fed into other downstream tasks such as mapping services.

The recognition and disambiguation tasks have different naming in literature. Some studies refer to recognition as extraction or geoparsing. The disambiguation is alternatively named resolution, linking (looking up a geo-positioning database to find matches), or geocoding (assigning geo-coordinates to LMs regardless of the sources used). In rare cases, geoparsing could refer to both LMR and LMD tasks. For clarity, recognition and disambiguation terminologies are used throughout this chapter.

Location Mention Recognition

This section starts with the formulation of the LMR task in section “[Task Formulation](#).” It then discusses the challenges associated with it in section “[LMR-Specific Challenges](#),” dives into different categories of proposed solutions in the existing literature in section “[Literature Review](#),” and finally presents the evaluation tools and their shortcomings in section “[LMR Evaluation](#).”

The LMR task is generally defined as *the automatic extraction of toponyms from text*. The scope of this section is limited from two angles: The extraction is focused on *tweets*, and more specifically *disaster-related* tweets that are posted *during disaster events*. Figure 4 illustrates the high-level overview of the LMR task.

Task Formulation

The LMR task is formally defined as follows: Given a tweet t that is related to a disaster event e , the LMR system aims to identify all location mentions (LMs) : $L_t = \{l_i; i \in [1, n_t]\}$ in tweet t , where l_i is the i th location mention and n_t is the total number of location mentions in t , if any. The location mention may constitute one or more *tokens* in the tweet text. The location type can also be fine-grained (e.g., street, building, natural feature, etc.) or coarse-grained (e.g., country, state, city, etc.). Thus, the LMR task can be tackled in two setups: (i) *Type-Less Recognition*, where the

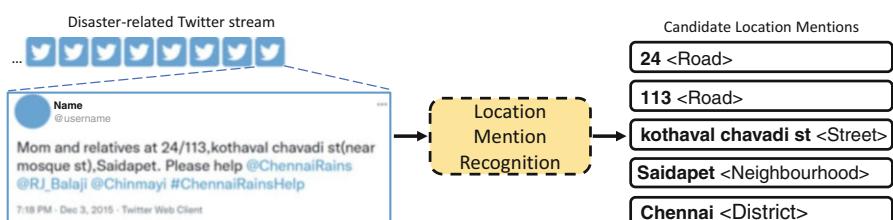


Fig. 4 High-level overview of the LMR task

Table 1 Tweets from real-world disaster events with location mentions (underlined). HRC, EQK, and FLD refer to hurricane, earthquake, and floods, respectively

Dataset	Tweet #	Tweet text
Chennai FLD	#1	[user_mention] Dear friends, Pl help by sending boat to 54 and 58, <u>Vivekananda Nagar Street, Nesapakkam, Chennai</u> [...]
	#2	[user_mention] fear bridge being washed away. <u>Adayar Bridge Saidapet</u> . Hope TVK bridge is holding up fine at <u>Malhar</u> [url]
Houston FLD	#3	#USGS08076700 – <u>Greens Bayou</u> at <u>Ley Rd, Houston, TX</u> is above NWS flood stage (30 ft) [URL]
	#4	FWD cancels Flood Warning for North <u>Bosque River</u> at <u>Valley Mills [TX]</u> [url] #ntwx
Louisiana FLD	#5	Flash FloodWarning for <u>Livingston, St. Helena</u> , and <u>Tangipahoa Parish</u> in <u>LA</u> until 7:45 am Saturday
	#6	This line of storms in <u>Evangeline</u> is moving to the southwest towards <u>Allen</u> , which will bring heavy rainfall #LAWX [url]
ChCh EQK	#7	RT [user_mention]: all kids safe at <u>Cashmere kindergarten</u> . #eqnz
HRC Sandy	#8	All roads into and out of <u>Ocean City, New Jersey</u> are closed due to flooding that has cut off the popular Jersey... [url]
	#9	Flooding at <u>East 8th</u> and <u>Avenue C</u> before the blackout (GIF) [url]

system detects all potential LMs in the tweet text regardless of their types, and (ii) *Type-Based Recognition*, where the system detects LMs and predicts their types (e.g., city, country, street, POIs, etc.). All the existing LMR studies in the disaster domain propose *Type-less Recognition* approaches.

Table 1 shows a few example tweets shared during different real-world disaster events including *Chennai floods 2015*, *Houston floods 2016*, *Louisiana floods 2016*, *Christchurch earthquake 2012*, and *Hurricane Sandy 2012* (Al-Olimat et al., 2018; Middleton et al., 2018). These tweets are important for the relief organizations and first-responders, who rely on Twitter for effective management, as the tweets contain (i) situational reports such as incident or casualty statistics, the status of resources, etc., or (ii) actionable information, including the calls for rescue, requests for resources, need for volunteers, etc.

The LMs appear in different forms in tweets, such as:

- *Full address*: Examples include the location where rescue boats are needed in tweet #1, and the location of reported water levels in tweet #3.
- *Administrative divisions*: Different levels of administrative divisions are commonly mentioned during disasters. For instance, states are mentioned for high-level updates, such as “TX” and “LA” in tweets #3 and #5, respectively. Cities are also reported, such as “Valley Mills” and “Ocean City” in tweets #4 and #8, respectively. Neighborhoods are also mentioned, such as “Greens Bayou” in tweet #3.
- *Points-of-interest (POI)*: Examples include the location of a natural POI where a flood warning is issued, e.g., “Bosque River” in tweet #4, the location of a

human-made POI to report the status of children, e.g., the “Cashmere kindergarten” in tweet #7, or worship places, e.g., “Tangipaho Parish” in tweet #5.

- **Streets:** Examples include bridges, e.g., “Adayar Bridge Saidapet” and “TVK bridge” in tweet #2, and flooded streets, e.g., “East 8th” and “Avenue C” in tweet #9.

Moreover, due to the short length of tweet text limited to 280 characters, Twitter users lean to use abbreviation forms, such as “TX” and “LA” in Tweets #3, #5, and #6 and shortcuts such as “Rd” and “St.” in Tweet #3 and #5, respectively. The abbreviations and shortcuts cause the mismatch challenge that is discussed among other challenges in section “[LMD-Specific Challenges](#).”

LMR-Specific Challenges

The following different challenges arise when tackling the LMR task:

- ***Emerging location:*** Over time, the disaster event develops over the Twitter stream with new incidents and discussions. Hence, new unseen LMs emerge. Therefore, The LMR systems have to learn detecting the patterns of locations instead of memorizing the vocabulary of toponyms to generalize well to unseen data.
- ***Toponymic Polysemy:*** Location mentions might have different meanings referring to different entity types other than locations. For example, “Sabah Al Ahmad” could mean the “Sabah Al Ahmad city, Kuwait” or could refer to the former Emir of the State of Kuwait “Sabah Al Ahmad.” Thus LMR systems have to accurately distinguish locations from other entities, especially the unusual toponyms.
- ***Temporary locations:*** Temporary facilities (i.e., medical camps and shelters) are constructed during emergencies to provide resources and support the affected people. However, these facilities are disassembled (e.g., quarantine centers) once the emergency is over. Additionally, the names of some locations could change during emergencies, such as converting schools into shelters and giving them new expressive names (e.g., “main shelter”). Once the disaster event is over, schools will return to providing their original services. The difficulty of detecting and disambiguating these temporary locations is due to the need to comprehend their context.

There are challenges associated with the gazetteer-based solutions, including the “mismatch” and “incompleteness of gazetteers” issues, that are discussed in section “[LMD-Specific Challenges](#)” in detail.

Literature Review

Existing studies exploit different techniques and features to extract location mentions (LMs) from text (Zheng et al., 2018). It is worth mentioning that, comparing the performance across approaches is unattainable due to the absence of a unified evaluation framework for a long time including datasets with standard training and test splits, and public evaluation scripts. Recently, Suwaileh et al. (2023) released the largest to date public and generalizable LMR datasets. Hence, the discussion and comparison of approaches in this section will solely focus on the methodology.

NER-Based Approaches with Domain Transfer

LMR can be considered a subtask of a more general task of detecting entities (e.g., people, organizations, locations, etc.) in text, which is known as Named Entity Recognition (NER). Therefore, a naive solution would be to start from NER by applying the existing NER models for extracting LMs. Interestingly, the explored transfer-learning directions are not limited to only employing the existing NER models, but researchers have also used the NER datasets to train their LMR models. For instance, Lingad et al. (2013) explored the effectiveness of four off-the-shelf NER models on toponyms extraction over disaster-related tweets. The models are StanfordNER (Finkel et al., 2005), OpenNLP (Apache, 2022), Yahoo! PlaceMaker (No longer available), and TwitterNLP (Ritter et al., 2011). Both StanfordNER and OpenNLP allow custom training; hence, Lingad et al. retrained them using Twitter data. TwitterNLP provides the option to expand the Freebase dictionary. The study showed that StanfordNER is the top-performing tool after retraining it with Twitter data; otherwise, it poorly detects LMs. The OpenNLP comes next with the same retraining condition. Following this intuition, Gelernter and Balaji (2013) developed GeoLocator tool that uses OpenCalais NER tool to extract toponyms and facilities (i.e., buildings). In an effort to combat the gazetteer incompleteness issue, they augmented OpenCalais with a list of building types to improve its recall when detecting buildings.

Later, the StanfordNER tool was commonly employed in LMR studies due to its superiority (Ghahremanlou et al., 2015; Liu et al., 2014; Mao et al., 2019; Nand et al., 2014; Yin et al., 2014). The original StanfordNER model is trained on newswire articles. The first LMR shared task organized by the research community was part of the Australasian Language Technology Association (ALTA) Workshop 2014 (Molla & Karimi, 2014). Among the four participating teams, a couple of them used the StanfordNER tool for toponyms recognition. One team used it in a data transfer mode, as a pretrained model within an ensemble LMR system with rule-based modules that identify abbreviations and location specifiers in text (Nand et al., 2014). Alternatively, Liu et al. (2014) retrained the StanfordNER model over the ALTA training data. Ghahremanlou et al. (2015) and Yin et al. (2014) had also retrained StandfordNER using tweet datasets aiming at improving its effectiveness. Furthermore, Mao et al. (2019) compared three NER models including the original StanfordNER model, a retrained version of it with tweets, and Bi-LSTM model to map the places where power outages happened using Twitter data.

Recently, Nizzoli et al. (2020) have used the NER dataset from the Named Entity rEcognition and Linking (NEEL) challenge (Rizzo et al., 2015) to train their LMR model. They then employed the off-the-shelf TAGME tool (Ferragina & Scaiella, 2010) to capture meaningful short phrases in the text and match them to Wikipedia articles to identify the LMs in the text. Wang and Hu (2019a), alternatively, retrained the three top systems from the Toponym Resolution in Scientific Papers task, which was held at SemEval 2019 (Weissenbacher et al., 2019), on CoNLL 2003 NER Web dataset (Tjong Kim & De Meulder, 2003). The systems are, namely, *DM_NLP* (Wang et al., 2019), *UniMelb* (Li et al., 2019), and *UArizona* (Yadav et al., 2019). These systems recognize and disambiguate entities using independent components. The recognition components of all of these Toponym Resolution systems are, at their core, Bidirectional Long Short Term Memory (BiLSTM) models (Discussed further in section “[Riding the Wave of Deep Learning Models](#)”). The disambiguation components of these systems are discussed in section “[Literature Review](#).[“](#) Furthermore, to create dynamic disruption maps during disaster events, Roy et al. (2020) extracted LMs from tweets’ text using the NLTK-NER model (Bird et al., 2009).

Following this line of research, Cite Suwaileh et al. (2020) and Suwaileh et al. (2022). empirically investigated the usefulness of transfer learning over multiple datasets from two angles: (i) training LMR models on Web (CoNLL-2003 (Tjong Kim & De Meulder, 2003)) versus Twitter (BTC (Derczynski et al., 2016)) general-purpose NER data, and (ii) training LMR models using all types of entities versus only the location entities. They composed four setup combinations and compared them to training on only disaster-related LMR Twitter datasets. Their study recommends a preference of dataset types based on the performance gains when used for training LMR models. The best scenario is to train the LMR models on disaster-related LMR data whenever available. Otherwise, Twitter general-purpose NER data is put forward, then the Web general-purpose data is recommended when no other resources are available for training. Additionally, Cite Suwaileh et al. (2020) and Suwaileh et al. (2022) suggest limiting the training on location entities, rather than using all types of entities, to remarkably improve the LMR performance.

Takeaway Messages: The key motivation of the *domain transfer recognition* approaches is to mitigate the response latency of relief authorities at the onset of a disaster event. The latency might occur due to the costly annotation of target disaster data. Directly applying the NER models trained on web data is not the best option during emergencies. Hence, when data from disaster-related data is not available, the Twitter NER datasets, with solely location entities, provide a valuable resource for training acceptably performing LMR models.

Gazetteer-Based Approaches

The subsequent research direction was to develop disaster-specific LMR models. To achieve this, the intuitive approach is to verify the potential LMs against a geolocation database (i.e., gazetteers) while detecting them. Many of the existing LMR models are gazetteer-based models with two main components (Al-Olimat et al., 2018; Dutt et al., 2018; Gelernter & Balaji, 2013; Malmasi & Dras, 2016; Middleton et al., 2018): (i) *extraction*: aims to detect potential LMs in text, and

(ii) *retrieval*: aims to link the candidate LMs with toponyms in gazetteers. Hence, these approaches could be categorized under joint recognition and disambiguation, as the resulting LMs correspond to existing toponyms in gazetteers.

Several existing gazetteers were employed in the gazetteer-based approaches, including Geonames (Dutt et al., 2018; Malmasi & Dras, 2016), OpenStreetMap (Al-Olimat et al., 2018; Dutt et al., 2018; Middleton et al., 2018), and National Geospatial Intelligence Agency gazetteer of New Zealand (Gelernter & Balaji, 2013), among others.

The gazetteer-based approaches extract LMs from the textual content; however, they do not qualify LMs before verifying them against a gazetteer. For example, after extracting candidate LMs using OpenCalais NER model, the GeoLocator (Gelernter & Balaji, 2013) matches (exact matching) the extracted toponyms and building names against a gazetteer after correcting misspellings. To alleviate the mismatch issue between the user-generated text (tweets) and gazetteers, GeoLocator expands tweets with abbreviations and acronyms using a C4.5 decision tree classifier. Middleton et al. (2018) proposed *map-database* approach that relies on direct matching with the gazetteer. An index of locational phrases is constructed by augmenting different variations of LMs in OpenStreetMap gazetteer using a set of heuristics. The collected variations are represented in n-grams before being indexed and searched. All combinations of n-grams tokens of the input tweet are issued against the index of the locational phrases.

Another direction for matching gazetteers is utilizing language models. For instance, Middleton et al. (2018) adopted a language modeling approach, namely, the *lmtags-gazetteer* proposed by the top team in the MediaEval 2016 Placing Task (Kordopatis-Zilos et al., 2016) after extending it for location entities. The extended system uses gazetteers and a large geo-tagged social media dataset (Flickr posts) to build a language model. The language model is computed on a regional basis to account for highly indicative terms of specific locations.

Similarly, Al-Olimat et al. (2018) proposed an unsupervised statistical approach to construct regional language models. Their tagger identifies the LMs by traversing a tree of n-grams while matching them against a prebuilt region-specific gazetteer. Alternatively, Dutt et al. (2018) apply syntactical heuristics to identify candidate LMs before matching them against gazetteers. After identifying the nouns in text using a POS tagger, they consider the candidate nouns followed by common suffixes as LMs. A suffixes list is precompiled using different naming conventions of locations (e.g., streets, cities, etc.). They also constructed a prefix list of prepositions (at, in, etc.) and directions (north, south, etc.) to tokenize text.

Takeaway Messages: Acquiring labeled data is a key bottleneck during emergencies. The elegance of gazetteer-based solutions lies in their essence being unsupervised approaches that enable them to evade the need for acquiring annotated data at all. Additionally, the gazetteer-based approaches do achieve high precision levels. However, albeit being training-free models and highly accurate, they have two main drawbacks. First, the noisiness of Twitter streams causes the mismatch issue between textual content of tweets and gazetteers which introduces two challenges: (i) the need for careful preprocessing (e.g., spell checking), and (ii) the need

for augmenting all variations of the LMs including their abbreviations and acronyms into gazetteers for more effective matching. As an alternative, these steps could be replaced by semantic text representation models. Second, the incompleteness of gazetteers affects the performance of LMR models when detecting correct LMs that do not exist in the used gazetteer. These two challenges are discussed further in section “[LMD-Specific Challenges](#).”

Learning-Based Approaches

The machine learning-based (ML-based) LMR models alleviate the limitations of the gazetteer-based LMR solutions. The virtue of ML-based approaches lies in their promising ability to generalize beyond the seen data if supported with (or inherently learned) useful features.

Before discussing the ML-based models, we first discuss the different features used to train those models. Note that all features are token-level features (except one type of the geographical features and the temporal features), as the LMR task here is defined to be a sequential token-level tagging/classification task.

Textual features: While words are the essential component of tweets, they constitute the basic feature to be used in all ML-based approaches. Tweet text is tokenized using different techniques, and the resultant tokens are used to represent each tweet as a bag-of-words. *N-grams* are employed at both word- (Finkel et al., 2005; Han et al., 2014; Li & Sun, 2014) and character- (Xu et al., 2019) levels for the LMR task.

Lexical features: Following the NER tools behavior that heavily relies on *capitalization* to identify entities, especially in formal documents, different cases of capitalization are used by the LMR models (Han et al., 2014; Li & Sun, 2014) including all characters uppercased, all characters lowercased, only the first character uppercased, mixed capitalization, the prior probabilities of the lowered form of the token having the first character capitalized, and the prior probabilities of having all characters capitalized. While capitalization shows a strong signal for entities, in Twitter, and social media in general, users typically ignore capitalization; thus, letter case correction could be applied before recognition. In addition to that, an indicator feature for whether a token is numeric or alphanumeric was also used for the LMR task (Li & Sun, 2014).

Contextual features: The bidirectional context of tokens is usually considered for the Conditional Random Fields (CRFs) classifiers to capture the boundaries of locations by adding the adjacent words within a window of a maximum size of 2 (Finkel et al., 2005; Han et al., 2014) or 5 (Li & Sun, 2014). Furthermore, *word embeddings* have been used for the LMR task (Kumar & Singh, 2019; Suwaileh et al., 2020; Xu et al., 2019) to contextually represent tokens/tweets using pretrained models such as GloVe (Pennington et al., 2014) and BERT (Devlin et al., 2019).

Syntactic features: Assigning the *Part-Of-Speech tags* (POS), e.g., noun, verb, and adjective, among other types, to words (or tokens) showed to be effective when combined with other features (Finkel et al., 2005; Han et al., 2014; Li & Sun, 2014).

Geographical features: To trade-off between precision and recall, a few studies (Han et al., 2014; Li & Sun, 2014; Xu et al., 2019) prelabeled the tweet tokens using

a toponym inventory which has been proven to be influential on the LMR performance. To build the toponym inventory, Li and Sun (2014) labeled the common names of POIs mentioned in tweets with the associated Foursquare check-ins. This method generates a Twitter-like noisy POI inventory. Alternatively, Han et al. (2014) combined GeoNames gazetteer with a manually crafted list of location abbreviations and codes to account for the incompleteness and mismatch challenges. Both Wikipedia and Google are mined to compile this list. They leveraged the ConceptMapper (Tanenblatt et al., 2010) to link locations (extracted from gazetteers) and use them to represent tweet tokens for the LMR task. Xu et al. (2019) assigned the BIO-like LMR prelabels that are predicted by a CRFs model to represent the tweet tokens alongside their distributed word and character representations. Note that crafting this type of features is equivalent to the *extraction* of candidate LMs phase in the gazetteer-based approaches (refer to section “[Gazetteer-based Approaches](#)”).

Entity features: This type of features is more general than the *Geographical features* in which the LMR models are fed with the NER tags extracted by NER models and their confidence scores (Nizzoli et al., 2020). In addition to that, some entity features are extracted from knowledge bases such as the DBpedia ontology class of the entity, the number of classes and superclasses of the entity, the node degree of the entity, and the length of the corresponding Wikipedia article in characters, among other features (Nizzoli et al., 2020).

Temporal features: The goal of these features is to capture common words based on chronology. Li and Sun (2014) manually complied a time-trend list of 36 common English verbs, auxiliary verbs, adjectives, or adverbs with scores of 1, 0, and –1 representing the future-, present-, and past-trends, respectively. These scores are then used to compute the time-trend score per tweet by averaging the scores of the tweet tokens occurring in the time-trend list.

Note that the Stanford NER tool employs a linear chain CRF model in its core (Finkel et al., 2005), hence all studies that leverage it are considered ML-based as long as their output is not interrogated by a gazetteer verification. The first employment of LM-based approaches for the LMR task is dated back to 2014 when Li and Sun (2014, 2017) developed their PETAR system. PETAR uses a linear-chain Conditional Random Fields (CRF) model. It is trained over features from all aforementioned feature categories. To overcome the mismatch issue in cases of informal abbreviations and misspellings, Li et al. applied the Brown clustering technique that groups tokens appearing in similar contexts. Concomitantly, Han et al. (2014) leveraged various lexical, semantic, syntactic, and geographical features on top of a CRF classifier to participate in the ALTA shared task (Molla & Karimi, 2014).

Takeaway Messages: Although CRF models accompanied by noisy gazetteers and a variety of hand-engineered features have achieved competitive performance in different studies (Han et al., 2014; Li & Sun, 2014, 2017; Molla & Karimi, 2014), their main limitation is the expensive feature-engineering phase, especially when developing the solutions for the emergency management domain.

Riding the Wave of Deep Learning Models

More recently, several studies proposed Deep Learning (DL) approaches. The first exploitation of DL approaches for LMR in the disaster management domain was proposed in 2019 by Kumar and Singh (2019). They trained a Convolutional Neural Network (CNN) model to learn tweets representation and perform the recognition. Xu et al. (2019) proposed DLocRL, a deep learning sequential pipeline for location recognition and disambiguation in tweets. For recognition, they employed the BiLSTM-CRF model that is fed with contextualized word- and character-level features concatenated with their geographical CRF prelabels. Following the same approach, Wang et al. (2020) proposed the NeuroTPR model that employs BiLSTM-CRF NER model (Lample et al., 2016) for recognition.

The employed Toponym Resolution systems by Wang and Hu (2019a) exploit neural-based BiLSTM recognition modules. The *DM_NLP* (Wang et al., 2019) recognizer learns character and word-level text features to represent documents. A CRF layer is added on top of the BiLSTM model. The model takes advantage of other syntactic features such as POS, StanfordNER, and chunking labels. It also uses contextual features that improved the performance of the model. Unlike *DM_NLP*, UniMelb (Lietal., 2019) BiLSTMbased model solely learns from world-level text representation. It differs in employing the self-attention mechanism. A binary softmax out layer is added on top of the BiLSTMbased model. The *UArizona* (Yadav et al., 2019) goes to the extreme and learns from concatenated word-, character-, and affix-level representations of text data. Akin to *DM_NLP*, a CRF layer is added on top of the BiLSTM model.

Suwaileh et al. (2020) reported the first results for the direct and simple employment of the BERT-based model in the LMR task under different transfer learning setups that account for the difference between the sources and target disaster events in terms of data domain, entity type, disaster domain, and geo-proximity. Later, Khanal et al. (2022) and Khanal et al. (2021) exploited the transform-based pre-trained models for the LMR task. Khanal and Caragea (2021) further pre-trained LUKE (Yamada et al., 2020) model on their data to learn contextualized entity embeddings that allow optimizing a self-attention mechanism for recognizing LMs. Khanal et al. (2021) investigated multi-task learning for different crisis management computational tasks, including LMR, key-phrase identification, eyewitness identification, and humanitarian categories classification. They empirically confirmed the positive impact of multi-task learning on LMR performance.

Diverging from others, Hu et al. (2022) introduced the GazPNE recognizer, an unsupervised model that fuses CNN and Bi-LSTM models to learn from around 4.6 M positive training examples extracted from gazetteers and 220 M negative synthesized examples. The advantage of GazPNE is that it does not require labeled examples for training.

Takeaway Messages: By now, we understand that the learning-based models show superior performance compared to other approaches as reported by the existing studies. With the plenty of existing DL approaches, there are yet many directions to explore, such as multitask learning, reinforcement learning, and adversarial

approaches, among others. The main disadvantage of the DL approaches is that they are data hungry. This unfavorable requirement has to be alleviated by building large-scale datasets and exploring the domain adaptation and transfer-learning techniques.

LMR Evaluation

A fair evaluation framework for the LMR task in the disaster domain has to provide diverse evaluation datasets, evaluation measures, and baseline LMR models. Unfortunately, the lack of a unified evaluation framework prevented comparing the methods we discussed in section “[Literature Review](#)” under fair conditions. Long-delayed, the first effort to provide a unified framework for the LMP task was the EUPEG framework (Wang & Hu, [2019b](#)) in 2019. EUPEG provides access to 5 non-disaster-specific LMP models and 8 general-purpose datasets. Only one of them is a Twitter dataset called Geo-Corpora (Wallgrün et al., [2018](#)). Surprisingly, the framework was used solely by Wang et al. ([2020](#)). Lately, Suwaileh et al. ([2023](#)) released the largest to date human- and automatically-labeled public and generalizable LMR datasets, alongside the evaluation script and benchmark results against representative the LMR task models.

This section discusses and compares the available evaluation datasets, the widely used evaluation measures for the LMR task, and the evaluation setups.

Datasets

Many Twitter disaster datasets are made available for the research community; however, a few are labeled for LMR. The construction of LMR datasets is an expensive task, as it requires human annotators to manually identify the locational spans in text, which is not a trivial task. Table 2 summarizes the existing LMR datasets Columns “#LMs (unique),” “Annotation,” “LM type,” and “Public” refer to the number of LMs in the dataset (and distinct LMs), the type of annotation, whether the LMs are annotated for location types, and whether the dataset is public..

There are several characteristics that most of the existing LMR datasets lack to possess to assure fair and practical evaluation Suwaileh et al. ([2023](#)) such as reasonable size, disaster domain coverage (to capture disaster-specific vocabulary), geographical coverage (to cover different location-naming conventions), temporal coverage (to include pre- and postdisaster periods), relevance and informativeness (to ensure quality and reliability of content), LM granularity coverage (to capture all types of location), and consistency and reliability in annotations.

Evaluation Measures

The standard evaluation measures for effectiveness of the LMR task are Accuracy (Acc), Precision (P), Recall (R), and F_β score that is the harmonic mean of Precision and Recall, per entity.

Nevertheless, the way these measures are computed is different from one study to another based on three main factors: (1) handling the *partial matches*, i.e., whether to reward the model when detecting part of the LM span; (2) evaluating

Table 2 Summary of the English disaster-related datasets

Dataset	# Tweets	# LMs (unique)	Annotation	Type	Pblc
Gelernter and Balaji (2013)	3987	—	In-house	✓	✗
Middleton et al. (2014)	3996	2030 (451)	In-house	✗	✓
Molla and Karimi (2014)	3003	4854 (1704)	Crowd	✗	✓
Al-Olimat et al. (2018)	4500	5323 (1619)	In-house	✗	✓
Dutt et al. (2018)	1000	~100 (—)	In-house	✗	✗
GeoCorpora (Wallgrün et al., 2018) ^{+D}	6648	3100 (1119)	Crowd	✗	✓
Hu and Wang (2020)	1000	2139 (989)	In-house	✓	✓
Hu et al. (2022)	3000	3530 (1351)	In-house	✗	✓
Fernández-Martínez (2022)	9435	5958 (3457)	Automatic	✗	✓
Khanal et al. (2022)	9339	9655 (1639)	Crowd	✓	✓
IDRISI-RE_gold (Rsuwaileh et al., 2023)	20,514	21,879 (3830)	Crowd	✓	✓
IDRISI-RE_silver (Rsuwaileh et al., 2023)	56,682	43,404 (2675)	Automatic	✓	✓

“+D” indicates LMD datasets

per tweet or event, i.e., whether to report token-level macro or micro average performance; and (3) handling the *true negatives*, i.e., whether to reward the models when they correctly stay silent for a single tweet.

The partial matches are typically ignored from evaluation except in a few studies (Al-Olimat et al., 2018; Hu et al., 2022; Molla & Karimi, 2014). Molla and Karimi (2014) claim that they account for partial matches, but they do not elaborate on their strategy nor make their evaluation script public. Al-Olimat et al. (2018) penalize models by adding 0.5 to both false positive and false negative counts before computing the Precision and Recall. Hu et al. (2022) adopted the same evaluation guidelines as Al-Olimat et al., 2018.

Real Scenarios for Evaluation

Typically, the existing models are evaluated under an unrealistic assumption that labeled target data is available during the early stages of disaster events. As acquiring labeled data is costly during disasters, researchers should report the performance of their models under the zero-shot setup, where the model had never been introduced to training data from the target disaster. Therefore, studying the models’ generalizability under zero-shot learning is important while considering different factors such as disaster domain, geographical proximity, and language.

To investigate LMR model performance under these different scenarios, Suwaileh et al. (2020, 2022) explored the out-, in-, and cross-domain scenarios under the zero-shot condition using 5 disaster-specific datasets (Al-Olimat et al., 2018; Middleton et al., 2018). Their extensive experiments suggest that “target” evaluation setups show misleadingly high performance when compared to the more genuine scenarios, cross- and out-domain scenarios, during emergencies. Furthermore, they empirically

showed the importance of considering the domain (i.e., the disaster type) and the geographical proximity of the training and test data to improve the LMR models' performance. They also showed preliminary experiments that suggest training a multilingual model with little data from the target language is promising.

Above all, all the discussed studies in this chapter , except Suwaileh et al. (2023), are type-less recognition models, due to the lack of datasets that support the type-based recognition (Suwaileh et al., 2022).

Location Mention Disambiguation

This section starts with the formulation of the LMR task in section “[Task Formulation](#).” It then discusses the challenges associated with it in section “[LMD-Specific Challenges](#),” dives into different categories of proposed solutions in section “[Literature Review](#),” and finally presents the evaluation tools and their shortcoming in section “[Evaluation](#).”

Once the candidate location mentions are identified by the LMR system, the next step is to resolve them into actual locations that exist in a geo-positioning database (i.e., gazetteer); this task is known as Location Mention Disambiguation (LMD). The output of LMD models can be then used to pin LMs on the map using a geographical representation such as the standard *geographic coordinate system* (GCS) or the *geocode system*. The GCS is a spherical coordinate system that represents points on the earth using *longitude* and *latitude* angles measured with respect to the center of the earth. The geocode system represents geographical entities (points, lines, or polygons) using unique human-readable codes (or hashes) generated by dividing the geographic surface of the earth into grid cells at a multilevel hierarchy. Figure 5 illustrates the high-level overview of the LMD task, with the LMR task in context.

Task Formulation

To define the task formally, given the following inputs:

- A tweet t that is related to a disaster event e .
- A set of location mentions (LMs): $L_t = \{l_i; i \in [1, n_t]\}$ in the tweet t , where l_i is the i th location mention and n_t is the total number of location mentions in t , if any.
- A geo-positioning database (i.e., gazetteer) that consists of location profiles of toponyms: $P = \{p_i; i \in [1, k]\}$, where p_i is the i th location profile, and k is the number of location profiles that exist in G . Different gazetteers may contain different location properties such as the name (in different languages), alternative names (e.g., exonyms), geo-coordinates (latitude and longitude), hierarchical address, location type (e.g., city, street, POI, etc.), and other type-specific properties for different location types (e.g., “population” property for type “city”).

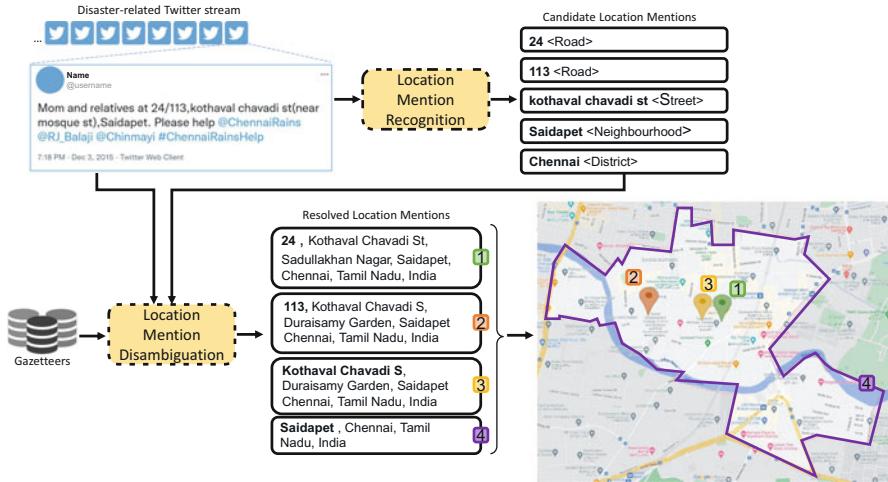


Fig. 5 High-level overview of the LMD task

The LMD system aims to match (or link) every location mention l_i in a tweet t to one of the location profiles p_i in G that correctly and accurately represent l_i , if it exists, otherwise it declares the location mention l_i as irresolvable (or unlinkable). The irresolvable LMs are usually due to the incompleteness of gazetteers as most of the existing digital gazetteers are crowdsourced.

LMD-Specific Challenges

Tackling the LMD task requires alleviating different challenges including:

Toponymic homonymy: The same location name might refer to different locations. For instance, “Doha” might refer to the “capital city of Qatar state” or the “Doha city in Kuwait.” Also, “Kuwait” could refer to the “State of Kuwait” the country, or the capital city “Kuwait” (different granularity). Additionally, at the finest-grained level, “Ooredoo” may refer to any branch of the telecommunications service provider inside, or outside Qatar.

Incompleteness: The existing digital gazetteers are constructed by the contribution of the community, crowdsourced. Hence, many of the locations, especially the fine-grained locations, might not appear in the gazetteers. In case the LMR system managed to detect such locations, the LMD system will not be able to resolve them.

Dynamism: The set of locations that exist in gazetteers are dynamic and do change over time as a consequence of multiple actions such as (i) changing the name (or properties) of a location (e.g., common with street names), (ii) deleting a location (e.g., permanently closing a restaurant), or (iii) building or opening a new facility (e.g., malls, airports, parks, etc.). This requires maintaining up-to-date gazetteers that log such changes to aid the LMD systems.

Large-scale multiclass problem: When perceiving the LMD as a classification task, it is converted into a large-scale multiclass problem in which the LMD system has to classify all l_i in G , in orders of millions, against the target LM l_i in tweet t . In this formulation, the LMD becomes more because of different issues such as class imbalance, data scarcity, and computational complexity.

Constructing a unified location database: Consolidating multiple gazetteers is a key to covering as many locations as possible with different properties into one unified gazetteer. Nevertheless, the merging and deduplication of toponyms is nontrivial task.

Literature Review

This section reviews the current solutions from the methodology perspective due to the absence of a unified evaluation framework that allows performance comparison between proposed solutions. There are a few studies that tackle the LMD task using machine learning and deep learning approaches. This chapter starts with a discussion on the hand-crafted and automatically computed features employed. It then presents presenting an overview of the existing approaches. Akin to the LMR systems, contextual features at character and word levels (e.g., learned by CNNs), syntactic features (e.g., POS tags), and geographical features (extracted from gazetteer attributes) are used. In addition to that, a few other features are proposed:

Contextual features: The gazetteer entries lack context to learn rich representations. Thus, external resources are used for expanding their representations such as Wikipedia articles. Articles could be used as a whole, or “in” segments.

Similarity features: These features are computed by the similarity of the candidate LMs that are extracted from tweets against the toponyms in gazetteers. The similarity is encoded using exact matching, substring matching (i.e., candidate LM partially matches a gazetteer toponym or the opposite), prefix matching (LM matching the beginning of a gazetteer toponym or the opposite), Jaccard similarity, or Levenshtein similarity.

Gazetteer features: The properties of toponyms in gazetteers are employed to capture relevance signals and prioritize gazetteer candidates. These features change according to the employed gazetteer. Different types of attributes are considered including the popularity of the toponym, the number of ancestor LMs, and the administrative division level, among others.

Mention neighbors features: The LMs often co-occur with their child or parent toponyms as illustrated in Fig. 1. This type of features takes advantage of this observation and uses all LMs in the tweet besides the target LM to be resolved. The relationship is encoded between the multilevel mention lists. They are also encoded by examining whether the gazetteer (i) toponym, (ii) the ancestor, or (iii) alternate names exist in the mention lists of the LM. The collective disambiguation considers the co-occurring LMs as features as discussed in section “[Collective Disambiguation](#).”

There are three commonly used English digital gazetteers as follows:

- Geonames: Geographical database covers all countries and contains over 11 M unique places (with 25 million different geographical names) that are available for download. The locations are categorized into nine main types (e.g., country, park, village, road, etc.) and also subcategorized into 645 feature codes.
- OpenStreetMap: An international street-level gazetteer that is constructed by a community of mappers. They continuously add and maintain data about streets, trails, and POIs around the entire world.
- Foursquare: A database with more than 105 M placenames that are collected using a collective crowdsourcing method. Specifically, they are collected by logging the users' check-ins from different platforms such as Twitter and Instagram.

Learning-Based Models

Middleton et al. (2018) trained an SVM model on gazetteer-based features including location type, population, and alternative names. Additionally, the disambiguation models of the toponym resolution system employed by Wang and Hu (2019a) are essentially machine learning models: (i) *DM_NLP* (Wang et al., 2019) is a Light Gradient Boosting Machine (LightGBM) model trained on similarity scores, contextual representations, gazetteer attributes, and mention list features; (ii) *UniMelb* (Li et al., 2019) is a Support Vector Machine (SVM) that uses different feature types such as the history results in the training dataset, population, gazetteer attributes, similarity, and mention neighbors features; and (iii) *UArizona* (Yadav et al., 2019) is a heuristic-based system that selects the toponym with the highest populations in gazetteers.

Deep Learning Models

Xu et al. (2019) proposed a novel attention-based two-pairs of bi-LSTMs trained for matching LMs against the Foursquare gazetteer. The Foursquare gazetteer constitutes a collection of location profiles. Each location profile (p) contains several attributes including title, category, address, tips, tips count, visitor count, visit count, and rating. To process the ps , the category attribute is represented in a one-hot vector, the word-based attributes are represented by averaging their TFIDF vector representations, and the numeric-based attributes are normalized using the global gazetteer counts. All these representations are concatenated before they are fed to the disambiguation model. On the other hand, tweet-LM pair are represented using their text-contextual representation, text-contextual representation attended to the p representation, and geographical distance. The two-pair networks learn the left (starting from the first token in the tweet and ending at the end of the LM) and right (starting from the LM and ending at the last token of the tweet) contexts of the LM. The geographical distance is measured using the Manhattan distance between the geo-coordinates of the user location, if available, and every p . Both representations then go through a fully connected layer to learn disambiguation.

Collective Disambiguation

To disambiguate LMs appearing in the same tweet, such as “Kuwait” and “Ooredoo,” one might expect that “Ooredoo” should be in “Kuwait” not in “Qatar.” The general approaches differ whether to resolve entities in isolation or using pair-wise strategy or in collective manner. Inspired by the pair-wise methods, Zhang and Gelernter (2014) consider the hierarchy of the location mentions in tweets when resolving them. Recently, Xu et al. (2019) collectively disambiguate all LMs in a tweet by adopting the Pair-Linking algorithm (Phan et al., 2017) that improved the disambiguation performance (accuracy).

Takeaway Messages: The LMD task is understudied for the disaster domain. A major challenge is the low performance of the LMR system that could negatively affect the LMD system. To mitigate this effect, sharing feedback between these two systems is a potential direction to explore.

Evaluation

Evaluating the LMD systems requires ground truth data of tweets containing the LMs and their corresponding entries from gazetteers. A non-gazetteer-specific dataset would contain the full addresses of the LMs allowing the LMD systems to freely choose their geo-positioning database.

Datasets

There is a dearth of Twitter disaster-specific LMD datasets. Only three datasets have been constructed and contain tweets in order of a few thousand. Table 2 presents the statistics of these datasets. Two of these datasets are available for the research community, namely, Middleton et al. (2014) and GeoCorpora (Wallgrün et al., 2018).

Middleton et al. (2018) evaluated their system using their own datasets (Middleton et al., 2014). Wang and Hu (2019a) evaluated it using eight different datasets available through EUPEG framework (Wang & Hu, 2019b), solely one of which is a tweet dataset that is GeoCorpora (Wallgrün et al., 2018) (refer to Table 2). Xu et al. (2019) used the dataset released by Ji et al. (2016).

Evaluation Measures

Similar to the LMR task, the Accuracy (Acc), Precision (P), Recall (R), and the F_β score are computed to evaluate the performance of LMD systems.

Additionally, the LMD systems are evaluated using geographical distance-based evaluation measures including the mean distance error (Mean DE), the median distance error (Median DE), and the distance-based accuracy (Acc@d), to quantify the distance between the predicted location and ground truth location in kilometers.

Furthermore, Karimzadeh (2016) proposed more evaluation measures that overcome the shortcoming of P, R, and F_β scores. While these measures evaluate binary classification tasks, the LMD task can be perceived as a multiclass classification task

that links toponyms in gazetteers against LMs in tweets; hence, these evaluation measures hence they are not the most applicable. Alternative measures assume that the LMD system output is a ranked list of toponyms extracted from gazetteers sorted by probabilities such as Cross Entropy (CE), Root Mean Square Error (RMSE), AND Eccentricity.

Challenges

Learning to predict the location mentions is a nontrivial task. LMP systems have to address many challenges that are generally related to the nature of the Twitter stream or related to the difficulty of recognition and disambiguation tasks.

Twitter Stream Challenges

Processing Twitter data entails accounting for various challenges that stem from the nature of the stream. This section discusses these challenges:

Tweet sparsity: Using solely the tweet text limited to a length of 280 characters to extract and resolve LMs leads to a lack of understanding of the context of the tweet.

Rapidly changing: The rapid linguistic and topical drift over the stream makes the LMP task more challenging. As a result, the commonly mentioned locations over the stream are easier to detect than the new and infrequent ones.

Hashtag riding: Once a hashtag attracted the attention of many users on Twitter, spammers use it to post irrelevant content with different intentions like advertising, self-promotion, propaganda, etc.

Noisiness: The noisiness of the stream causes a mismatch between the language used in tweets and the language used to create the gazetteers which are known as *Out of Vocabulary (OOV) issue*. Twitter users tend to use informal writing in contrast to other Web documents (e.g., news articles) that contain formal language. On the other hand, gazetteers are often constructed using formal names of locations. Below are example issues associated with the noisiness of the Twitter stream with example tweets from Table 3:

- **Nicknames:** Some places are known by different nicknames. In Tweet #1, *Chennai* is nicknamed “The Detroit of India” which does not exist in OSM gazetteer.
- **Capitalization:** Users tend to ignore capitalization when writing tweets (e.g., “chennai” instead of “Chennai” in Tweet #4).
- **Abbreviations:** Using short versions of the location names is common on Twitter, due to the restricted length of tweets, such as using “T. Nagar” instead of “Theagaraya Nagar” and “GM Chetty Road” instead of “Gopathi Narayanaswami Chetty” in Tweet #3.

Table 3 Example tweets from Chennai floods to illustrate the challenges of processing Twitter stream for LMP task

Tweet #	Tweet text	Problem
Tweet #1	#ChennaiFloods sad to see the state of city. <u>Detroit of India</u> is suffering. Hv personal experienced	Nickname
Tweet #2	Accommodation in t nagar to 30–50 people in Rameswaram road, <u>T. Nagar</u> . Contact 9843111199 #ChennaiRainsHelp #ChennaiFloods #chennaimicro	Capitalization
Tweet #3	Anyone around <u>T. Nagar</u> , needing shelter or food, can approach the Gurudwara on <u>GM Chetty road</u> #Chennai	Abbreviations
Tweet #4	Medical students of <u>shri</u> ramchandra medical college in chennai stranded without supplies. Need help.	Misspelling
Tweet #5	sm 1 help providing water 50 children <u>@Lawrence Charitable Trust</u> .safe.2/4, <u>1st cross st</u> , 3rd avenue,AshokNagar-LakshmanSruti #ChennaiFloods	Shortcuts: “st” and “@”

- **Misspelling:** Incorrect spelling and grammar mistakes are common in tweets; hence, LMs could be also misspelled such as “shri ramchandra medical college” that should be corrected to “sri ramchandra medical college” in Tweet #4.
- **Shortcuts:** In Tweet #5, the wrote used shortcuts (e.g., st and Rd. instead of street and road, respectively) and symbols instead of prepositions (e.g., “@” instead of “at”).

Task-Specific Challenges

In this subsection, we discuss the challenges related to tackling the LMP task generally and during crisis scenarios.

Time-criticality of solutions: Empirically effective solutions are not necessarily ready for efficient deployment at the onset of disaster events. Therefore, the developed systems must be trained and evaluated to run in real-time to enable effective crisis management.

Scarcity of LMD labeled data: Supervised learning algorithms need a huge amount of representative data to perform effectively. However, acquiring training datasets is critical when systems must be trained and deployed promptly *in real time* for disaster management because acquiring labeled data slows down the process greatly. There are a couple of existing LMD datasets with size in order of a few thousands.

Future Directions

There are several directions for future work, including:

LMP problem modeling: In pipeline architecture, the performance of the disambiguation system depends greatly on the recognition system. Inaccurate candidate

location mentions affect negatively the LMD system performance as it would fail to match potential locations from the knowledge base of locations. Hence, joint solutions allow the two systems to pass feedback to each other and optimize accordingly. This direction was explored for the LMP systems outside the disaster domain (Ji et al., 2016).

Technical considerations: First, the Twitter stream challenges need further exploration such as researching potential techniques to (1) enrich the tweet representation, (2) mitigate the effect of lack of labeled data at the onset of a disaster event, among other challenges. Second, the social networks (e.g., following networks and interaction networks) are neglected in LMP studies. Hence, utilizing social signals is an important aspect to explore its effect on the performance of the LMP. Last but not least, the key bottleneck of gazetteer-based LMR solutions and LMD systems is the choice of geo-positioning databases. There is a large room for contribution regarding augmentation, aggregation, and maintaining up-to-date geo-positioning databases.

Evaluation: There is a persistent need for improving the evaluation strategies for LMP tasks. For LMR evaluation, in almost all existing studies, the evaluation is limited to exact matches with gold annotations. The studies that focus on partial matches are heuristics-based. Further exploration on best practices for evaluating partial matches is required. For LMD evaluation, proper ways to tune the distance threshold in the distance-retrieval-based evaluation measures is worth investigation.

Deployment in real scenarios: The existing LMP systems are rarely deployed by response authorities (Reuter, 2015; Reuter et al., 2018) due to various issues, for example, the lack of analysis in real-time settings. Analyzing efficiency is overlooked in most of the existing studies, and the focus is mostly on effectiveness albeit some studies account for efficiency when designing the systems.

Other issues include the unreliability of information from social media and the lack of readiness of solutions to be customized for the needs of different stakeholders, to list a few. Recent studies have attempted bridging the gap between technologists and relief organizations by understanding their needs (Hiltz et al., 2020) and the utility of existing solutions (Zade et al., 2018).

Conclusion

This chapter sheds light on the importance of geolocation information for the response authorities in the domain of disaster management. It discusses the geolocation information requirements of different stakeholders and links them to the existing computational tasks. The discussion highlights the recent trends for proposed solutions from technical perspective, including their strengths and shortcomings, then shapes potential future directions to address the limitations and meet the requirements of stakeholders.

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Remote Sensing for Flood Mapping and Monitoring

45

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Contents

Introduction	680
Methodology	682
Paper Selection Criteria	683
Remote Sensing for Flood Mapping	683
Synthetic Aperture Radar Imagery for Flood Mapping	684
Optical Imagery for Flood Mapping	689
Hybrid Satellite Imagery for Flood Mapping	690
Remote Sensing for Flood Monitoring	691
Conclusion	693
References	694

Abstract

Working on countermeasures to reduce floods and respond quickly is vital for ensuring fatalities are reduced to a minimum. Remote sensing can provide an adequate amount of information for flood management systems. Techniques from several disciplines, considering image processing, remote sensing, machine learning, and data analysis, have been investigated in the literature to manage various flood management duties. Despite the growing number of research articles outlining the application of numerous computer vision techniques in the field of remote sensing applications, there exists a dire need for a complete analysis of these technologies from the standpoint of flood management. This chapter aims to fulfill this need by providing a comprehensive review of the literature covering all aspects of remote sensing applications for flood management including flood detection, flood delineation of affected areas, and damage assessment. The review is organized to cover both traditional and deep learning methods as well as the open-source datasets used in the relevant studies.

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In addition, the chapter investigates existing products and services that currently provide usable insights about past or ongoing flood disasters to emergency response operations. Finally, the chapter highlights the challenges and future areas of research in flood management.

Keywords

Flood mapping · Flood monitoring · Remote sensing

Introduction

Floods are one of the widely occurring and expensive natural disasters. As a result of global climate variation consequences, more persistent and intense precipitation is projected to further boost the severity of floods (Mason et al., 2021a). Floods, according to a report published by the “United Nations Office for Disaster Risk Reduction (UNDRR)” (UN Office for Disaster Risk Reduction, 2020), were the most prevalent type of disaster in the last two decades, affecting the greatest number of people. Floods are a persistent threat to both developed and developing countries. The increasing number of flood incidents around the world requires the identification of appropriate flood management strategies. Various global organizations like Red Cross, European Commission, UN Office for Disaster Risk Reduction (UNDRR), and UN Climate Technology Center and Network (UNCTCN) are working independently or in collaboration for minimizing the impact of floods on human lives. It is critical to comprehend how flood susceptibility can be precisely measured and mapped to aid emergency responders. Thus, both preventive and emergency actions are required to minimize the possible impact of floods on human lives and property. According to a report by UNCTCN, flood mapping predominantly looks at the anticipated extent and depth of flooding in a designated location, based on a number of scenarios. Utilizing these flood maps, necessary measures can be taken to enhance preparedness like alterations in land-use planning, execution of particular flood-proofing measures, establishing emergency response plans, etc.

The stakeholders have specific requirements for the map’s content, scale, accuracy, and readability based on the particular objective. According to “European Exchange Circle on Flood Mapping (EXCIMAP),” flood plain maps reflect the geographical locations which could be affected by flood water (excluding sewerage system) (Anonymous, 2007). Various stakeholders have different use cases for flood maps. The stakeholders have specific requirements for the map’s content, scale, accuracy, and readability based on the particular objective. Considering diverse use cases, flood maps can be utilized for:

- Monitoring of floods
- Risk management strategies for flood prevention and mitigation
- Land-use planning and land management
- Planning emergency response

- Raising public awareness
- Insurance sector (private sector)

In recent years, advancements in technologies have altered the way the world works. The field of disaster management, like any other, is increasingly leaning toward the use of modern technologies. During a flood event, satellite-based flood inundation mapping becomes more and more important for emergency responders. In addition to helping crisis managers with flood monitoring, management, and reaction during a disaster, it also provides better situational awareness by highlighting the areas that call for immediate action. Remotely sensed flood mapping can also help to identify flood-affected areas which may go undetected due to large geographical areas and thus can cause a delay in immediate relief response activities (Ahmad & Afzal, 2019). Not only, remote sensing is commonly used to map the information about the flood water, but it can also be used to assess the impact caused by floods. For this purpose, spatial and temporal aspects of high-resolution satellite imagery are acquired before and after the flood event to compare the prior situation with the post-event situation.

Most of the literature is focused on utilizing remote sensing technologies for a specific study area, hence, limiting the scope of generalization and overall global impact of flooding (Brema, 2020; Borah et al., 2018; Das, 2018; Zhang et al., 2016; Feng et al., 2015; Haq et al., 2012; Scotti et al., 2020; Syifa et al., 2019; D'Addabbo et al., 2016b).

As the flooding phenomenon is a highly random process and the rate of retrieving images via satellites is pretty slow itself, such local implementation is nonetheless constrained by a number of restrictions. There are issues with exclusively employing remotely sensed images to analyze, capture, and comprehend the full scope of flood monitoring (Syifa et al., 2019); this limitation led to the area of research where multiple sources are integrated together for enhanced flood mapping (Sadiq et al., 2022). Additionally, flooding is known to significantly destroy highly valuable infrastructure, like bridges, roads, and the communications network, making it challenging to evacuate those trapped in flooded regions. As per the report of *Financial Management of Flood Risk* published by the “Organization for Economic Cooperation and Development” on flood-related economic loss in the year 2016 (OECD, 2016), roughly 40 billion US dollars were lost owing to floods in different areas of the world. Destruction of communication setup during floods can severely affect map generation, thus resulting in delayed risk management and rescue operations (Watik & Jaelani, 2019). The majority of existing literature covering remote sensing for flood mapping focuses on one or very limited aspects and does not provide a comprehensive review covering the broader spectrum of remote sensing in flood mapping. (Munawar et al., 2021) recently presented a review on flood management covering only the literature related to image processing and machine learning. Similarly, (Iqbal et al., 2021) reviewed only the literature from the aspect of computer vision techniques associated with successive flood management phases. Literature covering the area of remote sensing for damage assessment was reviewed by (Rahman & Di, 2020). Still, their study was only limited to flood crop loss

assessment, whereas (O’Hara et al., 2019) considered just one case study of Ireland to provide the review of the agricultural impact of flooding. Their study was also limited to Sentinel-1 analysis. (Sharma et al., 2019) provided a limited review of flooding in Nepal at the regional level and compared it with the global context. Similarly, (Shivaprasad Sharma & Roy, 2017) only focused on remote sensing for flood management in the area of Kopili river basin, Assam, India. (Teng et al., 2017; Rahman et al., 2017) reviewed the use of remote sensing in flood management, where (Teng et al., 2017) considered the advances in remote sensing for the assessment of flood hazards, susceptibility, exposure, risk, early warning system, damage assessment, and planning for risk mitigation, whereas (Rahman et al., 2017) provided an empirical analysis of software capable of modeling flood inundation. Although (Shen et al., 2019) provided a detailed review of SAR-based studies for flood inundation and extent mapping, their study lacks the literature on optical imagery for flood mapping. Earlier reviews are either limited to fixing geographical locations or targeted the limited scope of remote sensing of flood management.

This study focuses on covering the gaps mentioned in previous studies by reviewing major aspects of remote sensing for flood mapping and monitoring. Especially, for early-stage researchers and practitioners, it is critical to have a systematic review of existing literature on the significance of remote sensing for flood mapping and monitoring. Therefore, the first aim of this study is to provide a comprehensive review of the literature covering major aspects of remote sensing for flood management ranging from flood detection, mapping, and damage assessment. This study also aims on reviewing the literature covering traditional and machine learning methods along with a detailed overview of any open-source datasets related to the corresponding studies. Another aspect of this study is to list down the systems, repositories, and services that currently exist to provide usable insights about an ongoing flood disaster to emergency response operations by analyzing the remote sensing data.

The flow of the rest of the chapter is arranged as follows. Section “[Methodology](#)” enlists the details on the methodology used to select, screen, and review papers used in this study. Section “[Remote Sensing for Flood Mapping](#)” presents the role of remote sensing in flood mapping, followed by the remote sensing in flood monitoring in section “[Remote Sensing for Flood Monitoring](#)” and conclusion and future directions in section “[Conclusion](#).”

Methodology

The main objective of this research is to conduct a thorough and methodical analysis of the recent state-of-the-art remote sensing technologies extensively used for flood monitoring and mapping in order to identify any current limitations. In this context, a detailed review of the literature in the remote sensing domain was conducted in order to discover new developments in flood monitoring and mapping. To accomplish these aforementioned objectives, a data repository of relevant, up-to-date, and authentic research papers published in top-tier journals was compiled.

Paper Selection Criteria

Initially, in the search process to gather articles for this research work, Google Scholar and Scopus search engines were preferred. The article search was done in two major phases: article retrieval and screening phases. Later, the search engine's queries were constructed to fetch the articles. The search queries were created using keywords associated with flood mapping using remote sensing which include “remote sensing” AND “flood mapping,” “satellite imagery OR satellite image” AND “flood mapping,” “remote sensing” AND “flood monitoring” AND “Damage assessment,” “remote sensing” AND “flood mapping” AND “deep learning OR machine learning,” and “remote sensing” OR “satellite image” AND “flood mapping” AND “change detection.” Using all these keywords, total of 986 research articles were fetched. During the first screening phase, a set of filtering options were used to ensure the papers belonged to the (1) final publication stage, (2) article or book chapter, (3) articles published after 2010, and (4) articles published in the English language which were included in this review. These filtered articles were then processed to remove any duplicates, reducing the number of articles to 365. After screening and duplicate removal, articles were manually filtered to remove irrelevant ones. The manual screening was performed based on the following:

1. Articles only using remote sensing as an auxiliary task are excluded.
2. Articles focused on flood prediction are excluded.
3. Articles focused on flood risk assessment are excluded.
4. Articles focused on flood analysis from sources other than remote sensing are excluded.

The manual screening reduced the article's number to 70, which were then reviewed in detail for this chapter. Figure 1 provides an overview of the search and selection criteria.

Remote Sensing for Flood Mapping

Floods are a natural phenomenon that can practically occur anywhere. Although river and coastal floods are two of the most prevalent forms, floods may not even occur near a body of water. Flood damage can be caused by heavy rainfall, inadequate drainage, and even nearby dam construction projects. Wide-scale flood mapping is used to determine the extent of a flood or inland inundation, as well as the impacted infrastructure, such as roads and settlements, and impaired regions of interest, such as agricultural fields, as part of an emergency response. Disaster management authorities and other stakeholders can use the flood mapping information to conduct rescue operations in affected areas, as well as coordinate appropriate recovery actions and preventive measures for any future catastrophes. Remote sensing technologies which provide a unique source of data for the application can currently be used to assess the devastating effects of flooding (Bresciani et al., 2011).

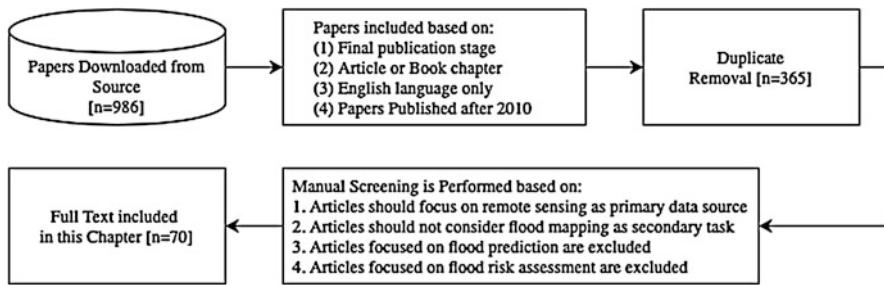


Fig. 1 Paper selection criteria

Remote sensing is one of the most extensively utilized platforms for disaster management and extended area mapping. *Sentinel-1*, *Sentinel-2*, *Landsat 8*, *Dove*, and *WorldView* are a few examples of medium- to high-resolution satellite imagery that can offer a lot of important data for locating and extracting flood-affected regions, evaluating the damage (such as to infrastructures like roads and bridges), and feeding information to models that can determine how much flooding occurs in inland and coastal locations. For inundation mapping, both synthetic aperture radar and optical sensors can be utilized, with varying levels of precision, capacity, and terrain difficulty. Water surfaces can be quickly and precisely extracted from optical remote sensing data using water indices. As new satellites (like *Sentinel-2* and *Landsat 9*) and long-term fine-resolution satellite data (like *Landsat* data) are being launched and operational, optical remote sensing techniques are significantly assisting in the global and regional water delineation. However, clouds and overcast weather, which are typical during flood occurrences, reduce the validity of optical readings, whereas synthetic aperture radar (SAR)-based remote sensing techniques penetrate the atmosphere well and can thus provide more accurate measurements. SAR can map flooding at high to very high and detailed resolution (from 30 m to 1 m) under practically any weather situation by identifying the scattering process. SAR can also operate at night as an active sensor. SAR data retrieval techniques are more difficult to develop than optical sensor technologies, and fully automated systems that don't require any human involvement at all are still unusual. SAR also suffers from noise in the reflected signals, and it is a challenging task in itself to clean the SAR imagery for further processing (Table 1).

Synthetic Aperture Radar Imagery for Flood Mapping

SAR data dependability is growing quickly as remote sensing data availability increases and new state-of-the-art processing techniques are being developed. *TerraSAR-X*, *ALOS-2/PALSAR-2*, *COSMO-SkyMed*, *RADARSAT-2*, and *ICEYE* constellations are now among numerous very high-resolution (VHR) SARs capable of detecting urban flooding with a spatial resolution of 3 m or more. The medium-high-

Table 1 Open-source labeled dataset specifications

Dataset	Source	Satellite	Resolution	Task	Date	Events	Reference
Sen1Flood11	SAR, optical	Sentinel-1 Sentinel-2	10 m 10 m	Seg	2016–2019	11 real-world Flood events	(Bonafilia et al., 2020)
WorldFloods	Optical	Sentinel-2	10 m	Seg	2015–2019	119 real-world Events	(Mateo-Garcia et al., 2021)
Sen12-floods	SAR, optical	Sentinel-1 Sentinel-2	10 m 10 m	Cls	2018–2019	337 locations West and south east Africa, Middle East, And Australia	(Schmitt et al., 2018)
RAPID-NRT	SAR	Sentinel-1	10 m	Seg, Cls	2016–2021	CONUS	(Yang et al., 2021)
ETCI 2021 (Earth Science Informatics Technical Committee)	SAR	Sentinel-1	5x20m	Seg	2017–2019	5 flood events Nebraska North Alabama Bangladesh Red River North America Florence	(Erci, 2021)
FloodNet	UAV	Drone	1.5 cm	Seg	Aug–Sep 2017	Hurricane Harvey	(Rahnamoonfar et al., 2021)
RescueNet	UAV	Drone	1.5 cm	Seg	October 2018	Hurricane Michael	(Gupta & Shah, 2021)

resolution Sentinel-1 is delivering open access to freely available satellite data in near real time obtained on a predetermined schedule, making it particularly appealing for flood-related studies.

Due to different backscattering characteristics, several forms of land cover must be taken into account for SAR-based flood mapping:

- Open water or river flooding, where parts of the land or bare vegetation are completely submerged
- Urban flooding, where buildings and other infrastructure are partially/fully submerged in flood water but the majority of the structures remain above water but suffer high damage
- Vegetation area flooding, forest or under vegetation flooding

Automated flood detection in rural or riverine areas has been the subject of extensive research (D'Addabbo et al., 2016b; Pulvirenti et al., 2011a, b; Martinis et al., 2015; Twele et al., 2016; Matgen et al., 2011; Giustarini et al., 2012). The majority of studies has been using traditional techniques, including thresholding and change in backscatter intensities between the SAR images captured before and after the flood. (Pulvirenti et al., 2011a) computed the threshold values between water and land pixels by using Otsu thresholding, whereas (Matgen et al., 2011) applied a nonlinear fitting approach for thresholding, while assuming a gamma distribution. (Tamkuwan et al., 2021) applied change detection over the imagery from *ALOS-2* and *Sentinel-1* satellites to detect flooded areas from the flood events in Nakhon Phanom province, Thailand. Flood detection in the open landscape areas was recently explored by (Hlaváčová et al., 2021). They proposed an automatic flood detection system that combined histogram thresholding with multi-temporal change detection techniques for open-water identification. Integrating remote sensing and geographic information system (GIS) for assessment of crops damaged due to the flood was proposed by (Banerjee & Pandey, 2019). Fuzzy logic over high-resolution imagery from TerraSAR-X for generating flood segmentation maps was also very popular and employed by many researchers during the last decade (Pulvirenti et al., 2011b; Martinis et al., 2015; Twele et al., 2016), where (Martinis et al., 2015) developed an open-source full pipeline including SAR data preprocessing, classification model's initialization followed by a post-classification, and processing by fuzzy logic-based approach. Their service can be triggered automatically through an online service but only after satellite data delivery is done. For emergency response purposes, the service can also be activated on demand (Table 2).

Several organizations, including the “Copernicus Emergency Management Service (EMS),” have developed semiautomatic flood extent extraction methods using SAR images. These systems operate relatively better in rural regions but perform poorly in the majority of highly urbanized or densely populated areas. Due to radar shadowing and latency caused by structures, urban flood detection is problematic because certain portions of the urban ground surface could not be visible to the SAR. The dry shadows, in particular, appear to be identical to most water regions in SAR imaging and could be misclassified as water. Most of the previous studies follow the

Table 2 List of satellites available for flood mapping – Paid* indicates that the source is paid but provides constrained resources for free

Satellite	Source	Resolution	Availability
Sentinel-1	Copernicus, UNOSAT	10 m	Free
Sentinel-2	Copernicus, UNOSAT	10 m	Free
RadarSat-1	UNOSAT	8–30 m	Free
RadarSat-2	UNOSAT	1–3 m	Free
Landsat 8	UNOSAT	30 m	Free
QuickBird-2	UNOSAT	0.61–2.4 m	Free
Spot-4	UNOSAT	10 m	Free
Spot-5	UNOSAT	5x10 m	Free
RISAT-1	UNOSAT	1–50 m	Free
RISAT-2	UNOSAT	1.8–8 m	Free
PALSAR-2	ALOS	10–30 m	Free
TerraSAR-X	TSX	0.25–40 m	Paid
WorldView-1	MAXAR	0.5–2 m	Paid*
WorldView-2	MAXAR	0.46 m	Paid*
WorldView-3	MAXAR	1.24 m	Paid*
GeoEye-1	MAXAR	0.41 m	Paid
Dove	PlanetLab	3–5 m	Paid*
RapidEye	PlanetLab	5x5m	Paid*
SkySat	PlanetLab	0.57–1 m	Paid
Spot-6	CNES	1.5 m	Paid
Spot-7	CNES	1.5 m	Paid
ICEYE-X2	ICEYE	0.5–15 m	Paid

approach of utilizing Sentinel-1 SAR imagery for flood mapping of urban areas using change detection algorithms requiring pre-flooded and post-flooded images from areas of interest. (Giustarini et al., 2012) used a change detection method over very high-resolution SAR imagery from TerraSAR-X to accurately map flooding in the urban areas during the 2007 Severn River flood (UK). Recently, (Ulloa et al., 2022) proposed incorporating the spatial signatures for the change detection along with deep convolutional long short-term memory for time series analysis of satellite data to efficiently map flooding in urban areas. (Chini et al., 2019) proposed a two-stage technique using Sentinel-1 data of Hurricane Harvey in Houston, Texas. (Li et al., 2019) employed a Bayesian network to construct an unsupervised classification method for flood detection in urban areas by combining interferometric coherence and SAR intensity. (Jiang et al., 2021) used unsupervised deep learning models over Sentinel-1 imagery for flood mapping. They were able to estimate the damages to various land cover types by superimposing a worldwide land cover map on top of it. (Lin et al., 2019) used a Bayesian framework to do a time series analysis of Sentinel-1 SAR imagery for urban flood detection. With the recent advancements in deep learning technologies, many researchers have used modern deep learning architectures in their studies of flood mapping. But, these supervised deep learning

methods rely heavily on annotated data sources. Recently, (Bonafilia et al., 2020) released a dataset *Sen1FloodII* which is publicly available for remote sensing community to develop deep learning-based solutions for flood segmentation task. The details of the dataset can be found in Table 3. *NASA Interagency Implementation and Advanced Concepts Team* in collaboration with the “IEEE GRSS Earth Science

Table 3 Flood mapping, detection, prediction systems

Source	Provider
“The Global Flood Awareness System (GloFAS) - Flood prediction” http://www.globalfloods.eu/glofas-forecasting/	Copernicus
“UNOSAT Flood Portal” http://floods.unosat.org/geoportal/catalog/main/home.page/	UNOSAT
“Dartmouth Flood Observatory (DFO) - Flood extent mapping” https://floodobservatory.colorado.edu/	Dartmouth College, USA
“Near real-time Global Flood Mapping - Flood extent mapping” https://floodmap.modaps.eosdis.nasa.gov/index.php	NASA
“Flood and Drought Portal - Flood prediction” https://www.flooddroughtmonitor.com/home	UNEP
“G-REALM - Global Reservoir and Lake Elevation Database - Reservoir heights” https://dahiti.dgfi.tum.de/en/map/	G-REALM
“EFAS European Flood Awareness System - Flood prediction” https://ipad.fas.usda.gov/cropexplorer/global_reservoir/	EFAS
“Famine Early Warning Systems Network (FEWS NET) Precipitation monitoring” https://earlywarning.usgs.gov/fews/search/Africa/West%20Africa	USGS and USAID
“EOSDIS WorldView - Flood risk map” https://worldview.earthdata.nasa.gov/	NASA
“Global Disaster Alert Coordination System (GDACS) Flood and hurricane location mapping” https://www.gdacs.org/Alerts/default.aspx	UN
“Hazards Data Distribution System Explorer (HDDS) - Flood extent mapping” https://hddsexplorer.usgs.gov/	USGS
“ITHACA Standard Precipitation index/ Extreme Rainfall detection system - Precipitation mapping”	ITHACA
Global Risk Data Platform (UNISDR) - Exposure and damage assessments https://www.preventionweb.net/risk/dataviewers	UNISDR
Desinventar - Inventory of losses related to disasters https://www.desinventar.net/	UNISDR
PDC DisasterAWARE and DisasterAlert App - Flood and hurricane location mapping precipitation forecasts https://disasteralert.pdc.org/disasteralert/	PDC
NOAA LEO/GEO Flood Mapping Product - Flood extent mapping https://www.ssec.wisc.edu/flood-map-demo/	George Mason University
Data basin 1985 to 2003 Archive data- Flood risk map https://databasin.org/maps/5305774d716a4d9b908ad237244a73f3/	CHRR

Informatics Technical Committee” launched a flood detection contest. Participants were given the task to develop appropriate approaches that can delineate open-water flood areas and identify flood extents from SAR imagery, which occurs frequently throughout the world. The details of the dataset released with the contest can be found in Table 3. (Paul & Ganju, 2021) proposed an ensemble-based unsupervised deep learning approach to generate the flood segmentation masks. (Yang et al., 2021) compiled a high-resolution (10 m) flood inundation dataset across the “contiguous United States (CONUS)” using data from almost the full Sentinel-1 SAR collection. Additionally, they connected their information to the “Dartmouth Flood Observatory (DFO) Global Active Archive of Large Flood Events database” (Robert Brakenridge, 2010).

Optical Imagery for Flood Mapping

Optical satellites operate by recording the electromagnetic energy and rely upon the sun’s illumination, or thermal radiation is reflected from the earth’s surface to generate the image values that are observed by the sensor. This generates natural-looking visuals, easily perceived by human eyes. Due to higher bandwidth and larger spectral channels, optical sensors can produce high-resolution images that can be further used for many applications. The remote sensing community has also been using optical imagery for flood mapping.

The availability of “Landsat/ERTS-1 and Sentinel-2” data allowed scientists to develop the algorithms to quantify land cover changes over time, starting with the Normalized Difference Water Index (NDWI) (Myneni et al., 1995). This work laid the foundation for later researchers to develop similar spectral indices focusing solely on water mapping such as the “Normalized Difference Water Index (NDWI)” (Gao, 1996; Ety et al., 2021; Yovan Felix & Sasipraba, 2021; Solovey, 2019; Munasinghe et al., 2018; Bangira et al., 2017) and “Modified Normalized Difference Water Index (MNDWI)” (Hanqiu, 2006; Li et al., 2021; Sajjad et al., 2020; Solovey, 2019; Munasinghe et al., 2018; Bangira et al., 2017). Recently, (Solovey, 2020) used Sentinel-2 spectral indexes for flooded wetland mapping. Like any other field, machine learning is also used in flood mapping using optical imagery (Syifa et al., 2019; Zhang et al., 2021; Mateo-Garcia et al., 2021; Bai et al., 2021). (Akiva et al., 2021) proposed a self-supervised flood segmentation network *H2O-Net*, where the model was trained on low-resolution Sentinel-2 imagery to generate the NIR band for high-resolution images from PlanetScope for generating better flood segmentation maps.

A recent study focused on urban areas (Peng et al., 2020) proposed a self-supervised learning framework leveraging multi-temporal optical imagery for patch-wise urban flood mapping. Their approach works by analyzing change vectors with patch features learned via a self-supervised autoencoder to generate patches of potentially flood-affected areas. MediaEval 2019 also launched a subtask “city-centered satellite sequences (CCSS)” of the multimedia satellite task. Participants approached the problem using both change detection, deep learning, and hybrid

approaches combining change detection with deep learning (Jain et al., 2019). Recently, (Mateo-Garcia et al., 2021) collected Sentinel-2 imagery for all the flood events between 2016 and 2019 from Copernicus hub and released a dataset *WorldFloods* covering most of the world surface areas. Using the dataset, they also developed a deep learning model for flood segmentation. While most high-resolution imagery is not free, MAXAR and PlanetLab do provide limited high-resolution imagery for research purposes (users need to get approved). Using the high-resolution Planet imagery collected during Hurricane Harvey, (Peng et al., 2019) developed a deep learning model that can take the advantage of bitemporal optical imagery to generate detailed flood segmentation masks. In small- to medium-scale project areas, UAVs are rapidly being acknowledged as an effective tool for gathering data that is critical for flood mapping research. The imagery gathered by UAVs may be used to create detailed flood maps and digital elevation models (DEMs). The data provided by UAVs are more accurate and geo-referenced and have greater resolutions than most publicly available data. This information may be used with FEMA floodplain maps to determine the most appropriate and cost-effective flood control measures for a given town. (Rahnemoonfar et al., 2021) gathered a high-resolution aerial imagery dataset *FloodNet* that shows the damage the impacted areas sustained after the flooding. The dataset was collected after the event of Hurricane Harvey.

Hybrid Satellite Imagery for Flood Mapping

Both SAR and optical imagery come with some limitations, e.g., optical imagery is not immune to the weather conditions like clouds and haze; thus a high cloud percentage on any given day can hamper the performance of any modeling technique using optical imagery. Similarly, SAR imagery is not directly generated by the sensor in a human-understandable form; the reflected microwave signals undergo extensive and complex preprocessing to lay out a perceivable representation of the objects in the area of interest, thus making the whole process expensive and prone to errors. However, cooperation between the SAR and optical imagery has been employed successfully in recent years thanks to significant developments and the frequent availability of multi-sensor data. Recently, (Notti et al., 2018) provided an overview of the shortcomings of independent satellite sources for flood mapping and proposed a multisource method. They combined SAR, multispectral imaging, DEMs, manual mapping, and auxiliary data such as field measurements, civil protection reports, geolocated images, or news articles found on credible websites to generate quality flood maps. (Bai et al., 2021) fused the SAR data from medium-resolution Sentinel-1 and optical imagery of Sentinel-2 to enhance the flood mapping. They demonstrated their deep learning-based approach on Sen1Flood11 (Bonafilia et al., 2020) dataset. A similar approach for data fusion of high-resolution imagery of SAR (“COSMO-SkyMed strip map” at 3 m resolution) and optical (“RapidEye” at 5 m resolution)

was proposed by (D'Addabbo et al., 2016a). They utilized the Bayesian network approach for data fusion and compared the findings with models from independent sources to prove the superiority of the fusion technique. (Ohki et al., 2020) combined the hydrodynamic flood simulation data by TE and SAR data from ALOS-2 for flood mapping of urban areas. (Elkhrachy et al., 2021) generated flood hazard maps by combining the thresholding method applied on Sentinel-1 imagery, velocities, and depth obtained from HEC-RAS 2D simulation data. Recently (Gašparović & Klobučar, 2021) used a multimodal approach, where they used Sentinel-1 and Sentinel-2 data to generate the flood segmentation maps. To further improve the accuracy of obtained results, they incorporated geographic information system (GIS) layers, habitat maps, and flood hazard maps as additional sources of information. During Hurricane Irene and Schoharie Creek floods, (Renschler & Wang, 2017) performed multisource data fusion (GIS, hydraulic model HEC-RAS, and airborne LiDAR data) and modeling to assess and communicate complex flood dynamics for supporting better decision-making. Urban flooding can be detected using the change detection approach (Mason et al., 2021a), which uses Sentinel-1 and the WorldDEM DSM, albeit it may not be as precise as utilizing VHR SAR and LiDAR. Urban flooding is a major problem for SAR imagery as well as optical imagery; (Mason et al., 2021b) combined flood maps of the urban area with SAR backscattering signals with adjacent digital surface models to yield a high detection accuracy. Their approach worked well in both rural and urban areas than SAR-based mapping alone. Similarly, (Sadiq et al., 2022) proposed to utilize the flood maps generated from SAR imagery and social media content from Twitter to provide more informed flood maps for both urban and coastal areas. They also compared the generalization capabilities of deep learning vs the thresholding method for flood mapping. Remote sensing has been comprehensively used for the assessment of financial damages caused by flooding. (Psomiadis et al., 2019) used Landsat 7 and Sentinel-1 for flood mapping and Sentinel-2 for land cover. Combined with the elevation data, they were able to map the affected cultivations with high precision and the financial effects of flooding.

Remote Sensing for Flood Monitoring

Flooding can happen anytime and anywhere; even the developed nations are hardly immune, and it costs dozens of lives and billions of dollars. But, with constant monitoring and assessment, the impact of flooding can be reduced. Flood monitoring can be divided into multiple phases of flooding:

- Planning: This step involves educating people, building infrastructure less likely to be damaged by flooding, and planning measures to reduce the impact of flooding.
- Risk assessment: Methods involving the identification of vulnerable areas and population.

- Early warning system: The set of capacities needed to generate and disperse timely and resourceful warning information to individuals, communities, and organizations to prepare and act appropriately in sufficient time to reduce the possibility of loss (UNDRR 2009).
- Flood extent mapping: Segmenting flooded areas in a satellite imagery.
- Flood hazard mapping: Identification of flood risk areas and level of damage shown on the map.
- Damage assessment: Methods involving the estimation of economic and noneconomic damages caused by flooding.

Flood monitoring is a continuous process that generally spans various stages of flood and also during normal days where the planning, prediction, vulnerability, and risk assessment occur, followed by early warning systems before the flooding. Mapping and damage assessment are performed during and post-flooding. While flood prediction, early warning systems, and vulnerability assessment are crucial for many practitioners and researchers, they are not in the scope of this study; thus, we considered the role of remote sensing for flood monitoring in the mapping and damage assessment part only. Different approaches have been employed in the literature to perform the flood monitoring task. Recently, (Hlaváčová et al., 2021) performed the multi-temporal analysis of Sentinel-1 imagery for open-water flood detection and monitoring. Similarly, (Ulloa et al., 2022) also focused on performing the spatiotemporal analysis of Sentinel-1 imagery using convolutional neural networks. By combining Landsat 8 optical imagery and COSMO-SkyMed radar imagery, a new strategy for flood monitoring was proposed by (Tong et al., 2018). For water extent determination in the periods before and during the flood, they applied a support vector machine and an active contour without edges model. Combining multiple source satellite datasets, including the Gaofen (GF) series and Zhuhai-1 hyperspectral, (Zhang & Xia, 2021) used a mix of machine learning and thresholding techniques for flood monitoring. Their proposed method not only could detect the water extent but also could estimate the flood course during the flood. (Refice et al., 2020) integrated different bands of SAR imagery for detailed flood monitoring of remote vegetated land.

Satellite data can help with flood mapping, near-real-time monitoring, and damage assessments, which are often complemented by in situ data and physical models. However, the variety of supporting data available, along with the varying demands of authorities, first responders, and academicians, makes it challenging to be aware of all accessible information. We list down the number of freely accessible as well as interactive web mapping tools that throw light on flood management from a variety of viewpoints in order to acquire a better understanding. Table 3 provides the list of all the available flood monitoring systems along with their links. Similarly, Table 2 lists down all the satellites that can possibly be used in flood monitoring from various perspectives. While some of these can be obtained free of charge, others require a paid subscription to download the imagery.

Conclusion

This study categorizes the remote sensing technologies adopted for flood mapping and monitoring into radar, optical, and hybrid. We classified these studies based on the locales (urban/rural), methodology, and data sources used by the authors after doing a thorough content analysis of each study article's flood mapping approaches. For example, change detection, indexing, and thresholding approaches for flood mapping have been widely used in the literature and have proven to be the most effective in rural areas, whereas machine learning-based methods are more suited to urbanized areas. The difference between machine learning-based methods and traditional thresholding/thresholding/indexing methods is that generally supervised machine learning methods are driven by a huge amount of specific (annotated) data to generate plausible results, whereas numerical models are not dynamic and rely on a predefined set of mappings, calculations, and equations, implying that flood-related knowledge has already been fed to them by human experts. SAR and optical data have been extensively used in literature for flood mapping in rural as well as urban areas, but using hybrid data sources provides a more informed decision for different terrain types. We also conclude that, although the SAR data has been dominant by constituting 40% of the overall literature since 2010, the use of the hybrid approach is currently gaining rapid interest in the remote sensing community and becoming the major approach for recent studies. Since 2018, 51% of the flood monitoring literature reported better performance using hybrid approaches. Machine learning approaches effectively control the uncertainties associated with natural disasters like floods. The constraints of machine learning algorithms may be overcome by giving the model appropriate historical flood data and flood inventory maps. Machine learning models provide a time- and cost-efficient technique to track several aspects of floods. The considerable annotation required by supervised machine learning techniques can be reduced by using semi-supervised deep learning methodologies. Machine learning algorithms can effectively analyze and extract features from unstructured data. There is still a scarcity of high-quality accurately annotated datasets for flood mapping that has yet to be addressed. For flood mapping, deep learning models tailored explicitly to flood dynamics have neither been thoroughly experimented with nor properly documented. Therefore, more research into this area is required. This may be accomplished by obtaining data from a variety of sources, including disaster history, satellite imagery, social media, and geographic information systems (GIS). The collected data may be utilized to train the deep learning system. Currently, remote sensing-based approaches are used with specific types of satellite imagery and these approaches fail to perform well when exposed to the data gathered from a different sensor/satellite. This opens a new area of research and a need for a consolidated system with the capability to process the data from variable sources. Another possible future direction can be to enhance the resolution of low- to medium-resolution satellite data for a better flood mapping system.

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Part IV

GIS and Geospatial Studies



GIS and Geospatial Studies in Disaster Management

46

Chandan Ghosh

Contents

Introduction	702
Geospatial Tools	704
Application of Geospatial Technologies	705
Conclusion	707
References	708

Abstract

Managing disaster is a major challenge with often untenable cascading effects to many countries, geographically collated regions, states, districts, and local areas with vulnerable population, infrastructure, and economies. Today substantial quantity of data is received via various sensors, including smart phones, satellites, social media, the internet of things (IoT), LoRA (long range) radio communication, LiDAR (Light Detection And Ranging), HAM radio, Global Navigation Satellite System, and various on-site as well as off-site tracking devices, thanks to the rapid evolution and development of technology. The Web Portal Services are the resource hub of all these critical information which has made geospatial technologies a vital asset in all stages of disaster management, including prevention, mitigation, preparedness, rescue, relief, and recovery. With the assistance of big data and artificial intelligence-powered machine learning tools, numerous other technologies have engaged with a diverse group of decision-makers by creating interfaces and applications that can be accessed on portable smart devices worldwide. The progress made in Remote Sensing (RS) has made a noteworthy contribution to the enhancement of the spatial and temporal resolutions of optical and radar sensors. Terrestrial mobile units have enhanced emergency response capabilities by implementing real-time video conferencing,

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ensuring prompt and effective response. The Spatial Data Infrastructure (SDI) offers a comprehensive system for efficient data acquisition, retention, geospatial analysis, and dissemination to facilitate disaster management. Artificial intelligence and big data technology have recently been extensively utilized in the quantitative comprehension of natural phenomena. The integration of point clouds, 3D Geographic Information System, Building Information Modeling System (BIMS), and sensor information has proven effective in various emergency response applications, utilizing 3D capture of disaster scenarios. More so all information obtained is integrated into super computing platform and shared in live mode during all facets of disaster management. Despite so many advancements in data capturing, this chapter explains various challenges that distinguish our world of intelligence, timely decision-making, and smart communications in disaster management paradigm.

Keywords

Disaster management · GIS · Remote sensing · GPS · Geomatics

Introduction

Disasters have been happening since the beginning of our existence in this planet. Government agencies, decision-makers, and disaster professionals are familiar with geoinformation technologies for understanding disaster risks and losses. Natural causes of disasters such as torrential rainfall, storm surges, violent volcanic activities, flood inundations, and earthquakes have claimed several lives, destroying food, shelter, and place (Bhanumurthy & Sharma, 2019; Bhatt & Karnatak, 2019). The minimizing of fatalities and property damages could be accomplished by the provision of improved data on the demographics of at-risk communities and susceptible infrastructure, the ecological variables, and the characteristics and dynamics of the various types of hazards. The availability of information is on the rise, accompanied by technological advancements such as meteorological and earth observation satellites, communication satellites, and satellite-based positioning technologies. These technologies are complemented by hazard-vulnerability-risk modeling and GIS.

With the advent of Remote Sensing (RS) techniques significant leap towards acquiring of critical information about the physical characteristics of an area using electromagnetic radiations reflected back from the surface without having to touch them. The incorporation of these technologies into a disaster risk reduction strategy, alongside their integration with national and community risk management frameworks, presents a significant opportunity to mitigate the impact on human life and physical assets. The utilization of this method enables the surveillance of the dispersion of an occurrence of air pollution that arises from an inadvertent discharge of radioactive matter or any other hazardous element into the atmosphere. Additionally, it facilitates the identification of potential groundwater contamination within a particular area. Specialized programming tools are often developed to analyze the

interdependent impact of satellite imagery, drone imagery, and Multiparametric Geophysical Observatory (MPGO) sensor data.

In the wake of the hour India has also introduced the National Geospatial Policy 2022 (NGP) (The National Geospatial Program Division, 2022), and the Draft Space Bill to encourage the development of geospatial technology and to take advantage of economic growth in many economic areas. All stakeholders, including many of the Government of India mission-mode projects like the National Infrastructure Pipeline, National Hydrology Project, PM Gati Shakti – National masterplan for multi-modal connectivity, Namami Gange, Sagarmala, and the Digital India Land Records Modernization Programme (DILRMP), benefit from the use of geospatial data for planning and monitoring. The NGP's goal is to advance geospatial science and technology, public policy, practical solutions, entrepreneurship, and international collaboration for sustained socioeconomic growth at all levels of governance. The Geospatial Data Act of 2018 (National Geospatial Deliverable Standard, 2018) of the USA requires agencies to collect, maintain, disseminate, and preserve geospatial data such that resulting data, information, or products can be shared comprehensively across all projects. Geospatial technologies are used for mapping and monitoring potential hazards, assessing risks and vulnerabilities, conducting post-disaster survey, auditing the prevention measures taken, planning and coordinating multi agency and multi stake holder's emergency responses. The use of GPS (for coordinates), coupled with GIS and Remote Sensing (RS) data, has been employed to assist in compiling quick damage estimates (Reinsel et al. 2018). Web-GIS-aided disaster preparedness, incident response, and recovery and reconstruction measures have been found very effective (Coppola, 2015). Remote Sensing involves the use of sensors that are mounted on aircrafts or satellites to capture images of the Earth's surface. These images are then processed to extract useful information about the geo-environment, such as vegetation cover, land use and land cover (LULC), meteorological information, population density, etc. Remote sensing is used to map the extent and severity of a disaster, such as floods, fires, or landslides. Remote sensing can be used to detect changes in water levels or to identify damaged infrastructure. Remote sensing can also be used to monitor the progress of a disaster, such as the spread of wildfire, or to track the movement of people or goods during an evacuation. On the other hand, GIS allows users to capture, store, manipulate, analyze, and present spatial data. GIS collects data from various sources, including remote sensing data, and integrates it into a common spatial reference system. GIS provides a platform for managing and analyzing spatial data, and enables users to make informed decisions based on the analysis of spatial data (Tomaszewski 2015). GIS can be used to identify vulnerable areas and population groups, and to develop evacuation plans. During disaster, the Incident Commander could track the movement of resources, such as emergency vehicles or supplies, and to coordinate rescue and relief efforts.

A framework for assisting at-risk individuals and/or communities to avoid, minimize, or recover from the impact of the catastrophe event is provided by disaster management issues, which encompass the pre-during-post activities related to disaster occurrence. Organizations in charge of disaster management are tasked with

lowering community vulnerability and developing capacities for handling and fast recovering from calamities. The last several years have seen an increase in the complexity of catastrophe management. Large-scale disasters appear to be happening more frequently, and new hazards are present. Multiple departments must work together and be supported by disaster managers during preparation, response, and recovery.

Geospatial Tools

In recent years, geospatial technology has grown in significance and is now used in a number of industries, including forestry, disaster management, forestry, logistics, defense, and resource management. Global atmospheric data analysis using satellite sensors is essential for forecasting natural disasters like hurricanes and tsunamis (Dilo & Zlatanova, 2011; Erden & Coskun, 2010). Efforts are being made to gather, store, and integrate environmental monitoring data with health services. There is also a growing trend to correlate everyday environmental conditions with outcomes in public health. Healthcare professionals and policymakers can improve public health by using satellite data to develop better prevention and mitigation strategies. The relationship between ground- and space-based air quality observations and respiratory health, as well as the use of satellite data to enhance health services, has been the subject of numerous research (Ghawana & Zlatanova, 2018; Phillips et al., 2012).

Agriculture, healthcare, disaster management, forestry, logistics, defense, and resource management are just a few of the industries that are currently using geospatial technology as it has grown in significance. In order to forecast natural disasters like hurricanes and tsunamis, satellite sensors are essential for monitoring global atmospheric data (Dilo & Zlatanova, 2011; Erden & Coskun, 2010). Additionally, there is a growing movement to connect current environmental conditions with results in public health, and initiatives are being made to gather, store, and incorporate environmental monitoring data with health services. Healthcare professionals and policymakers can create better prevention and mitigation methods to enhance public health by utilizing satellite data. There have been several research on how to link air quality observations from the ground and space to respiratory health and how satellite data might be used to enhance health services (Ghawana & Zlatanova, 2018; Phillips et al., 2012).

The GNSS (Global Navigation Satellite System), which includes GPS, GLONASS, and European Galileo; Geographic Information Systems/Science (GIS); and Remote Sensing (RS) – three geomatics technologies – play a crucial role in hazard mitigation. GIS manages large volumes of spatial data in both vector and raster formats, allowing for spatial queries, attribute queries, overlaying analysis, 2D and 3D spatial analyses, and data visualization in various formats; RS acquires both geometric and physical information of objects, making it a valuable tool for various studies, including land use detection and agriculture crop classification. High-resolution satellite photos can act as a foundation upon which additional data

can be placed or used in conjunction. While GIS handles and analyses data, GPS and RS primarily acquire data, and they are frequently integrated in many applications.

During all stages of a natural disaster, GIS is equipped with analytical skills that support decision-making and data integration. Risk assessment, hazard mapping, warning, and forecasting for occurrences like floods, forest fires, landslides, earthquakes, and tropical cyclones are all possible with it. The platform for many disaster management systems is GIS. GIS can also carry out the following tasks: Store, process, and combine multiple data types connected to catastrophic events in an effective and efficient manner using a variety of formats, such as through custom integrations with other systems (such electronic display boards).

- (a) By managing data in real time, GIS allows emergency managers to integrate data on the fly, visualize, and analyze events as they unfold. Wireless technology also enables dynamic data exchange from the field to the geo-database in the office.
- (b) GIS can analyze risk and predict the most likely outcome in high-risk areas based on historical data. The results can be presented in detailed maps and analytical reports. Analyzing hazard and risk information with demographics can help identify those who will be most affected and prioritize their needs.
- (c) GIS can automatically send alerts to people in a defined area within a specified time period, such as for landslides, live bomb threats, etc. It can also provide specific messages to people with special needs, such as those with respiratory issues or the elderly, as identified from hospital data or national health portals.
- (d) Spatial analysis in GIS can help identify the factors and elements related to the hazard. It can model disaster behavior and estimate damage losses through multidimensional analysis.
- (e) GIS can produce a buffer zone in the disaster area and estimate the surrounding population affected. It can also identify the shortest route between shelter centers and victims while avoiding dangerous areas.
- (f) GIS can mobilize first responders, intensive care units, and hospitals as needed, and ensure engagement through two-way communication.

Application of Geospatial Technologies

In order to help decision-makers better understand the physical environment and its potential dangers, geospatial technology is becoming more and more crucial in providing crucial information, such as the location and extent of damage, the location of people in need of assistance, and the distribution of resources like food, water, and medical supplies. Applications for geospatial technology include tracking the expansion of refugee camps and mapping volcanic eruptions using high-resolution satellite data, predicting the potential health effects of dust storms and mapping flood-prone areas using satellite images, spotting structural deformation during construction and tracking crustal deformation using GNSS and InSAR (Interferometric Synthetic Aperture Radar), and using a variety of other techniques.

By making it easier to plan, design, and manage urban infrastructure and services including transportation, electricity, water supply, waste management, and public safety, geospatial technology is also playing a crucial part in the creation of smart cities. By providing real-time data on traffic flow, air quality, energy usage, and emergency response, it can help maximize the utilization of resources and enhance inhabitants' quality of life.

Geospatial technology is additionally utilized in agriculture to improve crop management by analysis of soil characteristics, vegetation development, and weather patterns. Additionally, it can help in estimating crop yields and locating probable insect infestation or crop disease hotspots.

In summary, geospatial technology has become an essential tool in various domains, including disaster management, healthcare, agriculture, smart city development, and resource management, by providing critical information for decision-making and enhancing our understanding of the physical environment.

Some of the most common applications of geospatial technology in disaster management are:

- (a) Hazard Mapping: To map and monitor natural hazards such as earthquakes, floods, and wildfires. This helps in identifying the areas that are most vulnerable to disasters and informing disaster management strategies.
- (b) Risk Assessment: To assess the risk of disasters in a particular area. This involves analyzing data related to land use, terrain, and other environmental factors to identify areas that are more prone to disasters.
- (c) Emergency Response Planning: To develop emergency response plans. This includes identifying evacuation routes and shelter locations and planning the deployment of emergency personnel and resources.
- (d) Damage Assessment: To assess the extent of damage caused by a disaster. This involves analyzing satellite imagery and drone footage to identify areas that have been affected by the disaster.
- (e) Search and Rescue: To locate people who are in need of assistance. This includes using drones to search for missing persons and using location data from mobile phones to locate people in need of rescue.
- (f) Resource Management: To manage resources such as food, water, and medical supplies during a disaster. This involves identifying the locations of these resources and coordinating their distribution to those in need.
- (g) Post-Disaster Recovery: To aid in the recovery process after a disaster. This includes identifying damaged infrastructure and buildings and planning for their repair and reconstruction.
- (h) Emergency Communication: To facilitate communication during a disaster. This includes using mapping software to share information about the location of shelters, evacuation routes, and emergency personnel.
- (i) Public Awareness: To raise public awareness about disaster risks and preparedness and timely communications to citizens so that citizens are able to think spatially and understand how to use maps and other spatial navigation devices

- during a disaster situation. This includes creating maps and other visualizations to communicate information about disaster risks and response strategies.
- (j) Healthcare: The healthcare industry has heavily relied on geospatial tools and dashboards during the COVID-19 pandemic to monitor contact tracing, containment zones, disinfection efforts, migrant support, and vaccine distribution.
 - (k) Societal Problems: Geospatial technologies are increasingly utilized to address complex societal problems such as education, livelihood, financial inclusion, and natural resource management.
 - (l) Real estate: Remote sensing technologies and drone mapping are now commonly used in the real estate industry for visualization and analysis of properties.
 - (m) Insurance: Geospatial technology plays a vital role in risk management for specific areas such as parametric-based agro-farming through historical georeferenced data analysis in the insurance industry.

All disasters have a geographic and temporal impact that determines the extent and duration of their effects on the Earth's surface. Location plays a crucial role in disaster management response, and preparedness is key to facilitating an effective response. To determine the location, we need to utilize various geospatial data resources such as imagery, maps, datasets, tools, and procedures that link every event, feature, or entity to a location on the Earth's surface, and leverage this information for disaster management purposes. With the advancements in technology, huge volumes of data are generated from various sensors including satellite sensors, smartphones, social media, Internet of Things (IoT), Global Navigation Satellite System (GNSS), radio frequency identification (RFID), among others.

In December 2006, the United Nations General Assembly passed resolution 61/110 ([UNGGM, 2017](#)) to create the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) with a mission statement to “Ensure that all countries and international and regional organizations have access to and develop the capacity to use all types of space-based information to support the full disaster management cycle.” This platform works on the usage of space-based technologies for emergency response to connect the disaster management and space-based communities in addition to being a facilitator of capacity-building and multidisciplinary institutional strengthening ([UNDRR, 2019](#)).

Conclusion

Critical event management and public warning solutions which supports government authorities and emergency responders through every stage of a crisis is the hallmark of Geospatial technologies that provide a platform for visualizing disaster situations and explore various facets of analyzing and preparing for emergency measures. It also gives near to real situation to the incident response commander. The availability of geospatial data and information has been greatly expanded by the

use of Geoweb services and online open data repositories, offering a wide range of data formats, scales, and resolutions from global to local levels for scientific studies in the geospatial domain.

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Numerical Simulation and Modeling of Landslide-Related Hazards Using Geospatial Technology: Selected Case Studies from India and Abroad

47

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Contents

Introduction	710
Study Area	711
Methodology and Input Data	712
Source Area Characterization	712
Model Input Data	713
Satellite Data Including Digital Elevation Model	713
Frictional and Shear Strength Parameters and Calibration of the Model	715
Result and Discussion	716
Interpretation of Simulation	716
Instrumental Validation of Shear Strength Parameters	719
Conclusion	722
References	722

Abstract

The devastating effect and mitigation challenges due to landslide-related hazard have recently been observed to intensify manifold. Pertinently, it is time to accept that research works dedicated to landslide hazard zonation could not restrain itself

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from subjectivity as LHZ is operator, algorithm, and data-dependent. However, real-time mitigation mostly strives for available tailor-made solutions to alleviate effects of hazard. Thus, there is an ever-increasing demand to employ process-based modeling of mass movements involving snow avalanche, debris flows, and landslides. Numerical simulation and modeling using satellite data, ad rem, is still in budding stage in India but capable of objectively predicting runout in three dimensions and provide critical geophysical parameters, viz., velocity, momentum, height, and pressure at most vulnerable locations with a post-facto and predictive approach.

This research work not only takes cues from advanced satellite-derived products but also engages emerging aerospace technology involving UAV, TLS, etc. as the mainstay that caters to ultra-high-resolution terrain attributes essential for landslide modeling in an integrated manner, designing remedial measures, to evacuate people and also help to simulate and understand the actual cause, process, and mechanism of landslides. In comparison to the space-borne inputs, the airborne or terrestrial platforms are better equipped with operational flexibility, rapid deployment, flight repeatability, low operational costs, and fewer weather-related flying. This work, thus, holistically aims to model selected landslides from India and abroad to showcase the use of EO and geospatial technology in disaster mitigation.

Keywords

Debris flow · Numerical simulation · Disaster mitigation · Geospatial technology

Introduction

Landslides constitute one of the main prevailing geological hazards in the mountainous areas across the globe and are controlled by different types of causative and triggering factors like slope, geomorphology, drainage, vegetation, rock types and disconformities, torrential rainfalls, cloudbursts, glacial lake outburst (GLOF), seismicity, reservoir drawdown and off late, prodigal anthropogenic activities, etc. (Chatteraj et al., 2019; Cruden & Varnes, 1996; Guzzetti et al., 2002; Khanna et al., 2021; Pourghasemi et al., 2012). Pertinently, changes in global climatic conditions in recent years leading to extreme weather events have also contributed in enhanced frequency of landslides (Zou et al., 2021).

In the Himalaya and other mountainous regions in India, specially the Deccan Sahyadri hills, landslide emerges as a hindrance to growth of human life, property, and living of this mountainous area which is based principally on religious trips or Yatra, tourism, and cultivation (Anbalagan, 1992; Anbalagan et al., 2015; Chatteraj et al., 2019; Champati ray & Chatteraj, 2014; Chatteraj & Ray, 2015; Gupta et al., 1993; Kumar et al., 2012; Onagh et al., 2012; Sarkar et al., 1995, 2006; Sundriyal et al., 2007). Froude and Petley (2018) reported that the Indian Himalayas are one of the major global landslide hotspots and account for about 16% of the landslides triggered by rainfall. An estimate by the NIDM (National Institute of Disaster

Management) in the year 2011 and EM-DAT (Emergency Events Database) report (2010–2020) highlighted respectively annual financial losses owing to landslides are of the order of INR 150–200 cores every year in India and affecting more than 1.7 lakhs people. Nonetheless, recent landslide events in Sikkim (2011), the Kedarnath disaster in Uttarakhand (2013), and the Chamoli incident (2021) signify the graveness of the concern (Chattoraj et al., 2019; Martha et al., 2021; Pandey et al., 2021; Shrestha et al., 2021; Shugar et al., 2021).

Characteristically, the Himalayan landslides are typically of smaller dimension and with shallow depth of slip surface, on an average. But unfortunately, they are complimented by frequency of occurrence, in some cases which spread across a decade. Most of these landslides are not only responsible for putting life and property at stake but exhibit changes in landform due to mass wasting, LLOFs (Landslide Lake Outburst Flood), GLOFs (Glacial Lake Outburst flood), river aggradation, etc. (Champati ray, 2013; Champati ray et al., 2015). All such features, albeit, have been mapped, monitored, and meddled for the last two decades, but these studies gained a boost after the invention and application of space-based products. Earth observation from remote sensing satellites can provide authentic and timely information on the extent of landslides in a cost-effective and timely manner.

Analysis of landslides taking cues from EO or ancillary data has expanded beyond simple hazard zonation mapping, albeit still relevant. Rainfall-triggered landslide models, on the other hand, have also reached academic maturity to provide aid in development of successful strategy for landslide hazard mitigation (Brand, 1995; Chattoraj, Ketholia, Champati ray, & Pardeshi, 2015b; Deganutti et al., 2000; Scott, 2000). However, it is time to integrate such abundant piecemeal studies in the holistic analysis of landslide which depends on inputs from advanced research components. Thus, the need arises for understanding the physical modeling using mathematical simulation techniques in compliment to LHZ (Landslide Hazard Zonation) and rainfall threshold models. Unfortunately, there are fewer studies available for this novel approach in this part of the Himalaya.

This work, hence, aims to fill in knowledge gap in the field of numerical simulation and modeling of landslide-related hazards, with a special focus on geospatial technology and to demonstrate applications of satellite-derived products in selected case studies from the Uttarakhand Himalaya and Bangladesh. This work gives an overview of the case studies related to post facto analysis of landslides including reactivated cases and predictive modeling for future flows and, thus, portrays an inclusive review of earlier works with an essence of recent value addition. Derivation of the important physical flow parameters taking cues from earth observation techniques to understand the root cause of the devastation is the mainstay of the work, which is directly relevant to effective mitigation measures.

Study Area

It will be worth mentioning here that most of the bigger landslides have a debris flow component which is capable of causing en-route damage (Chattoraj, 2016; Chattoraj et al., 2014; Chattoraj, Ketholia, Champati ray, & Kannaujiya, 2015a;



Fig. 1 Schematic locations of landslides (star symbol with yellow border) and major localities in the vicinity (triangle symbol with white border) from parts of the Uttarakhand Himalaya and South Eastern Bangladesh plotted on Google Earth imagery

Champati ray et al., 2013). Accordingly, the selected case study areas include either active, old, or stabilized and potential areas representative of different altitude, geology, and geomorphology in Indian subcontinent, viz., (1) Kaliasaur landslide ($30^{\circ}14'30''N$, $78^{\circ}53'53''E$) on the bank of Alaknanda river, near Srinagar town in Pauri Garhwal district of Garhwal-Himalayan Region, (2) Baliyanala landslide in Nainital ($29^{\circ}22'27''N$, $79^{\circ}28'4''E$) in Nainital district of Kumaon region, (3) Malaria ($30^{\circ}40'12''N$, $79^{\circ}54'24''E$) in Dhauliganga sub-basin, (4) Langsi Landslide ($30^{\circ}29'3''N$, $79^{\circ}28'48.5''E$), close to Joshimath, and (5) Betchora Headman para ($22^{\circ}7'20''N$, $92^{\circ}15'39.5''E$) and Lama Bus Station area landslide ($22^{\circ}11'00''N$, $92^{\circ}13'13.50''E$), close to Chattogram in Bangladesh (Fig. 1).

Methodology and Input Data

Source Area Characterization

The initiation zones of targeted debris flows were identified based on field observations and visual and/or digital analysis of satellite data, as discussed:

Kaliasaur

Source area of Kaliasaur landslide (aka. Seerobagad landslide) is located at an elevation of 770 m and is distributed for about 22–23 m below road till it reaches Alaknanda river bend. The width of the slide ranges from 40 to about 100 m. The slope is steep and often reaches up to 60–70° towards south west. The slide is covering a distance of 100–150 m wide along the road (NH-58) and total height is about 1 km from the bottom of the river to the top of the slide. The rock type of the study area is Uttyasu Quartzite of Rudraprayag Formation consisting of white, pink, purple, medium- to coarse-grained, profusely ripple marked quartzite, and subordinate purple/greenish gray slates with basic metavolcanics (Kumar et al., 2012). The estimated run out length of the slide is close to 400 m.

Baliyanala Landslide

The source of Baliyanala landslide is located at 1850 m above MSL with the Krol Limestone as the main lithology with subordinate quartzite. The slide is divided into

two broad channels, each having maximum width of 150 m and length of 390 m. The slide is strategically important as density built up area at the source area. The east facing slope is on an average 45° with maximum value of 70° . The source area is characterized by many shear zones.

Malari Avalanche Chute

The potential avalanche site was located in the south east of the Malari village in the higher Himalaya with an altitude of more than 5000 m MSL and slope ranging between 10° and 80° facing north west. The predicted length of the total runout path of the chute is about 5300 m. Geologically the area is close to Himadri/Malari fault which brings Central Crystalline rock types in contact with Tethyan sequence (Sethia et al., 2018; Thakur & Rawat, 1992; Valdiya et al., 1999).

Langsi Landslide

A large number of landslide activities are reported from different parts of the basin mainly along the National Highway-58 highway which runs for 128 km along the Alaknanda River. Close to Joshimath, the Langsi landslide has its crown lying at 150 m above the road and its toe 100 m below the road. The area is close to the Munsiari thrust passing along the Patal Ganga Valley (Kuthari, 2007). The slide is at times vertical with an average west dipping slope of 47° . The total runout path is about 1250 m.

Betchora Headman Para and Lama Bus Station Area, Bangladesh

Geographically Bangladesh is a floodplain area, and most of the hilly terrain is situated in the Chittagong region and a small part surrounded in the Sylhet region, and thus natural disasters always affect this area (Ahmed et al., 2014; Ahmed, 2015; Mia et al., 2015). Sudden and excessive rainfall triggered flash flood and landslide have become significant disasters in the South-East and North-East hilly regions of Bangladesh and occurring frequently almost every year (Ahmed, 2015; Moniruzzaman & Chattoraj, 2021; Sarker & Rashid, 2013). These landslides are located (at 60–80 m above MSL) close to Bandarban in Chattogram area which mainly consists of small hillocks of maximum height of 100 m on the banks of Sangu river. The riverine hillocks have relatively smaller runout compared to other study areas. Geologically they are in the proximity of Chittagong-Tripura Fold Belt and comprise of the Miocene to Pleistocene claystone and sandstones of the Surma and Tipum Group (Fig. 2).

Model Input Data

Satellite Data Including Digital Elevation Model

Topographic inputs like elevation, slope, and aspect are few of the fundamental inputs required for simulation using RAMMS (Rapid Mass Movement Software), in compliment with release area, mass, and density of the rocks characterizing the source area. Pertinently, a good resolution, i.e., less than 10 m spatial resolution, is, hence, the first thing to start with a model required for numerical modeling. In this study, ALOS (Advanced Land Observing Satellite) PALSAR 12.5 m DEM (Digital Elevation

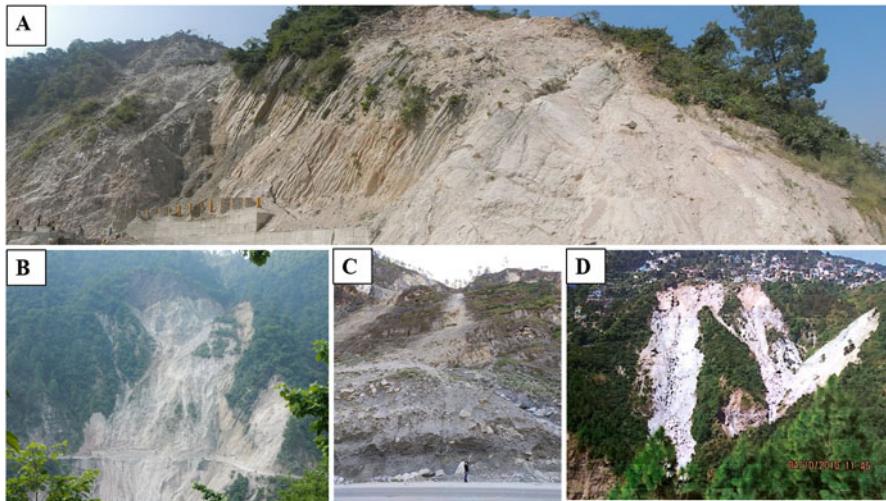


Fig. 2 Field photographs of few of the modeled landslides: (a, b) panoramic view of the Kaliasur landslide showing exposures of quartzites (length of retaining wall and road affected by landslide are ~60 m and 100 m, respectively); (c) Langsi landslide above road (height of the person is about 1.5 m); (d) panoramic view of the Balyanala landslide exposing part of the Krol Limestone (length of the right branch of the slide is ~350 m)

Model), converted to ESRI (Environmental Systems Research Institute) ASCII (American Standard Code for Information Interchange) grid was used for all study areas. Cues were also taken from Cartosat DEM (10 m) to check the landslide areas in three dimensions. High-resolution geospatial mapping, off late, is trending mostly in the domain of UAVs (Unmanned Aerial Vehicle) which are either multi-rotor or fixed drone. More flexible multi-rotor UAV drone, in this case study, has been utilized at places to generate DEMs of ground sampling distance which is less than 5 cm. Use of airborne platform promotes improved work safety, rapid deployability, and flexibility of operation and encourages flight repeatability at minimal one time operational costs and less weather-related flying limitations over traditional platforms (Chatteraj et al., 2021).

However, other input parameters like friction and geo-mechanical properties are also crucial to get idea about the resisting forces arising out of solid and liquid phases present in debris. The release and movement of geophysical mass, en-route, can also be influenced by vegetation, etc. The starting conditions, in this study, have been assumed to be of block release type for simplicity (block release of Rickenmann et al., 2006, Rickenmann, 2005, Rickenmann et al., 2006, Rickenmann, 2016). Though simulations ideally should be capable of mimicking both channelized and un-channelized debris flows, it is observed that un-channelized debris flow condition for hillslope debris flows could be best simulated by this. Albeit, the models developed for the selected study areas consist of both channelized and un-channelized flow paths which were validated on Sentinel 2B and IRS (Indian Remote Sensing satellite) LISS-IV (Linear Imaging Self Scanning Sensor) multispectral images. In the present study, landslide-specific release areas were identified which have been demarcated over the DEM. Apart from providing

a release area, a calculation domain (local water divide restricting the flow) was also delineated on DEM for better visualization of the runout.

Frictional and Shear Strength Parameters and Calibration of the Model

Mathematically RAMMS simulation is based on characterization of rheological properties of the rocks and debris responsible for facilitating shear strength failure. This takes cues from the Voellmy friction law (Salm et al., 1990). Debris flow ideally comprises of an in situ or otherwise solid (rock) phase, chunks, soil, river-borne material, and associated debris, and liquid phase, mostly water/slurry phase. Hence, the frictional resistance forces consist of dry-Coulomb-type friction (coefficient, μ) from the rock phases, directly related to normal stress and a velocity-squared drag or viscous-turbulent friction (coefficient, ξ) arising out of the liquid phase. The geo-technical inputs to the model for calculation of total shear strength would be cohesion (C) and anger of inter resistance (φ) which can be derived both empirically and instrumentally. The total resistance provided by the material due to friction S (in Pa) is formulated as:

$$S = \mu\rho H g \cos\theta + (\rho g U^2)/\xi$$

where ρ is the density of the mass, g the acceleration due to gravitational force, φ the slope in ($^\circ$), H the flow height, and U the initial velocity of the flow. The initial velocity is often non zero as in case most of the debris flows with substantially large source area. Physical samples of debris collected from the depositional zone of the flow were analyzed to get their shear strength parameters in electronic direct shear testing equipment at the Indian Institute of Remote Sensing, Dehradun (Model No. AIM 104), at maximum saturation level without inducing a mechanical shear plane. Samples were analyzed at different impounding normal load to get an idea about shear failures.

As for the validation, the simulated flow should match the observed flow paths. Therefore, a set of simulations were run with different values of input parameters to get the desired results. The input parameters were validated with instrumentally derived ones, and simulation results were validated with naturally observed flow paths, and the best fitted simulation outputs were, therefore, adopted (Sosio et al., 2008). This whole approach requires to search for site-specific optimal friction values from standard tables pertaining to particular type of debris. Numerous simulations were performed with the μ ranging from 0.05 to 0.25. On the other hand, viscous turbulent flow ranges from 100 to 1500 m/s² with a fixed density, release height, etc. Amidst all the simulations, the one which was closest to the dimension and runout of the real debris flow was chosen to be best fit, which was further subject to validation by satellite images and field validation. The parameters helped to recognize the same in satellite images were, viz., the total length of runout distance, their spatial coverage, arcuate shape of the flow, lighter tone, variation in

pattern, and association of geomorphic features detectable in the debris flow zone and outside its influence. To zero-in on best fit model from many possible modeled outcomes, pixel-wise spatial matching technique was adopted in GIS (Geographic Information System) platform to detect the extent of matching of dimensions of modeled flow vis-à-vis the actual landslide as portrayed in the image with an error bar of $\pm 10\%$. It is intriguing to note that shortening of the runout path happened with an enhancement in the frictional coefficient μ (M_u) as it caused an enhanced drag upslope to the mass. Increase in ζ (X_i) value in a relatively smoother flow with proportionate increase in runout length adds to dilution of the flow.

On a general note, as for the results discussed below, caution is to be maintained as momentum is not absolute. This is due to the fact that RAMMS simply considers momentum to be a product of velocity and height of the flow and so is its unit (m^2/s). Density of the material and area under influence are also to be considered to obtain the real momentum in kg-m/s. The numeral simulation model does not, as well, consider en-route erosion and additional contribution from side channel into the main flowing mass along runout which results in lower value ranges for output parameters. Landslide validation carried out by visual estimation/ digital feature extractions of satellite data is also subject to human error and field validation.

Result and Discussion

Interpretation of Simulation

Kaliasaur

The final simulation gives the value of total release volume as $20245\ m^3$ and has a total runout length of 360 m. The simulated height gives maximum value of 1.79 m at the initiation point and above the road cut. The height remains constant (1–0.8 m) up to the road (i.e., up to 120 m). Thereafter, the height decreases from 0.8 to 0.6 m and at the base, maximum height is 0.1–0.2 m. The modeled result reveals that maximum velocity (14.26 m/s) is found at the initiation zone and above the road. It is evident that velocity of 8–14 m/s continues up to 18 m and then suddenly falls to 6–4 m/s between 200 and 300 m. At the road cut maximum velocity is 7–8 m/s. At the base maximum velocity is 2–3 m/s. According to the model result, simulated momentum gives maximum value of $16.41\ m^2/s$ at the initiation zone and pressure is about 528.61 kPa at the initiation zone and above the road. The main focus of the study was to model the debris flow runout using numerical simulation technique. Such information is very essential for designing mitigation measures and also provides insight into the event. It is evident from the study that the debris flow is capable of providing enough debris to block the main road as well river (Fig. 3).

Baliyanala Landslide

Modeling of Baliyanala landslide provided a unique opportunity to see the contrast of the outputs derived from the satellite and airborne (UAV) derived DEMs. The debris flow at Baliyanala at Nainital shows a bifurcation from its very source region and continues to broaden at the base. As for the outputs from ALOS PALSAR DEM,

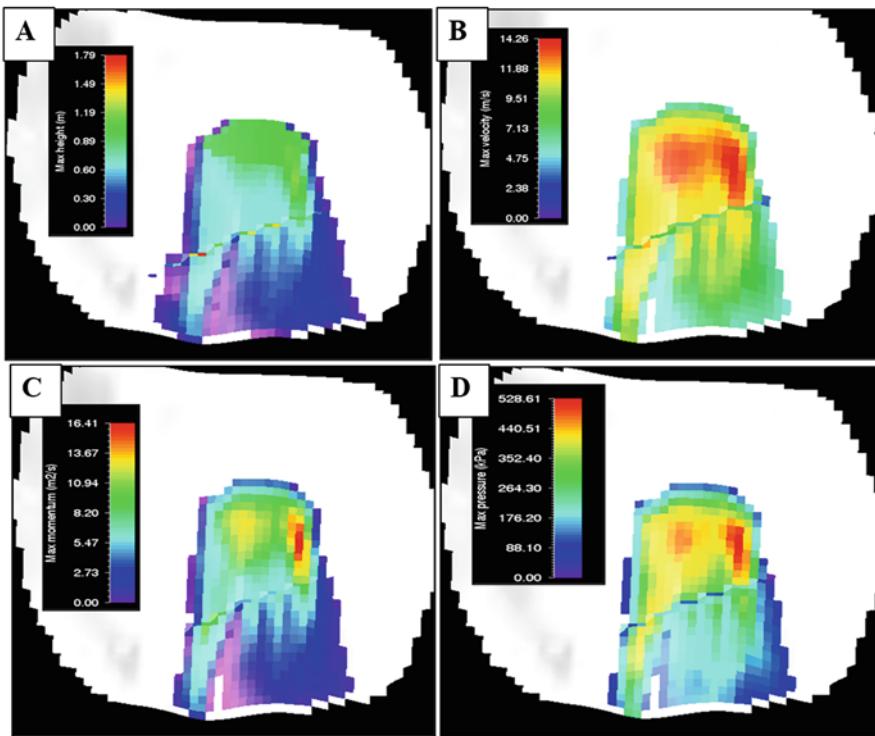


Fig. 3 Modeled outputs (maximum height, velocity, momentum, and pressure) of debris flow at Kaliasaur Landslide near Srinagar, Garhwal (**a–d**). Units of variables are in SI format

the maximum height of the flow was calculated to be 6.2 m and the maximum velocity of the flow was ~18 m/s owing to very steep slopes at several locations (Fig. 4). Maximum height anomaly is seen just below the source area in the right branch of the debris flow. The right branch flow in totality also shows maximum variation in height compared to the left branch. The right branch also shows regular hot spots in terms of velocity all throughout the runout length. However, in both cases maximum height is recorded close to source area. The results from UAV-based DEM are definitely more refined as it matches well with the ground/field measurements also. The maximum modeled height remains to be 4.7 m, and the velocity reaches 22 m/s at places, which is slightly on the higher side (Fig. 4). Variation of velocity and height along the runout path displays an almost similar trend. This result postulates that satellite and airborne platform-based DEMs used in an integrated way is, at times, necessary to make the simulated models more realistic and robust, which becomes more meaningful for mitigation point of view.

Malari

Numerical simulation at Malari is different from all other case studies presented in this work as this considers a predictive model of a potential avalanche. The model output results showed that the avalanche flow was unbranched till it reached the base

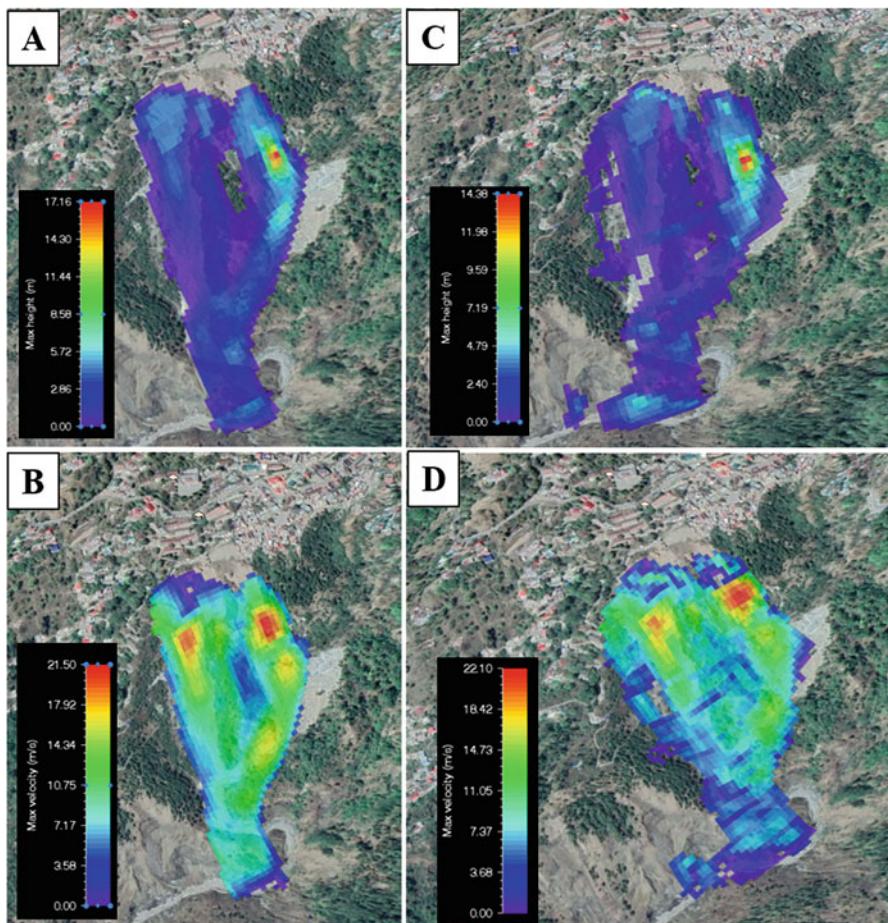


Fig. 4 Modeled outputs (maximum height and velocity) respectively from DEM derived from ALOS PALSAR (**a, b**) and UAV-based (**c, d**) of the Baliyanala Landslide in Nainital, projected on images available in Google Earth platform. Units of variables are in SI format

near a bridge in Malari village. The maximum height of the flow was ~17 m, and the maximum velocity of the flow was ~52 m/s (Fig. 5). The flow pressure was as high as up to 933 kPa. The result of the simulation indicated that the avalanche can reach up to the Malari village mar raise a concern. This work demonstrated that a potential avalanche zone mapping with a combination of numerical simulation model can be proved to be promising tools for risk prediction and evaluation in the inaccessible but strategically important Himalayan villages like Malari.

Langsi Landslide

Langsi landslide has also recurred few times in past one decade or so (Sarkar et al., 1995, 2006; Chatteraj et al., 2019). The present work represents a predictive numerical simulation of the area in case of reactivation of the slide. The outputs

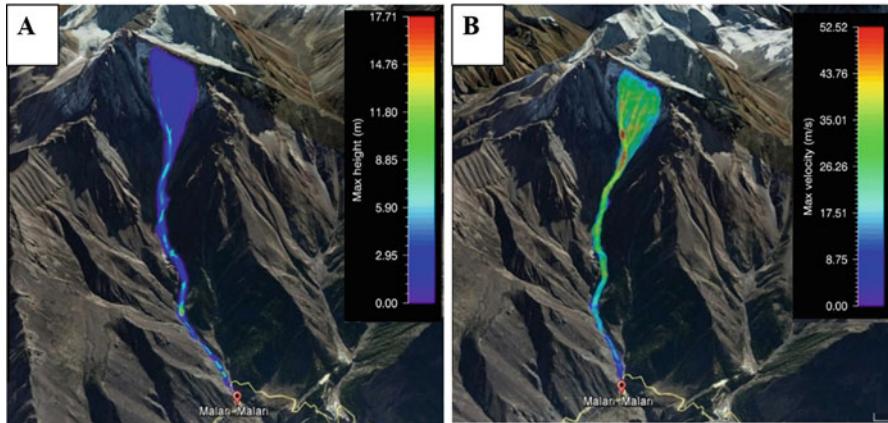


Fig. 5 (a) Modeled maximum height and (b) velocity of an avalanche location near Malari Village by predictive simulation, projected on images available in Google Earth platform

with the best-fitted simulation observed the maximum velocity of 25.75 m/s and the maximum height attained by the sliding material was 14.61 m (Fig. 6). From the following outputs, it can be inferred that if this landslide takes place again then about 14.61 m of the debris will be deposited at the bottom of the flow. Along the road, the maximum height will vary in the range of 0.5–3.1 m. So, if the flow occurs then 1 m or more of the debris will be deposited at the road, whereas the maximum velocity will vary in a range from 4.29 to 13.02 m/s depending on different locations in the road.

Lama Bus Station Area and Betchora Headman Para Landslide, Bangladesh

Betchora Headman Para site is relatively flatter with a number of settlements at the base of the small hill. The RAMMS simulation results show that the maximum flow height raised up to 2.05 m and maximum velocity of the debris found 6.02 m/s. The release volume estimated 3966.3 m^3 . Modeled maximum flow height and velocity at Lama Bus Station area are respectively 2.52 m, 9.1 m/s (Fig. 7). The estimated release volume found 23808.7 m^3 . Results are projected on the Google Map for the visualization purpose and shown in Fig. 7 where it has been clearly seen that all of the houses have been damaged by the debris flow. Results clearly indicate how devastating both the landslides can be considering the heavy built-up area at the zone of deposition.

Instrumental Validation of Shear Strength Parameters

As mentioned above, cohesion (c) and frictional coefficient for dry and liquid phases (μ and ξ , respectively) for soil/debris have been used as critical inputs to numerical simulation-derived models in this study. Cohesion is not directly related to stress

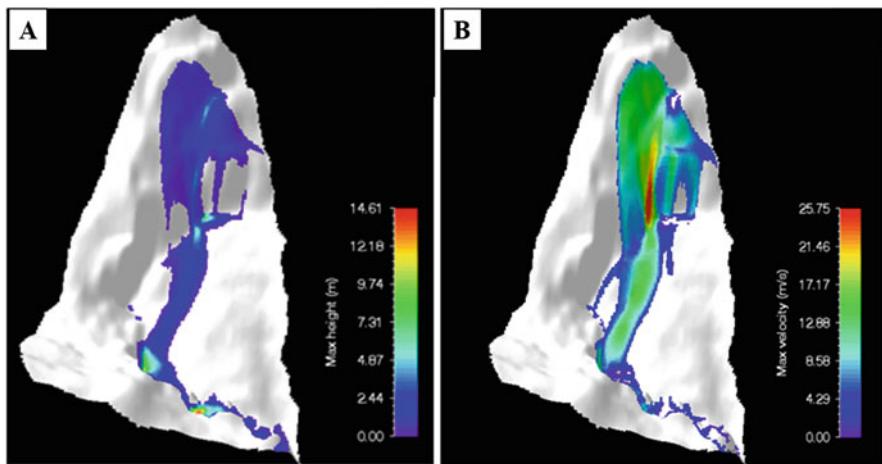


Fig. 6 Modeled outputs (maximum height and velocity) of debris flow at Langsi Landslide near Joshimath (**a, b**). Units of variables are in SI format

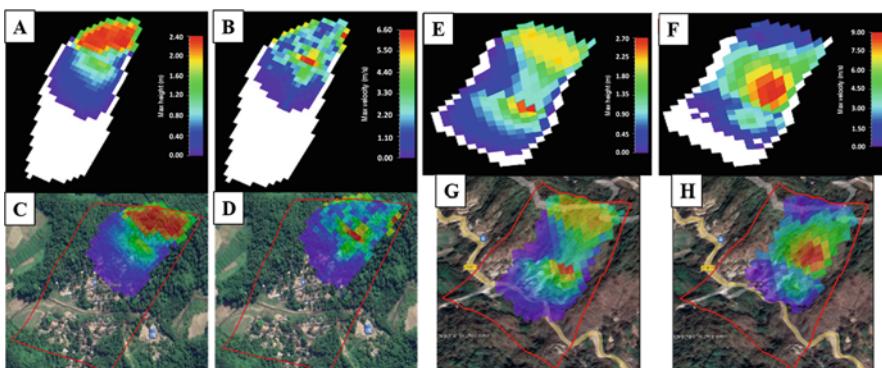


Fig. 7 Modeled outputs (maximum height and velocity) of debris flows at Betchora Headman para (**a–d**) and Lama Bus Station area (**e–h**) Landslide, Bangladesh, with their projections on imagery available in Google Earth platform, respectively. Units of variables are in SI format

system. However, if the angle of sliding is considered to be equal to angle of repose, then as per the rule of friction static frictional coefficient (μ) is intricately related to the slope of the topography. Fortunately, μ and c , both are quantifiable in the laboratory within a defined error range. It will be reiterating to mention here that for the best fit simulation, the instrument derived and modeled inputs of shear strength parameters should be similar. C and Φ were derived by analysis of samples in direct shear instrument which follows the Mohr-Coulomb failure behavior, and thereby the friction static frictional coefficient (μ) which helps to validate the model as per Table 1:

Table 1 Shear strength parameters of debris flows and avalanches: input to model vs. instrument-derived outputs

Flow characteristics		Shear strength parameters		
Flow location		Inputs provided to model	Outputs derived from direct shear instrument	
	Total runout length (Km)	Simulated flow height at base (m)	Simulated velocity at base (m/s)	Cohesion (c) (kPa)
Kaliassaur landslide	0.360	2.5	8.75	15–25
Balyanala landslide	0.58	6.2	18.5	20–30
Malari ^a	4.8	17	52	24–27
Langsi landslide	0.83	14.61 m	25.75 m/s	20–30
Beichora Headman para and Lama Bus Station	0.45–0.55	2.05–2.5	6.0–9.1	10–14
				12–15
				12.8
				15
				16

^aThe friction parameter is based on terrain characteristics that are empirically derived (Bartelt et al., 2013; Christen et al., 2010)

Conclusion

Comprehensive assessment of landslide hazard requires process-based modeling using simulation methods. This work reveals two important outputs by employing satellite images and other geo-engineering parameters, viz., (1) successful post-facto (including a potential of reactivation) and predictive future simulation of selected debris flow events showcased depicting spatial variation of geophysical parameters like velocity, height, pressure, and momentum for few most vulnerable locations. Secondly, it provides stakeholders, ranging from disaster management authority to the general public, the critical insight of the events and related consequences. It has also emerged that recent UAV-based airborne mapping provided high/ultra-high resolution terrain attributes essential for better simulation to help better decision-making and crucial to all stakeholders. It provides idea about the location and nature of implantation of check dams to digest the initial trust of such flow, thus, directly helping mitigation. The work at the same time demonstrates how best a numerical simulation be validated using earth observation-based products and engineering geological instrumentation. This work opens the scope of monitoring and modeling of future glow in a predictive way for landslides of international importance.

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Geomagnetic Signal Processing System for Pre-earthquake Anomaly Detection

48

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Contents

Introduction	728
Theoretical Background	730
Precursor Detection	730
Direction Estimation	731
The Software Package	732
Input and Supplemental Data	732
Functionalities and Interface	734
Example of Output	737
Conclusion	739
References	740

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Abstract

The conventional method of predicting earthquakes is based on historical seismic records of earthquake-prone areas that can only provide probabilistic predictions. However, the predictions are limited in terms of precision as one cannot obtain narrow temporal and spatial windows of the impending earthquake occurrence. Hence, a method that detects earthquake precursors, for example, in the form of geomagnetic anomalies, has the potential to overcome the limitation of the conventional method. Additionally, the adoption of processing tools with a graphical user interface is highly advantageous in enabling analyses to be performed more widely. In this chapter, a software package serving as a geomagnetic signal processing system for detecting pre-earthquake anomaly is presented. The software, which was built based on in-house MATLAB code, provides an efficient and intuitive tool in detecting geomagnetic pre-earthquake anomalies and estimating the directions. The anomaly detection method is based on ultralow-frequency polarization ratio analysis, whereas direction estimation is based on the polarization ellipse technique; however, both are widely used in the field of seismo-electromagnetics. As a comprehensive software package, it allows the user to input raw and unextracted geomagnetic field data, select an earthquake of interest within a determined period of observation, and select the signal processing parameters. It also automatically acquires supplemental data including space weather data and earthquake catalog from an online repository. It then processes the data, outputs the graphical results, and sends the results to the user's email if desired. More specific details including processing principles and features are elaborated in this chapter, along with the presentation of examples of usage and outputs.

Keyword

Software development · Earthquake precursor · Geomagnetic anomaly · Ultralow frequency

Introduction

Non-seismic techniques for observing seismo-electromagnetic phenomena particularly anomalous low-frequency geomagnetic emission have been widely adopted to achieve earthquake prediction (Stănică & Stănică, 2021; Yusof et al., 2021). It has been hypothesized that the emission can be generated at the hypocenter several days up to around a month prior to a sizeable earthquake, possibly due to the following mechanisms: (i) piezomagnetic and piezoelectric effects (Yamazaki, 2016), (ii) induced electric current caused by changes of underground conductivity (Sorokin & Pokhotelov, 2010), (iii) electrokinetic effect (Fedorov et al., 2001), and (iv) microfracturing electrification (Molchanov & Hayakawa, 1998). However,

lithospheric emissions which may be generated during the earthquake preparation phase are much weaker compared to disturbances due to sources from the different atmospheric layers of the Earth like the ionosphere and magnetosphere. In order to address this limitation, emissions within the ultralow-frequency (ULF) range of 0.01–0.10 Hz have been considered as they undergo less attenuation, thus increasing their probability of reaching the Earth's surface (Prattes et al., 2011). Furthermore, the ULF range is mostly free from various contamination sources from space that affect other frequency ranges, for instance, discharge of lightning (3 Hz–3 kHz) (Siingh et al., 2008) and high-frequency ionospheric heating (0.2–6.6 kHz) (Papadopoulos, 2005). These characteristics of ULF make it a likely candidate for the purpose of studying seismic events like earthquakes.

A complete earthquake prediction system should be able to perform two processing tasks: precursor detection and direction estimation. In order to detect precursors, the issue of weak lithospheric-originating emissions being masked by the more intense natural electromagnetic field needs to be addressed. Prior studies adopted the polarization ratio analysis method that relies on the abnormal increase of the vertical component of geomagnetic field intensity in relation to the horizontal component prior to sizeable earthquakes (Hayakawa et al., 2021; Swati et al., 2020; Yusof et al., 2019a). Meanwhile, polarization ellipse method has been successfully applied in estimating the direction of seismo-atmospheric emission within either extremely low-frequency (ELF) or ULF ranges (Schekotov et al., 2015; Yusof et al., 2021). Despite the promising findings by prior studies that adopted both methods, implementing them is not without its challenges, mainly due to the complexity of the necessary signal processing.

The complexity of the processing tasks therefore makes automation of the tasks favorable and of interest, which led to the idea of developing an interactive graphical user interface (GUI) software package. The utilization of such software could expedite essential processing routines in ensuring that predictions are obtained within an actionable timeframe prior to the earthquake. Additionally, although geomagnetic field data are continuously collected at many locations all over the world, they are owned by private organizations or individuals and are usually not made available for public use. Therefore, a GUI software package would facilitate people who have access to the data to conduct the analysis, and it would encourage them to contribute back to a central database. This database is envisioned to gather prediction analysis results from various earthquakes, and this will help in determining the relationships between earthquake properties and precursor characteristics as demonstrated by a few past studies (Schekotov et al., 2020; Yusof et al., 2021).

In this chapter, the alpha release of a software package that automates some tasks of earthquake precursor analysis based on anomalies in the geomagnetic field is presented. Several aspects of this state-of-the-art software are elaborated including the theoretical background, data description, functionalities, and user interface. Finally, an example of the outputs based on an earthquake is discussed to demonstrate the software usage.

Theoretical Background

Precursor Detection

The software adopted the polarization ratio analysis for precursor detection, which is arguably the most used method for seismo-geomagnetic anomalies. The analysis involves the calculation of the polarization ratio parameter, $P(f)$, on the i th day that is given by the following:

$$P(f)_i = \frac{\langle S_Z(f) \rangle_{\Delta f, \Delta T, i}}{\langle S_H(f) \rangle_{\Delta f, \Delta T, i}} \quad (1)$$

where S denotes power spectral density (PSD) of the vertical (Z) and horizontal (H) field components, which are then averaged over a ULF range, Δf , and a period, ΔT (Stanica & Stanica, 2019). In terms of Δf , most past studies observed a narrower range within the full ULF range (i.e., 0.01–0.10 Hz), for example, 0.03–0.05 Hz, usually without any justification (Yusof et al., 2019b). Hence, the ULF range is divided into nine frequency ranges, i.e., $\Delta f = 0.01 - 0.02, 0.02 - 0.03, \dots, 0.09 - 0.10$ Hz, and $P(f)$ is computed for all ranges by the software without making any presumptions. Additionally, only 4-hour local nighttime periods (i.e., $\Delta T = 22 - 02, 23 - 03, 00 - 04, 01 - 05, 02 - 06$ LT) are processed to reduce signal noise due to human activities like power transmission and mass production that are typically higher during the day (Potirakis et al., 2019). The splitting of frequencies and periods allows the user to interpret the outputs and decide which parameter combination produces the most desirable results in detecting a precursor for a given earthquake.

Geomagnetic field components may vary over different ranges; therefore, the normalization step was recently introduced in polarization ratio analysis to ensure that each component contributes a sensible weightage when computing $P(f)$. Normalized $P(f)$ based on z-score (Ida et al., 2008) and ranges (Yusof et al., 2020) are obtained as follows:

$$P(f)_{\text{zscore},i} = \frac{(S_{Z,i} - \mu_{S_Z})/\sigma_{S_Z}}{(S_{H,i} - \mu_{S_H})/\sigma_{S_H}} \quad (2)$$

$$P(f)_{\text{range},i} = \frac{(S_{Z,i} - S_{Z,\max})(\frac{b_Z - a_Z}{S_{Z,\max} - S_{Z,\min}}) + b_Z}{(S_{H,i} - S_{H,\max})(\frac{b_H - a_H}{S_{H,\max} - S_{H,\min}}) + b_H} \quad (3)$$

where S_Z and S_H in (2) and (3) are short forms for $\langle S_Z(f) \rangle_{\Delta f, \Delta T}$ and $\langle S_H(f) \rangle_{\Delta f, \Delta T}$, respectively. In (2), μ and σ refer to the mean and standard deviation of the parameters, respectively. Meanwhile in (3), a_Z , b_Z , a_H , and b_H are the lower and upper limits of normalization ranges for the Z and H components, respectively, where the ranges are [$a_Z = 1, b_Z = 3$] and [$a_H = 1, b_H = 2$] (Yusof et al., 2021).

The way an anomaly is identified depends on the normalization type used: $P(f)_i > \mu_{P(f)} \pm \sigma_{P(f)}$ for z-score and $P(f)_i > b_Z/b_H (=1.5)$ for ranges.

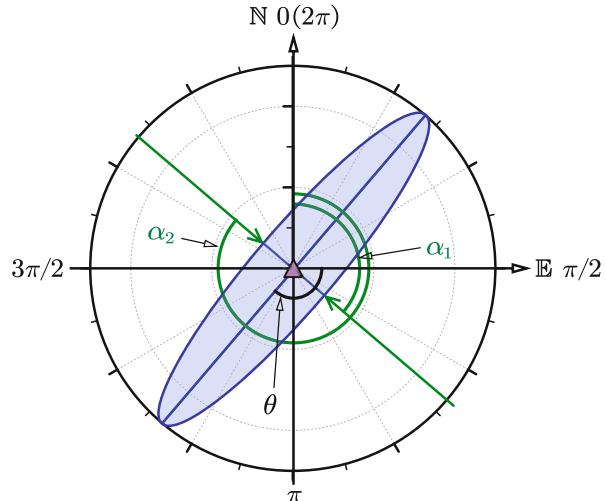
Direction Estimation

The direction from where the anomalies originate can be estimated by using the polarization ellipse method. The method relies on the concept of polarization ellipse that has a major and minor axis. It is hypothesized that the major axis will align perpendicular to the direction of incoming anomalies (Ohta et al., 2013). Figure 1 illustrates the ellipse (in light blue) and both of its axes (dark blue interior lines) where the angle the major axis makes with the eastward direction (\mathbb{E}) revolving clockwise is referred to as θ (where $\theta > 0$); its tangent can be calculated as follows:

$$\tan(2\theta) = \frac{2A_N A_E \cos(\varphi_N - \varphi_E)}{A_N^2 - A_E^2} \quad (4)$$

In (4), A_N and A_E are the instantaneous amplitudes, whereas φ_N and φ_E are the phase angles of N and E geomagnetic field components, respectively. In order to obtain the four variables, a band-pass filter within Δf range, which is determined in the precursor detection step, is applied to each component separately. The filtering modifies the original data into quasi-monochromatic signals (U_N and U_E), which are then Hilbert-transformed to get complex signals and, consequently, the four variables. Through simple geometry, one can easily obtain two possible directions of the incoming signals (green arrows), where the angles the signals make with the northward direction (\mathbb{N}) revolving clockwise are represented by α_1 and α_2 in Fig. 1, where $\alpha_1 = \theta$ and $\alpha_2 = \theta + \pi$ (Hayakawa et al., 2021).

Fig. 1 Depiction of polarization ellipse with its axes (blue oval with interior lines) and possible incoming signal directions (green arrows)



Since these angles, hereby referred to as azimuthal directions, are computed from instantaneous U_N and U_E , both α_1 and α_2 are therefore time-variant. Thus, estimating the dominant direction is necessary, which can be achieved by plotting the azimuthal distribution of α (i). Additionally, to increase the accuracy of the estimation, only α (i) that originate from high-intensity horizontal field relative to the average value (i.e., corresponds to high signal-to-noise ratio, SNR) are considered when plotting the distribution that is given by the following:

$$\sqrt{U_N^2(i) + U_E^2(i)} > k \sqrt{U_N^2 + U_E^2} \quad (5)$$

The value of coefficient k in (5), which determines the threshold of acceptable SNR, of between 3.5 and 5.0 was found to be useful in estimating the direction of ULF signals which are probably coming from earthquake epicenters (Ohta et al., 2013; Yusof et al., 2021).

The Software Package

The software package was designed and built using MATLAB® App Designer and then compiled as an executable file using MATLAB® Compiler for it to run as a standalone software package. The minimum system requirements for the software follow the ones for MATLAB® software, namely, any Intel or AMD x86–64 processor, 8 GB of disk and 4 GB of RAM on either Windows, Mac, or Linux operating systems (The MathWorks Inc., 2019).

Input and Supplemental Data

Input data The software accepts raw geomagnetic field data as the input, specifically those that are released by the Magnetic Data Acquisition System (MAGDAS). As illustrated in Fig. 2, MAGDAS is a magnetometer network with nearly 80 stations globally that is run by the International Center for Space Weather Science and Education (ICSWSE), Kyushu University, Japan (Yumoto and MAGDAS Group, 2007). Most MAGDAS magnetometers are of the ring-core fluxgate type; the magnetometers measure three magnetic orthogonal components, i.e., northward (N), eastward (E), and downward vertical (Z), as well as the total field, $F = \sqrt{N^2 + E^2 + Z^2}$ in nanotesla (nT). Along with these components, the metadata such as data and time (UTC), station location and code, elevation, and sampling frequency are also recorded in data files, which are released in the textfile format as exemplified in Fig. 3.

Supplemental data Several supplemental data are required for the software to operate properly, namely, earthquake catalog and global geomagnetic indices; both are preprocessed, packaged, and uploaded regularly to an online repository

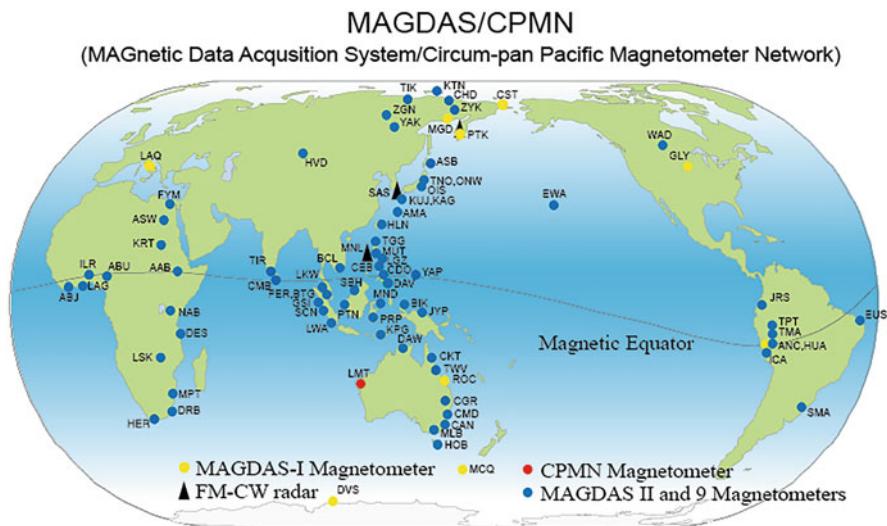


Fig. 2 A map showing MAGDAS magnetometer stations around the world. (Source: Yumoto and MAGDAS Group (2007))

Format	IAGA-2002
Source of Data	Space Environment Research Center, Kyusyu-U
Station Name	Onagawa
IAGA CODE	ONW (SERC code)
Geodetic Latitude	038.400
Geodetic Longitude	141.470
Elevation	8888.88
Reported	HDZF
Sensor Orientation	HDZF
Digital Sampling	1 second
Data Interval Type	1-second
Data Type	Provisional
DATE TIME DOY	ONWH ONWD ONWZ ONWF
2012-01-01 00:00:00.000	001 28203.20 -285.37 37734.17 47110.18
2012-01-01 00:00:01.000	001 28203.13 -285.36 37734.16 47110.14
2012-01-01 00:00:02.000	001 28203.06 -285.35 37734.14 47110.08
2012-01-01 00:00:03.000	001 28203.02 -285.34 37734.12 47110.04
2012-01-01 00:00:04.000	001 28203.00 -285.33 37734.10 47110.01
2012-01-01 00:00:05.000	001 28203.02 -285.32 37734.08 47110.00
2012-01-01 00:00:06.000	001 28203.06 -285.32 37734.08 47110.03
2012-01-01 00:00:07.000	001 28203.11 -285.31 37734.05 47110.04
2012-01-01 00:00:08.000	001 28203.15 -285.30 37734.03 47110.04
2012-01-01 00:00:09.000	001 28203.17 -285.29 37734.02 47110.05
2012-01-01 00:00:10.000	001 28203.14 -285.29 37734.03 47110.04
2012-01-01 00:00:11.000	001 28203.09 -285.27 37734.01 47109.99
2012-01-01 00:00:12.000	001 28203.02 -285.27 37734.01 47109.95
2012-01-01 00:00:13.000	001 28202.97 -285.27 37734.01 47109.92
2012-01-01 00:00:14.000	001 28202.94 -285.27 37734.01 47109.92

Fig. 3 An example of daily raw geomagnetic field data file released by MAGDAS

(www.github.com). The data are automatically retrieved every time the software is initialized to ensure that the user has the most updated version of the data locally. The earthquake catalog is acquired from the European-Mediterranean Seismological Centre (EMSC) earthquake database (www.emsc-csem.org). It encompasses tens of thousands of earthquakes having magnitude $M \geq 4.5$ and hypocentral depth $h \leq 200$ km that have occurred globally since the year 2007. The catalog provides fundamental properties like occurrence time (UTC), moment magnitude, latitude, longitude, depth, and region name. The software computes the distance between a given earthquake and magnetometer station using their latitudes and longitudes, which is known as epicentral distance, r . It is essential in approximating whether precursors could be detected at a given location; Hayakawa (2015) hypothesized that precursors are detectable if $r < 40$ ($M = 4.5$). Additionally, to consolidate r and M into a single quantity that represents the impact of an earthquake at a location, the local seismicity index K_{LS} (Molchanov & Hayakawa, 2008) is calculated as follows:

$$K_{LS} = \frac{10^{0.75M}}{r + 100} \quad (6)$$

The geomagnetic field is frequently disturbed by various sources from the Sun such as geomagnetic storms and solar events, especially during solar maxima (Yusof et al., 2022). Thus, an index that describes the geomagnetic condition at a global scale needs to be observed, in contrast to the localized measurements at the magnetometer stations. The disturbance storm time (Dst) and planetary (ap) indices are therefore acquired from NASA OMNIWeb Service (www.omiweb.gsfc.nasa.gov) and observed. The Dst and ap indices are obtained by computing the average of geomagnetic field intensities at several magnetometer stations in the dip-equatorial and midlatitude/sub-auroral regions, respectively (Rostoker, 1972). As each index represents a different region, it is beneficial to observe both simultaneously to have a more generalized indicator. The periods of high solar-terrestrial disturbance are known as disturbed days, which are given by $Dst < -30$ nT or $ap > 27$ nT; otherwise, they are identified as quiet days (Namgaladze et al., 2019). If a geomagnetic anomaly is identified during a disturbed period, it will be discarded to avoid a false precursor.

Functionalities and Interface

As a versatile software, it can perform several sequential functions which include (i) geomagnetic field data extraction and preprocessing, (ii) earthquake searches, and (iii) precursor detection and direction estimation. Descriptions within this section mainly refer to Fig. 4. It is worth noting that extracted data obtained from function (i) can be saved in the MATLAB data format (*.mat) for other processing purposes

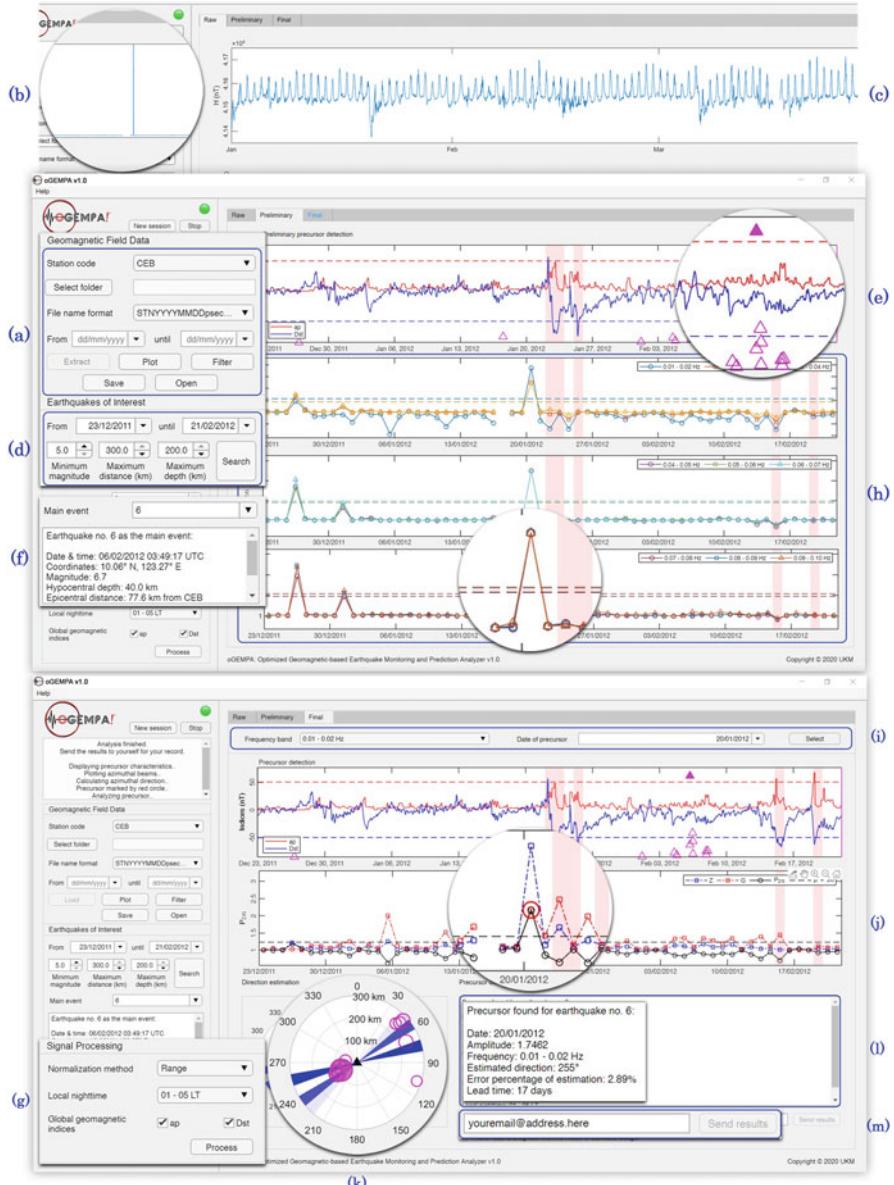


Fig. 4 The software's user interface showing its various functionalities that are marked by letters and referred in the main text

outside the software. Additionally, the software can function as a standalone earthquake seeker based on the selected station and earthquake parameters provided by function (ii) without inputting the geomagnetic field data.

Geomagnetic field data extraction and preprocessing As described in the previous section, geomagnetic field data are typically supplied by data providers in the textfile format. MAGDAS in particular releases individual files of daily data with various file extension conventions, making the extraction and merging process of the data tedious and complicated if it were to be performed manually. Additionally, despite being cleaned by the data provider prior to being released, noises and outliers sometimes persist in the raw data. As shown in Fig. 4a, the software accepts a station code selection, path to the raw data folder, file name, and extension format as well as start and end dates to perform data extraction. At present, data from all MAGDAS stations are supported, with the capability of adding more new stations as well as supporting other magnetometer networks like SuperMAG (supermag.jhuapl.edu) in future versions of the software. After setting the parameters, the software starts the extraction by iteratively opening the data files, copying the contents, and appending the contents chronologically based on associated timestamps (*Extract* button in Fig. 4a). The user can then plot the raw data for inspection or filter it to remove noises and outliers to prepare for the next processing steps (*Plot* and *Filter* button in Fig. 4a). The raw data before and after being filtered are shown in Fig. 4b and Fig. 4c, respectively. If the user has already extracted and saved the data in the MATLAB format, they can skip the previous tasks and open the data to continue with the analysis.

Earthquake searches The analysis proceeds with earthquake searches based on several parameters such as start and end dates, minimum magnitude, maximum epicentral distance, and hypocentral depth (Fig. 4d). Note that epicentral distance is measured from the magnetometer station selected beforehand. Earthquakes matching the set parameters are plotted as hollow magenta triangles with the y-axis corresponding to K_{LS} of the earthquakes as shown in Fig. 4e. Earthquakes commonly occur in a swarm with fore- and aftershocks preceding and succeeding a main shock which usually has the largest magnitude, respectively. Therefore, the software requires an earthquake to be selected as the “main event” and be the focus of the analysis, where the main shock is recommended but not compulsory. Upon selecting the main event, the triangle representing the earthquake will change from a hollow to a filled one (Fig. 4e), while the details of the earthquake will be displayed in Fig. 4f.

Precursor detection and direction estimation This part presents the main functionality of the software that starts with signal processing parameter setting which includes normalization method, local nighttime, and global geomagnetic indices as can be observed in Fig. 4g. The software automatically processes the signals in nine ULF ranges, which are then plotted to be examined by the user (Fig. 4h). The plots also indicate the $\mu + 2\sigma$ threshold for each frequency range to aid the user in identifying the anomalies that could be considered as precursors. Then, the frequency range exhibiting the precursor and the date of appearance is specified as displayed in Fig. 4i, and this prompts the software to compute the estimated azimuthal direction. As illustrated by the azimuthal plot in Fig. 4k, the blue bars

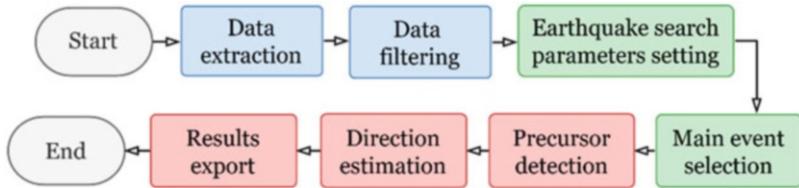


Fig. 5 Flowchart of the software operation

show the incoming signal directions where the color saturation represents the probability, whereas the magenta circles represent the location of earthquakes within the predefined spatiotemporal range. One of the circles that corresponds to the main event is filled. Hence, when the most saturated blue bar overlaps with the filled magenta circle, a high-accuracy direction estimation is obtained. The characteristics of the precursor, i.e., date of appearance, amplitude, frequency range, estimated direction, error percentage of estimation, and lead time, are displayed in Fig. 4l. As an option, the set of information together with the precursor detection and direction estimation plots can be sent to the user's e-mail address (*Send Results* button in Fig. 4m).

The operation flow of the software is concisely visualized in Fig. 5 where the blue, green, and red boxes correspond to geomagnetic field data extraction and preprocessing, earthquake searches, as well as precursor detection and direction estimation functionalities, respectively.

Example of Output

The M5.5 earthquake that struck in the ocean near the east coast of Onagawa, Japan (38.49° N, 141.78° E), on August 29, 2012, 19:05:11 UTC, was chosen as an example of the software output. It was a shallow earthquake with a hypocentral depth of 48 km and located 27 km away from the MAGDAS Onagawa (ONW) station located at 38.40° N, 141.47° E. In reference to the station, the earthquake was located at $\vartheta = 77.89^{\circ}$ from the true north, revolving clockwise. Based on its magnitude and epicentral distance, the earthquake would have generated $K_{LS} = 105$ at the station, as given by (6).

The left axis of Fig. 6a indicates the intensity of the temporal evolutions of Dst (blue line) and ap (red line) indices, whereas the right axis shows K_{LS} of the main earthquake event (filled magenta triangle) and other earthquakes (hollow magenta triangles). Figure 6b depicts the evolution of $P_{Z/G}$ parameter (in 0.08–0.09 Hz) as the black solid line with circle markers and its $\mu + 2\sigma$ threshold as the black dashed line. The marker of $P_{Z/G}$ when it exceeds both $\mu + 2\sigma$ and 1.5 (red horizontal line) is identified as an anomaly (encircled red). Since it did not happen during disturbed periods (red shades), it qualifies as a precursor. Otherwise, it will be ignored as it

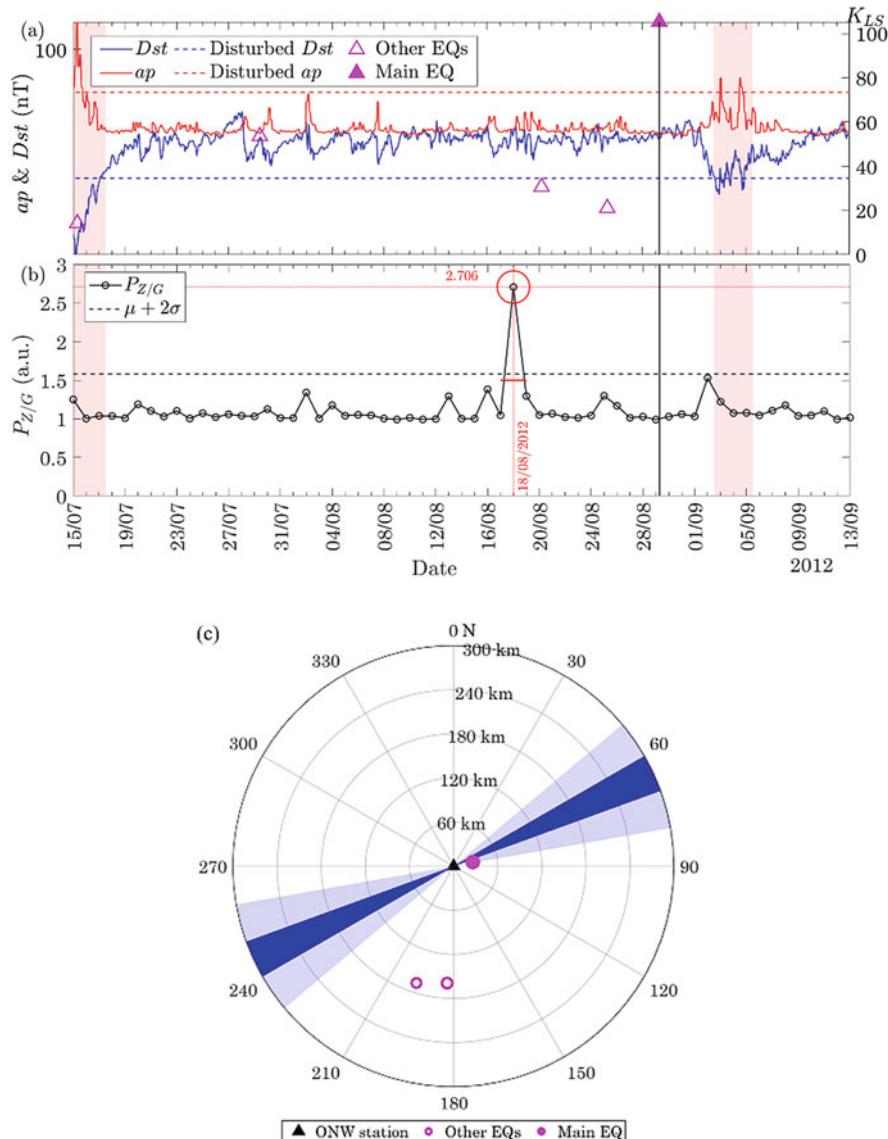


Fig. 6 Temporal evolutions of global geomagnetic indices and K_{LS} in (a) and $P_{Z/G}$ in (b) as well as azimuthal distribution in (c) for the earthquake example

might be a manifestation of solar disturbance in the geomagnetic field. As denoted by the red dotted vertical and horizontal lines in the figure, the precursor of amplitude 2.706 appeared on August 18, 2012, giving a lead time of 11 days before the earthquake.

Azimuthal distribution during the date of precursor appearance is illustrated in Fig. 6c where it is clear that the most saturated blue beam points to 65° and 245° . In addition, the locations of the main and other earthquakes are represented by the filled and hollow magenta circles, respectively. Relative to the actual earthquake location, the estimation had an error of 12.89° (3.581%). The fact that an anomaly which is possibly generated by the earthquake could be observed demonstrates the capability and flexibility of the software, and to an extent the underlying methods, in detecting precursors of moderate earthquakes (i.e., M5.0–M5.9) in addition to strong, major, and great earthquakes. This observation also aligns with the relationship of $r < 40$ ($M - 4.5$), which predicts that an M5.5 earthquake could produce detectable precursors up to 40 km away.

Conclusion

The limitation of conventional seismic methods in predicting earthquakes urges for seismo-electromagnetic approaches, for example, through the observation of ultralow-frequency (ULF) geomagnetic anomalies. In this chapter, precursor detection and direction estimation of the anomalies are applied and extended through the development of a software package. The primary functionality of the software is to automate some of the earthquake precursor analysis steps, of which the processing principles are based on polarization ratio analysis and polarization ellipse methods. As a comprehensive GUI-based software, it provides easy-to-use analysis tools to process geomagnetic field data from its raw, unextracted form to graphical and numerical outputs. Moreover, the software is built to be modular and flexible, in that its functionalities can be used independently in addition to the primary one, for example, as a geomagnetic field data extractor and preprocessor as well as earthquake seeker. The software usage is demonstrated on the M5.5 earthquake that struck Onagawa, Japan, on August 29, 2012. It successfully detected a precursor 11 days prior to the earthquake with a good direction estimation that had an error of just 3.581%. By removing the technical barrier due to sophisticated processing procedures, the software is envisioned to encourage more people to conduct their own analyses using the data that they have access to. Taking it one step further, continuous data streaming could be incorporated into the software, transforming it into a real-time prediction system. This will help relevant government bodies obtain predictions in a timely manner and execute the appropriate plan of action.

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Risk Mapping in Managing Flood Vulnerability in Disaster Management

49

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Contents

Introduction	744
Methodology	747
Databases and Search Terms Used	747
Paper Selection Process	748
Analysis	748
Urban Region	752
Rural Region	753
Coastal Region	753
Riverine Region	754
Non-Traditional Data Sources	756
Social Media Indicators	757
Conclusion	760
Appendix	760
References	773

Abstract

Flood risk is a product of hazard and vulnerability, and is important in managing floods, making decisions, and developing policies. While different approaches can be used to construct these maps, Geographic Information System (GIS)-based maps are increasingly being adopted, which requires researchers to utilize different layers of information. Poorly constructed indices can present misleading messages; therefore, this chapter analyzes existing vulnerability indicators across geographic region and flood type. Moreover, all the indicators are examined for their selection criteria where a priority is given to each, to understand which

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indicator is more important than another. These weights were then inputted into a Sankey diagram to easily interpret which vulnerability dimension, indicator, and flood type is of highest priority. While these diagrams will assist researchers with their indicator selection process they will still encounter challenges with data scarcity and outdated data. Therefore, we propose the use of non-traditional data sources like social media to further enhance the flood vulnerability maps, a crucial requirement for crisis responders who need to prioritize their response operations.

Keywords

Flood · Vulnerability · Indicators · GIS · Social media

Introduction

Climate change is increasing the intensity and frequency of floods around the globe, resulting in huge damages. While flooding causes great disruption to livelihoods and the society, it largely leaves a negative impact on the economy in short- to medium-term context. In order to mitigate the impacts caused by various disasters, the United Nations' Sendai Framework for Disaster Risk Reduction 2015–2030 outlines a strategy based on four guiding principles: understanding disaster risk, strengthening disaster risk governance to manage disaster risk, investing in disaster risk reduction for resilience, and enhancing disaster preparedness for effective response (Asian Disaster Reduction Center, 2015). The first principle emphasizes the need to understand and assess flood disaster risk at various scales (i.e., national and local levels), where the specific sub-goal is to reduce hazard exposure and vulnerability to disasters. There is an emphasis on both hazard and vulnerability together because measuring hazard alone does not provide valuable information to disaster response teams. For example, if a community is located in a flood-prone area and is not vulnerable to a natural disaster, then response efforts should not be prioritized for this specific region. Instead, the limited rescue and response resources can be redirected to highly vulnerable regions which is only possible when disaster risk is taken into account.

Disaster risk is defined as the potential losses, which could occur to a particular community or a society over some specified future time period, where different types of potential losses include lives, health status, livelihoods, assets, and services (United Nations, 2009). Nowadays there is a consensus that risk (R) depends on the interactions between hazard (H) and vulnerability (V), which is generally calculated using the following equation (WBGU–Wissenschaftlicher Beirat der Bundesregierung Globale, 1998; ISDR Terminology, 2004):

$$R = H \times V \quad (1)$$

where R is a representation of the potential for adverse impacts; H is the likelihood of experiencing a certain intensity of a natural or human-induced hazardous event

(i.e., flood, earthquake, or cyclone, etc.) at a specific location; V is a reference to how the exposed elements at risk are vulnerable and susceptible to the adverse impacts of the hazard event.

Interestingly, recent literature has shifted away from vulnerability and began focusing more on resilience as vulnerability deals with the preparedness phase of a disaster, whereas resilience deals with the post-event response and recovery from disasters (Cutter et al., 2014, 2008; Sajjad & Chan, 2019). While there is an open debate about whether resilience or vulnerability should be used, this book chapter focuses on vulnerability as it is widely accepted by international organizations like the United Nations. Equation 1 is widely used for the calculation of disaster risk, but there is still no consensus on how the three factors of vulnerability (V): exposure (E), susceptibility (S), and coping capacity (C) are aggregated and calculated. Most of the debate relies on whether an additive aggregation method (Balica, 2007) (refer to Eq. 2) or a multiplicative aggregation method (Balica et al., 2009; Villordon & Gourbesville, 2014) (refer to Eq. 3) should be used when constructing the vulnerability composites as both methodologies can produce varying outcomes. However, it is noted that as these composites are relative measures of vulnerable aspects of a specific community or society, the outcome and overall essence of the vulnerability is preserved no matter which method is employed for aggregation.

$$V = E + S - C \quad (2)$$

$$V = \frac{E \times S}{C} \quad (3)$$

where V is the function of exposure, susceptibility, and coping capacity; E is the presence of elements such as people, infrastructure, systems, and other elements are subject to potential losses; S is when the exposed elements are susceptible to damage with the occurrence of a disaster event; C is the ability to react to and recover from the effects of a hazard in a timely and manner.

This book chapter focuses on flood-related disasters. This is because, according to a report by the United Office for Disaster Risk Reduction (UNDRR) (UN Office for Disaster Risk Reduction, 2020), floods are the most common type of disaster to occur over a 20-year period of 2000 and 2019, and have affected the 1.65 billion people. Specifically, floods accounted for 44% of all the total 7348 disaster events recorded between 2000 and 2019. Moreover, flood events are anticipated to become more frequent and intense due to the combined effect of population growth and climate change (Gu et al., 2011; Miller & Hutchins, 2017; Saurav et al., 2021). Thus, it is imperative to understand how vulnerability to flooding hazards can be assessed and mapped accurately to assist effective mitigation of potential damages and adaptation to future events.

Examining vulnerability is an integral part of flood risk management (analysis, profiling, and communication) where there lie several approaches within the existing literature for the assessment of flood vulnerability. These approaches include stage damage functions (Papathoma-Köhle et al., 2017; Tarbotton et al., 2015), damage

matrices (Papathoma-Köhle et al., 2017), computer modeling methods (Balica et al., 2013), and vulnerability indices (Barroca et al., 2006; Müller et al., 2011). The first three methods rely on physical vulnerability indicators and neglect other important dimensions like social, economic, and environmental vulnerability, thus making these methods unrepresentative. While indicator-based assessment models are the only method to provide a holistic overview of flood vulnerability (Nasiri et al., 2016) by considering the multi-dimensional factors, it is important to note that these models do not have a specific set of indicators that are universally accepted. This is primarily due to site-specific environmental, socioeconomic, institutional, political, and organizational settings in different areas. Another reason behind this discord is the availability of relevant data on the scale of assessment (i.e., local, sub-national, and national) which is one of the biggest challenges researcher encounter when dealing with data scarce regions. In this context, poorly constructed indices can misrepresent the situation, which could potentially be misleading in terms of decision-making and resource allocation. Therefore, it is necessary to have a clear understanding of all indicators to allow decision and policymakers to set precise targets to reduce vulnerability.

Existing review papers have attempted to assess the different types of indicators involved in constructing vulnerability maps from indicator-based methods. For example, Bigi et al. (2021) analyzed all the socioeconomic indicators and sub-indicators for urban areas only. Moreover, it considered citation count as a criteria to determine the relevancy of indicators. While their study only focused on reviewing one vulnerability dimension for one geographic region, this will only be beneficial to researchers interested in mapping vulnerability in urban regions for socioeconomic vulnerability. Similarly, other review papers either focused on one vulnerability dimension (i.e., Fatemi et al. (2017)) or one geographic region (i.e., Giampieri (2021)). While Moreira et al. (2021a) attempted to focus on all vulnerability dimensions over a set of geographic regions limited to urban, rural, or both regions, it still missed coastal and riverine geologies; and mainly focused on reviewing the different stages involved in the construction of flood vulnerability indices, instead of the indicator selection process. Therefore this chapter first aims to conduct an extensive analysis of indicators belonging to all the vulnerability dimensions across four geographic regions: urban, rural, coastal, and riverine and varying flood type. Moreover, this chapter aims to identify the selection criteria of indicators as indicators derived by experts, household surveys, interviews, and practitioners, which would have higher priority than indicators derived by researchers themselves. This method of distinction is more valuable than citation count and will help researchers easily identify a list of indicators relevant to their study.

This systematic analysis of indices will examine published studies from four different perspectives: (1) vulnerability dimension, (2) type of geographic region, (3) type of flood, and (4) selection criteria. While this evaluation will assist planners, practitioners, and future researchers with their indicator selection process, it will not resolve the challenges of finding relevant data for the indicators in different regions where there is no centralized database for geospatial indicators or when the data sources are outdated. To overcome these two challenges, we introduce the

integration of traditional and non-traditional data sources, which can serve two purposes: (1) replace existing geospatial indicators that are outdated, and/or (2) enhance existing indicators by combining both sources. This will bring about several advantages where firstly the vulnerability maps will be even more accurate as near real-time data from non-traditional data sources is being used to represent the changing vulnerability over time, rather than treating it statically with traditional indicators. Secondly, utilizing the public knowledge through non-traditional data sources is more appealing as it would give a natural distribution of indicators during a disaster where real-time weights can be applied. This is not the case with traditional indicators selected through expert elicitation, which is one of the potential reasons of human bias where individuals are inclined in providing more importance to indicators in line with their specific domain of work.

The remainder of the chapter is organized as follows. Section “[Methodology](#)” details the methodology used to select, screen, and review a specific number of papers for analysis. Section “[Analysis](#)” presents an overview of the indicators analysis for each geographic region. Section “[Non-Traditional Data Sources](#)” introduces a new data source that can be integrated to further enhance flood vulnerability evaluation and profiling through detailed mapping, and section “[Conclusion](#)” finally concludes the chapter.

Methodology

Databases and Search Terms Used

To begin with, a bibliographic search was performed by focusing on studies that produced flood vulnerability mapping through indicator-based methods. For the purpose of this chapter, three different globally known literature databases including Scopus, ScienceDirect, and Web of Science were accessed in February 2022. The authors selected a few tailored keywords that would retrieve highly relevant papers, where the title was considered to narrow down the search space substantially. The following search criteria were used in the Scopus database: TITLE(flood*) AND TITLE(vulnerability) AND TITLE(indicator* OR index* OR indices). This is slightly different from the search performed in Web of Science: Title contains flood* AND Title contains vulnerability AND Title contains indicator* OR index* OR indices, while in the ScienceDirect the following was used in the TITLE: (flood OR flooding) AND vulnerability AND (indicator OR indicators OR index OR indexes OR indices). The search criteria are the same across the three databases, which combined three sub-criteria by the AND operator. Some keywords were included with asterisk (*) so that both the singular and plural forms of those keywords are considered in the search. However, it is noted that only Scopus and Web of Science databases supported such operation. Moreover, some keywords are separated by an OR operator to include the various derivations of the term “indicator” used within flood vulnerability literature. This systematic search resulted in 90 papers from Scopus, 134 from Web of Science, and 18 from ScienceDirect.

Paper Selection Process

An open search was conducted across all three bibliographic databases with no date limit which elicited 243 papers in total. A set of filtering options was used to ensure that the papers belonged to the (1) final publication stage and was an (2) article or book chapter. Only articles and book chapters written in (3) English language and (4) contained in journals and books were included for the evaluation presented in this chapter. This initial filtering stage reduced the number from 243 papers to 175, where duplicate removal was then applied to retrieve a unique set of 92 papers published between 2006 and 2022. These 92 papers were then manually screened based on the title, abstract, and keyword, to remove irrelevant papers that were not useful for the purpose of this review. A set of inclusion criteria was used during the manual screening stage where papers focused only on (1) flooding, (2) community-based flood vulnerability, and (3) vulnerability indicators were selected to be included. Similarly, a set of exclusion criteria was set to remove papers that focused on (1) multiple hazards, (2) climate change or sea level rise, and (3) other vulnerability topics such as building or agriculture vulnerability. This manual screening step reduced the number of papers from 92 to 32, where the full text of the 30 open access papers was then reviewed in detail. Figure 1 provides an overview of the search and selection process where the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Tricco et al., 2018) flow diagram was used.

Analysis

The 30 papers were first examined for three main characteristics including region type, flood type, and selection criteria, where each characteristic is detailed below.

Region Type In this study, we categorize the papers into four broad regions based on the area of interest they focused their analysis on. These regions include urban, rural, coastal, and riverine. Urban regions are characterized with a high population density with features of a built environment. This is completely opposite to rural regions which are comprised of lower population settlement and large amounts of undeveloped land. Coastal zones consist of areas between land and sea and come in different features like cliffs, beaches, and mudflats. With respect to river floodplains, this consists of large flat land occurring on either side of rivers.

Flood Type A distinction can be made between the four most common types of floods: urban floods, flash floods, coastal floods, and river floods. Urban floods tend to result from the accumulation of extreme local rainfall, which causes blocked drainage systems. Flash floods can result from intense rainfall, dam failures, or the sudden release of water from ice jams which often occur over a small geographic area and causes huge damage. Coastal floods occur when storms coincide with high tides or from high tidal waves created by tsunamis, hurricanes, or tropical storms. River floods are a result of increased water flow from rainfall that causes overtopping of the banks, thus spilling water onto the surrounding land.

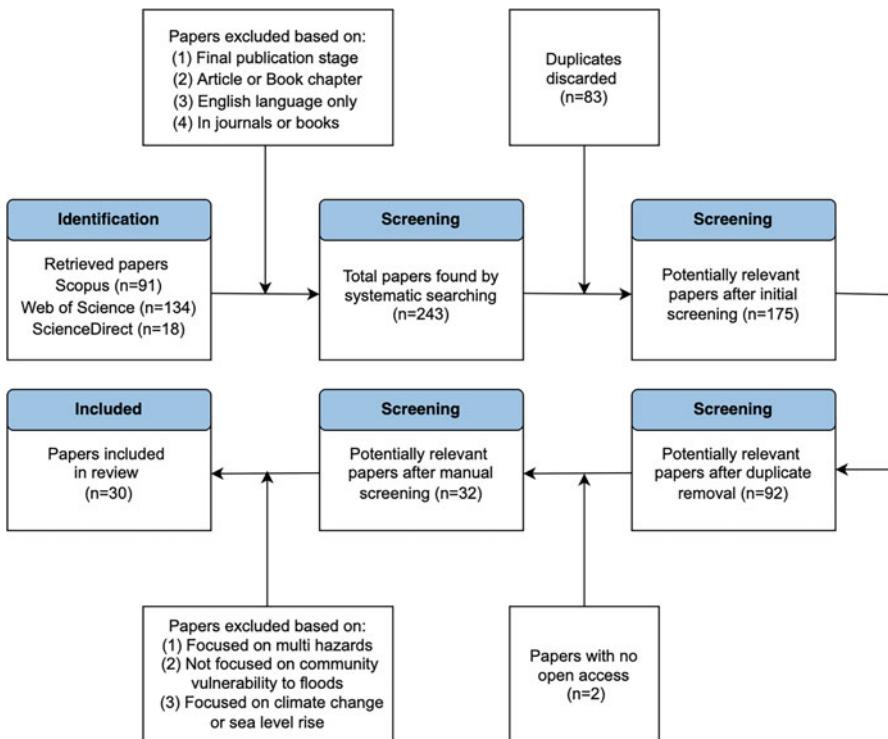


Fig. 1 Flow diagram of the search and selection process based on PRISMA

Selection Criteria Indicators can be selected from a variety of sources where some studies have conducted interviews and surveys with local households to understand which indicators are relevant and how they contribute to increase or decrease the vulnerability. Other researchers rely on conducting Delphi surveys to understand the opinions of experts and practitioners in the field of flood management. Other than interviews, questionnaires, and surveys, which are all primary data, some researchers have relied on secondary data by consulting the published literature to identify the commonly used indicators relevant for their area of study.

Table 1 shows the final 30 papers organized by region type where each paper was then examined for flood type and source of indicators selection. It is evident that a large proportion of these papers belong to the urban region, while the remaining rural, riverine, and coastal regions have almost similar number of fewer papers. These statistics show that researchers are increasingly focusing on examining flood vulnerability across different urban regions. The potential reason for this focus could be the higher exposure of urban areas to flooding along with the likelihood of largest impact and damage due to higher population and capital investments in cities. The next step involved analyzing all the indicators by region type with different vulnerability dimensions in mind. A detailed list of all the indicators can be found in the Appendix.

Table 1 Overview of 30 papers categorized by selection criteria and flood type

	Number	Selection criteria	Flood type	Reference
Urban	1	Literature	Flood	Baeck et al. (2014)
	2	Experts	River, coastal, and urban flood	Oulahen et al. (2015)
	3	Literature	Flash flood	Aroca-Jiménez et al. (2017)
	4	Statistical analysis	Flood and flash flood	de Andrade and Szlafsztein (2018)
	5	Literature, experts, household survey	Flood	Rodriguez-Gaviria et al. (2019)
	6	Literature	Flood	Liew et al. (2019)
	7	Expert	Flash flood and monsoon flood	Nasiri et al. (2019)
	8	Literature	Flood	Salazar-Briones et al. (2020)
	9	Literature and stakeholder engagement	Flood	Mason et al. (2021)
	10	Expert	River flood	Rashetnia and Jahanbani (2021)
	11	Literature	Flood	Cian et al. (2021)
	12	Literature	Flood	Karmaoui and Balica (2021)
	13	Household survey	Perennial floods	Harahap (2021)
	14	Experts and household survey	River flood	Membele et al. (2022)
	15	Literature	Flood	(Chang and Chen (2016))
	16	Researcher	River	Zachos et al. (2016)
	17	Statistical analysis	Flash floods	Aroca-Jiménez et al. (2020)
Rural	1	Household survey, focus groups	Flood	Antwi et al. (2015)
	2	Literature	River flood	Yang et al. (2018)
	3	Questionnaire survey, literature review	River flood	Hidayah et al. (2021)
	4	Literature	River flood	Moreira et al. (2021b)
Riverine	1	Questionnaires	Flood	Vári et al. (2013)
	2	Literature	Recurrent floods	Jha and Gundimeda (2019)
	3	Statistical analysis	Flash floods	Aroca-Jiménez et al. (2020)
Coastal	1	Literature	Flash floods	Andres et al. (2015)
	2	Researcher	Flood	Martinez-Graña et al. (2016)
	3	Researcher	Coastal flood	Tao (2021)

(continued)

Table 1 (continued)

	Number	Selection criteria	Flood type	Reference
	4	Household survey and stakeholder survey	Riverine, coastal, and urban	Bernadel et al. (2016)
	5	Literature	Coastal flooding	Giannakidou et al. (2019)
	6	Literature	Flood	Giampieri (2021)

Table 2 The priority list developed for weighting the different selection criterion's

Selection criteria	Priority	Description
Household survey or interview	6	This involves surveying the affected locals in flood-prone areas
Stakeholder or organizational engagement	5	This involves collecting data from organizations and stakeholders
Expert questionnaire or focus groups	4	This involves collecting data from experts in the disaster domain
Statistical analysis	3	This involves using statistical techniques to get relevant indicators
Literature	2	This involves conducting a literature review of the indicators used
Researcher	1	Researchers use their GIS knowledge to include relevant indicators

While this comprehensive list of indicators is a good starting point for researchers in the field of flood vulnerability assessment and mapping, they will still struggle to understand which indicators should be prioritized. To tackle this problem, we devised a priority list as seen in Table 2 where we assigned the highest priority score (6) to indicators that are derived by surveying or interviewing individuals in flood-prone regions. This first-hand information is highly valuable and is the most representative of the vulnerability situation of a community at the highest possible resolution. The second highest priority (5) includes indicators collected from interviewing or surveying key stakeholders or governmental/non-governmental organizations in the disaster response and recovery phase. The next priority (4) relates to gathering insights from experts who have been in the domain of disaster risk reduction, whether that is being part of research institutes or educational institutes. After this, the priority score (3) is given to indicators that are proven to be statistically significant for the past researchers area of interest, where common techniques include the Analysis of Variance (ANOVA) and the Principal Component Analysis (PCA) conducted by different researchers. The second last priority score (2) relates to indicators that were collected by consulting past flood vulnerability literature, which is already published after the formal peer-review procedures. Finally, the lowest priority (1) is given to indicators derived by researchers themselves and can introduce bias if the researcher is not very knowledgeable or experienced in this field.

Urban Region

All the indicators from the 17 papers were analyzed and consolidated, to create a final list of 60 indicators, which belonged to either social, economic, or physical vulnerability dimensions. In particular, 30 indicators belonged to social vulnerability, 11 to economic vulnerability, and the remaining 18 to physical vulnerability. For effective communication and to visualize these indicators appropriately, the Sankey diagram is used to present the flow of indicators in relation to both vulnerability dimension and flood type, as presented in Fig. 2. The thickness of the lines represents the weight given to each indicator based on the selection criteria involved. In cases where an indicator has multiple selection criteria, an average of the priority weights is taken. These weights are reflected in the diagram which is separated by a colon.

Figure 2 shows the social vulnerability indicators for urban regions, where all 30 indicators have similar weights between 2 and 4 indicating that all of them are commonly used. Within urban regions there exists different types of floods, and the greatest emphasis can be seen on flash floods, river floods, and flooding in general.

Figure 3 displays the economic and physical vulnerability indicators, where the overall weight of the physical dimension is greater than economic but less than social vulnerability. With regard to the economic dimension, the majority of the indicators are applicable to coastal flooding, river flooding, and urban flooding, whereas for physical vulnerability, most of the indicators are used in river flooding scenarios.

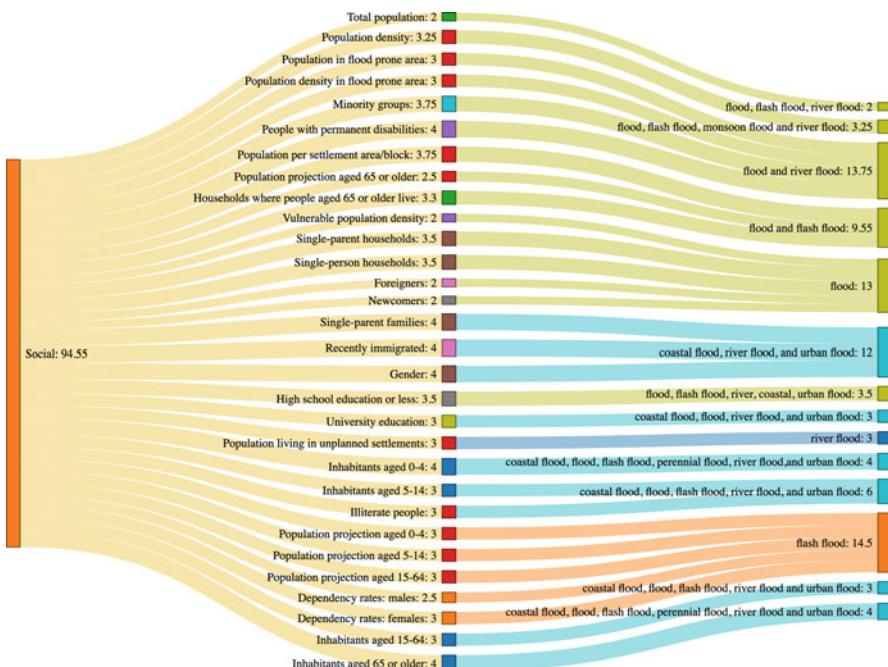


Fig. 2 Overview of social vulnerability indicators for urban regions

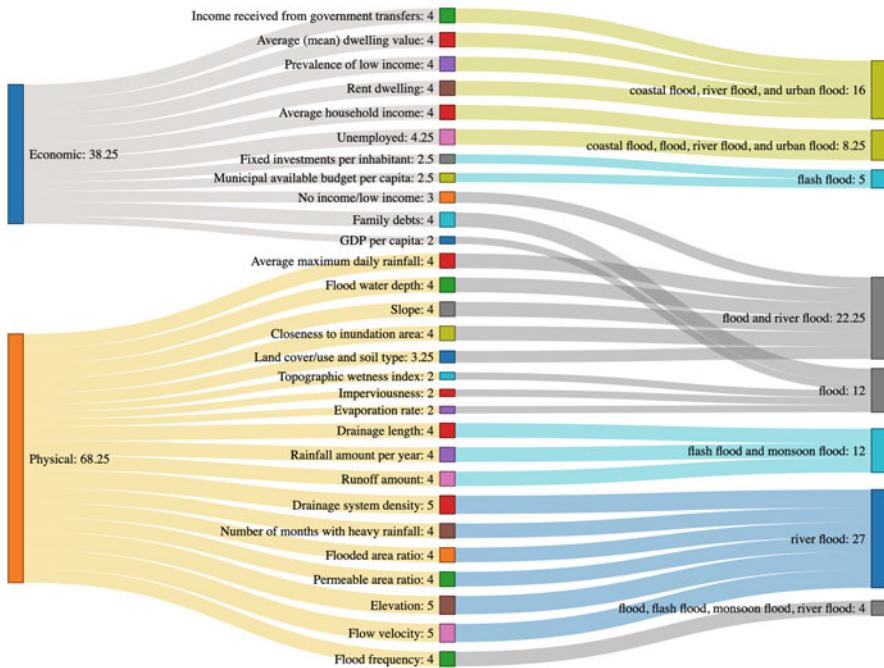


Fig. 3 Overview of economic and physical vulnerability indicators for urban regions

Rural Region

For rural regions, indicators are spread across four dimensions with physical vulnerability being the highest priority followed by ecological, environmental, and political vulnerability as seen in Fig. 4. All 35 indicators either belonged to general flooding and river flooding where flood-related indicators have a combined overall weight higher than river flooding indicators. Only the environmental vulnerability indicators are used in river flooding scenarios while the physical, ecological, and political indicators are spread across general flooding and river flooding.

Coastal Region

Figure 5 visualizes all 71 indicators, which are distributed across physical, institutional, social, and economic dimensions. Interestingly, 47% of the indicators for flood vulnerability assessment over coastal regions belong to the physical dimension only. Within the physical dimension, three indicators have higher priority than the rest, which include frequency of flooding, height of flooding, and number of cyclones/typhoons. These three indicators are applicable to coastal flooding, river flooding, and urban flooding. Next, the institutional dimension has six indicators with the same weights, which can be used in general flooding scenarios. Coming to the social dimension which is the second most important dimension after physical vulnerability,

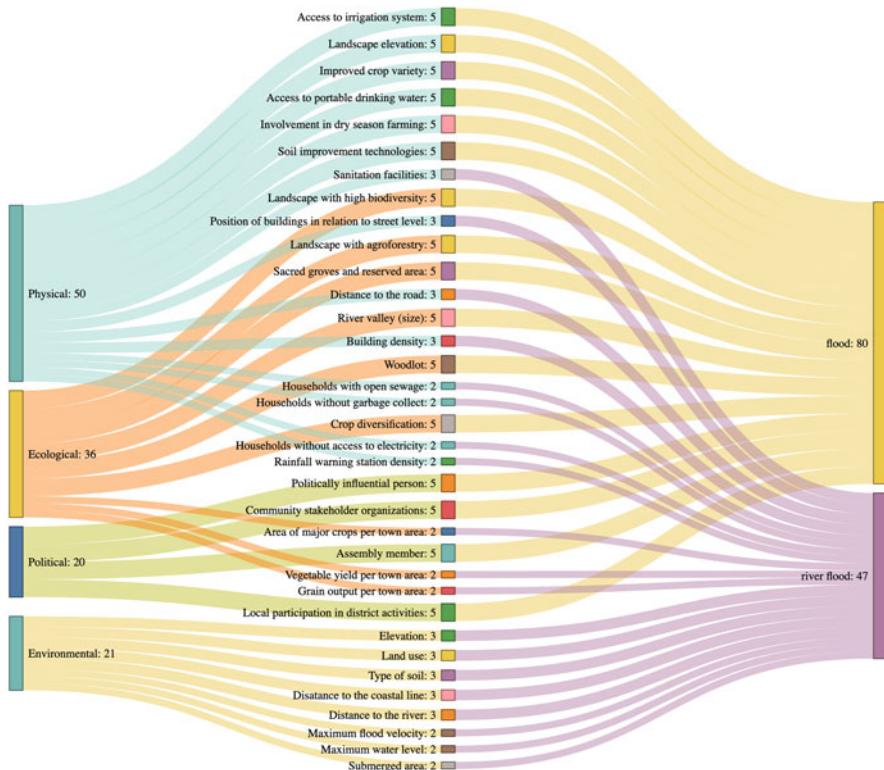


Fig. 4 Overview of physical, ecological, political, and environmental vulnerability indicators for rural regions

we see that five indicators in particular have greater priority over the others including housing conditions, houses with no access to improved sanitation, houses with no access to an improved water source, presence of rats in the vicinity, and presence of waterlogged areas in the vicinity. While data for these five indicators can be gathered only through first-hand information from locals, researchers who cannot collect this information will not be able to include these indicators in these studies. Thus, there is a need for introducing non-traditional indicators, which can be incorporated into the vulnerability assessment and profiling, as a proxy of these traditional indicators collected through primary data sources. Lastly, within the economic dimension, there are two indicators applicable to coastal, river, and urban flooding which should be given importance, and this includes family income and property insurance.

Riverine Region

In total there are 49 indicators applicable to rural regions which either belong to the social or economic dimension. Similar to the other regions, the social vulnerability indicators have almost similar weights as all of them are commonly used by

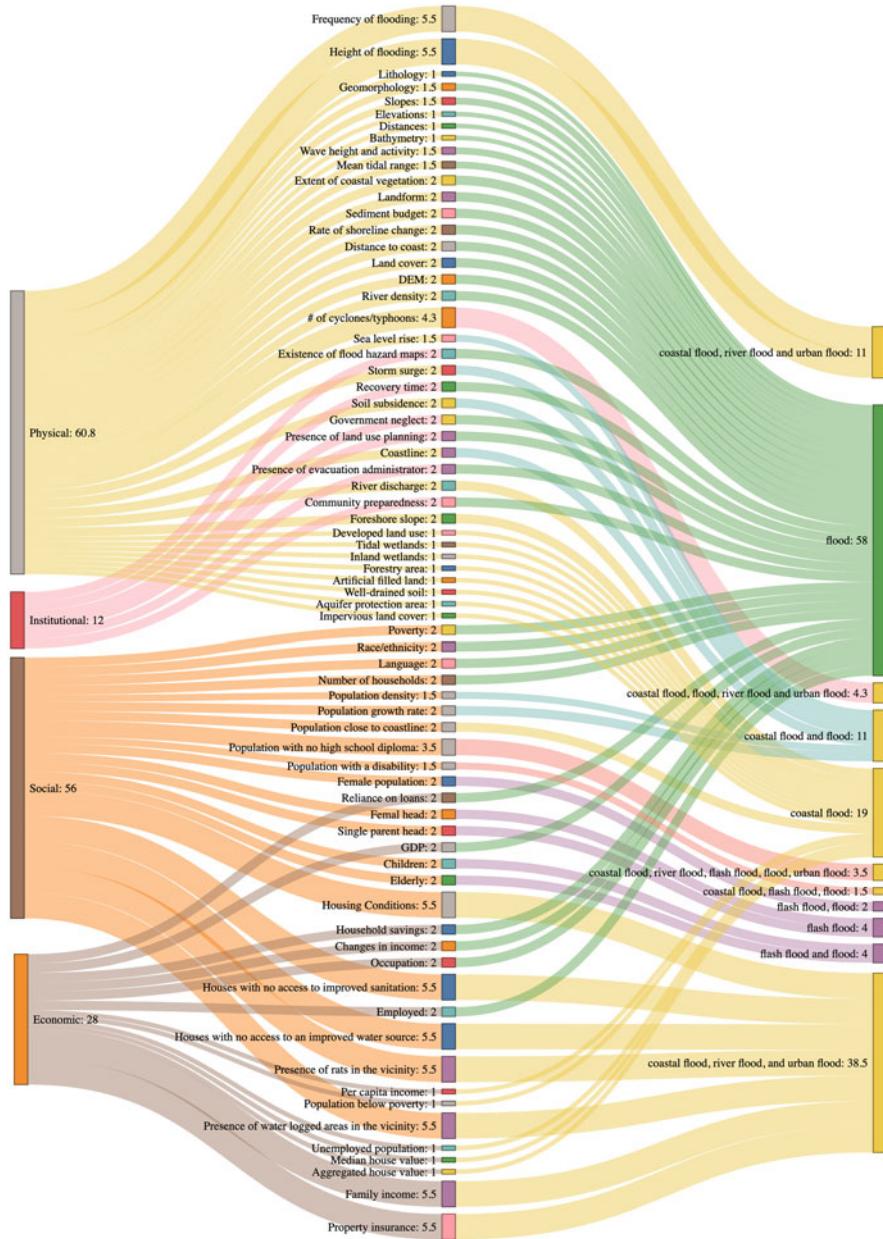


Fig. 5 Overview of social, economic, physical, and institutional vulnerability indicators for coastal regions

researchers, where most of these indicators are used in studies examining flash floods in riverine regions. Coming to the economic dimension, there is one indicator that stands out amongst the rest which is fixed investments per inhabitant which has a

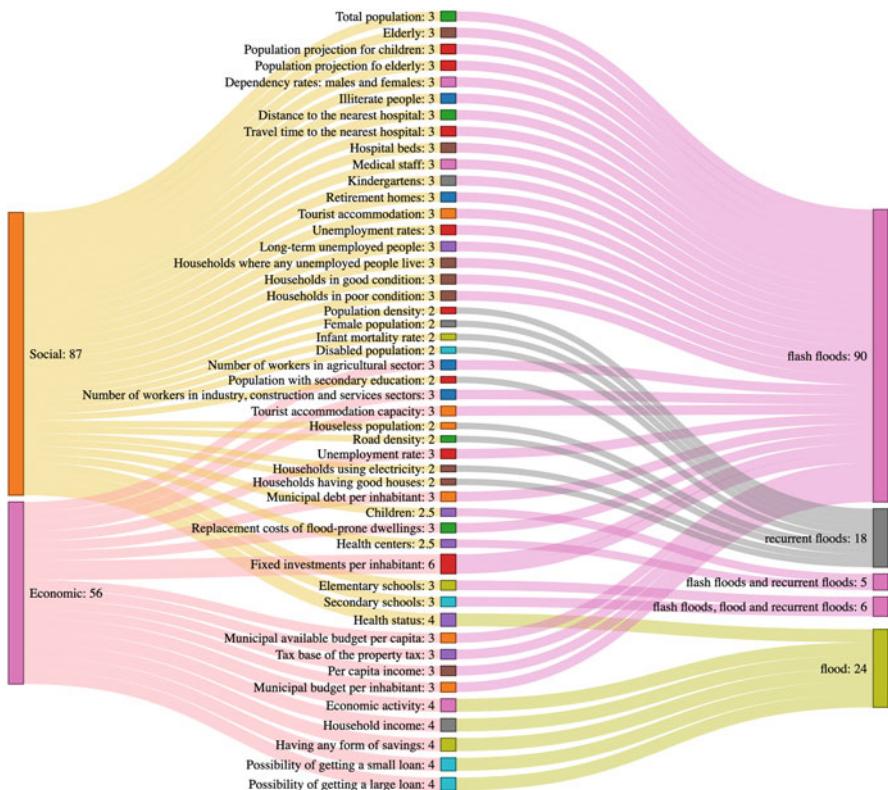


Fig. 6 Overview of physical and social vulnerability indicators for river regions

weightage of 6. Almost 75% of the indicators are applicable to flash floods while the remaining can be applied to general flooding scenarios (Fig. 6).

Non-Traditional Data Sources

Volunteered geographic information (VGI) refers to the creation of user-generated information, which has been disseminated voluntarily by individuals (Goodchild, 2007). During an onset of a disaster, social media, in particular, acts as a VGI platform to deliver real-time geospatial information about the disaster with the help of geolocation features. Provisioning of such kind of information can progressively help inform response teams about the location of affected people who need assistance so that rescue and relief operations can be directed in an efficient and informed manner. Similarly, decision makers will be able to make smart as well as more informed decisions around deploying resources for recovery operations as they would have a better situational awareness of the disaster, which would not be possible otherwise. This ability of VGI platform-based information has an upper hand as compared with traditional data sources, which are static in nature and are mostly outdated due to

carrying out the surveys well before or after the disaster event. Hence, leveraging the power of VGI platform-based data to formulate non-traditional vulnerability indicators has a wide scope, particularly for near-real-time situation awareness and assessment of vulnerability assessment in data-scarce regions (i.e., developing countries).

While social media platforms like Twitter harness the local knowledge and provide the advantage of filling in the information gap during a disaster event, there comes the drawback of the quality and reliability of this information. Nevertheless, this type of information is continuously being explored in the domain of flood management, where several studies have explored the potential use of Tweet text and images in producing flood extent maps and damage assessment maps, identifying local hotspots, and examining the spatial variation in social media activity during a disaster (Bono et al., 2022; Cervone et al., 2016; Amir Masoud Forati and Rina Ghose, 2022; Kersten & Klan, 2020; Yuan & Liu, 2018). However, there still lies a gap in this domain, where no studies to the best of our knowledge have utilized social media information for the enhancement of indicator-based flood vulnerability maps, which could provide opportunities to direct efforts for the mitigation of vulnerable aspects during an emergency situation. This is because the data sets utilized in the construction of indicator-based flood vulnerability maps are always static where some indicators rely on outdated information sources, such as national census data. Moreover, finding indicator-related data sources can become challenging in data scarce regions like small island states and developing countries where no centralized data management infrastructure is available. To overcome these limitations, user-generated information from social media can be introduced into the flood vulnerability index to provide an enhanced overview of the flood situation in near real-time to benefit response teams.

Social Media Indicators

Social media indicators for flood vulnerability mapping can be used in two different ways: (1) replace existing geospatial indicators or (2) enhance existing geospatial indicators by introducing proxy social media indicators. The first scenario is applicable when traditional indicators are hard to find in data scarce regions or when there is no access to experts or local knowledge in order to get data for these traditional indicators. The second scenario is applicable when traditional indicators exist but are outdated making it unrepresentative and thus there is a need to use up-to-date non-traditional data sources. Therefore, the first step is to understand what type of social media indicators can be used to proxy for the traditional indicators.

For this, a recent study that explored the fusion of remote sensing and social media for flood mapping provided insights into three different types of contextual information evident from social media text and images (Sadiq et al., 2022). This includes Needs and Requests, Impact Assessment, and Situational Awareness reports as seen in Table 3. For example, if a researcher is focusing on a coastal region and is interested in using social vulnerability indicators like “Houses with no access to improved sanitation” as seen in Fig. 5 and they cannot find data for this indicator, they can refer to the Situational Awareness section and see the proxy indicator for “Population without access to sanitation hygiene” which is “NO. of sanitation and hygiene reports.” These

Table 3 Overview of traditional indicators and its proxy non-traditional indicators

	Traditional indicator	Non-traditional indicator
Needs and requests	Population under poverty	No. of monetary aid requests
	Persons with disabilities	No. of disability item requests
	Lost family members	No. of rescue requests
	Population without access to food and water supply	No. of food and water requests
	Human health	No. of medical assistance requests
	Shelters	No. of shelter requests
Impact assessment	Household without sewage disposal system	No. of water system and sewage damage reports
	Household without electricity	No. of electricity damage reports
	House damage value	No. of infrastructure damage reports
	Crop lost value	No. of agriculture, crops, livestock damaged
	Damages to public utilities	No. of utilities damage reports
	Unplanned waste deposits	No. of pollution and contamination reports
Situational awareness	Population affected	No. of affected individuals
	Population in flood area	No. of affected areas
	Household member with illness	No. of health and disease-related reports
	Crime rate	No. of safety and security-related reports
	Population without access to sanitation and hygiene	No. of sanitation and hygiene reports
	Warning system	No. of weather information and updates
	Warning system communication penetration rate	No. of cautionary/advice reports
	Awareness	No. of donations and volunteering reports
	Dependency on public infrastructure	No. of logistics and transportation reports
	Flood insurance	No. of insurance reports

reports can come from either social media text or images which are geolocated with relevant classifier information, where the following approach can be used:

Traditional and Non-Traditional Indicators

1. Collect social media text and images available in the area of interest that has been affected by a flood event. For example, with the Twitter platform the Artificial Intelligence for Disaster Response (AIDR) system (Imran et al., 2014) can be

used to automatically trigger the collection of tweets based on a geographic region and/or a set of flood-related keywords.

2. Geo-tag as many social media posts as possible. For example, the methodology proposed in (Qazi et al., 2020) can be used to assign city, county, state, and country information to tweets based on various metadata fields like geo-coordinates, user location, place, user profile description, and tweet text.
3. Filter out irrelevant social media texts by passing the social media posts through text classification models. For example, CrisisDPS (Alam et al., 2019) can be used to classify tweet texts based on disaster type, informativeness, and humanitarian information. Social media texts classified as “flood,” “informative,” and any relevant humanitarian category can then be considered.
4. Filter out irrelevant social media images with the help of image classification models. For example, the disaster type prediction model proposed by Weber et al. (2020) can be used to extract images classified as “heavy rainfall” and “flooded.”

Once relevant geolocated social media text and images are collected, the next step involves deciding how to aggregate the information presented in these point data instances. Such aggregation could be made using the imaginary boundaries (i.e., grids with specific resolution – 30, 50, or 100 m) or over the localized administrative boundaries of the region of interest. While both have their own advantages and shortcomings, the utilization of administrative boundaries has an upper hand as it can effectively inform the stakeholder and professionals working in the field of flood management. The use of administrative region makes it easy to communicate the outcome as people are familiar with these names as compared with grids that are assigned assumed codes for reference. There exists three different aggregation techniques within literature which include using an additive or multiplicative approach (Sajjad, 2021; Sajjad & Chan, 2019), mode approach (Sajjad et al., 2020), or rates approach. Below we describe how each method can be used to create flood vulnerability maps using social media indicators:

1. **Sum:** In order to show the intensity of each dimension (i.e., needs and requests, Impact assessment, and situational awareness), the aggregation of relevant tweets using a simple sum could be used (i.e., the additive approach).
2. **Multiplicative:** In order to show the intensity of each dimension (i.e., needs and requests, Impact assessment, and situational awareness), the aggregation of relevant tweets using a multiplicative method could be used.
3. **Mode:** In order to evaluate all aspects, the proportion of each dimension within the total tweets can be used to aggregate for a specific administrative boundary.
4. **Rate:** In order to show the dominant dimensions as well as to evaluate the rates of different dimensions, the population weighted aggregation method can be used.

It is noted that as the resultant vulnerability maps represent a relative measure, utilization of any aggregation method will suffice. Once the aggregation method is selected and applied to the social media points, the output layer can then be used as part of the final flood vulnerability map construction. Additionally, such maps can

further be used to identify the patterns and trends, if any, in flood vulnerability by the application of several spatial information models. However, this would require proper understanding, skills, and additional resources.

Conclusion

This study analyzed 30 indicator-based flood vulnerability assessment papers to holistically understand the different indicators used across four region types: urban, rural, riverine, and coastal regions. All the indicators were categorized among common vulnerability dimensions and to understand which indicator within a dimension should be given importance, a priority list was devised in order to apply weights to each indicator depending on which selection criteria was used in deriving the indicator. For example, indicators collected through household surveys and interviews were given the highest priority as it is highly representative of the locals in flood-prone areas unlike indicators gathered by researchers who do not have knowledge of the reality, thus making researcher-derived indicators the lowest priority. These weights were then applied to all the indicators and were inputted into the sankey diagrams where the thickness of the line represented the weight. These diagrams revealed several insights such as which vulnerability dimension is more important than others, which indicator within a dimension has higher priority over others, and finally which type of flood is most commonly used for flood vulnerability assessment. While these findings would assist researcher with their indicator selection process, they are bound to encounter challenges with finding data for some of these traditional indicators, especially for data scarce regions or when the data is outdated. Thus, we propose that non-traditional data sources like social media should be used as proxy indicators to either replace or enhance traditional indicators, where we provide a step-by-step approach to achieving these flood vulnerability maps through the aggregation of social media point data.

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Appendix

Refer to Tables 4, 5, 6, and 7 for a detailed list of all the indicators.

Table 4 Overview of vulnerability indicators for urban regions where the following key is used for the selection criteria: R for Researcher, L for Literature, HS for Household Survey, SE for Stakeholder Engagement, SA for Statistical Analysis, E for Experts

	Selection criteria	Flood type	References
Social vulnerability			
Total population	R, SA, L	Flood, flash flood, river flood	de Andrade and Szlafsztein (2018), Aroca-Jiménez et al. (2017, 2020), Zachos et al. (2016)
Population density	L, R, E, HS	Flood, river flood, flash flood, monsoon flood	Baeck et al. (2014), Chang and Chen (2016), Karmaoui & Balica, 2021, Membele et al. (2022), Nasiri et al. (2019), Rashetnia and Jahanbani (2021), Salazar-Briones et al. (2020), Zachos et al. (2016)
Population density in flood-prone area	L, E	Flood, river flood	Liew et al. (2019), Rashetnia and Jahanbani (2021)
Population in flood-prone area	L, E	Flood, river flood	(Karmaoui and Balica (2021), Liew et al. (2019), Rashetnia and Jahanbani (2021))
Population per settlement area	L, HS, E, SA	Flood, flash flood	Aroca-Jiménez et al. (2017, 2020), Rodriguez-Gaviria et al. (2019)
Vulnerable population density	L	Flood	Baeck et al. (2014)
Single-parent families	E	River, coastal, urban flood	Oulahen et al. (2015)
Recently immigrated	E	River, coastal, urban flood	Oulahen et al. (2015)
High school education or less	E, SA, L, SE	Flood, flash flood, river, coastal, urban flood	de Andrade and Szlafsztein (2018), Cian et al. (2021), Mason et al. (2021), Oulahen et al. (2015), Rashetnia and Jahanbani (2021)
University education	E, L	Flood, river, coastal, urban flood	Oulahen et al. (2015), Salazar-Briones et al. (2020)
Minority groups	L, R	Flood, river flood	Chang and Chen (2016), Zachos et al. (2016)
Population living in unplanned settlements	L, E	River flood	Mansur et al. (2016)

(continued)

Table 4 (continued)

	Selection criteria	Flood type	References
Inhabitants aged 0–4	E, SA, L, HS, SE	Flood, perennial flood, flash flood, river, coastal, urban flood, perennial flood, flash flood, river, coastal, urban flood	de Andrade and Szlafsztein (2018), Aroca-Jiménez et al. (2017, 2020), Cian et al. (2021), Harahap (2021), Liew et al. (2019), Mansur et al. (2016), Mason et al. (2021), Membele et al. (2022), Oulahen et al. (2015), Rashednia and Jahanbani (2021), Salazar-Briones et al. (2020)
Inhabitants aged 5–14	E, SA, L, HS	Flood, flash flood, river, coastal, urban flood	de Andrade and Szlafsztein (2018), Aroca-Jiménez et al. (2017, 2020), Liew et al. (2019), Mansur et al. (2016), Membele et al. (2022), Oulahen et al. (2015)
Population projection aged 0–4	SA	Flash flood	Aroca-Jiménez et al. (2017, 2020)
Population projection aged 5–14	SA	Flash flood	Aroca-Jiménez et al. (2017, 2020)
Inhabitants aged 15–64	E, SA, L	Flood, flash flood, river, coastal, urban flood	de Andrade and Szlafsztein (2018), Aroca-Jiménez et al. (2017, 2020), Liew et al. (2019), Mansur et al. (2016), Oulahen et al. (2015)
Population projection aged 15–64	SA	Flash flood	Aroca-Jiménez et al. (2017, 2020)
Inhabitants aged 65 or older	E, SA, L, HS, SE	Flood, perennial flood, flash flood, river, coastal, urban flood	de Andrade and Szlafsztein (2018), Aroca-Jiménez et al. (2017, 2020), Cian et al. (2021), Harahap (2021), Mansur et al. (2016), Mason et al. (2021), Membele et al. (2022), Oulahen et al. (2015), Rashednia and Jahanbani (2021), Salazar-Briones et al. (2020)
Population projection aged 65 or older	L, SA	Flood, flash flood	Aroca-Jiménez et al. (2017, 2020), Liew et al. (2019)
Dependency rates: males	L, SA	Flash flood	Aroca-Jiménez et al. (2017, 2020)
Dependency rates: females	SA	Flash flood	Aroca-Jiménez et al. (2020)

(continued)

Table 4 (continued)

	Selection criteria	Flood type	References
Households where people aged 65 or older live	SA, L, SE	Flood, flash flood	Aroca-Jiménez et al. (2017, 2020), Mason et al. (2021)
Illiterate people	E, L, SA	Flood, river, coastal, urban flood, flash flood	Aroca-Jiménez et al. (2017, 2020), Liew et al. (2019), Oulahen et al. (2015)
People with permanent disabilities	L, HS, E	Flood, river food	Liew et al. (2019), Membele et al. (2022), Rashednia and Jahanbani (2021), Rodriguez-Gaviria et al. (2019)
Gender	E	River, coastal, urban flood	Oulahen et al. (2015)
Single-parent households	L, SE	Flood	Mason et al. (2021)
Single-person households	L, SE	Flood	Mason et al. (2021)
Single-person households	L, SE	Flood	Mason et al. (2021)
Foreigners	L	Flood	Cian et al. (2021)
Newcomers	L	Flood	Cian et al. (2021)
Economic vulnerability			
No income/low income	L, E	Flood, river flood	Mansur et al. (2016), Salazar-Briones et al. (2020)
Income received from government transfers	E	River, coastal, urban flood	Oulahen et al. (2015)
Average household income	E, L, HS	Flood, river, coastal, urban flood	Chang and Chen (2016), Liew et al. (2019), Membele et al. (2022), Oulahen et al. (2015), Rodriguez-Gaviria et al. (2019)
Average (mean) dwelling value	E	River, coastal, urban flood	Oulahen et al. (2015)
Prevalence of low income	E	River, coastal, urban flood	Oulahen et al. (2015)
Rent dwelling	E	River, coastal, urban flood	Oulahen et al. (2015)
Unemployed	E, L, HS, SE	Flood, river, coastal, urban flood	Mason et al. (2021), Membele et al. (2022), Oulahen et al. (2015), Salazar-Briones et al. (2020)
Fixed investments per inhabitant	L, SA	Flash flood	Aroca-Jiménez et al. (2017)

(continued)

Table 4 (continued)

	Selection criteria	Flood type	References
Municipal available budget per capita	L, SA L, SA	Flash flood	Aroca-Jiménez et al. (2017)
Family debts	L, E, HS	Flood	Rodriguez-Gaviria et al. (2019)
GDP per capita	L	Flood	Liew et al. (2019)
Physical vulnerability			
Average maximum daily rainfall	L, E, HS	Flood, river flood	Karmaoui and Balica (2021), Liew et al. (2019), Membele et al. (2022), Rashetnia and Jahanbani (2021)
Flood water depth	L, E, HS	Flood, river flood	Liew et al. (2019), Membele et al. (2022)
Drainage length	E	Flash flood, monsoon flood	Nasiri et al. (2019)
Drainage system density	E, HS	River flood	Membele et al. (2022), Rashetnia and Jahanbani (2021)
Rainfall amount per year	E	Flash flood, monsoon flood	Nasiri et al. (2019)
Runoff amount	E	Flash flood, monsoon flood	Nasiri et al. (2019)
Number of months with heavy rainfall	E	River flood	Rashetnia and Jahanbani (2021)
Flood frequency	L, E, HS	Flood, flash flood, monsoon flood, river flood	Liew et al. (2019), Membele et al. (2022), Nasiri et al. (2019)
Slope	L, E, HS	Flood, river flood	Membele et al. (2022), Rashetnia and Jahanbani (2021), Salazar-Briones et al. (2020)
Closeness to inundation area	L, E, HS	Flood, river flood	Karmaoui and Balica (2021), Membele et al. (2022), Salazar-Briones et al. (2020)
Topographic wetness index	L	Flood	Karmaoui and Balica (2021), Salazar-Briones et al. (2020)
Land cover/use and soil type	R, L, E, HS	Flood, river flood	Membele et al. (2022), Salazar-Briones et al. (2020), Zachos et al. (2016)
Flooded area ratio	E	River flood	Rashetnia and Jahanbani (2021)
Permeable area ratio	E	River flood	Rashetnia and Jahanbani (2021)
Imperviousness	L	Flood	Cian et al. (2021)
Evaporation rate	L	Flood	Karmaoui and Balica (2021)
Elevation	E, HS	River flood	Membele et al. (2022)
Flow velocity	E, HS	River flood	Membele et al. (2022)

Table 5 Overview of vulnerability for rural regions where the following key is used for the selection criteria: HS for Household Survey, FG for Focus Group, QS for Questionnaire Survey, and L for Literature

	Selection criteria	Flood type	References
Physical vulnerability			
Access to irrigation system	HS, FG	Flood	Antwi et al. (2015)
Landscape elevation	HS, FG	Flood	Antwi et al. (2015)
Improved crop variety	HS, FG	Flood	Antwi et al. (2015)
Access to portable drinking water	HS, FG	Flood	Antwi et al. (2015)
Involvement in dry season farming	HS, FG	Flood	Antwi et al. (2015)
Soil improvement technologies	HS, FG	Flood	Antwi et al. (2015)
Sanitation facilities	QS, L	River flood	Hidayah et al. (2021)
Position of buildings in relation to street level	QS, L	River flood	Hidayah et al. (2021)
Distance to the road	QS, L	River flood	Hidayah et al. (2021)
Building density	QS, L	River flood	Hidayah et al. (2021)
Households with open sewage	L	River flood	Moreira et al. (2021b)
Households without garbage collect	L	River flood	Moreira et al. (2021b)
Households without access to electricity	L	River flood	Moreira et al. (2021b)
Rainfall warning station density (number of rainfall warning stations /number of flooded villages)	L	River flood	Yang et al. (2018)
Ecological vulnerability indicators			
Landscape with high biodiversity	HS, FG	Flood	Antwi et al. (2015)
Landscape with agroforestry	HS, FG	Flood	Antwi et al. (2015)
Sacred groves and reserved area	HS, FG	Flood	Antwi et al. (2015)
River valley (size)	HS, FG	Flood	Antwi et al. (2015)
Woodlot	HS, FG	Flood	Antwi et al. (2015)
Crop diversification	HS, FG	Flood	Antwi et al. (2015)
Area of major crops/town area	L	River flood	Yang et al. (2018)
Vegetable yield/town area (t-km-2)	L	River flood	Yang et al. (2018)
Grain output/town area (t-km-2)	L	River flood	Yang et al. (2018)
Environmental vulnerability			
Elevation	QS, L	River flood	Hidayah et al. (2021)
Land use	QS, L	River flood	Hidayah et al. (2021)
Type of soil	QS, L	River flood	Hidayah et al. (2021)

(continued)

Table 5 (continued)

	Selection criteria	Flood type	References
Distance to the coastal line	QS, L	River flood	Hidayah et al. (2021)
Distance to the river	QS, L	River flood	Hidayah et al. (2021)
Maximum flood velocity (m/s)	L	River flood	Yang et al. (2018)
Maximum water level (m)	L	River flood	Yang et al. (2018)
Submerged area (km ²)	L	River flood	Yang et al. (2018)
Political vulnerability			
Politically influential person	HS, FG	Flood	Antwi et al. (2015)
Community stakeholder organizations	HS, FG	Flood	Antwi et al. (2015)
Assembly member	HS, FG	Flood	Antwi et al. (2015)
Local participation in district activities	HS, FG	Flood	Antwi et al. (2015)
Social vulnerability			
Total population	HS, FG, L	Flood, river flood	Antwi et al. (2015), Moreira et al. (2021b)
Population density	HS, FG, L	Flood, river flood	Antwi et al. (2015), Moreira et al. (2021b), Yang et al. (2018)
Households with more than five people	HS, FG	Flood	Antwi et al. (2015)
Knowledge on climate	HS, FG	Flood	Antwi et al. (2015)
Migration rate/rural-urban migration	HS, FG	Flood	Antwi et al. (2015)
Access to social services	HS, FG	Flood	Antwi et al. (2015)
Gender	QS, L	River flood	Hidayah et al. (2021)
Level of education	QS, L	River flood	Hidayah et al. (2021)
Age	QS, L	River flood	Hidayah et al. (2021)
Household size	QS, L	River flood	Hidayah et al. (2021)
Experience of flooding	QS, L	River flood	Hidayah et al. (2021)
Number of women	L	River flood	Moreira et al. (2021b)
Dependency rate	L	River flood	Moreira et al. (2021b)
Vulnerable groups (women, children, physically challenge invalids)	L	River flood	Moreira et al. (2021b)
Number of women head of homes	L	River flood	Moreira et al. (2021b)
Inhabitants aged 0–4 years	L	River flood	Moreira et al. (2021b)

(continued)

Table 5 (continued)

	Selection criteria	Flood type	References
Inhabitants aged more than 65 years	L	River flood	Moreira et al. (2021b)
Illiterate people	L	River flood	Moreira et al. (2021b)
Per capita income	L	River flood	Moreira et al. (2021b)
Unemployed people	L	River flood	Moreira et al. (2021b)
Sex ratio	L	River flood	Yang et al. (2018)
Labor force/town population	L	River flood	Yang et al. (2018)
Rural population/town population	L	River flood	Yang et al. (2018)
People living in rented houses	L	River flood	Moreira et al. (2021b)
Economic vulnerability			
Livelihood diversification (o_-farm income source)	HS, FG	Flood	Antwi et al. (2015)
Family welfare	QS, L	River flood	Hidayah et al. (2021)
Household's per capita monthly income equal 1/8 of the minimum wage	L	River flood	Moreira et al. (2021b)
House head without income	L	River flood	Moreira et al. (2021b)
House head's income less than 1 minimum wage	L	River flood	Moreira et al. (2021b)
House head's income less than 2 minimum wages	L	River flood	Moreira et al. (2021b)
Net income of farmers	L	River flood	Yang et al. (2018)
Township financial income	L	River flood	Yang et al. (2018)
Gross domestic product (GDP) on unit area	L	River flood	Yang et al. (2018)
Rural fixed asset investment/town population	L	River flood	Yang et al. (2018)

Table 6 Overview of vulnerability indicators for riverine regions where the following key is used for the selection criteria: SA for Statistical Analysis, L for Literature, and Q for Questionnaire

	Selection criteria	Flood type	References
Social vulnerability indicators			
Total population	SA	Flash floods	Aroca-Jiménez et al. (2020)
Population density	L	Recurrent floods	Jha and Gundimeda (2019)
Inhabitants aged 0–4/0–6	L, SA	Recurrent floods, flash floods	Aroca-Jiménez et al. (2020), Jha and Gundimeda (2019)
Inhabitants aged 5–14	SA	Flash floods	Aroca-Jiménez et al. (2020)
Inhabitants aged 15–64	SA	Flash floods	Aroca-Jiménez et al. (2020)
Inhabitants aged 65 or older	SA	Flash floods	Aroca-Jiménez et al. (2020)
Population projection aged 0–4/0–5	SA	Flash floods	Aroca-Jiménez et al. (2020)
Population projection aged 5–14	SA	Flash floods	Aroca-Jiménez et al. (2020)
Population projection aged 15–64	SA	Flash floods	Aroca-Jiménez et al. (2020)
Population projection aged 65 or older	SA	Flash floods	Aroca-Jiménez et al. (2020)
Dependency rates: males	SA	Flash floods	Aroca-Jiménez et al. (2020)
Dependency rates: females	SA	Flash floods	Aroca-Jiménez et al. (2020)
Female population	L	Recurrent floods	Jha and Gundimeda (2019)
Infant mortality rate	L	Recurrent floods	Jha and Gundimeda (2019)
Disabled population	L	Recurrent floods	Jha and Gundimeda (2019)
Illiterate people	SA	Flash floods	Aroca-Jiménez et al. (2020)
Population with secondary education	L	Recurrent floods	Jha and Gundimeda (2019)
Houseless population	L	Recurrent floods	Jha and Gundimeda (2019)
Distance to the nearest hospital	SA	Flash floods	Aroca-Jiménez et al. (2020)
Travel time to the nearest hospital	SA	Flash floods	Aroca-Jiménez et al. (2020)

(continued)

Table 6 (continued)

	Selection criteria	Flood type	References
Distance to the nearest health center	SA	Flash floods	Aroca-Jiménez et al. (2020)
Travel time to the nearest health center	SA	Flash floods	Aroca-Jiménez et al. (2020)
Health centers, e.g., per 10,000 population	L, SA	Recurrent floods, flash floods	Aroca-Jiménez et al. (2020), Jha and Gundimeda (2019)
Health status	Q	Flood	Vári et al. (2013)
Hospital beds	SA	Flash floods	Aroca-Jiménez et al. (2020)
Medical staff	SA	Flash floods	Aroca-Jiménez et al. (2020)
Kindergartens	SA	Flash floods	Aroca-Jiménez et al. (2020)
Elementary schools	Q, L, SA	Flood, recurrent floods, flash floods	Aroca-Jiménez et al. (2020), Jha and Gundimeda (2019), Vári et al. (2013)
Secondary schools	Q, L, SA	Flood, recurrent floods, flash floods	Aroca-Jiménez et al. (2020), Jha and Gundimeda (2019), Vári et al. (2013)
Retirement homes	SA	Flash floods	Aroca-Jiménez et al. (2020)
Tourist accommodation	SA	Flash floods	Aroca-Jiménez et al. (2020)
Road density	L	Recurrent floods	Jha and Gundimeda (2019)
Unemployment rates	SA	Flash floods	Aroca-Jiménez et al. (2020)
Long-term unemployed people	SA	Flash floods	Aroca-Jiménez et al. (2020)
Households where any unemployed people live	SA	Flash floods	Aroca-Jiménez et al. (2020)
Households in good condition	SA	Flash floods	Aroca-Jiménez et al. (2020)
Households in poor condition	SA	Flash floods	Aroca-Jiménez et al. (2020)
Households residing in house with a dilapidated condition	L	Recurrent floods	Jha and Gundimeda (2019)
Households having access to away location of drinking water	L	Recurrent floods	Jha and Gundimeda (2019)

(continued)

Table 6 (continued)

	Selection criteria	Flood type	References
Households not having latrine facility within the premises	L	Recurrent floods	Jha and Gundimeda (2019)
Households using electricity	L	Recurrent floods	Jha and Gundimeda (2019)
Households having good houses	L	Recurrent floods	Jha and Gundimeda (2019)
Economic vulnerability			
Economic activity	Q	Flood	Vári et al. (2013)
Household income	Q	Flood	Vári et al. (2013)
Having any form of savings	Q	Flood	Vári et al. (2013)
Possibility of getting a small loan	Q	Flood	Vári et al. (2013)
Possibility of getting a large loan	Q	Flood	Vári et al. (2013)
Number of workers in agricultural sector	SA	Flash floods	Aroca-Jiménez et al. (2020)
Number of workers in industry, construction, and services sectors	SA	Flash floods	Aroca-Jiménez et al. (2020)
Tourist accommodation capacity	SA	Flash floods	Aroca-Jiménez et al. (2020)
Unemployment rate	SA	Flash floods	Aroca-Jiménez et al. (2020)
Municipal debt per inhabitant	SA	Flash floods	Aroca-Jiménez et al. (2020)
Replacement costs of dwellings located at flood-prone areas	SA	Flash floods	Aroca-Jiménez et al. (2020)
Fixed investments per inhabitant	SA	Flash floods	Aroca-Jiménez et al. (2020)
Municipal available budget per capita	SA	Flash floods	Aroca-Jiménez et al. (2020)
Tax base of the property tax	SA	Flash floods	Aroca-Jiménez et al. (2020)
Per capita income	SA	Flash floods	Aroca-Jiménez et al. (2020)
Fixed investments per inhabitant	SA	Flash floods	Aroca-Jiménez et al. (2020)
Municipal budget per inhabitant	SA	Flash floods	Aroca-Jiménez et al. (2020)

Table 7 Overview of vulnerability indicators for coastal regions where the following key is used for the selection criteria: R for Researcher, L for Literature, HS for Household Survey, OS for Organization Survey

	Selection criteria	Flood type	Flood type
Physical vulnerability			
# of cyclones/typhoons etc.	L, HS, OS	Flood, coastal, riverine, urban flood	Giampieri (2021), Giannakidou et al. (2019), Bernadel et al. (2016)
Frequency of flooding	HS, OS	Riverine, coastal, urban flood	Bernadel et al. (2016)
Slopes	R, L	Flood	Giampieri (2021), Martinez-Graña et al. (2016)
Elevations	R	Flood	Martinez-Graña et al. (2016)
Distances	R	Flood	Martinez-Graña et al. (2016)
Bathymetry	R	Flood	Martinez-Graña et al. (2016)
Wave height and activity	R, L	Flood	Giampieri (2021), Martinez-Graña et al. (2016)
Sea level rise	R, L	Flood, coastal flood	Giampieri (2021), Giannakidou et al. (2019), Martinez-Graña et al. (2016)
Mean tidal range	R, L	Flood	Giampieri (2021), Martinez-Graña et al. (2016)
Geomorphology	R, L	Flood	Giampieri (2021), Martinez-Graña et al. (2016)
Height of flooding	HS, OS	Riverine, coastal, urban flood	Bernadel et al. (2016)
Lithology	R	Flood	Martinez-Graña et al. (2016)
Storm surge	L	Flood, coastal flood	Giampieri (2021), Giannakidou et al. (2019)
River discharge coastal	L	Flood	Giannakidou et al. (2019)
Foreslope	L	Coastal flood	Giannakidou et al. (2019)
Soil subsidence	L	Flood, coastal flood	Giampieri (2021), Giannakidou et al. (2019)
Coastline	L	Flood, coastal flood	Giampieri (2021), Giannakidou et al. (2019)
Developed land use (%)	R	Coastal flood	Tao (2021)
Tidal wetlands (%)	R	Coastal flood	Tao (2021)
Inland wetlands (%)	R	Coastal flood	Tao (2021)
Forestry area (%)	R	Coastal flood	Tao (2021)
Artificial filled land (%)	R	Coastal flood	Tao (2021)
Well-drained soil (%)	R	Coastal flood	Tao (2021)
Aquifer protection area (%)	R	Coastal flood	Tao (2021)
Impervious land cover (%)	R	Coastal flood	Tao (2021)

(continued)

Table 7 (continued)

	Selection criteria	Flood type	Flood type
Extent of coastal vegetation	L	Flood	Giampieri (2021)
Landform	L	Flood	Giampieri (2021)
Sediment budget	L	Flood	Giampieri (2021)
Rate of shoreline change	L	Flood	Giampieri (2021)
Distance to coast	L	Flood	Giampieri (2021)
Land cover	L	Flood	Giampieri (2021)
DEM	L	Flood	Giampieri (2021)
River density	L	Flood	Giampieri (2021)
Social vulnerability			
Population density	L, R	Flood, coastal flood	Giampieri (2021), Tao (2021)
Population close to coastline	L	Coastal flood	Giannakidou et al. (2019)
Population growth rate	L	Flood, coastal flood	Giampieri (2021), Giannakidou et al. (2019)
Population with no high school diploma	L, R, HS, OS	Flash flood, flood, coastal, riverine, urban flood	Giampieri (2021), Andres et al. (2015), Bernadel et al. (2016), Tao (2021)
Population with a disability	L, R	Flash flood, flood, coastal flood	Giampieri (2021), Andres et al. (2015), Tao (2021)
Female population	L	Flash flood, flood	Giampieri (2021), Andres et al. (2015)
Female head	L	Flash flood	Andres et al. (2015)
Single parent head	L	Flash flood	Andres et al. (2015)
Children	L	Flash flood, flood	Giampieri (2021), Andres et al. (2015)
Elderly	L	Flash flood, flood	Giampieri (2021), Andres et al. (2015)
Poverty	L	Flood	Giampieri (2021)
Race/ethnicity	L	Flood	Giampieri (2021)
Language	L	Flood	Giampieri (2021)
Number of households	L	Flood	Giampieri (2021)
Housing conditions	HS, OS	Riverine, coastal, urban flood	Bernadel et al. (2016)
Houses with NO access to improved sanitation	HS, OS	Riverine, coastal, urban flood	Bernadel et al. (2016)
Houses with NO access to an improved water source	HS, OS	Riverine, coastal, urban flood	Bernadel et al. (2016)
Presence of rats in the vicinity	HS, OS	Riverine, coastal, urban flood	Bernadel et al. (2016)
Presence of water-logged areas in the vicinity	HS, OS	Riverine, coastal, urban flood	Bernadel et al. (2016)

(continued)

Table 7 (continued)

	Selection criteria	Flood type	Flood type
Economic vulnerability			
Per capita income (\$)	R	Coastal flood	Tao (2021)
Population below poverty (%)	R	Coastal flood	Tao (2021)
Unemployed population (%)	R	Coastal flood	Tao (2021)
Median house value (\$)	R	Coastal flood	Tao (2021)
Aggregated house value (\$)	R	Coastal flood	Tao (2021)
Family income	HS, OS	Riverine, coastal, urban flood	Bernadel et al. (2016)
Property insurance	HS, OS	Riverine, coastal, urban flood	Bernadel et al. (2016)
Reliance on loans	L	Flood	Giampieri (2021)
GDP	L	Flood	Giampieri (2021)
Household savings	L	Flood	Giampieri (2021)
Changes in income	L	Flood	Giampieri (2021)
Occupation	L	Flood	Giampieri (2021)
Employed	L	Flood	Giampieri (2021)
Institutional			
Existence of flood hazard maps	L	Flood	Giampieri (2021)
Recovery time	L	Flood	Giampieri (2021)
Government neglect	L	Flood	Giampieri (2021)
Presence of coastal management plan/land use planning	L	Flood	Giampieri (2021)
Presence of dedicated administrator for evacuation/preparedness	L	Flood	Giampieri (2021)
Community preparedness	L	Flood	Giampieri (2021)

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Cloudburst Events in the Indian Himalayas: 50 A Historical Geospatial Perspective

Hemant Singh, Divyesh Varade, and Prabhash K. Mishra

Contents

Introduction	778
About the Indian Himalayan Ranges	780
Topography and Cloudburst Distribution over IHR	781
Cloudbursts Categorization and Historical Studies	782
Categorization of Cloudburst Events	782
Past Study of Mini-cloudbursts	783
Historical Cloudburst Events in IHR	784
Analytical Studies of Cloudburst Events in IHR	791
Present State of Activities on Account of Cloudbursts	793
Conclusion	794
References	795

Abstract

In the past decade, the southern rim of the Himalayas experienced several anomalous weather events such as cloudbursts, extreme precipitation, flash floods, and avalanches due to a changing climate. The topography and orography process of the Indian Himalayas facilitates a favorable condition to cloudbursts. These events mostly appear during the monsoon period and are elusive corresponding to their geographical position and associated impacts due to a lack of monitoring and data observations. The sudden downpour of rainfall in a range of 100–250 mm/h in a short span covering a smaller spatial extent similar to 1 km² is typically defined as a cloudburst event. On the other hand, according to the India Meteorological Department, if the rainfall occurs more than 100 mm/h

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with strong winds and lightning over an area of 20–30 km² is termed a cloudburst. Interestingly, the elevation band where the occurrence of such events is frequent lies between 1000 to 2000 m which are densely populated valley folds of the Himalayas. Some studies derived that mostly cloudbursts occur and are expected to occur in low elevation high-temperature zones of topoclimate regimes of the Himalayas which receive low rainfall and exhibit high land surface temperature ranging from 18° C to 28° C in July and August. This study provides a comprehensive understanding of the physical driving processes such as atmospheric circulations, thermodynamics, orographic lifting, and its distribution based on analytical and geospatial approaches to know the triggering factors of cloudburst events and invigoration of the convection process.

Keywords

Himalayas · Cloudburst · Precipitation · Extreme rainfall · Land surface temperature

Introduction

The Himalayas is the third biggest snow cover and ice deposition region and provides freshwater to 1.3 billion population living in the lowlands of river basins of Indus, Ganga, and the Brahmaputra (IGB) covering eight countries (Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan) (Qazi et al., 2020). The Himalayan cryosphere has a significant role in tributaries of these river basins and indispensable character to river runoff in terms of livelihood (Qazi et al., 2020). Indian Himalayas play a crucial role in the supply of essential water resources and drive several rivers in India that originate from them. The Indian Himalayas exhibit a multitude of glaciers which act as water towers (Bandyopadhyay, 2013). The region has a significant role in regulating the climatic conditions of northern India as well. The topography of these mountains is known to trap the moisture content (summer monsoon) that triggered precipitation primarily in the form of rainfall and snow.

Considering the significance of the Indian Himalayas for the regional regime, it is vital to discuss the impending natural hazards that occur frequently in this region. The Indian Himalayas have witnessed several natural disasters like extreme rainfall, cloudburst, flash floods, earthquake, landslide, and avalanches (Sati, 2018). Extreme rainfall is most frequently seen in this region that facilitates flash floods and landslide. Kedarnath flash flood in 2013 was a classical example of extreme rainfall and cloudburst events that caused severe damage of life and property (Sikka et al., 2015). In the past few decades, cloudburst events and associated flash floods have been reported in the middle Indian Himalayas (Mishra et al., 2021). These cloudburst events have severe spontaneous impacts on the loss of lives, agriculture, and infrastructure (Thayyen et al., 2020). One of the major cloudburst events that affected more than 200 humans and 33 houses in terms of death and property

damage was on 20 July 1970 in Ganai village of Almora (Joshi & Kumar, 2006). In August 2010, the surrounding rim of Leh city experienced a devastating flash flood due to massive cloudburst events which have resulted in 255 dead bodies (Thayyen et al., 2013). The impact of these flash floods covered a 100 km radius surrounding Leh and demolished various infrastructures such as roads, bridges, hospitals, and national highways. Almost 52 villages and 1749 houses were affected due to this flash flood (Thayyen et al., 2013). Similarly, in August 2012, a flash flood occurred in the Asi Ganga tributary of Bhagirathi due to a massive cloudburst. Approximately 35 people and 436 livestock were missing and 12,000 people and 250 houses were affected due to this extreme event (Mishra et al., 2022). Furthermore, there was property damage of 612 crores (Vikram et al., 2013). Recently, a cloudburst event was captured using remotely sensed spaceborne rainfall data and satellite imagery on 12 June 2018 over the mountain ridge of Trisha Village of Nubra valley in the Ladakh region (Thayyen et al., 2020). Moreover, this cloudburst event covered a much smaller spatial extent less than 1km² and also triggered a flash flood. There were 57 cloudburst events that have been reported from 2010 to 2020 in the upper Ganga basin (Mishra et al., 2022) and 30 events from 1990 to 2016 in the Indian Himalayan region (IHR) (Dimri et al., 2017).

Climate change has developed to be a basis for an aggravated occurrence of such events and is bringing several challenges globally due to increased temperature influencing these extreme events which trigger severe disasters that have resulted in loss of lives and infrastructure. Recently, ice rock avalanche in Chamoli district of Uttarakhand due to warm permafrost, changes in seasonal snow pattern, shifting rainfall, and land surface temperature are such an indication of climate change (Thayyen et al., 2021). In the past few decades, the alterations in precipitation patterns are a clear indication of climate change, and the driving factors for these changes are not comprehensively defined yet (Kumar et al., 2018). The orographically locked system of IHR and its interaction with monsoon provide the required conditions for extreme rainfall and cloudburst events (Thayyen et al., 2013, 2020; Dimri et al., 2016, 2017). The IHR regions are categorized in four topoclimate regimes with the low elevation high temperature being one of the most hazardous topoclimate zones due to a frequent recurrence of these events (Mishra et al., 2022). In general, thermodynamically unstable atmosphere carrying high moisture content and heat (due to tropical origin) has resulted in high-intensity rainfall which may often transpire into a cloudburst (Kelsch et al., 2001; Grunfest & Handmer, 2001; Woolley et al., 1946). This cumulonimbus cloud is stuck in vertiginous topography by local convection (Dimri et al., 2017; Das et al., 2006; Deoja et al., 1991; Upadhyay, 1995). The combination of southwest monsoon and western disturbances leads to high-intensity rainfalls during the early monsoon over IHR (Thakur, 2000; Ray et al., 2015). In the recent past year, the cloudburst events that occurred during pre-monsoon (May, June) were seen in Ladakh and Karakorum regions (Dimri et al., 2017).

Cloudburst events are influenced by the topographic control, particularly the elevation (Mishra et al., 2022). Research demonstrates that the annual rate of temperature is much higher than the average global temperature over the Indian

Himalayan region (Reay et al., 2007). Hence, there is a direct relationship between extreme events and climate change (Krishnan et al., 2019). Many studies referred to cloudburst events as short lived and occurred at localized area (Thayyen et al., 2020). However, as per IMD parlance, cloudbursts are characterized by rainfall rate of more than 100 mm/h over a geographical area of 20–30 km² (Dimri et al., 2017). The recurrence of cloudburst events has been widely observed over smaller areas in the lower IHR. However, these events have only been reported at locations comprising the requisite field technology for recording cloudburst events. Further, such locations are few, and development in approaches to sense remotely the occurrence of such events is highly sought. Additionally, the non-cyclic pattern of these cloudbursts and associated moisture amount is yet unknown (Kumar et al., 2018).

The driving forces to facilitate these events comprise a complex convective system, mesoscale thunderstorms, and orographic processes (Kumar et al., 2018). The accompanied dynamics, thermodynamics, and orographic interaction to the formation of cloudburst are still missing (Dimri et al., 2017). Subsequently, a proper definition of cloudburst is yet not evident due to the complex weather convection processes and insufficient hydrometeorological data and associated investigations. Several studies suggested that climatic variability has a significant character to lead to extreme events. The variability of the Indian summer monsoon in terms of atmospheric circulations and teleconnection such as ENSO, NAO (El Nino Southern Oscillations, North Atlantic Oscillations), etc. plays a paramount role for hydrological extreme events (Sun & Wang, 2012). Dimri et al. (2017) suggested understanding the associated factors like physical and dynamical phenomena for cloudburst events.

About the Indian Himalayan Ranges

The Himalayas is one of the world's loftiest and younger mountain ranges which covers approximately 25,000 km from Indus valley beyond the Nanga Parbat in the west to Namcha Barwa in the east (Roy & Purohit, 2018). The Himalayan topography is highly rugged and sharp at west to Sulaiman Kirthar ranges (Roy & Purohit, 2018). Due to the historical and numerous occurrences of cloudburst events in the states of Uttarakhand, Himachal Pradesh, and Union Territory (UT) of Jammu Kashmir and Ladakh, we primarily focus our study in these regions of IHR. The spatial extent of the mentioned region lies between 28.72° to 37.09° N and 72.51° to 81.04° E. The IHR exhibits significant variation in terms of the vivid climatic conditions and elevation. Figure 1 illustrates the variation in the elevation from as low as 184 m to 8.56 km a.s.l based on the 30 m Shuttle Radar Topography Mission (SRTM) – digital elevation model (DEM). This region covers approximately a geographical area of 333,848 Km², and the dominant topography is mountainous. The entire area is classified into three precipitation regimes which are monsoon dominant, monsoon deficit, and precipitation transition zone (Yadav et al., 2020).

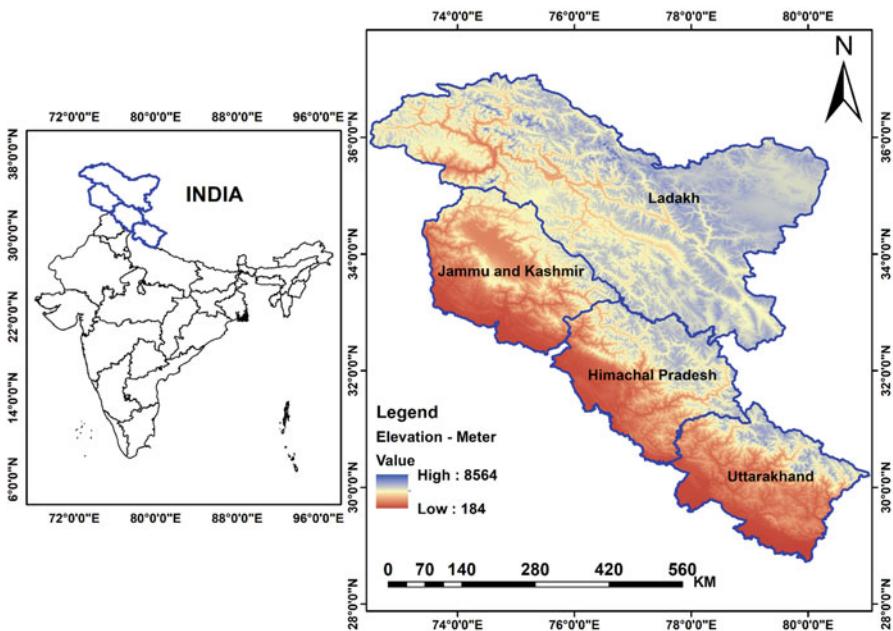


Fig. 1 Study region showing the states and elevation of the region based on the Shuttle Radar Topography Mission (SRTM) digital elevation model (30 m spatial resolution)

Topography and Cloudburst Distribution over IHR

Topography is an important factor for understanding the orographic processes over the Indian Himalayan region where elevation is one of the necessary criteria. The topography has influence the patterns of precipitation at global and regional scale (Smith, 1979). The rugged terrain of mountain affects the flow of air and disturbs the vertical stratification of the atmosphere and acts as barriers (Barros & Lettenmaier, 1994). Anders et al. (2006) suggest that there is direct relationship between the spatial pattern of the precipitation and topography.

In this context, the Shuttle SRTM-DEM at 30 m spatial resolution has been used for the classification into eight elevation bands for the identification of the cloudburst distributions, as shown in Fig. 2. Extreme rainfall and cloudburst events were commonly observed during the peak monsoon season; when the cumulonimbus clouds are trapped in the steep rugged terrain of the Indian Himalayas, it provides suitable condition for heavy downpours of water through extreme rainfall (Thayyen et al., 2020). The elevation also has a significant role in such events (Thayyen et al., 2013). The distributed pattern of the southwest monsoon is developed due to local relief and the topography of the Himalayas. The topographic controls termed as two-step topography have an indispensable role in the spatial extent of monsoon rainfall over the Himalayas. The majority of cloudbursts take place in this two-step

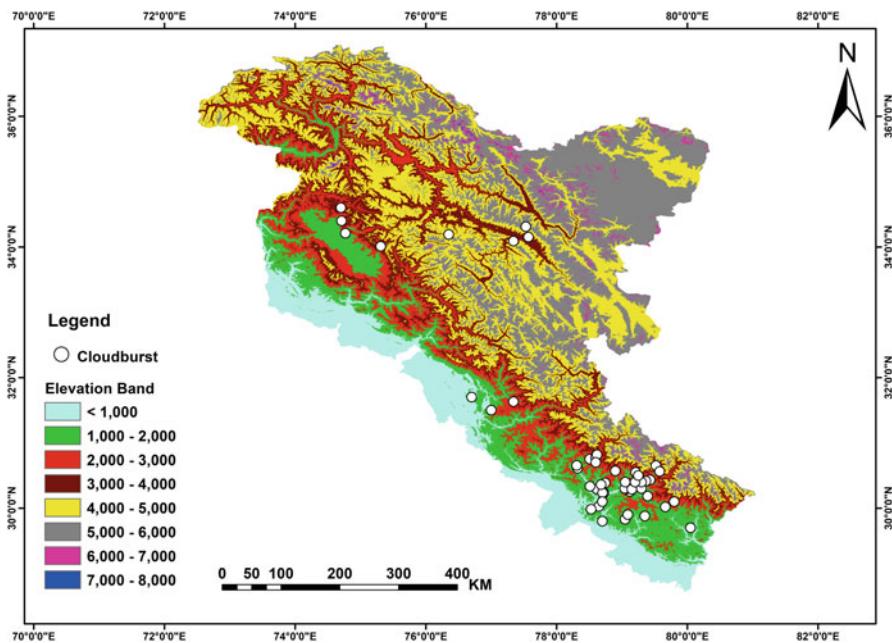


Fig. 2 Elevation bands (1 km interval) from below 1 km to 8 km in the Indian Himalayas and associated cloudburst distribution shown in white dots concentrated majorly in Uttarakhand (lower part of the map)

topography (Mishra et al., 2022). Hence, the identifications of elevation control bands are mandatory for the assessment of cloudbursts. In many studies, it is found that the 1000 to 2000 m elevation band is the most favorable place for such events in the entire Himalayas. These elevation bands have the most populated villages which are most vulnerable to cloudburst, flash flood, extreme rainfall, and livelihood vulnerability index (Mishra et al., 2021). Therefore, the future occurrence of cloudbursts in these critical zones would have massive impact in terms of human fatality and economic loss.

Cloudbursts Categorization and Historical Studies

Categorization of Cloudburst Events

The cloudburst events are categorized fundamentally into mini-cloudbursts and CB cloudbursts detailed as follows:

(a) *Cloudburst (CB)*

In India, rainfall is classified into three categories in terms of its intensity, defined by Deshpande et al. (2018). The classified ranges of rainfall are

>6.5 cm/day, >13 cm/day, >20 cm/day for heavy, very heavy, and extremely heavy, respectively, as per the Indian Meteorological Department (IMD). This rainfall intensity has further been classified according to the duration of the downpour.

(b) *CBa and CBb Cloudburst*

The cloudburst (CB) has been further classified into two categories as “CBa” and “CBb” in hours (Deshpande et al., 2018). Firstly, the CBa events predominantly occurring in the steep rugged terrain of the Himalayas which constitute a majority of events are associated with a heavy downpour. The impacts of CBa have been identified to trigger hazards such as flash floods and debris flow. Secondly, the CBb events have been categorized based on the rainfall rate of more than 10 cm/h. The CBb events have been observed to occur in many places of India, further discussed later.

(c) *Mini-cloudburst*

The term mini-cloudburst was first assigned by Ramage and Schroeder (1999). However, they were unable provide any significant quantitative analysis of this event. Another new classification of cloudburst event by Deshpande et al. (2018) is “mini-cloudburst” (MCB) which is recognized based on short-duration rainfall. The rainfall range of MCB is ≥ 5 cm in two consecutive hours (Deshpande et al., 2018). The mini-cloudburst events are more spread apart in India occurring in various regions including the Himalayas, Western Ghats, and central India. The occurrence of MCB is common during the monsoon period at the foothills of the Indian Himalayas, but the Western Ghats and central India experience the mini-cloudburst during the pre-monsoon season, particularly in June only. The majority of these events arise in the early morning in the Western Ghats and Himalayan region, but in the southern peninsula, it appears at night (Deshpande et al., 2018).

Past Study of Mini-cloudbursts

Some studies synthesized that the orographic process is not an only cause to an aggravation of these events. Therefore, the solar radiations and synoptic-scale might be primary factors to arise the mini-cloudbursts (Deshpande et al., 2018). In some regions, these events are generally associated with tropospheric cyclones and deep convective clouds in central India but are triggered due to orographic uplift in Himalayan regions. A study by Deshpande et al. (2018) shows the spatial distribution of mini-cloudburst and recorded rainfall where it varies from 7 cm to ≥ 22 cm in two consecutive hours. Such an amount of rainfall-runoff is sufficient to trigger flash floods at a localized level. Deshpande et al. (2018) depicted that the average occurrence of mini-cloudbursts is three per season in the Himalayan foothill and Western Ghats area but was rarely found in Rajasthan.

Figure 3 demonstrates the cloudburst events and associated rainfall at different stations geographically located at different regions of India, as illustrated in Table 1 (Deshpande et al., 2018). The blue bars in Fig. 3 indicate the rainfall of a particular

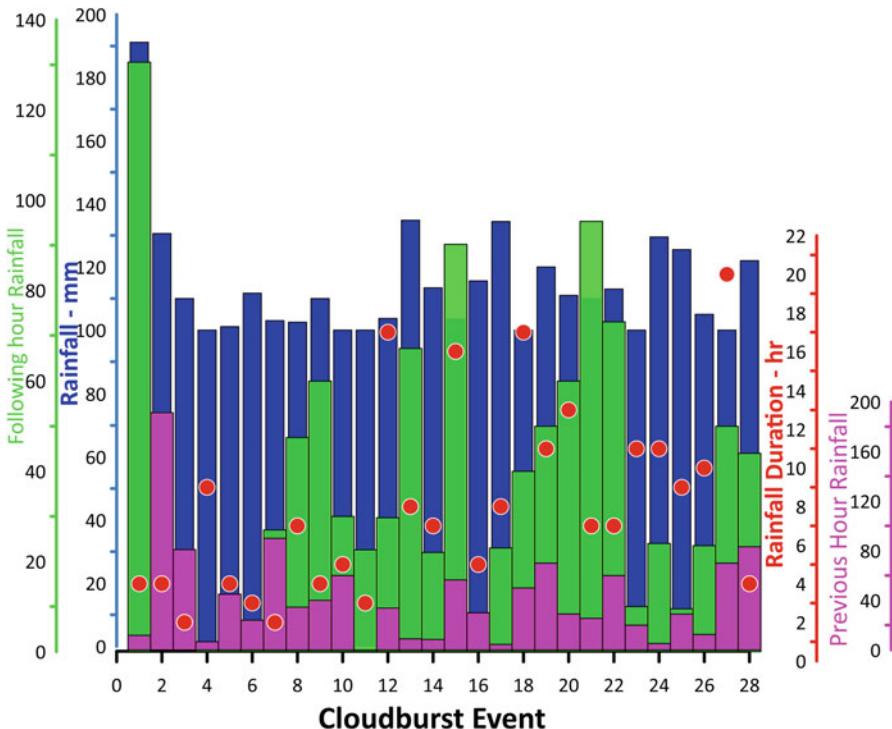


Fig. 3 The blue bars show the rainfall of a particular day of an event and its associated previous and following hour rainfall in magenta and green, respectively. The duration of the rainfall is highlighted in red dots

day of an event and its associated previous and following hour rainfall in magenta and green, respectively. The duration of the rainfall is highlighted in red dots. Based on this, data segregated the rainfall amount before and after an hour of the event and found that there are 22 cases where rainfall exceeded 10 mm in the previous 1 h (Deshpande et al., 2018). Table 1 illustrates details of historical mini-cloudburst events and corresponding recorded rainfall, while further including information on the previous and the following hour's rainfall of a particular day, when the cloudburst happened at specified locations.

Historical Cloudburst Events in IHR

We summarized the various cloudburst events between 1970–2020 in the various states and UTs of IHR in Table 2 and observed that the occurrence of these events is most frequent in the Uttarakhand region than in the other parts of the Himalayas. Taking into consideration the dominance of the cloudburst events in the Uttarakhand region, we analyzed the influence of elevation with respect to the occurrence of the

Table 1 Historical mini-cloudburst events and associated rainfall by Deshpande et al. (2018)

CB event	Station name	Elevation (m)	Date	Rainfall hours	Rainfall	Previous hour	Following hour	Rainfall duration (h)
1	Dharamsala	1547	26-07-1983	11	191.2	11.8	130.6	4
2	Dharamsala	1547	26-07-1983	12	130.6	191.2	0	4
3	Patiala	351	03-07-1988	24	110	80.9	0	2
4	Ambala	264	12-09-2002	20	100	6.7	1.3	9
5	Dehradun	435	14-06-1970	11	101.1	45	1.2	4
6	N. Delhi	216	20-08-1995	14	111.7	24	1.4	3
7	Bahrainch	126	06-09-1984	24	103	90	27	2
8	Bahrainch	126	25-06-1986	6	102.5	34.5	47.5	7
9	Allahabad	98	13-07-1977	15	110	40	60	4
10	Varanasi	81	11-09-1997	10	100	60	30	5
11	Ahmedabad	53	26-06-2005	12	100	0	22.6	3
12	Agartala	13	10-07-1969	8	103.7	33.8	29.7	17
13	Okha	5	01-07-1973	4	134.8	9	67.1	8
14	Okha	5	01-07-1998	23	113.4	8.5	22	7
15	Okha	5	05-08-2007	13	103.5	56.5	90.2	16
16	Rajkot	128	15-06-1978	18	115.6	30	6	5
17	Veraval	0	19-07-1984	6	134.4	4.5	23	8
18	Veraval	0	15-07-2009	17	100	50	40	17
19	Bhubaneshwar	45	22-06-1971	3	120	70	50	11
20	Jagdalpur	552	16-06-1974	24	111	29	60	13
21	Mumbai	4	31-07-1975	3	110	25.5	95.3	7
22	Mumbai	4	16-06-1990	1	113	60	73	7

(continued)

Table 1 (continued)

CB event	Station name	Elevation (m)	Date	Rainfall hours	Rainfall	Previous hour	Following hour	Rainfall duration (h)
23	Mumbai	4	27-06-1998	13	100	20	10	11
24	Panjim	7	23-07-1998	1919	129.5	5.2	24	11
25	Mormugao	10	24-07-1998	22	125.5	28.9	9.5	9
26	Karwar	6	19-07-1998	1	105	12.5	23.5	10
27	Aminidivi	2	05-05-2004	11	100	70	50	20
28	Port Blair	16	21-07-1977	11	122	83.2	44	4

Table 2 Assimilated record of extreme events and cloudbursts with the extent of damage during 1970–2020 based on the studies by 1970–2020 by Joshi and Kumar (2006), Dimri et al. (2017), and Mishra et al. (2022)

S. No	Long (DD)	Lat (DD)	Date	Location (village, district, and state)	Damage (death, livestock, property)
1	79.35	29.88	20-07-1970	Ganai-Almora, Uttarakhand	200 humans, 33 houses
2	79.3	30.4	17-06-1979	Saikot-Chamoli, Uttarakhand	3 humans, 70 animals, 50 houses
3	79.05	30.4	17-08-1979	Kontha-Rudraprayag, Uttarakhand	39 humans, 39 animals, 20 houses
4	79.09	29.9	17-08-1979	Sirwari-Rudraprayag, Uttarakhand	13 humans, 150 animals, 34 houses
5	78.7	29.8	31-07-1982	Mandakhal Chennil-Pauri, Uttarakhand	3 humans, 80 animals, 8 houses
6	79.8	30.1	22-07-1983	Armi-Kapkote, Bageshwar, Uttarakhand	150 humans, 20 animals, 6 houses
7	78.6	30.7	09-07-1990	Nilkanth-Puri Garhwal, Uttarakhand	100 humans, 10 houses
8	79.2	30.4	16-08-1991	Dewar Khadola, chamoli, Uttarakhand	24 humans, 63 animals, 38 houses
9	NA	NA	02-09-1992	Gadni-Chamoli, Uttarakhand	14 humans, 31 houses
10	78.7	30.1	13-08-1995	Bhintai-Pauri Garhwal, Uttarakhand	13 humans, 6 houses
11	80.05	29.7	17-07-1996	Berinaga Pithoragarh, Uttarakhand	18 humans, 85 animals
12	79.21	30.55	11-07-1998	Okhimath-Rudraprayag, Uttarakhand	103 humans, 422 animals, 820 houses
13	NA	NA	18-08-1998	Malpa-Alaknanda	221 humans, 60 animals, 40 houses
14	78.9	30.57	11-08-2001	Phata-Rudraprayag, Uttarakhand	27 humans, 64 animals, 22 houses
15	78.68	30.36	31-08-2001	Gona, Tehri, Uttarakhand	7 humans, 7 animals, 28 houses
16	77	31.5	16-07-2003	Shillagarh, Himachal Pradesh	35 humans
17	77.34	34.09	06-08-2010	Leh, Jammu and Kashmir	255 humans, 1749 houses
18	30.3	79.04	23-06-2010	Ratura, Rudraprayag, Uttarakhand	blockage of road
19	30.77	79.5	19-07-2010	Mana, Chamoli, Uttarakhand	2 humans
20	30.38	78.8	02-08-2010	Nailchami (area), Tehri Garhwal, Uttarakhand	Agriculture field, 25 bridge
21	30.77	79.5	15-08-2010	Mana, Chamoli, Uttarakhand	highway
22	30.02	79.66	31-08-2022	Lingadi, Chamoli, Uttarakhand	3 houses, 5 animals

(continued)

Table 2 (continued)

S. No	Long (DD)	Lat (DD)	Date	Location (village, district, and state)	Damage (death, livestock, property)
23	30.08	79.88	09-06-2011	Teekh Daula, Bageshwar, Uttarakhand	2 houses
24	30.75	78.53	06-08-2011	Hina-Maneri (L), Uttarkashi, Uttarakhand	Road
25	30.47	78.69	04-07-2012	Kothar, Tehri Garhwal, Uttarakhand	Agriculture loss of 40 farmer
26	30.28	78.37	04-07-2012	Khadi, Tehri Garhwal, Uttarakhand	4 animal
27	30.41	79.39	04-07-2012	Birahi, Chamoli, Uttarakhand	1, several house
28	30.79	78.44	04-07-2012	Ravada, Uttarkashi, Uttarakhand	10 house, 11 animal
29	30.84	78.56	03-08-2012	Bakariya Top, Uttarkashi, Uttarakhand	26 human, 250 houses
30	30.53	79.13	13-07-2012	Chunni-Giriya (L), Rudraprayag, Uttarakhand	43 human
31	30.39	78.9	15-07-2012	Badma Jakholi, Rudraprayag, Uttarakhand	6 human
32	30.43	78.99	15-07-2012	Kirora Malla, Rudraprayag, Uttarakhand	5 human
33	30.73	79.07	16-06-2013	Kedarnath, Rudraprayag, Uttarakhand	5748 human
34	30.99	78.94	16-06-2013	Gangotri (L), Uttarkashi, Uttarakhand	NR
35	30.74	79.49	16-06-2013	Badrinath (L), Chamoli, Uttarakhand	NR
36	30.57	79.39	17-06-2013	Urgam Valley, Chamoli, Uttarakhand	8 human
37	30.14	78.53	24-06-2013	Baunth, Tehri Garhwal, Uttarakhand	NR
38	30.57	79.39	07-08-2013	Urgam Valley, Chamoli, Uttarakhand	27 houses
39	30.28	79.34	24-07-2013	Sunali (L), Chamoli, Uttarakhand	NR
40	30.31	79.33	24-07-2013	Tefna Bantoli, Chamoli, Uttarakhand	2 human
41	30.08	79.38	30-07-2013	Maiduni, Chamoli, Uttarakhand	NR
42	30.66	78.22	05-08-2013	Khadara, Uttarkashi, Uttarakhand	NR
43	30.41	78.72	30-07-2014	Semaltha, Tehri Garhwal, Uttarakhand	6 human, 12 houses
44	30.15	78.78	15-08-2014	Purala, Pauri Garhwal, Uttarakhand	16 human

(continued)

Table 2 (continued)

S. No	Long (DD)	Lat (DD)	Date	Location (village, district, and state)	Damage (death, livestock, property)
45	29.98	78.57	15-08-2014	Parsuli, Pauri Garhwal, Uttarakhand	3 human, 2 houses
46	30.04	78.77	15-08-2014	Naoli, Pauri Garhwal, Uttarakhand	2 human
47	30.13	78.84	09-07-2015	Chhani, Pauri Garhwal, Uttarakhand	NR
48	29.99	78.86	09-07-2015	Maina, Pauri Garhwal, Uttarakhand	6 human
49	30.28	78.8	09-07-2015	Soni, Tehri Garhwal, Uttarakhand	NR
50	30.28	78.78	09-07-2015	Sirset, Tehri Garhwal, Uttarakhand	NR
51	74.71	34.4	16-07-2015	Sonamarg, Srinagar, J&K	4 humans
52	75.31	34.01	12-07-2015	Pahalgam, Anantnag, J&K	2 humans
53	74.77	34.21	17-07-2015	Ganderbal, Jammu and Kashmir	3 humans
54	74.7	34.6	24-07-2015	Baltal, Jammu and Kashmir	NA
55	76.35	34.19	28-07-2015	Choskore village Kargi, Jammu and Kashmir	20 houses
56	77.34	31.63	25-07-2015	Jibhi village, Banjar Division Kullu Tandi, Nullah	NA
57	77.53	34.31	04-08-2015	Upper Ganglass, Saboo, etc. Leh	NA
58	76.7	31.7	08-08-2015	Dharampur, Mandi, Himachal Pradesh	5 human
59	30.57	78.68	28-05-2016	Kemra, Tehri Garhwal, Uttarakhand	NR
60	30.47	78.62	28-05-2016	Kothiyara, Tehri Garhwal, Uttarakhand	1 human, 200 animal, 200 house
61	30.45	78.64	28-05-2016	Silyara, Tehri Garhwal, Uttarakhand	NR
62	30.4	78.54	15-06-2016	Tuniyar, Tehri Garhwal, Uttarakhand	NR
63	30.3	79.39	30-06-2016	Dasholi (Siron, Jakhni), Chamoli, Uttarakhand	3 human, 54 animal
64	30.12	79.01	20-08-2016	Markhola, Pauri Garhwal, Uttarakhand	7 human
65	30.14	78.87	22-08-2016	Maroda, Pauri Garhwal, Uttarakhand	1 human, 25 animal
66	30.6	79.79	21-08-2017	Tamak village, Chamoli, Uttarakhand	NR

(continued)

Table 2 (continued)

S. No	Long (DD)	Lat (DD)	Date	Location (village, district, and state)	Damage (death, livestock, property)
67	30.13	79.38	02-05-2018	Narayanbagad, Chamoli, Uttarakhand	NR
68	30.25	79.42	15-07-2018	Kundi, Chamoli, Uttarakhand	NR
69	30.14	79.55	15-07-2018	Ratgaon, Chamoli, Uttarakhand	NR
70	30.64	79.78	19-07-2018	Jalam (Niti Valley), Chamoli, Uttarakhand	4 human
71	30.3	79.14	04-07-2019	Saari, Rudraprayag, Uttarakhand	NR
72	30.38	78.9	06-08-2019	Mayali, Rudraprayag, Uttarakhand	NR
73	30.39	78.83	08-08-2019	Tharti, Tehri Garhwal, Uttarakhand	2 human
74	30.37	79.3	09-08-2019	Saikot, Chamoli, Uttarakhand	NR
75	30.07	79.61	09-08-2019	Phaldhiya Gaon, Chamoli, Uttarakhand	2 human, 12 houses
76	30.35	78.7	09-08-2019	Thati Dagar, Tehri Garhwal, Uttarakhand	NR
77	30.23	79.45	12-08-2019	Lankhi, Chamoli, Uttarakhand	6 human, 40 animal
78	30.62	79.56	07-09-2019	Govindghat, Chamoli, Uttarakhand	NR
79	30.25	79.4	07-09-2019	Dhurma, Chamoli, Uttarakhand	2 houses
80	30.03	79.52	07-09-2019	Gundam, Chamoli, Uttarakhand	NR
81	30.31	79.53	28-07-2020	Padairgaon, Chamoli, Uttarakhand	1 human, 18 animal
82	30.46	78.93	09-07-2020	Sirwadi, Rudraprayag, Uttarakhand	NR

event for this regions as shown in Fig. 4. In Fig. 4, the graph shows the occurrence of cloudburst events (red dots) with respect to the elevation where 2000 m elevation is marked by the green line. It has been observed that the frequency of the cloudburst events is more between 1000 m to 2000 m elevation band of the Indian Himalayan region. This elevation band experiences low rainfall and high land surface temperature. The majority of the villages are located in these elevation bands. Therefore, this band is most vulnerable in terms of hazard and risk from cloudburst events (Mishra et al., 2022).

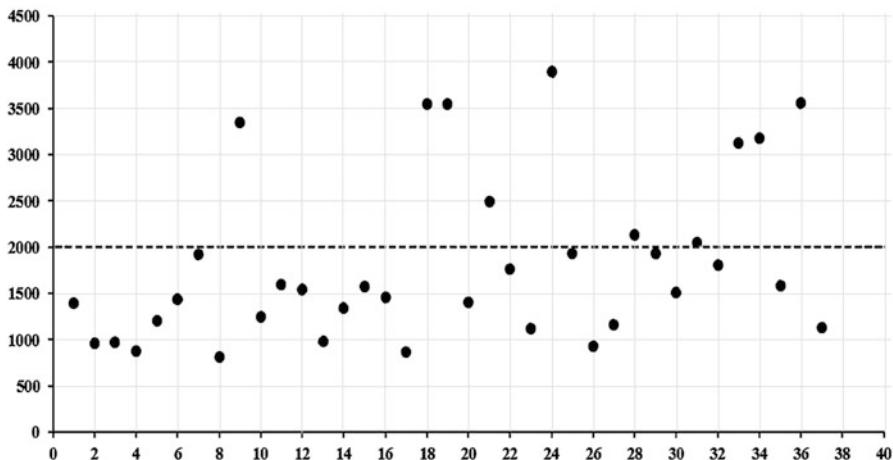


Fig. 4 Identification of prone elevation for cloudburst events for the Uttarakhand region in the Indian Himalayas. The red dots indicate the number of cloud burst events

Analytical Studies of Cloudburst Events in IHR

Remote Sensing and Geospatial Techniques

Satellite imagery has an indispensable role in monitoring, prediction, and assessment of natural disasters such as landslides, earthquakes, flash floods, and avalanches (Thayyen et al., 2020, 2021). While flash floods are commonly occurring in the Himalayan region for decades, their occurrence has been more frequent in the recent years due to extreme rainfall and cloudburst events in the mountainous region of India (Thakur, 2000; Thayyen et al., 2013, 2020; Kumar et al., 2018; Mishra et al., 2022). The assessment and prediction of these hydrologic extreme events are quite challenging due to ungauged basins and coarse resolution observed rainfall data (Mishra et al., 2022; Kumar et al., 2018). Satellite rainfall datasets are available at a relatively finer resolution like global precipitation measurement (GPM) and Tropical Rainfall Measuring Mission (TRMM). The GPM and TRMM datasets provide the rainfall data at every 210 min (<https://gpm.nasa.gov/missions/trmm>). These multi-temporal datasets are very useful in capturing the rainfall events that transform into cloudbursts and flash floods at the local level (Mishra et al., 2022).

A study by Mishra et al. (2022), the assessment of extreme rainfall and cloudburst events, has been done in Uttarakhand using geospatial data. They used multiple satellite datasets aided with field observations to identify the vulnerable administrative blocks in the Upper Ganga Basin from exposure to extreme rainfall and cloudburst events. The study focused on 57 extreme rainfall and cloudburst events. The entire analysis was carried out based on four factors that include elevation, precipitation zones, land surface temperature, and topographic controls from the perspective of cloudbursts. An SRTM DEM was used for elevation profiling of the entire region for the identification of the most vulnerable elevation band in terms of

the population from exposure to cloudburst events. By analyzing the profiles derived by SRTM DEM, it is observed that 66.6% of cloudbursts are going to occur between the 1000–2000 m elevation. Furthermore, these cloudburst events were also matched with heavy rainfalls based on TRMM/GPM (3-hour interval rainfall) for July and August during 2010–2020.

Based on the TRMM/GPM precipitation data, the events have been classified into two categories which are “standalone” and “prolonged” events. The 29 standalone events observed by Mishra et al. (2022) refer to cloudburst ranging from 1.65 mm/h to 65 mm/h, while 28 prolonged events termed as extreme rainfall lie between 10 to 154 mm/24 h. It has been noticed that the majority of the events take place in the low rainfall region based on the TRMM data (Mishra et al., 2022). In their study, the MODIS-land surface temperature was also accounted to identify the favorable warm zone that varies from 18 °C to 28 °C to facilitate the cloudburst events. This temperature band comes under low elevation and high-temperature zone of topoclimate regimes of Uttarakhand (Yadav et al., 2020). This work concludes that the 1 million population spread over these regimes is highly vulnerable from exposure to extreme rainfall and cloudburst events.

Simulation of Cloudburst Events

The orographic lifting carries an unstable moisture content that releases the convective available potential energy to arise the cloudburst also called *rain gust*. Hence, numerical simulation is necessary to understand the interactions of clouds and orographic dynamics for building a conceptual model of cloudbursts. A study by Das et al. (2006), the mesoscale MM5 numerical model, was used at 9 km and 3 km domains to characterize the cloudburst events. This event occurred in Shillelagh village of Himachal Pradesh on 16 July 2003.

A study by Das et al. (2006), the numerical weather prediction (NWP) model, was used as a basis for deriving the conceptual model for cloudburst simulation using vertical shear, vertical motion, and its moisture distribution. This model elucidates the three stage life span of cloudburst events. The first stage showed the separation of two convective cells and moves away from each other which lead to isolated heavy rainfall. In the second stage, the amalgamation of two convective cells takes place because of intense wind shear and vertical motion. During this stage, a rain gust occurs. The third stage depicts the formation of one single cell from two convective cells. In this stage, the triggering process of cloudburst comes to end. Furthermore, the hydrometeors of the cloudburst and its microphysical properties are extracted by TRMM data and simulation, respectively.

In a nutshell, these numerical models may help to categorize the stages of cloudburst and their rainfall intensity. Another study by Sravana Kumar et al. (2012) simulated the cloudburst over Leh (5 August 2010) using Weather Research and forecasting (WRF) model for the localized mesoscale event by determining various key parameters. Romatschke and Houze (2011) investigated some mesoscale parameters contributing to precipitation based on TRMM data. Kumar et al. (2014) used a coupled land surface and atmospheric model to simulate a storm scenario resulting in a flash flood. Shrestha et al. (2015) employed the regional weather

forecast model Consortium of Small-scale Modelling (COSMO) for the Himalayan foothills to investigate an extreme rainfall event.

Hydrometeorological Approach

The hydrometeorological data has a significant role in understanding the cloudburst events, but due to scarcity of stations, the data is not regularly available. A recent study by Kumar et al. (2018) explained the cloudburst events using available hydrometeorological data and source of moisture content for cloudburst in the IHR. The metrological forcing has been analyzed including air temperature and pressure. This work also comprises the hydrometeorological data in terms of its variability and distribution during the cloudburst. To know the vapor content of these cloudbursts, the pathways of vapor have been traced through wind trajectories using a Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model (Draxler and Rolph; Yerramilli et al., 2012). The tracing of these pathways is only for selected cloudbursts during pre-monsoon, post-monsoon, and the monsoon season. By analyzing all these factors, the windward side of the Himalayas is favorable to cloudburst, while the leeward side is moisture deficit (Kumar et al., 2018). The dominant moisture content during monsoon comes from the Arabian sea, but local moisture primarily sources during pre- and post-monsoon for these cloudbursts. These moisture-laden winds merge with local moisture and land in a low-pressure region of the Himalayas which turns into rain gust or cloudbursts. A similar work was carried by Srivastava and Bhardwaj (2014), Shukla et al. (2013), and Sundriyal et al. (2015).

Present State of Activities on Account of Cloudbursts

Several cloudburst events in the Himalayan region are unreported (Mishra et al., 2022; Thayyen et al., 2013). Nevertheless, the inventory of 82 cloudburst events in Table 2 provides significant information for developing strategies for cloudburst management and planning counteractive measures, particularly in the IHR. This inventory and past studies will also help in developing adaptive intervention against disaster risk reduction in the IHR.

Presently, it is challenging to forecast cloudburst events. However, a dense network of weather stations particularly in the elevation band of 1000–2000 m would prove to be a highly significant resource for the modeling and forecasting of cloudburst events. Besides weather stations, advanced early warning systems based on Doppler radar stat can be deployed at cloudburst hazard zones of sever intensity in IHR. A network of such stations is also highly sought to record precisely the extreme rainfall events which transforms into cloudbursts and their characteristics to improve our understanding of this phenomenon.

A useful approach in cloudburst management is being adopted in the city of Copenhagen, where municipal department has organized a cloudburst masterplan coupled with advanced structure implementations (Baykal, 2012). The plan is expected to be fully implementable in about 30 years time. The plan is envisioned with a view to cope with the effects of climate change and focuses at fixing

acceptable limits of flooding in the streets (tentatively fixed at 10 cm). The plan aims to decouple 30 to 40 percent of the excess storm water from the combined sewer system to level out the expected 40 percent excess rainfall due to climate change over a 100 year period. The plan incorporates both concretization of ideas and implementation of specially designed structures such as creation of strategic canals and the greening of Copenhagen. The report by Baykal (2012) indicates that Copenhagen represents the way forward in long-term planning for some of the aberrations that might be caused by climate change. An inbuilt mechanism to combat a disaster is the best solution, provided it delivers.

According to the Uttarakhand State Disaster Management Authority, the different aspects such as geology, geomorphology, and climatology should be accounted for in developing a forecasting model for cloudburst events (<http://usdma.uk.gov.in/cloudburst-15.aspx>). However, simultaneously, it is imperative that residents of the cloudburst vulnerable zones be aware of such extreme precipitation events and associated disasters (<http://usdma.uk.gov.in/cloudburst-15.aspx>). Subsequently, educational and awareness programs are also highly sought and need to be organized periodically.

Conclusion

The Indian Himalayas have witnessed historically frequent occurring of cloudburst events where Uttarakhand has been severely affected by these events when compared with the other states and UTs of the Indian Himalayas. The UT of Jammu and Kashmir and Ladakh were the second most vulnerable regions that were often hit by cloudbursts. Predominantly, in the Himalayan region, cloudburst events are falling in the low rainfall region where the elevation and land surface temperature are low and high, respectively. The occurrence of CB events per unit area is very high in Uttarakhand as compared to other regions in the Indian Himalayas. The recent cloudburst events have been more severe and had relatively more community impact. These events were known to lead to severe fatalities, loss of livelihood, economic loss, and property damage.

Due to the complex mechanism of cloudbursts and the constraints of data appropriately and availability, comprehensive studies on cloudbursts are yet limited owing. The data-related issues are primarily associated with the spatial resolution of the satellite data (best resolution data is available at 5 km, CHRIPS) required for such events that are focused on a much smaller region (sometimes <1 km radius) than that could be analyzed by the present spatial resolution of the satellite data. The mini-cloudburst (CBb) has been diagnosed based on the statistical characteristics of rainfall 10 mm/h. The frequency of mini-cloud has increased in many parts of India. The CBA cloudbursts which are dominant in the IHR are observed to be more severe than the others and are difficult to model.

Several studies indicate that the present capabilities of the sensor network are insufficient in providing the required volume of timely data for characterization and modeling of cloudburst events, particularly due to their inherent complex

mechanism. Subsequently, it has been challenging to understand the triggering phenomena of cloudburst and its post-event impact. Understandably, studies of cloudbursts are significant from multiple perspectives, particularly related to their prediction and pre-/post-event management and mitigation activities. Even though a certain depth of understanding has been achieved on the same, concrete actions in terms of policies, planning and management by national and global organizations are yet limited, and more thrust is envisaged on the same.

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Space Technology and Disaster Medicine

NASA-/Landsat7-Based Retrospective Study

of Haiti 2010 Cholera Epidemic

51

A. Choudry and J. Bickelmayer

Contents

Introduction	800
Method	803
Results	810
Conclusion	811
References	812

Abstract

Epidemic source tracing is crucial in epidemiology. Historically, from the 1832 Paris and the 1854 London cholera epidemics to the recent Wuhan COVID-19 epidemic, source tracing followed the strategy of a post facto analysis of infections and mortalities. On January 12, 2010, a 7.0 magnitude earthquake ravaged Haiti resulting in a cholera epidemic causing 8646 deaths. Cholera being a water-borne disease, it became imperative to identify the source of contamination.

Following the historical practice, an exhaustive analysis of the 8646 cholera deaths, lasting almost a year, was carried out. It identified an earthquake damaged sewage drain, emptying into the Artibonite River, the regional source of water, as the source of the Epidemic. An analysis of the damaged waterways, just after the earthquake, could have been carried out with the help of GIS (Geographic Information Systems including Satellite Data). This could have identified the contamination source before the outbreak of the Epidemic. GIS has become a sophisticated mature field, accessible to domain experts, e.g., ESRI, a private company (among others), specializes in GIS.

In the 1970s, space technology confirmed its impact on public health by pointing out Ozone Layer depletion causing severe UV-related medical

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malignancies. This led to a worldwide restriction on CFC. Taking this as an example of space technology benefitting Disaster Medicine, in 2016, we proposed to investigate the possibility of detecting the damaged sewer drain by comparing before and after earthquake images, available from, open source, NASA/Landsat. If successful, the contamination source could have been detected before 8646 cholera deaths occurred. This involved Satellite Data File Acquisition, Image Extraction from Data Files, and Image Noise Management to identify relevant features. This required dedicated hardware/software environment generally available from proprietary commercial sources. Such a proprietary environment, however, does not allow a detailed examination or flexibility in the underlying processing and is not suitable for a research study. Accordingly, we restricted ourselves to open sources, e.g., NASA/GSFC/USGS. This allowed us to do an ab initio, first principles, Image Processing as outlined in this chapter. Both Landsat 5 & 7 images were available. An image taken after the earthquake was analyzed to test if the relevant waterways could be detected. This image, based on 1990s technology, did not offer adequate spatiotemporal resolution to detect relevant waterways, e.g., the damaged sewer drain. In this case, 1990s Space Technology, due to its limitations, did not, thus, offer the expected benefit to Disaster Medicine by identifying the source of contamination before 8646 cholera deaths occurred. Since 1990s, Space Technology, however, has advanced considerably and the first principles' image analysis, presented in this chapter, is superseded by high-resolution images now available from various sources. This chapter aims to explore the potential of space technologies, e.g., satellite imaging, GIS, etc. to offer potential benefits to Disaster Medicine. A brief discussion of the analysis done for this chapter and some of the emerging space technologies with potential relevance to Disaster Medicine will be presented.

Keywords

Disaster Medicine · Space technology · Cholera epidemic

Introduction

On January 12, 2010, a Richter 7.0 earthquake struck Haiti. The ensuing damage and casualties from this earthquake have been extensively studied (2010 Haiti cholera outbreak, 2012; Centers for Disease Control and Prevention, 2010; Walton & Ivers, 2011). An estimated 230,000 people were killed. Another 300,000 were injured. In addition, 711,442 cases of cholera with 400,103 hospitalizations and 8646 deaths were reported. Cholera being a water-borne disease, it became imperative to identify the source of contamination. To trace the source of contamination, the sites of 8646 cholera deaths were analyzed. It is perhaps instructive to recall that this method of analyzing progressive causalities, to trace the source of contamination, follows a history of almost 200 years, starting with the 1832 cholera outbreak in Paris (Rapport sur la marche, 2012) and the “1854 Broad Street Cholera Outbreak” (1854 Broad



Fig. 1 Cholera deaths



Fig. 2 Cholera reporting centers

Street Cholera, 2009). In both cases, cholera deaths were plotted on street maps, Fig. 1, to identify the source of contamination.

Almost along the same lines and extending to the genetic profile, Piarroux (Piarroux et al., 2011) and Frerichs (Frerichs et al., 2012) carried out a comprehensive analysis of cholera deaths. A network of stations was established to collect data on cholera deaths over almost 2 months (Fig. 2).

By analyzing the time evolution of the clusters and extensive DNA profiling, the source of the cholera outbreak was traced to Meille village (Mirebalais region), Fig. 3, where a stream was flowing into the Artibonite River, the main source of



Fig. 3 Cholera clusters

drinking water. The Earthquake damaged a “Sanitation Drain” and polluted the stream that was a tributary to the Artibonite River.

The historical paradigm for epidemiology is thus:

1. Data collection (when and where infections/mortalities occurred).
2. Pattern recognition, i.e., source identification by data clusters.

This paradigm has also become the “Gold Standard” of clinical trials. Data collected from double blind, random samples is subjected to very sophisticated statistical analysis to detect patterns.

In its simplest form, it may just be to prove or disprove the null hypothesis that a drug/medical procedure is effective or not.

Medical disasters often follow environmental events, e.g., floods, forest fires, earthquakes, etc.

It will be most desirable if it is possible to monitor “precursor environmental parameter” that could predict a medical event. Preventive measures could then be taken before infections/mortalities occurred.

This will be a paradigm shift from the classical (post facto) data/pattern paradigm mentioned above.

The new paradigm.

1. Monitor medically relevant parameters.
2. Initiate preventive measures before medical incidents occur.

This, whenever possible, will be most desirable for Disaster Medicine.

Space technology has advanced enough to monitor, 24/7, many environmental parameters of medical relevance. A most notable, historical, example of this is the satellite-based “Ozone Layer Depletion” study (Ozone layer depletion, 2004).

In brief:

1969 Paul Crutzen and later.

1974 Mario Molina and F. Sherwood Rowland.

Identified CFCs as harmful to the ozone layer. They were awarded the Nobel Prize in 1995.

In the 1980s, NASA/NOAA started atmospheric monitoring but did not discover ozone depletion.

In 1985, Joseph Farman, Jonathan D. Shanklin, and Brian G. Gardiner proved the ozone layer depletion.

In 1987, NASA/NOAA claimed to have had data on “Ozone Layer Depletion” but detected it only after 2 years of intense, advanced data processing.

Ozone layer data was immersed in the “noise” of the general satellite data stream. It required specific (noise suppression) processing of satellite data to extract ozone sensor data. This yielded an image of the ozone layer and its connection to CFC (ozone layer and CFC). It led to a worldwide ban of CFC, preventing outbreaks of UV-induced melanoma, cataract, etc. This established the relevance of space technology to Disaster Medicine.

In January 2010, an earthquake hit Haiti. About 10 months later, a cholera epidemic caused 8646 deaths. Was it possible to study Earthquake-induced environmental changes and predict the possibility of a cholera outbreak? In this chapter, an attempt was made to “Identify the Source of the Haiti 2010 Cholera Outbreak” by comparing “before and after, Satellite images” of the earthquake zone. If successful, this could have identified contamination source before the cholera outbreak claimed 8646 deaths.

Method

The cholera outbreak was due to the contamination of the Artibonite River by a sewage drain in Meille village (Haiti, Mirebalais region). Figure 4 (Maps of the Mirebalais region, can be obtained by authorized users from USGS or from public domain: <https://www.google.com/maps/@18.8368863,-72.1089578,15z?entry=tlu>) shows the general course of the Artibonite river.

Waterways and tributaries in the Mirebalais region are of primary interest. These waterways can be highlighted, Fig. 5, by simple “photo-enhancements” of Fig. 4 (Google App <https://www.google.com/maps/@18.8368863,-72.1089578,15z?entry=tlu>).



Fig. 4 Mirebalais source region

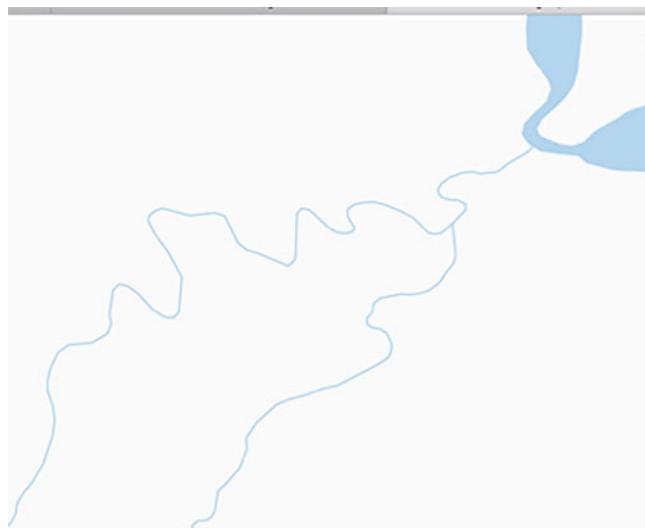


Fig. 5 Waterways in source region

In this chapter, it was attempted to identify the waterways and minor tributaries in the “before and after” satellite images and detect any significant realignments that could have caused sewage drain into a tributary of the Artibonite river. Satellite images are available from a variety of sources. ESA/Copernicus/Sentinel. ESA-GEO-EYE

(ESA-GEO-EYE) is a commercial source. For this chapter, images were acquired from the public domain NASA/LANDSAT (LANDSAT-7 Images), associated with NASA/Goddard Space Flight Center (GSFC) (US Geological Survey (USGS)).

NASA/Landsat is a series of civilian earth observation satellites. For this chapter, NASA/LANDSAT5&7 were available. LANDSAT7 was launched in 1999, and it covered 2010 earthquake period. Unfortunately, in 2003, LANDSAT7 developed an SLC (Scan Line Correction) malfunction which complicated data processing thereby, perhaps, impacting the ultimate result. It is important to remember that the Earth, the Sun, and the Satellite are in constant motion. As a result, images taken from a satellite at two different times (as needed for this study) may have variations due to relative positions, solar illumination, cloud cover, etc. Only satellites in special orbits can offer some uniformity. LANDSAT satellites are in “Sun Synchronous Orbits” such that the satellites are in fixed positions relative to the Sun. LANDSAT-7 observes the earth in different spectral bands (Table 1):

These bands generate data as a byte-stream (values between 0 and 256). Panchromatic data used here is a 3-byte stream; 1 byte for each red, blue, and green color. A typical image, e.g., defined by file header:

“LE07_L1TP_008047_20160216_20161015_01_T1_sr_band1” is a 3d-matrix of (7091×8121) elements with 3 bytes at each element. This bit stream of $(7091 \times 8121 \times 3)$ values is downloaded as “grey-strip” forming an image as .tiff (Tagged Image File Format) file, Fig. 6a.

The .tiff image itself, being just a very large data file, is not, by itself, suitable for identifying terrain features, e.g., river tributaries, relevant to this study and must be converted into other format(s) for further processing.

There are commercial resources available that can employ thematic enhancement to suppress noise and accent-desired features. Such thematic enhancements, perhaps aided by AI techniques, may lead to pattern-driven-recognition, e.g., enhancing waterways, Fig. 6b. An aggressive noise management and feature enhancement may also lead to spurious artifacts, e.g., false positive. Speckle in optical imaging

Table 1 Landsat-7

Band number	Spectrum	Wavelength range (μm)	Resolution
1	Visible	0.45–2	30 m
2	Visible	0.52–0.60	30 m
3	Visible	0.63–0.69	30 m
4	Near infrared	0.77–0.90	30 m
5	Near infrared	1.55–1.75	30 m
6	Thermal	10.40–12.50	60 m
7	Mid infrared	2.08–2.35	30 m
8	Panchromatic	0.520–0.90	15 m

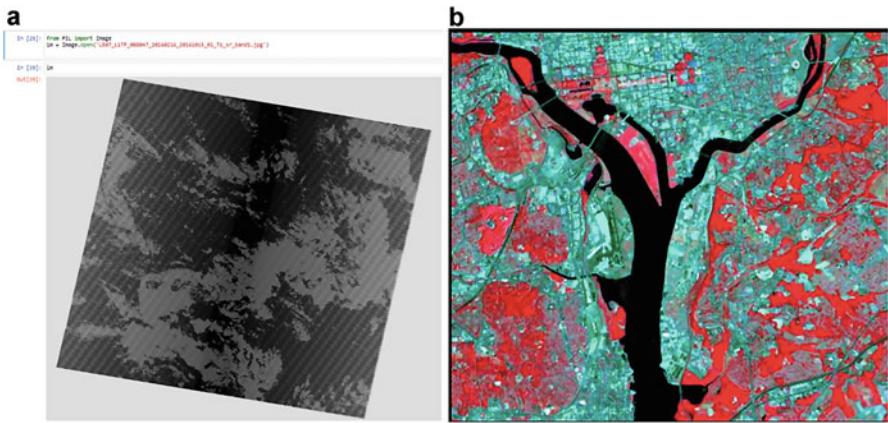


Fig. 6 (a) Typical Landsat .tiff image; (b) false color, simulated 15 m IR image, Washington, DC. Landsat 7

is a common occurrence, and digital filters can eliminate it. On the other hand, in Speckle Interferometry filters, to preserve and even enhance Speckle are desirable. This is an example of user-selected, i.e., pattern-driven, image processing, and the final result may depend on the user's choice of filters, etc.

In this chapter, we restricted the analysis to raw satellite data processing and controlled noise management.

Traditionally it involved a lot of data processing requiring special hardware/software environment. Since LANDSAT7, however, current technology has advanced considerably and high resolution, multispectral satellite images are now routinely available without having to go through the cumbersome format conversion, data processing, noise filtering, etc. employed in this chapter.

Below is a brief outline of such techniques used in this study.

Image formats:

GIF-Graphics Interchange Format. Historic format for simple web graphics with limited colors, always reduced to 8 bytes (256) colors. GIF files are small and easy to work with.

tiff-Tagged Image File Format. “Bitmap of Image Strips” containing a vast amount of information. .tiff files are very big (around 500 MB) as they are “lossless,” i.e., no information is lost due to compression. Satellite images are downloaded in this format and mostly must be converted into more manageable formats.

.png-Portable Network Graphics is the format for small files, i.e., smaller than .tiff, that preserves its color quality in graphic image files like charts, logos, etc. Note that .png does not support CYMK format as required by some publishers.

.jpeg-Joint Photographic Experts Group, also jpg, is the format for online photos. It supports a full spectrum of colors, and almost all devices, e.g., smartphone, selfies, and programs, can open and save to the JPEG format, making it the most universal of the four. JPEG files are ideal when you want to keep the file size



Fig. 7 Haiti, Mirebalais region (Frerichs et al., 2012) .jpeg image

down and do not mind giving up a little quality to create a very small file. JPEG quality drops when images are edited and saved.

A typical sequence of steps could be:

1. Select the appropriate location and before-and-after times for comparison. Download the corresponding large LANDSAT-7 .tiff files.
2. Convert .tiff to .png, images using USGS/GIS software to preserve color quality and storage as files much smaller than .tiff files.
3. Convert png to jpeg for visual comparison of areas of interest.

Figure 7 is an annotated presentation of a .jpeg file of the area of interest.

This could help visually recognize the river and its tributaries. Comparison of “before and after” images could help recognize the realignment of tributaries and thus identify the sewage drain as the source of cholera epidemic. Visual comparison of such images could not identify details of the tributaries due to noise, limited visual acuity, and resolution.

Image processing:

A large selection of digital image processing techniques to extract details from noisy images is available from commercial sources and some open sources, e.g., USGS. To use such techniques, an image must be first converted to a numerical 2d-file, e.g., Excel. The next step should thus be:

Convert selected .tiff files to Excel for numerical analysis.

However, .tiff files are very large and the corresponding Excel files become too large to process by standard techniques. On the other hand, .jpeg files are much



Fig. 8 tiff to .jpeg to .xlsx conversion sample

smaller and preserve color quality and can be converted to manageable Excel “color” files of Red, Blue, and Green. Conversion of .jpeg to an Excel file requires appropriate software, e.g., the Python program illustrated below:

LANDSAT-7 file “LE07_L1TP_008047_20160216_20161015_01_T1_sr_band1” has values stored in the matrix ($7091 \times 8121 \times 3$) each value is within (0, 255).

The following, including Python Imaging Library (PIL), outlines a possible process to convert the image array into the desired 2d shape.

```
Imarray = np.array(im)
K = imarray.shape
imarray = imarray.transpose(2,0,1).reshape(K[0]*K[2],K[1])
```

The following command is used to save the array into .xlsx format.

```
imarray.tofile('C:/Users/....result_files/result_1/test_sdp_3.xlsx', sep=",")
```

The 2d matrix is thus an Excel file with each element containing 3 bytes, one each for Red, Blue, and Green color. This .xlsx file can now be numerically manipulated to reduce noise and possibly recognize relevant features.

Figure 8 illustrates a very small part of the numerical data for each pixel in red, blue, and green color. As there are eight bands, a set of eight such files is a full numerical version of LANDSAT-7 images and requires various operations.

The goal is to take numerical versions of two time-lapsed images of one area before and after the earthquake, and numerically detect any changes between them. Thus, images $I(1)$ and $I(2)$ are taken at times $t(1)$ and $t(2)$ before and after a “disaster,” e.g., earthquake, flood, industrial accident, etc. In principle:

$$I(1) - I(2) \quad (1)$$

should highlight some features relevant to public health.

Images $I(1)$ and $I(2)$ as obtained from Landsat are numbers on a geometrical grid (x,y) . At each point x and y , there are eight spectral band values; thus, Image (1), of time 1, has spectral band s intensity at point x,y :

$$I(1, x, y, s) \text{ where } (s = 1, 2, 3, 8,) \quad (2)$$

Similarly, the image at time (2) is:

$$I(2, x, y, s) \text{ where } (s = 1, 2, 3, 8,) \quad (3)$$

In principle,

$$I(1, x, y, s) - I(2, x, y, s) = D \quad (4)$$

is a set of eight images (one for each spectral band) and should show any anomaly due to the event. In practice, however, two time-lapsed images generally need to be expressed on a “normalized” grid to compensate for:

x translation a

y translation b

x “magnification” p

y “magnification” q

Grid rotation r

In principle, this can be folded into a “Normalization” function:

$$N(x, y, a, b, p, q, r)$$

Thus, (4) becomes:

$$I(1, x, y, s) - I(2, N(x, y, a, b, p, q, r), s) = D \quad (5)$$

Recall that (5) is a set of eight images, one for each spectral band. To solve Eq. (5), special procedures to handle multidimensional very large data files of satellite images are required.

Access to such expertise for these operations was essential. Such facilities and expertise are available to any account holder at NASA, GLOVIS, USGS, etc., or private sources such as ESRI (Environmental Systems Research Institute (ESRI)).

In principle, D, Eq. (5) is the change due to earthquake, e.g., realignment of a tributary. It does, however, include the ever-present Random Noise R in each image. Thus Eq. (5) with random noise R should be:

$$[I(1, x, y, s) + R(1)] - [I(2, N(x, y, a, b, p, q, r), s)] + R(2) = D \quad (6)$$

Random noise is not canceled by subtracting two “noisy” images. As a matter of fact, the noise is additive, i.e., subtracting two noisy images will yield a noisier image, thus:

$$D \Rightarrow D + R(1) + R(2) \quad (7)$$

The noise $R(1) + R(2)$ sets a detection threshold for the size of any earthquake-induced alteration, e.g., realignment of drains, etc. Any earthquake-induced change not significantly above the noise threshold will thus not be seen.

Results

Figure 9 is an illustration of a typical pattern obtained by comparing two images, as described in Eq. 7 above.

This pattern is dominated by noise, and no landmark can be detected without noise management. Image noise management/suppression/filtering has become a major subfield of Digital Image Processing, Gonzalez (Gonzalez, 2008), Solomon (Solomon & Breckon, 2010). Two common approaches to Noise filtering are:

1. Domain filtering (D), e.g., Fourier Transform, Histogram Correction, Photogrammetric Gamma Adjustment, etc.
2. Convolution Kernel Filtering in Spatial Domain (S, Spatial Domain)

One may use D or S, OR both D and S. Of course, D and S do not commute, i.e., $D \times S$ is NOT EQUAL to $S \times D$.

Both D and S can be chosen in multiple of ways, e.g., D can filter high, low, and mid frequency, or even a particular band. Similarly, S can operate on a kernel of one or many pixels. There is thus a wide choice of D and S filters. Further, combination of D and S gives even a much wider choice. If D has n possible values and S has m possible values and 1 for no filter, then:

$(n + m + 1)$ possible filters for single pass.

Often multiple passes of filters are used. For a $2 \times$ pass filter, one gets:

$(n + m + 2mn)$ possible filters.

1.11E+02	4.50E+01	3.90E+01	3.40E+01	1.00E+02	3.90E+01	8.50E+01	4.50E+01	3.90E+01	3.40E+01	4.50E+01	3.90E+01
5.40E+01	3.20E+01	4.30E+01	5.40E+01	4.60E+01	4.40E+01	5.50E+01	4.70E+01	4.40E+01	5.50E+01	4.70E+01	1.09E+02
5.70E+01	5.70E+01	1.06E+02	6.80E+01	5.90E+01	3.30E+01	4.20E+01	1.00E+02	3.30E+01	1.11E+02	4.50E+01	6.90E+01
3.20E+01	4.50E+01	3.90E+01	3.40E+01	3.20E+01	3.90E+01	1.09E+02	4.50E+01	3.90E+01	6.40E+01	1.00E+02	3.90E+01
5.40E+01	1.00E+02	4.30E+01	5.40E+01	4.60E+01	4.40E+01	6.60E+01	3.20E+01	4.40E+01	5.50E+01	4.70E+01	4.40E+01
1.12E+02	5.50E+01	1.06E+02	5.30E+01	5.90E+01	3.20E+01	4.70E+01	8.10E+01	3.20E+01	6.80E+01	3.20E+01	3.20E+01
3.80E+01	4.50E+01	3.90E+01	3.20E+01	1.00E+02	3.90E+01	1.34E+02	4.50E+01	3.90E+01	1.40E+01	4.70E+01	3.90E+01
5.40E+01	3.30E+01	4.30E+01	5.40E+01	4.60E+01	4.40E+01	3.30E+01	8.10E+01	4.40E+01	5.50E+01	2.10E+01	4.40E+01
5.70E+01	6.70E+01	3.20E+01	3.90E+01	8.20E+01	7.50E+01	1.12E+02	4.20E+01	3.20E+01	4.50E+01	4.50E+01	4.50E+01
1.00E+02	4.50E+01	3.90E+01	3.40E+01	4.50E+01	1.00E+02	4.50E+01	3.20E+01	3.90E+01	1.00E+02	4.50E+01	2.70E+01
5.40E+01	3.20E+01	4.30E+01	5.40E+01	4.60E+01	4.30E+01	1.09E+02	1.26E+02	4.30E+01	5.50E+01	1.00E+02	4.30E+01
5.70E+01	6.90E+01	1.06E+02	2.30E+01	5.50E+01	5.40E+01	1.18E+02	3.30E+01	1.12E+02	4.50E+01	4.50E+01	4.50E+01
3.40E+01	4.50E+01	6.50E+01	5.30E+01	4.50E+01	1.09E+02	5.80E+01	4.50E+01	3.50E+01	3.20E+01	1.00E+02	3.90E+01
5.40E+01	4.60E+01	3.10E+01	5.40E+01	3.20E+01	4.30E+01	5.40E+01	4.60E+01	1.67E+02	5.40E+01	4.60E+01	4.30E+01
5.50E+01	3.20E+01	5.50E+01	5.50E+01	5.50E+01	5.50E+01	6.70E+01	8.10E+01	3.20E+01	1.11E+02	4.50E+01	1.08E+02
3.40E+01	4.50E+01	3.90E+01	8.70E+01	4.50E+01	1.00E+02	4.50E+01	4.50E+01	3.90E+01	3.50E+01	6.00E+01	3.90E+01
5.40E+01	4.60E+01	3.20E+01	5.50E+01	4.60E+01	4.20E+01	5.30E+01	4.50E+01	4.20E+01	4.60E+01	3.20E+01	4.30E+01
4.50E+01	1.00E+02	4.50E+01	4.70E+01	1.00E+02	2.90E+01	4.50E+01	4.50E+01	5.50E+01	1.11E+02	4.50E+01	4.50E+01
3.40E+01	4.50E+01	3.90E+01	3.40E+01	4.50E+01	3.90E+01	6.50E+01	3.20E+01	3.90E+01	3.30E+01	2.00E+02	3.90E+01
5.40E+01	1.00E+02	4.30E+01	5.40E+01	4.60E+01	2.90E+01	5.30E+01	4.50E+01	4.20E+01	5.30E+01	9.60E+01	4.20E+01
3.80E+01	3.80E+01	3.80E+01	3.80E+01	1.00E+02	3.80E+01	3.80E+01	3.80E+01	3.20E+01	4.50E+01	5.40E+01	9.80E+01
3.40E+01	4.50E+01	3.90E+01	3.40E+01	4.50E+01	3.90E+01	3.40E+01	4.50E+01	3.90E+01	4.50E+01	4.90E+01	8.60E+01

Fig. 9 Time lapse comparison without noise filter

1.11E+02	4.50E+01	3.90E+01	3.40E+01	4.50E+01	3.90E+01	8.50E+01	4.50E+01	3.90E+01	3.40E+01	4.50E+01	3.90E+01
5.40E+01	4.60E+01	4.30E+01	5.40E+01	4.60E+01	4.40E+01	5.50E+01	4.70E+01	4.40E+01	5.50E+01	4.70E+01	4.40E+01
5.70E+01	5.70E+01	1.00E+02	6.80E+01	5.90E+01	1.07E+02	8.90E+01	4.80E+01	5.60E+01	1.11E+02	4.50E+01	6.90E+01
3.80E+01	4.50E+01	3.90E+01	3.40E+01	4.50E+01	3.90E+01	1.09E+02	4.50E+01	3.90E+01	6.40E+01	4.50E+01	3.90E+01
5.40E+01	4.60E+01	7.40E+01	5.40E+01	4.60E+01	4.40E+01	6.60E+01	8.50E+01	4.40E+01	5.50E+01	4.70E+01	4.40E+01
1.12E+02	7.40E+01	1.00E+02	5.30E+01	5.90E+01	3.80E+01	8.70E+01	8.10E+01	6.80E+01	6.80E+01	3.20E+01	6.70E+01
3.80E+01	4.50E+01	6.90E+01	5.70E+01	4.50E+01	3.90E+01	1.34E+02	4.50E+01	3.90E+01	3.40E+01	4.70E+01	3.90E+01
5.40E+01	3.30E+01	4.30E+01	5.40E+01	4.60E+01	4.40E+01	1.67E+02	8.10E+01	4.40E+01	5.50E+01	2.10E+01	4.40E+01
5.70E+01	6.70E+01	3.20E+01	3.90E+01	8.20E+01	7.50E+01	1.12E+02	8.10E+01	4.50E+01	4.50E+01	4.50E+01	4.50E+01
5.40E+01	4.50E+01	3.90E+01	3.40E+01	4.50E+01	3.90E+01	4.50E+01	1.56E+02	3.90E+01	5.50E+01	4.50E+01	2.70E+01
5.40E+01	4.60E+01	4.30E+01	5.40E+01	4.60E+01	4.30E+01	1.09E+02	1.26E+02	4.30E+01	5.50E+01	4.80E+01	4.30E+01
5.70E+01	6.90E+01	1.00E+02	2.30E+01	5.50E+01	5.40E+01	1.18E+02	8.10E+01	1.12E+02	4.50E+01	4.50E+01	4.50E+01
3.40E+01	4.50E+01	7.80E+01	5.30E+01	4.50E+01	3.90E+01	5.80E+01	4.50E+01	1.00E+02	4.50E+01	4.50E+01	3.90E+01
5.40E+01	4.60E+01	4.30E+01	5.40E+01	4.60E+01	4.30E+01	5.40E+01	4.60E+01	1.67E+02	5.40E+01	4.60E+01	4.30E+01
5.50E+01	5.50E+01	5.50E+01	5.50E+01	5.50E+01	5.50E+01	6.70E+01	8.10E+01	1.06E+02	1.11E+02	4.50E+01	1.08E+02
3.40E+01	4.50E+01	3.90E+01	8.70E+01	4.50E+01	3.90E+01	4.50E+01	4.50E+01	3.90E+01	1.11E+02	6.00E+01	3.90E+01
5.40E+01	4.60E+01	4.30E+01	5.50E+01	4.60E+01	4.20E+01	5.30E+01	4.50E+01	4.20E+01	1.09E+02	4.50E+01	4.30E+01
4.50E+01	4.50E+01	4.50E+01	4.70E+01	4.50E+01	2.90E+01	4.50E+01	4.50E+01	5.50E+01	1.11E+02	4.50E+01	4.50E+01
3.40E+01	4.50E+01	3.90E+01	3.40E+01	4.50E+01	3.90E+01	6.50E+01	4.50E+01	3.90E+01	8.70E+01	2.00E+02	3.90E+01
5.40E+01	4.60E+01	4.30E+01	5.40E+01	4.60E+01	2.90E+01	5.30E+01	4.50E+01	4.20E+01	5.30E+01	9.60E+01	4.20E+01
3.80E+01	5.70E+01	4.50E+01	5.40E+01	9.80E+01							
3.40E+01	4.50E+01	3.90E+01	3.40E+01	4.50E+01	3.90E+01	3.40E+01	4.50E+01	3.90E+01	4.50E+01	4.90E+01	8.60E+01

Fig. 10 Selective noise suppression for time lapse comparison

For a modest double pass of $m = 2$ and $n = 2$, one gets 12 filtered images. Which of the 12 filtered images is accepted is purely a matter of “User Driven” pattern recognition, i.e., what the user wants to see.

One can thus train a system to see if a certain pattern appears. This becomes the basis of emerging AI-based pattern recognition, which was beyond the scope of this chapter.

By using different noise filters, a faint, tributary could be seen in Fig. 10. This feature was sensitive to the choice of noise filters. With a sensor resolution limited to 15–20 m, the noise content in the original tiff file was too high to allow the detection of 0.5–1.0 m features. It was, thus, not possible to identify relevant landmarks.

Comparing two such files showed mostly noise, and no distinct landmark realignment (sewage drain) could be identified.

An AI-based pattern recognition system, e.g., Convolutional Neural Network (CNN), could perhaps be trained to detect relevant features with greater sensitivity if a proper set of “training” images is available. It is, however, still not clear if an AI system can reach sub-millipixel resolution, i.e., 50 cm. resolution in a 15 m pixel image as required for this study.

Conclusion

Cholera epidemic in Haiti, caused by the 2010 earthquake, resulted in 8646 deaths. Cholera being a water-borne disease, its contamination source, a damaged sewage drain, was identified by the customary post facto analysis of the 8646 deaths. Inspired by the success of the satellite-based monitoring of the ozone layer in 1970s and thereby predicting UV-related health hazards, this chapter attempted to detect the contamination source by analyzing LANDSAT satellite images before and after the earthquake. If successful, it would have identified the contamination source

before the onset of the epidemic. Limitations of spatirospectral resolution of onboard sensors and standard numerical image processing could not identify the contamination source.

Since LANDSAT 7, significant advances in space technology and digital image processing have occurred. Advanced satellites, e.g., LANDSAT9, the Hubble Telescope and its successor JWST (James Webb Space Telescope) could detect biomolecules (CH_4 , NH_3 , H_2O , etc.) in galaxies light years away. With such advances, it might be possible to detect the migration of bats and thus perhaps COVID-19 virus. Numerous LEO (Low Earth Orbit) satellites could possibly correlate human population and animal migration for possible zoonotic transfer. Both NASA and ESA have started new space-based initiatives to aid the COVID-19 pandemic (ESA COVID-19). Even the ubiquitous GPS signal consists of information about Earth's hydrologic cycle. GPS signal can distinguish whether the surface is wet or dry, how much water is contained in the soil and vegetation, and how much snow is on the ground (Chew, 2022). Similarly, space-borne monitoring of methane (Monitoring Methane Emissions), the second most-abundant anthropogenic greenhouse gas, is being pursued. Further, geologic high-resolution terrain profiles, till 2012 classified secret, are now available from SAR (Synthetic Aperture Radar) resources, Butterworth, Quill (Butterworth, Quill). Identification of terrestrial chemicals of medical relevance could be aided by Hyper-spectral Imaging (Hyperspectral Imaging). There is even an attempt to analyze information from Mars (Mars Mission) to advance medical knowledge.

Along with advances in Space Technology, very significant advances have been made in Satellite and Medical Image Processing. LeCun (LeCun et al., 2015) and Habibi (Aghdam, 2017) successfully used Convolutional Neural Networks (CNN) in Medical Radiology. Paras (Lakhani & Sundaram, 2017) achieved automated tubercular tumor detection.

Based on such advanced Space and AI technologies, one could design a Satellite Data Center that receives medically relevant environmental data. This data stream can be continuously and autonomously monitored to detect medically relevant anomalies and generate appropriate alerts.

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Multiresilience Indicators Assessment in Seismic Zone V Area in Parts of Uttarakhand, India, Using Geospatial Technology

52

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Contents

Introduction	816
Study Area	818
Methodology	819
Selection of Vulnerability Indicators	820
Results and Discussion	823
Environmental Aspects	823
Social Aspects	825
Economical Aspects	827
Physical Aspects	827
Conclusion	831
References	832

Abstract

The Himalayan region is a seismically active zone and has witnessed the massive loss of properties and lives due to the collapse of infrastructure and lack of preparedness. Many studies focus on the susceptibility analysis; however, in this chapter, we have considered the dynamic nature of the earthquake hazard and factors affecting the resilience at the household level. This chapter considers the aspects of environmental, economic, social, and physical parameters for resilience analysis. An amalgamated indicator-based framework has been developed including the level of exposure, coping capacity, and the level of resilience to assess the household vulnerability to the earthquake in the study area using indicators and subindicators. The outcome of the study establishes the risk of residential, commercial, and mixed-use buildings and their association with wider

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socioeconomic consequences of a major earthquake event. Lack of resource diversification, gaps in the implementation of building codes, and lack of awareness have put households at high risk. Further, the chapter highlights large migration from surrounding villages as a significant factor affecting the overall resilience of the community. Since this framework adopts vulnerability as the primary criteria to the dimensions with a bottom-up approach for analyzing the resilience of the household, it can be applied to other hazards and locations too at microlivelvel planning for disaster risk reduction.

Keywords

Vulnerability · Resilience · Household · Earthquake · Geospatial technology

Introduction

Earthquakes may strike for a few seconds or minutes but have a tremendous potential to cause mass destruction of properties and loss of lives. The primary cause behind this level of destruction is the failure of physical infrastructure (Meena et al., 2013). Apart from this, rapid population growth, unplanned urbanization, use of poor construction materials, and lack of awareness about their surroundings and building codes make people susceptible to earthquake impacts. Earthquakes are difficult to predict, and their ability to strike unanticipated makes them the most damaging event. With the subduction of continental plates or due to slipping of faults against one another, massive energy is released which travels through the crust in the form of seismic waves causing sudden shaking of the ground (Gaur, 1994). The continuous subduction of the Indian plate beneath the Eurasian plate has resulted in the upliftment of the Himalayas along the northern frontier region. This ongoing convergence of the two plates builds stress in the region making it highly prone to earthquakes (Rautela et al., 2007; Jayangondaperumal et al., 2017).

According to the Earthquake Hazard Zonation Map of the Bureau of Indian Standards (BIS), 56% of the Indian geographical area is prone to moderate to severe earthquakes (NDMA, 2019). BIS in 2017 has demarcated the whole parts of northern and north-eastern India and partially in Himalayan regions of Uttarakhand, Himachal Pradesh, Jammu, and Kashmir, Leh, and the western parts of India Rann of Kutch (Gujarat), parts of North Bihar and islands of Andaman and Nicobar into zone V meaning, seismically highly active zone (PIB, 2017). Several severe to moderate earthquakes of different magnitudes have occurred in the Himalayan region (Assam (1897, 8.3 M) and (1947, 7.3 M), Assam-Tibet (1950, 8.6 M), Bihar (1988, 6.9 M), Uttarkashi (1991, 6.8 M), Killari (1993, 6.2 M), Chamoli (1999, 6.8 M), Bhuj (2001, 7.7 M), Kashmir (2005, 7.6 M), Nepal (2015, 7.8 M), and Manipur (2016, 6.7 M)) (NDMA, 2019) causing around 40,000 fatalities due to collapse of buildings. Key observations on the failure of infrastructure in the earthquake-affected areas are inappropriate implementation of earthquake resistance in buildings, lack of awareness of the consequence of earthquakes among people, lack of professional

environment in the construction field, and inadequate system to check the implementation of BIS guidelines or to penalize its violation (NDMA, 2019). The vulnerability of the built-up environment of the country calls for quick intervention in terms of timely investment in seismic resilience building (Rautela et al., 2020). In the disaster management cycle, the vulnerability is the “characteristics and circumstances that make the system susceptible to the damaging effects” (UNISDR, 2009), “the measure of hazard and its implication on the physical, economical, and social components that affect the ability of the system to cope (ODPM, 2013; UNISDR, 2017; Yusmah et al., 2020). Proag (2014) discussed vulnerability as “risk combined with the level of social and economic liability, and the ability to cope with the resulting event,” or “the degree to which a system, or part of a system, may react adversely during the occurrence of a hazardous event.” Resilience is the “ability of the exposed system to resist, absorb, and accommodate to recover from the effects of a hazard in a timely event with efficient manner, including through the preservation and restoration of its essential basic structures and functions (UNISDR, 2009; Proag, 2014; Yusmah et al., 2020),” or “ability of a system to handle commotions while maintaining the efficiency in social, economic, physical and environmental aspects” (Combaz, 2015; Yusmah et al., 2020). The concept of resilience is an amalgamation of biophysical and socioecological attributes of a specific area (Bera et al., 2020). Past literature makes it clear that infrastructure failure is the major contributor to massive death rates during seismic events and causes a delay in emergency response (Cobum et al., 1992; Osaki & Minowa, 2001). Detailed seismic vulnerability assessment of infrastructure needs technical skills and is an expensive and time-consuming process. Rapid population growth, unplanned urbanization, migration, poor construction, and lack of awareness about the hazard amplify the seismic risk of a particular place. Reservoir-induced seismicity and landslides are also responsible for triggering a seismic event (Berg et al., 1969).

Considering the dynamic nature of the earthquake, studying the vulnerability of infrastructure will not be sufficient to handle it and a comprehensive approach is needed to assess the resilience of a particular region, keeping in mind the abovementioned factor, which also can act as a modifier (Peek-Asa et al., 2003). Attempts have been made to establish a link between vulnerability and resilience, marking them overlapping as well as discrete concepts (Kafle, 2012). Adger (2000) defines vulnerability as the state of susceptibility to destruction from hazards linked with the socioecological change and from the inability to adapt (Béné et al., 2012), which links vulnerability and resilience as “responding and implication” for humans and nature. In another attempt, “the buildup or wearing down of the attributes of socio-ecological resilience influence vulnerability, distinct events expose underlying vulnerability and push systems into new domains where resilience may be reduced,” leads to a circular explanation: “a system lacks resilience because of its vulnerability; it’s vulnerable because it lacks resilience.” Hence, establish a loose antonym between resilience and vulnerability (Adger, 2000; Béné et al., 2012). The main aim of the study is to assess the level of resilience in the earthquake-prone region among the household. To achieve these objectives and to develop a methodology, we treat resilience as an inbuilt capability of the community or individual to resist,

overcome, and recuperate efficiently from the disturbance caused by an earthquake in each place (Brigit & Sophie, 2008; Bera et al., 2020).

Study Area

The Kathgodam city lies in the foothills of lower Siwalik on the bank of the Gaula River and falls in Bhabhar plain. It is a part of the Haldwani-Kathgodam township and falls on the southern side of Nainital district, Uttarakhand State, India (Negi, 2018). The study area is situated in the proximity of the active Himalayan Frontal Thrust (HFT) and Main Boundary Thrust (MBT) fault line (Rautela & Pande, 2005). The geology of the area comprises an alternate bed of sandstone and clay shale (Valdiya, 1992).

The temperature in the study area is warm and temperate cold; during summer, the temperature ranges from 40 °C to 45 °C and in winter goes down to 4 °C to 1 °C. The area receives an annual rainfall of 1500 mm to 3000 mm mainly during the monsoon season. Thunderstorms, strong destructive wind, and lightning are common during the rainy season. The study area is well connected with the other parts of the state and is also called Gateway to Kumaon. Since the British era, this place has been acting as a commercial hub, generating employment and a supply point for hilly districts. With the increase in facilities like better health infrastructure and educational institutions, industrial establishment, and better living conditions, the area has experienced rapid population growth. Apart from these, military establishment, police training camp, barrage, roadway stations and workshops, religious buildings, and many holy shrines are also located in the area. This area also experiences landslides on different occasions; minor landslides were observed on the bank side of river Gaula and National Highway 109 (NH109). The recent ones are landslides near Don Bosco and Veer Bhatti in August 2021, which destroyed a large part of the road. Ward no. 4 (Tanakpur road) and Ward no. 5 (Ranibagh-Kathgodam) of the Kathgodam city were selected for this study (Fig. 1).

These two wards are located parallel to NH-109. NH-109 and River Gaula form the western and eastern boundaries of Ward no. 4. People settled in Ward no. 4 belong to the middle to low-income category with a population of 7585 and have a literacy rate of 75%. The ward has experienced rapid population growth of 43.9% from 2001 to 2011 (Indikosh, 2018a). Railway stations, railway staff colonies, railway maintenance offices, post office, commercial complex, veterinary hospital, and primary schools are some of the infrastructures present in the ward apart from the residential buildings. Water logging, open drainage, and lack of sanitation are common issues in the wards. Ward no. 5 has NH-109 forming its eastern boundary and hillocks on its western boundary. With a total population of 5534, people belong to higher to middle-income groups having a literacy rate of 87%. Infrastructures present in the ward are residential buildings, schools (private and government), mosques, underconstruction buildings, community gathering places, and multipurpose commercial buildings (Indikosh, 2018b). NH-109 and Tanakpur-bypass are the two main roads that connect the wards. In some places,

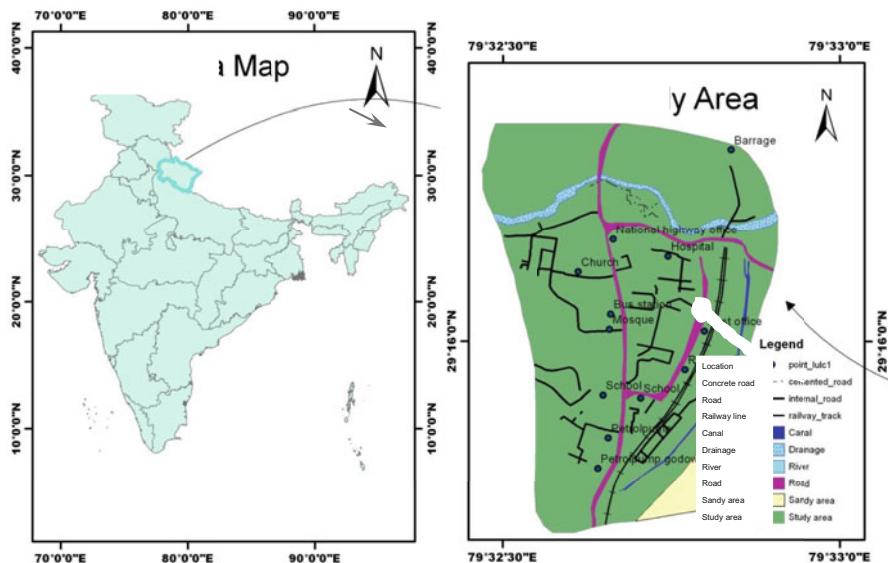


Fig. 1 Shows the basic information of the study of Kathgodam, Uttarakhand, with land use features

roads within the wards are narrow; small vehicles like two-wheelers pass through it. With the heavy inflow of tourists throughout the year, religious gatherings, and landslides, NH-109 experiences traffic jams very often.

Methodology

The study uses vulnerability and resilience indicators to assess the multi-resiliencies in the seismically prone area. The social and ecological attributes of resilience are studied to analyze the resilience of the study area, which helps to measure their capabilities and their return to normal after the earthquake hazard impacts. The methodological framework uses environmental, physical, social, and economical aspects. Within each dimension, indicators and subindicators are used to assess the resilience of a household, which are considered as the primary input to the framework and measure the risk to which a household is exposed. A bottom-up approach has been used in the framework to analyze resilience in the study area. Many studies have focused on physical indicators as the dimension for analyzing resilience (Peek-Asa et al., 2003; Bera et al., 2020), which does not provide a holistic result. To understand the resilience of a community/region, there is need to integrate the socioecological attributes (multiple interconnected factors of a specific location) in the resilience assessment along with the physical indicators. Therefore, a composite indicator-based approach is developed integrating these dimensions for analyzing

the vulnerability and coping capacities of the specific area. The environmental approach focuses on environmental factors such as drainage, soil, probability hazard, etc. of a specific area (Thanapackiam et al., 2012). Social dimensions sketch demographic details and economic characteristics such as income and livelihood profile of the households. Physical dimensions include building types, building condition, building usage, road width and accessibility, critical infrastructure, transportation, etc.

Primary data was collected from 303 samples by random sampling method through personal interviews using objective type and semistructured questionnaires. Geographical coordinates were collected using a handheld GPS device for each sample site. The questionnaire was intended to capture not only the existing status of the buildings but also a detailed socioecological profile of the area with sample location. The secondary data was collected from available literature, concerned government departments, guidelines on building construction from the city magistrate office, information on past disasters and loss of lives and property from the Haldwani Tehsil office; other details such as ward map, population, and the number of houses were obtained from Haldwani cum Kathgodam Nagar Nigam, Nainital District, Uttarakhand State. Personal interviews were conducted with the administration officials in Public Works Department, Kathgodam Railway station, and Scientists of Geological Survey of India for consensus over the level of resilience and risk with respect to seismic hazards as mentioned by the respondents in household interviews. A Digital database was created using the ArcGIS 10 software package. Detailed land use and land cover maps were created as well as various thematic maps were generated based on the indicators selected for studying the resilience in the ArcGIS 10 software from the primary and secondary data sources.

Selection of Vulnerability Indicators

Indicators are selected based on the dynamic nature of earthquake impacts, the influence of external factors, and from the past literatures. Information on indicators was collected at the household level; interaction with communities and the details of indicators were also discussed under their respective dimensions (Fig. 2). The geographical coordinate of every sample was recorded using a handheld Global Positioning System (GPS) device (Fig. 3).

Environmental Indicators

The community may experience different levels of pressures, disturbances, and various degrees of impact due to natural disasters (ODPM, 2013; UNDP, 2014). So, environmental dimensions illustrate the exposure to the earthquake event by the community (UNU-IAS, 2013; Bera et al., 2020) and its indicators such as soil texture, groundwater table, water bodies, and other hazards existing in the area. Bureau of Indian Standard (BIS) has classified the Indian mainland and islands into five seismic zones (zone II to zone VI). Zone IV and zone V comprise areas prone to very high intensity of seismic activity. Because of high intensity and frequency,

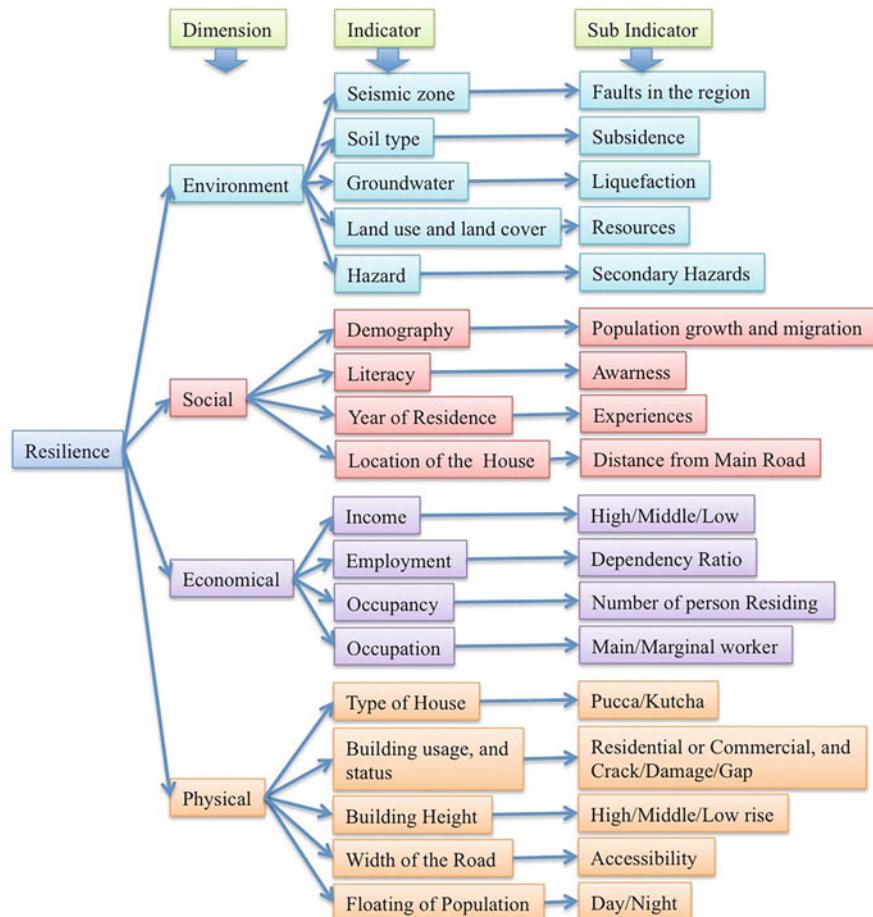


Fig. 2 Composite indicator-based methodological framework for resilience analysis to earthquake-prone region

danger to life and property is very high in these zones. Thus, a detailed study of environmental indicators of an area becomes crucial for developing an effective response mechanism to seismic activities.

Social Indicators

In the assessment of social aspects, the following indicators were studied such as dependent and vulnerable populations, literacy rate, and years of residence in the selected wards. Decreased sensory awareness, physical impairment, chronic medical conditions, and having special need and socioeconomic conditions make the elders, children, women, and differently abled persons likely to be at great risk during earthquake events, hence they are classified as vulnerable population. Education plays a key role in building the resilience of an individual as well as the community,

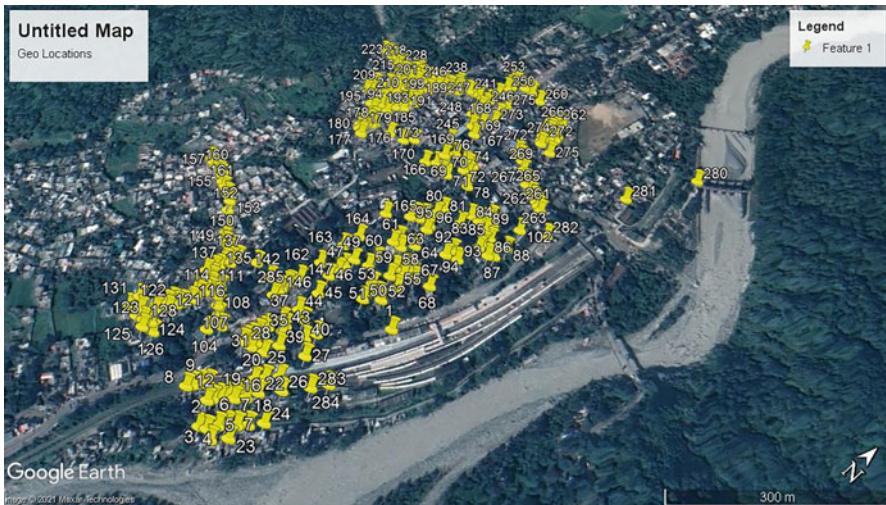


Fig. 3 Household survey locations (GPS locations overlaid with Google earth Image)

as a high literacy rate will enable a better understanding of the situation, and develops the skills and capacity to self-help and cope with the stress (Nifa et al., 2017). Thus, education helps in decreasing the level of vulnerability not only of the community but also of the vulnerable section of society. Further, lack of awareness about the existing hazards, poor construction practice, and lack of monitoring the construction practices may increase the risk exposure. Years of residence in a place are directly related to quantify the past disaster event experiences and learning from the events (Uy et al., 2011). This learning will help in developing better preparedness of the present and future generations against disasters (Yusmah et al., 2020).

Economic Indicators

The economic dimension of resilience considers the economic profile of the area and is comprised of four different indicators, namely, the percentage of both male and female employed population, occupation type and diversity of livelihood, number of occupants (or family members), and income of the population. The employed population depicts the financial independence of individuals and dependency on the economy. The ratio of the employed and dependent population shows the coping capacity of the community, as high number of employed people better access to resources which in turn increases resilience. A household with numerous occupants is more resilient as they show high adaptive capacity (Uy et al., 2011). Comparing to that, marginal workers are more vulnerable to natural disasters. Alternate livelihoods help in diversifying the options available and increase the coping capacity of the community as well as the individual when the system is pushed into a new domain by the disaster (Sinha & Goyal, 2004; Norris et al., 2008). Income is linked to economic capability, which directly affects the choice of the household like the location of the settlement. The group with high-income level is more capable of

coping with the stress induced by a disaster event than the low-income level group (Bera et al., 2020). Exposure to frequent and repeated disaster events makes the community economically less resilient.

Environmental Indicators

The following seven indicators were studied in the environmental resilience aspect namely; type of house, existing building status, year of construction, the height of the building, building usage, road width, and flow of population. Kutcha and Pucca houses are the two types found in India. The existing status of the building is evaluated by checking the existing cracks (minor cracks and major cracks) in the walls and gaps between doors and windows, which makes the building weak (Fig. 4). Structural irregularities are the outcomes of faulty design and poor workmanship, and they lead to uneven distribution of stress, overhead concrete water tanks, and the height of the building (low or middle rise buildings), which influence the evacuation time (Peek-Asa et al., 2003; Meena et al., 2013). The drainage next to the foundation can cause weakening of the foundation and soil nearby due to continuous water leakage. Buildings are used for different purposes; however, the residential and mixed-use category buildings are more vulnerable (Peek-Asa et al., 2003) due to their all-time occupancy and source of income. The flow of population defines the occupancy of the building, which varies during the day and night time. Year of construction directly relates to the use of materials and construction methods practiced. Width of the road and accessibility throughout the year increase resilience, as it will help emergency service to reach on time to minimize losses. A narrow and poorly planned road hinders the response during a disaster.

Results and Discussion

Environmental Aspects

According to BIS report (2017), the study area falls in seismic zone V (high-intensity earthquake damage zone) considering its proximity to the Himalayan Frontal Fault making the households prone to frequent earthquakes. Soil texture and groundwater table of a region play a crucial role during an earthquake. Soil textures with high water retention capacity and areas with shallow groundwater levels are prone to liquefaction (Iwasaki et al., 1984), slipping, and subsidence (Céline, 2019), which not only lead to failure of structure and roads built on it but also hinder the rescue and response activities. Soil test reports in the study area depict that the soil texture is highly porous with clay shale and boulders with ground water level below 170 ft.; thus, the site has no or low risk of liquefaction and subsidence making the household and the infrastructure highly resilient. From the observations, it is evident that the sliding of slope and landslide on the riverbank near the study site is common during the rainy season. The results coincide with the previous studies on earthquake research and assert that secondary hazards such as landslide, flash flood, fire, and reservoir-induced seismicity were triggered by the primary event



Fig. 4 Field photographs show different parts of the study area: (a) Cracks are present in the wall of the house; (b) fractures are present in the roof; (c) cracks are in the roof; (d) cracks are present in the steps and walls; (e) GPS values taken in the building; and (f) cracks are present in residential area

(Daniell et al., 2017; Céline, 2019). LULC change assessment for the study area depicts a mixed type of development including residential, commercial, railway and roadway facilities, bridges, schools, religious institutions, open public gathering places, petrol pumps, hotels, banks, etc. which are vital for the rapid response initiatives in the aftermath of the disaster and for stabilization of the area after the event. The presence of a well-maintained national highway to connect the commercial or mixed built-up areas (residential cum commercial) shows the study area has the facility to receive rapid response and rescue activities through roads. Whereas the

residential buildings are farther away from the motorable road/national highway with crowded and narrow lane areas showing that the response action team cannot reach the site as early as they reach the commercial or mixed built-up area for disaster response. Consistent with earlier research works, the necessity of land use and land cover change assessment provides an opportunity for a detailed profiling of various components that exist naturally in the environment or man-made in an area (Godschalk, 2003). It also supports in assessing the strength and weaknesses of present environment use for disaster resilience. Thus, the environmental indicators could be beneficial in understanding the vulnerability of the region and for planning efficient utilization of resources for disaster risk reduction process. Results indicate that diversifying the availability of resources such as shelters, evacuation routes, and impervious surfaces enables the people to be aware of hazard-associated response mechanism proving that it could be considered as a potential indicator to identify a resilient community in any given area.

Social Aspects

Demographic study identifies that Ward no. 4 has a population of 7585, with an annual growth rate of 43.9%, and a literacy rate of 75%. Household interviews show the average family size is comprised of 6 members. Ward no. 5 has a population of 5534 with an annual growth rate of 21.1%, literacy rate of 87%, and average family comprised of 5. Education makes individuals aware of the situation, to act promptly during an emergency, and warn others. Although the area has the pressure of rapid increase of population, the improving literacy rate shows the ability of the households to resist and cope efficiently and effectively, at present and in the future too for earthquake and associated hazards. Location indicator shows the presence of mixed-use type and commercial buildings along the national highway which indicate good coping capacity toward an earthquake event. Various research works on accessibility to buildings equipped with communication devices (TV, phone, mobile, fax, etc.) indicate to have strong social networking ability which in turn improves the dissemination of information for response and recovery (Suwanmolee, 2016). Some residential areas are congested with narrow lanes and low mobility hindering emergency response and evacuation.

Awareness on the importance of proper planning and emergency management, and finding an alternative to/ modifying the narrow lane, will help in reducing the existing risk associated with poor planning and thus will enhance community resilience. Figure 5 shows the building-wise population in the study area. The level of awareness about the natural hazards is found to be identical and higher among authorities and communities enabling them to be well prepared to adapt and cope with the stress. Respondents also reported that they have witnessed mild tremors now and then in the area but not a strong earthquake in the recent decades. However, few respondents recollect that they have felt the very severe earthquake that occurred in Nepal in the year 2015.

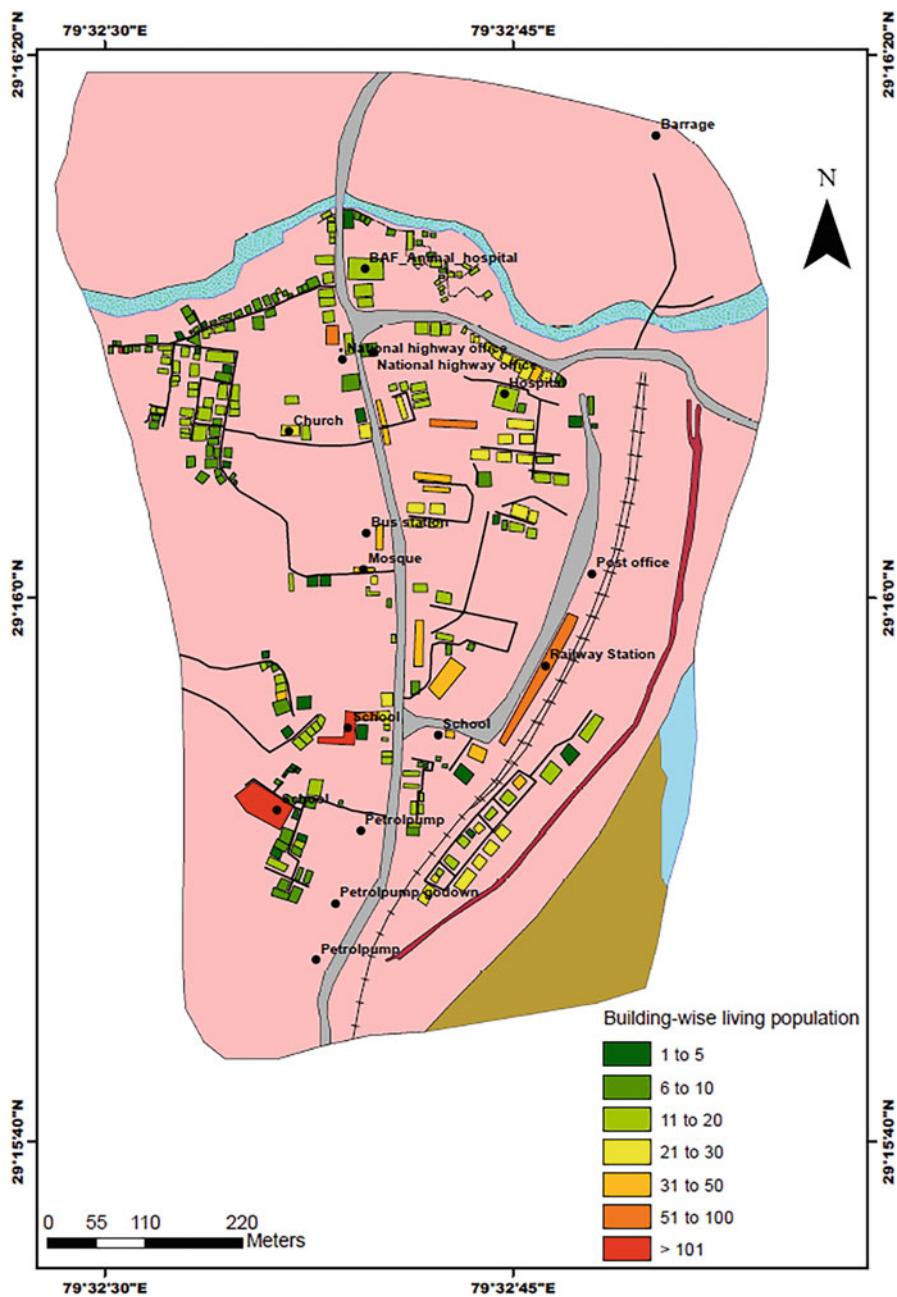


Fig. 5 Building-wise living population map of site

Economical Aspects

Income of households has a direct impact on their coping capacity. Since households were reluctant to tell their monthly income, conclusion was drawn from the past studies and census data of both wards. Ward 5 has households with high income while Ward 4 has low- and medium-income households. In the study area, there is no agricultural activity or livestock-rearing practices and the narrow range of livelihood opportunities in the region. Majority of the households are employed as either main or marginal workers in the study area. The majority of the population is employed in the tertiary sector as there is very less or no land for agriculture. Since the number of marginal workers (part-time) stands relatively low in comparison with main (full-time) workers, it shows better resilience of the community as the likelihood of having immediate disaster emergency plan or supply stocks for recovery. The average occupancy per household in Ward 4 is six and in Ward 5 is five (Fig. 6). It is understood that the household with better livelihood has the opportunity to tertiary education and those individuals are better in gathering provisions or implementing a better strategic plan to face a disaster event. With high occupancy, a greater number of individuals from a particular household can participate in economic activity. Also, with a high literacy rate the possibility of getting into an alternate occupation is higher indicating the presence of economic resilience in the area.

Physical Aspects

In the study region, the majority of the physical features are buildings that are built using concrete except for the few old buildings, which are built with conventional resources like timber, stonewall, and are short in height (present in both wards). The roof type varies with the time of construction in the area. Most of the old buildings are single storied, with tin and cement sheets as the rooftop. The new buildings are multistoried with brick walls, and the rooftop is constructed using cement and tin shades. In the study area, 71% are residential buildings, 14% are used both as commercial and other purposes and are classified under mixed use, 5% of the buildings fall under public infrastructure belonging to the government, 2% of the buildings are under educational category, and 6% fall in the category of others. All buildings are low rise (Fig. 7), with 51% buildings having ground floor only, and only 2% have second floor. With high single storied structure, quick evacuation is possible; even the elderly, differently abled, and children can be evacuated. During a building collapse, multistoried buildings tend to cause more damages to neighbor buildings, which is rare in case of single or double storied buildings. Occupancy-wise also, high-rise buildings tend to have more occupancy than the single-story building increasing the risk factor. Hence, the resilience of single- or low-rise buildings is better than high-rise buildings. The existing conditions of the building are marked under good, moderate, and low categories based on cracks present in the

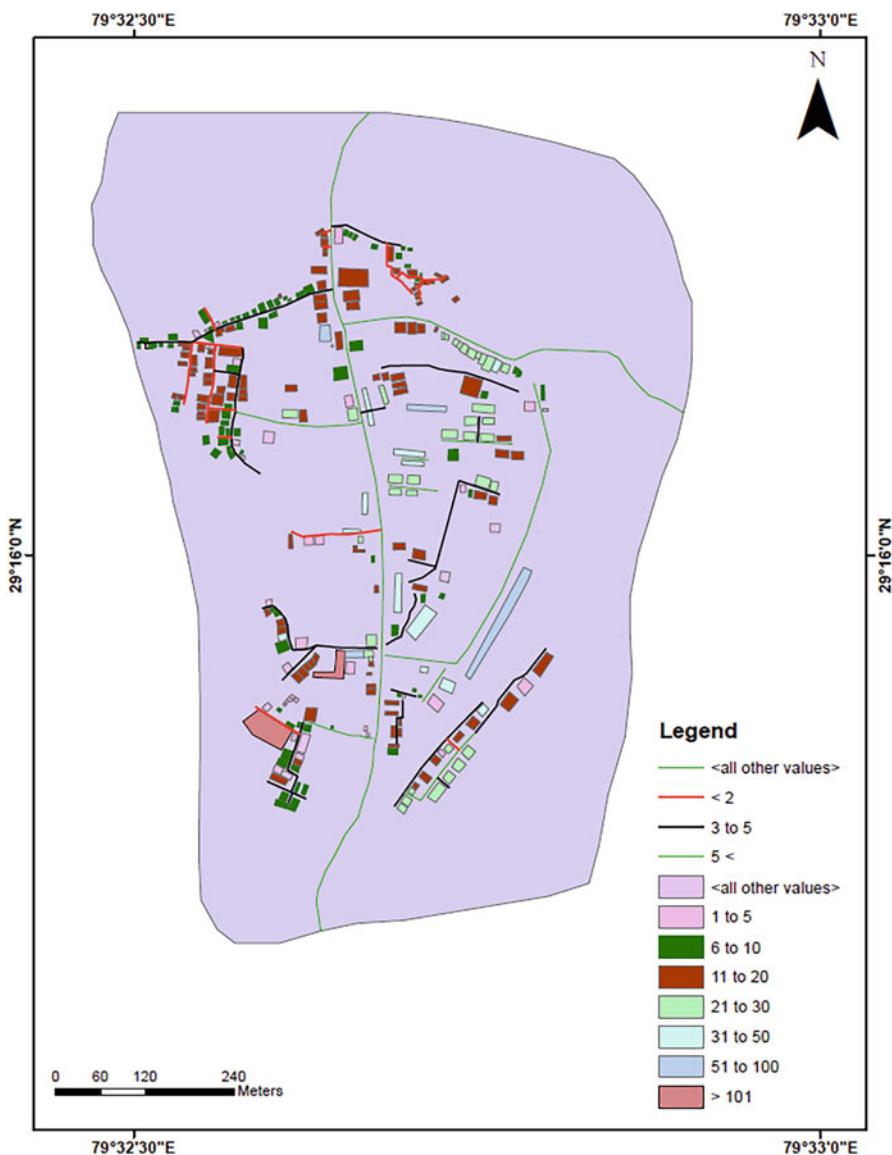


Fig. 6 Population distribution with road infrastructure of site

buildings. 44% of buildings have minor cracks, which have no or less effect on performance while 10% have major cracks and gaps in walls, doors, and windows (Fig. 8). Cracks directly affect the performance of the building. Buildings with major cracks (10%) are of main concern as they have very low resilience toward a seismic event. Since almost 90% of buildings have moderate and less cracks, the existing condition of the building shows good resilience. Total 34% of the buildings have

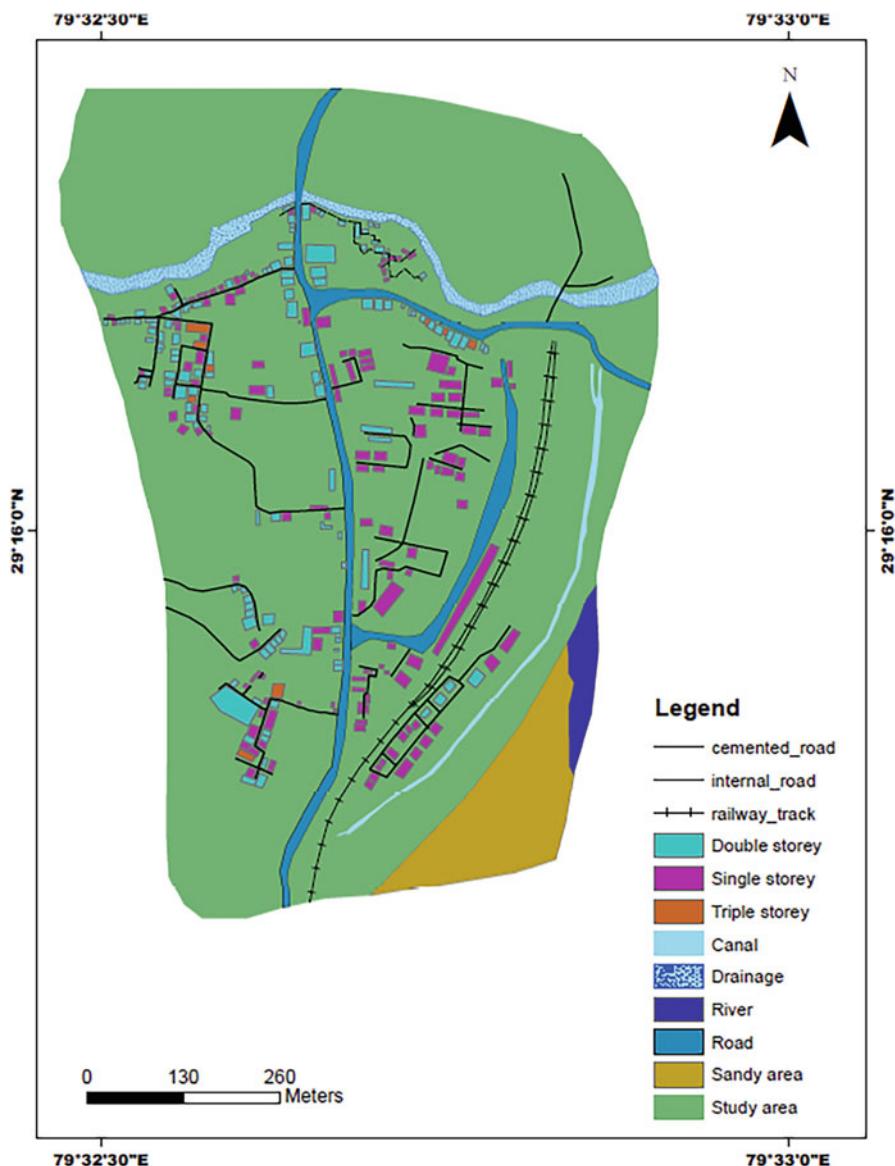


Fig. 7 Number of stories in building at study area

some form of geometrical irregularities and hanging hazards like piles of fuel wood on tilted roofs, and unused and old household stuff stored on slanted sheet roofs. Such extension with additional weight is unpredictable and increases the risk factor for the households. Using the union function of ArcGIS, the abovementioned indicators were merged. The result shows that out of the 71% of residential

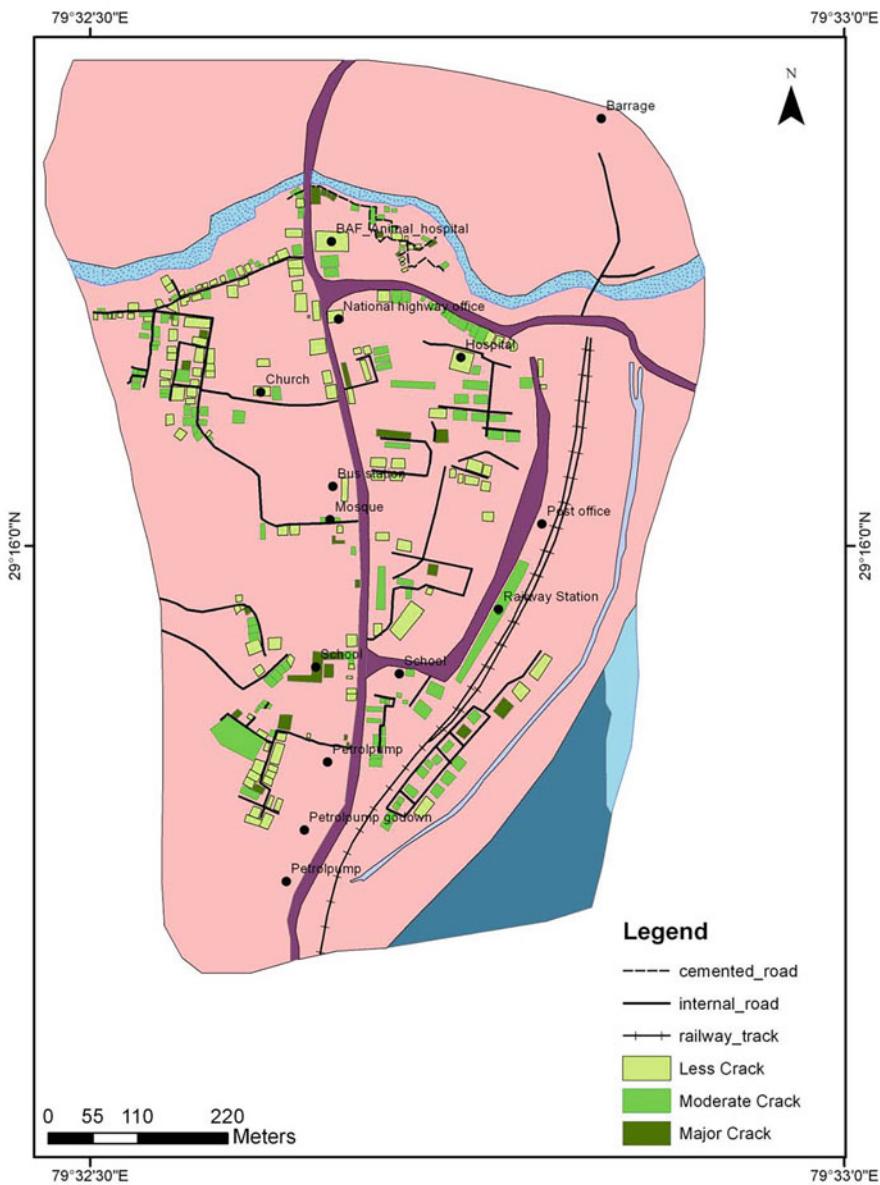


Fig. 8 Building with cracks in wall door and window in study area

buildings, 8% fall in the very high-risk category due to the presence of cracks or irregularities and hence have low resilience against seismic events. The risk factor, categories of very high-, and high-, falls in residential buildings followed by mixed-use and commercial. In the study area, there are 17 road segments having a width of

less than 2 m and in the case of emergency very difficult to assess for rescue and relief activities. In case of collapsed building, these areas will be difficult to access. Educational buildings that can be used as shelter during a seismic event are identified under the high-risk category due to lack of maintenance and attention of concerned authorities. Overall, the buildings in the study area have good physical resilience. They could further be enhanced by authorities by addressing issues like maintenance, awareness, and community participation in pre-, during, and postdisaster response and resilience activities.

Conclusion

Resilience is a dynamic phenomenon, which helps in accessing the ability of household, community resistance, and coping capacity toward the disturbance caused by stress and coming back to normal functioning from the seismic shock. Multiple features present at the community level affect the various degrees of resilience, hence assessing this in earthquake-prone areas is a complex task. The framework uses the vulnerability of the study area as its primary input, placing it under various indicators and dimensions of resilience. However, there are a few challenges and gaps in this. For example, the economic dimension deals with the economic profile of the area; due to hesitation among households, income and caste data could not be collected from most of the households. Similarly, since data is collected during working hours, the male members of the family were out for work and females of the households were not able to give data on physical dimensions like foundation type, materials used, year of construction, etc. No data on tremors felt in the area was available with the authority or with the household. So, the past experience factor under social dimension could not be analyzed. Since the migration rate has been high in the last two decades in the region, it has the potential to influence the dimensions at multiple levels. Thus, capturing its effects at the community level is difficult. Despite the above shortfalls, the study has successfully analyzed the resilience of the community at the household level. Thus, the framework can be used to analyze the resilience of other hazards in any region as it highlights the vulnerable and risk aspects of the community. With the increasing advocacy to adopt the community resilience, incorporation of insurance details and awareness level of citizen will help in improving the analysis further.

Himalayan region is sensitive toward seismic events, and inability to predict the timing, location, and magnitude of it thus will produce huge impact on human and properties. In this situation, preparedness at structural and nonstructural levels, and determining the weakness and strengths of the community, can help in reducing the impacts of earthquake. The composite indicator framework used the following four dimensions to resilience measurement, namely, physical, economic, social, and environmental. Union of the indicators shows the vulnerability and the risk associated with them has direct effects on the resilience of the household (Fig. 9).

Out of the total household surveyed, around 8% buildings in the area show high risk, implying low level of resilience as the population residing is at constant risk of casualty.

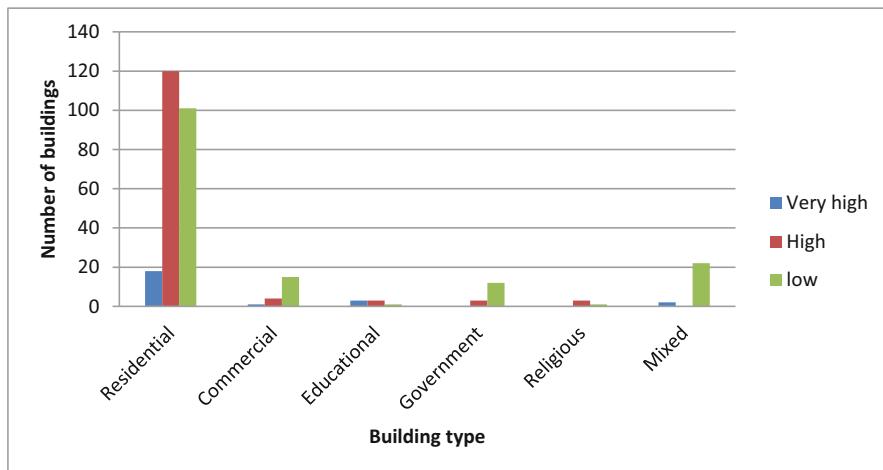


Fig. 9 Category-wise risk assessment of the building in the region

Commercial and mixed-used buildings at risk will impact the livelihood of the household, as it will affect their coping capacity by causing delay in livelihood recovery. A high education level enables individuals to acquire work skills faster, which in turn improves the adapting and coping capacity toward stress. However, the presence of narrow resources at community levels leaves less space for skill diversification.

Another important observation is the high rate of migration in the study area. Households residing in an area for years develop an understanding of the existing hazards and ways to cope with them through structural and nonstructural measures. However, in regions with high migration, these experiences are difficult to find. The high rate of migration to the low-income region and an expansion of settlement toward the riverbank put pressure on environmental and economical dimensions in the area that reduce the resilience levels of the community. With the increasing need of making resilience an integral part of disaster risk reduction, emphasis should be given to the role of community and authority. Mass awareness programs on seismic risk and good construction practices should be discussed with the community at the local level. Natural or artificial diversification of resources should be done to make the community more resilient toward stress. Region-centric intervention and micro-level study toward resilience should be encouraged. Authority should ensure implementation of building codes and training of local masonry in earthquake-safe construction practices.

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Part V

Institutions and Governance



Introduction: The Importance of Good Governance in Disaster Management

53

Nivedita Haran

Abstract

Disaster management is an integral part of governance. In the introduction, attempt has been made to bring the different chapters under a common theme and to point out the role played by the public/state agencies in this regard. Disaster can impinge on the life of anyone regardless of location, class, or gender. But the ability to face a disaster improves with better awareness, robust infrastructure, and stronger financial status. In other words, vulnerability is inversely proportional to risk, hence the need to engage all stakeholders in managing disasters.

Keywords

Governance · Inter-connectivity · Non-state actors

Introduction

Disaster management is closely linked to governance. Government or the state normally takes the lead in managing disasters. Even though the philanthropic organizations or individuals, volunteers, local residents, and other non-state actors pitch in, the organized assistance in disasters always comes from the government. This is more so in the pre-disaster scenario, preparation, awareness-building, generating better ability to face the impact, and mitigation. Ancient literature indicates that post natural calamities the benevolent rulers responded by providing relief assistance, writing off loans, or reducing taxes. History also provides spine-chilling examples of rulers squeezing taxes from drought-hit farmers causing untold misery

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and hardship. Historical records show how as a country under occupation food crops were diverted by the British government to feed its soldiers and countrymen during the Second World War leading to the Bengal famine that took the lives of more citizens in undivided Bengal than those who died as a result of the war. This reinforces the importance of sensitive and able governance to face disasters.

The chapters in this section deal with specific events and what measures were taken to handle these events, be it a cyclone, an epidemic, floods, or other natural and anthropomorphic disasters; the chapters also deal with the general institutional status and the need for systemic improvements to face disasters with greater alacrity and aptitude in order to ensure the loss of lives and property is at a minimal. Given this wide spectrum, the chapters perhaps are a bit eclectic as is wont to happen when the author selects the topic within the broad domain and not vice versa. However, this carries a major advantage: the reader is served an array of topics with diversity. Thus, while there is scope for the author to indulge in innovative thinking, creative conceptual analysis, and novel suggestions, there is also scope to tickle the readers' imagination while keeping an open, unbiased mind. The reader is free to glean out the administrative issues underlying the discussion without being spoon-fed into accepting the author's version alone. After all, some of the best and most practicable solutions have emerged thus. The idea to call up the District Disaster Management Officers (DDMA) in turn every week over VHF came to us when all phone lines were down and the VHF radio system was falling into disuse due to sheer nonuse. That's the beauty of a good idea: it pops up out of nowhere and survives the naysayers.

The Asia-Pacific region is the home for a diversity of natural disasters: flood and drought, cyclone and earthquake, and coastal erosion and landslide. Flood has been omnipresent in this region; with a surfeit of rivers and rivulets crisscrossing the land area and given the river flow and the density of population along the banks, the monsoon invariably brings floods in some region or the other. But, alas, it does not remain a natural phenomenon; human interventions have also been a causal factor for flooding. The urban floods are strongly human-induced: encroachment into riverbank and riverbed, filling up of ponds and lakes that were meant to act as drainage source, ill-planned bridges, etc., are all a result of increasing population density, human insensitivity and greed, and weak or ineffective administration in enforcing building and town planning regulations, and more than one paper tackle this subject. Floods caused due to cyclones are a bit more complicated, and the importance of community participation and local bodies is a moot point. The importance of flood management plans to save lives and properties and the role the public agencies play are undeniable. But the role of local volunteers, social groups, and other non-state actors is equally important initially as the first responders and later at the stage of reconstruction. At the same time, the lack of transparency within some of the non-state agencies and diversion of funds for unbudgeted functions are also worth attention.

In hilly areas, floods bring landslides which can be even more difficult to mitigate. Landslides and rockfalls have the potential to destroy lives and property and also to severely impact upon vegetation and forest. The significance of a robust and alert

administration is even more necessary here as is the need for digitized vulnerability mapping.

In a region so well endowed with high levels of precipitation, it may come as a surprise how drought occurs at fairly regular intervals in the countries in Asia and more specifically in South Asia. Drought has a strong impact on human lives, crops, and livestock; its impact on forests, cash crops, river watersheds, and water bodies is equally severe and long term. The lingering impact of drought makes it doubly dangerous as mitigation needs to be long term.

The Asia-Pacific region is carried over two geotectonic plates: the Australasian and the Asian, both of which are more active than some of the other geotectonic plates. The movement of the two plates and their rubbing against each other have created some of the most fantastic and youngest of mountain ranges, including the Himalayas that has given us Mount Everest, the highest peak in the world, but they are also the source of volcanic eruptions, earthquakes, and tsunamis. Since earthquakes are a natural disaster that cannot be predicted, the need for preparation and the role of active and dedicated administration become even more important.

Given the events and experiences of the past 2 plus years, the impact of the recent pandemic on human life, health, and livelihood is a matter of immense concern. The readers will be exposed to some interesting discussion on the impact of disasters on heritage sites. Then there are the anthropogenic disasters, viz., traffic accidents, nuclear disasters, terror attacks, and even wars. Some natural disasters get aggravated by human misdoings, and there are examples galore: fire, explosion in factories or in transport vehicles, etc. The authors have not limited themselves to simply analyzing the nature and handling of a specific disaster event: they have gone on to make their suggestions on what could be done to improve systems of administration. It is up to the readers to pick out the relevant suggestions and consider for replication on the ground or for further research.

The readership target for this handbook is rather diverse: it can be a good reference book for students, researchers, and teachers engaged in relevant disciplines; it is also targeted for public servants, especially those in this part of the region who are working at the field level or at the policy-making level; the book is also a compendium of disaster management for the corporates, activists, NGOs and INGOs, and anybody who evinces an interest in the subject. Hence, the potential readership could cover a wide spectrum, even 360 degrees.

Having been part of the disaster management teams in various capacities right from being the first responder that manages relief to reconstruction and later as the policy formulator, the question often asked is: which is the most difficult part? Frankly, no part is easy. As mentioned earlier, the state agencies are normally the first responders in a disaster event: the village officer (patwari), fire service, police, health services, and others. This will remain the primary responsibility of the state in most countries. But as we know, a disaster event response calls for alacrity, sensitivity, and access to basic infrastructure. As the DM Act, 2005, clearly states, not only is the state required to respond, it can also draw upon overarching powers to draw on any infrastructure available to ensure best services possible. The need of the hour is to save lives and property, private and public.

While drafting the disaster management policy (Kerala State Disaster Management Policy 2010; Kerala State Disaster Management Rules 2007) for the state of Kerala besides an extensive information search, various groups and stakeholders were contacted: the scientific organizations to seek data and knowledge, the universities for research work done, the media to gather data on past major disaster events, and different departments that had been engaged in the past in handling disasters, primarily home, agriculture, health, and revenue. A robust policy is a creation based on the right quality and right proportion of data, technology, and legal background all brought together with the objective of ensuring safety and security of the people. Of course, there are pitfalls: there are activist groups that have their own vested interests and who pursue their own agenda, and there are corporates keen on pushing for certain technologies or products, sometimes unknowingly but at times knowingly, and it is important to protect oneself from such pitfalls in order to ensure the policy being framed is balanced and does not deviate from its basic objective/s.

Furthermore, disaster management policies often cut across national boundaries much as climate change: more often than not the policy of a country could impact on neighboring countries or on the land, air, and water that it shares with other countries, sometimes even distant neighbors. That is where the concept of Vasudhaiva Kutumbakam or “the entire world is a single family” becomes so relevant. Rivers, mountains, deserts, and seas exist in their own right as geographical features without any concern for boundaries. Interventions on mountains could impact the weather parameters, the water flow in rivers emanating from these mountains, water-carrying capacity, rainfall, and temperature variations not only in the country that carried out such interventions but also countries surrounding it. The concept of the world being one family could not be more relevant than when viewed in the context of disaster management. The slight shift in the tectonic plate could cause an earthquake hundreds, nay, even thousands of kilometers away, and denuding of forests could affect the rainfall in countries far, far away, as indeed rivers and mountains and clouds and wind are not amenable to political divisions, nor are microbes and viruses as the world has experienced with disturbing poignancy over the last 3 years. That is why any work on disaster management has to be apolitical.

A few suggestions are apt with respect to the problems and shortcomings one finds within governance systems and outside:

- 1. Surfeit of agencies:** The most glaring issue is of the multitude of agencies working in the sector of disaster management that at times lacks unity of command and sometimes undercuts each other. Frankly, the engagement of multiple agencies is not an issue; after all, DM is the domain of many departments and falls under multiple disciplines. So, there are departments of home, agriculture, forests and wild life, environment, climate change, health, social welfare, water supply, transport, power, coast guard as well as the armed forces, and some more that are called upon to deal with it. Similarly, research on DM could be and is being carried out under a plethora of disciplines: sociology, public administration, law and governance, IT, geography, geology, botany, zoology, anthropology, health, engineering, and others. This is actually a good side as needless

compartmentalization has often been the bane of meaningful research. However, what is not acceptable is the lack of coordination between the different departments and disciplines. The wide chasms that exist are of concern. The natural scientist does not know and does not care to know the work being done in the social sciences. The researcher has no clue on the hurdles faced by the field officials or the kind of research work required for policy formulation. Digital technology remains far removed from all of the above. There is need to fill these existing gaps, and the earlier it is done the better. There is also the need to understand the role and importance of each. A holistic view would enable us to find better and lasting solutions. Take the case of floods in rural areas: The study of the gradient of the terrain, the water-carrying capacity of the river stretch, and siltation are for the natural sciences; the encroachments on riverbanks and riverbeds and strengthening the banks through embankments require engineering solution; planting of bio-shields is an environment-linked solution; digital mapping is for the IT and geography researcher; and finally an overall project to mitigate the problem of floods every monsoon is for the DDMA.

2. **Talk less, do more:** DM being an emerging area, there are a lot of new entrants hoping to find a niche for themselves. But the attempt to find fault with every work or research done is an egregious tendency. There is need to make research need-based and innovative. There are innumerable subjects waiting to be studied; yet, topics already researched are taken up again and again as this is an easier way out. DM being so intricately linked to public governance, it is advisable for research topics to be selected after consultation with the field officials and executive heads to avoid repetitive research that is a waste of national wealth in more ways than one.
3. **Look within:** Every agency engaged in DM while finding fault with other agencies should also look critically at whether his/her views fail to see the problems within the group. So, while there is need for sensitivity, there is also the need for self-introspection. Without being carried away by biased analysis, every agency needs to make an unbiased and balanced analysis. Taking the case of traffic accidents that falls in the category of anthropomorphic disasters, the per capita fatality per accident is very high in this region, one of the highest globally. This requires all stakeholders to design a plan to tackle every aspect: road design, road maintenance, road furniture and signage (engineering), speed limits, safe driving and enforcing these with utmost strictness (police and lower judiciary), better designing of vehicles (automobile design), guidelines and SoPs (policy makers), generating awareness right from a young age on road safety (education, health), and suchlike more. Similarly, that the natural disasters of yore are now getting aggravated due to man-made interventions is a worrisome fact. Without indulging in unnecessary polemics, each governing unit from the grassroots level needs to start working on it with sincerity and alacrity, be it floods caused by riverbank encroachment, landslides caused by forest denudation, or destruction of marine life due to oil spill.
4. **Non-state actors:** The disaster management setup in any country can be robust and active only if the state and all non-state actors come together for complete

synergy with each agency performing its role with dedication and responsibility to create a narrative of commitment and empathy. The state agencies by their very nature are distant and aloof. Also, a number of departments are required to deal with disasters in its various facets, some of which are as follows: home, health, agriculture, water supply, irrigation, power, environment and forest, and science and technology, all under the overall coordination of revenue and disaster management. However, managing disasters at every stage requires involvement and understanding that can only arise from a missionary zeal. It is for this reason primarily that while the state agencies perform their respective roles as laid down in the statutes, some activities can be best performed by the volunteers and philanthropic workers and other social constructs. It was found that while distributing relief material post-tsunami, much of the donated clothes were used clothes and of the type that the displaced persons would not be comfortable to wear. It was the volunteers who reported this fact to the Relief Commissioner who understood the objection and sorted out the issue. In another instance, during the panic generated due to the cracks detected in the 100-year-old earth and limestone Mullaperiyar dam in Kerala and the delay in reducing the water level, using college students and teachers, a massive awareness drive was launched by the SDMA with the local bodies along with setting up of floodlights to constantly monitor the water level and identify evacuation centers located higher than the anticipated floodline level that could allay the fears of the local inhabitants. Empathy and understanding are inalienable qualities essential in frontline workers handling disasters, be it state or non-state.

5. **Financial probity:** Fund flow at every stage of managing disasters, preparatory, relief or reconstruction, involves large amounts of expenditure. The DM Act, 2005, assigns immense powers on the SDMA and DDMA, and these powers are often delegated to block, village, and panchayat authorities. Substantial funding from the corporate sector under CSR is utilized for disaster mitigation, preparation, and relief and rehabilitation. Much of the funds are allocated and utilized under tremendous time pressure which paves the way for misuse of funds, at times unintentionally but sometimes intentionally too. There are enormous powers assigned that leave the scope for misuse of authority and embezzlement of funds. In a path-breaking case post-floods in Kerala in 1990–1991, a protracted vigilance inquiry could establish the willful dishonesty on the part of a senior district officer leading to his dismissal from service. But in the confusion that often prevails after a disaster, such cases are difficult to detect and equally difficult and time-consuming to prove. Similar or more serious misuse of funds is noticed among the non-state agencies and corporates, the latter in utilization of CSR funds, but since the kind of supervision, transparency, and auditing that exists in the public services is not present for the non-state sector, these often go undetected or uncorrected.
6. **Bottom-up approach:** The close involvement of the local bodies at every stage of disaster management, be it awareness and capacity building, relief or rehabilitation, or even sourcing of funds, can never be underestimated. There are various reasons for that: First, the resource availability and ground needs can be best

assessed at the field level. Second, accountability is best enforced at the field level; plans and guidelines are best enforced locally. Third, every activity connected to disaster management can deliver optimally when there is empathy from all stakeholders. Therefore, except major projects that cut across many panchayats and taluks or even districts, other projects are best implemented with the involvement of the direct stakeholders. Even for larger projects it is advisable to break it down into sub-projects engaging the local residents in the sub-projects. The Oachira drinking water supply project in Kollam district implemented with special post-tsunami reconstruction and rehabilitation funding would have remained effectively futile as the tail-end coastal residents would not have got the benefit of the pipe water as the water pressure remained low. It was only after a special pumping system was set up that water reached the coastal community, the community for whom the project was actually targeted under the 2004 tsunami rehabilitation program. The program to set up task forces at the panchayat/village level to handle health and hygiene, relief and temporary shelters, and awareness and preparedness is an excellent idea that started in 100 villages in Kerala but thereafter fizzled out. The three task forces could act as the eyes and ears of the local authority and would include persons available locally, such as retired teachers, public servants, nurses, etc. The task force set up for overseeing the temporary shelters can be extremely useful in ensuring safety and security of the inmates in the shelters and as a forum to redress grievances.

7. **Technology and its benefits:** These are times when technology plays a crucial role in good governance, even more so in managing disasters. Gone are the days when chain and cross-staff was used to measure the Earth's surface and height of mountain peaks. Land gradient can now be measured using digital technology, and floods are forecast using AI. Tsunami resulting from shifting of maritime tectonic plates impacts sea levels whose reach can be predicted with time period close to millisecond accuracy. The Indian National Centre for Ocean Information Services (INCOIS) is engaged in this work 24-7. The sensors placed in some of the Himalayan rivers assess the flow of water and issue forewarning on possible floods downstream. Such data needs to be collected and shared with all impacted areas and countries to alert the administration that can help save a large number of lives and properties in this part of the globe that is one of the most densely populated and is home to almost half the global population. There is urgent need for vulnerability maps based on digital data in order to make all attempts at mitigation and awareness-building more focused. The use of messaging and other apps to generate alerts on an approaching cyclone and resulting high tides even in the remote areas of Sundarbans is a case in point.

Conclusion

The problems that are starkly evident in disaster management governance are present in almost all countries as governance improves over time, through development and gathered experience. The important aspect is to learn from every experience and not

get overconfident. Also, a 360 degree oversight is crucial as is engaging all stakeholders. After all, taking mitigative measures to face a disaster and adapting to climate change are two sides of the same coin; when the two work in tandem, the result can be phenomenal. The chapters in this section help in focusing on these issues and perform one of the most important roles: learn from each other's experience.

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Building Resilience and Community-Based Disaster Risk Management (CBDRM): Experiences and Lessons from Communities in the Philippines

54

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Contents

Introduction: Understanding the Philippines' Vulnerability to Hazards	846
From Emergency Response to Building Community Capacity for Risk Management and Resiliency to Disaster	847
Building People's Resiliency to Disaster Risk and Climate Change	849
Building People's Capacities for Disaster Preparedness, Prevention, and Mitigation	849
Building Resiliency Through Disaster Preparedness, Sustainable Livelihoods, and Sustainable Housing	851
Building Local Resiliency and Food Security Through Sustainable Agriculture	853
Institutionalizing CBDRRM into Local Governance	855
Conclusion: Key Lessons in Understanding Resilience, Agency, and Social Transformation in the Context of CBDRRM Practices	858
References	860

Abstract

Community-based Disaster Risk Management or CBDRM is a “people and development oriented, comprehensive and participatory approach in reducing possible losses in the lives, properties, community resources and environment due to natural and human induced hazards” (Luna, E. M. (2007). At the center of the CBDRM framework and approach are people and communities – the analysis of people’s vulnerabilities and their individual and collective capacities in addressing the impact of the disasters and in transforming structures that have made them vulnerable to disasters. CBDRM gives primacy to building the capacities of people and communities in four aspects/processes – disaster prevention and mitigation, disaster preparedness, emergency response, and recovery and rehabilitation.

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This chapter focuses on experiences and lessons of selected communities, people's organizations, and NGOs in the Philippines in integrating CBDRM into processes of community development, sustainable agriculture, and participatory governance.

One of the goals of CBDRM is community resilience. This chapter also presents critical reviews of prevailing definitions of resilience and how the practices of grassroots communities and people-led CBDRRM are leading to emerging concepts of community resilience that include people's initiatives to challenge and transform structures that perpetuate their vulnerability, as well as efforts to promote sustainable development, social justice, and equity.

Keywords

Community-based disaster risk management · Resilience · Sustainable development · Community organizing · People's participation

Introduction: Understanding the Philippines' Vulnerability to Hazards

According to the 2016 report of the World Risk Index of the United Nations University – Institute for Environment and Human Security (UNU-EHS), the Philippines is one of five countries deemed to be most vulnerable to natural hazards and impacts of climate change. About 20 typhoons hit the country annually, usually in the months September to December. These typhoons often result in floods causing the loss of lives and livelihoods. For example, Yolanda (international name: Haiyan), one of the deadliest super typhoons in recorded history, hit the Philippines in 2013, causing at least 6200 deaths, more than 25,000 people injured, and an estimated cost of damage to agriculture and infrastructure reaching up to Php 40 million (Bawagan et al., 2015). In 2009, three successive storms hit the country: Ondoy, Pepeng, and Santi. Ondoy (International name: Ketsana) caused massive floods in Metro Manila and nearby provinces such as Bulacan, Pampanga, Batangas, Laguna, and Rizal. Three days after Ondoy left the country, typhoon Pepeng (international name: Parma) swept through Northern Luzon causing floods and landslides. In October of the same year, typhoon Santi (international name "Marina") landed in Central Luzon. These three successive in 2009 typhoons left 961 people dead, affected 2 million families, and caused damages amounting to a total cost of USD 4.38 Billion (Polotan-dela Cruz et al, 2010).

The Philippines also often experiences earthquakes, volcanic eruptions, and landslides. One of the deadliest volcanic eruptions in recent Philippine history was the Mt. Pinatubo eruption from April to Sept 2021, causing 847 deaths. In 2006, Mt. Mayon in the Bicol region erupted. This volcanic eruption coincided with heavy rains from Typhoon Durian, which caused mudslides and lava flows killing more than 1000 people.

The frequent occurrence of disaster in the country is often attributed to its geo-physical characteristics, which makes its vulnerable to natural hazards like typhoons, earthquakes, and volcanic eruptions. At the same time, other socioeconomic factors have caused the Filipino people's vulnerability to the adverse impact of natural hazards. These factors include environmental degradation caused by large-scale mining and massive logging, poverty and unsustainable livelihoods, which have led to increasing numbers of informal settlers in high risk areas in urban and rural areas, unstrategic development planning and governance that has failed to address the structural roots of our people's vulnerability to crises and disasters.

Development workers in the Philippines believe that

disasters should be viewed not as extreme one-off events but as a manifestation of unresolved problems of development planning, social exclusion, inequity and conflicts, bad governance and unsustainable development (Polotan-dela Cruz et al. 2010, p. 2)

Development workers, environmentalists, and social activists point to the prevailing economic policies, often referred to as Neoliberal development policies, that prioritize economic growth over social development – the provision of peoples's basic needs such as food, shelter, primary health care programs, sustainable sources of livelihood; sustainable agriculture and food production; sustainable urban/rural development, etc.

From Emergency Response to Building Community Capacity for Risk Management and Resiliency to Disaster

Because of the Philippine's high level of vulnerability to various hazards, disaster risk management has become an integral part of development work of the government, civil society organizations (CSOs), and nongovernmental organizations (NGOs). In the past, the usual response to disasters mainly focused on emergency response – relief distribution and the evacuation of disaster survivors.

In the past three decades, CSOs and NGOs working with urban and rural poor communities have shifted to more pro-active, comprehensive, multisectoral, and community-based approaches to disaster risk management. Central to this community-based approach is the active participation of people in affected communities. The Citizen's Disaster Response Center (CDRC) was one of the pioneers in the formulation and promotion of a "citizenry-based development-oriented disaster response in the Philippines (Bawagan, 2011). CDRC helped establish the Center for Disaster Preparedness or CDP, a resource center for CBDRM aimed at building capacities of NGOs, people's organizations and government agencies in CBDRM (Bawagan, 2011). In 2002, CDRC and the Philippine Disaster Management Forum (PDMF) spearheaded the advocacy for a new law on disaster risk reduction that

underscored the importance of a community-based framework for disaster response (Luna, 2004). In 2009, the PDMR, along with academic institutions, environmental NGOs, and other organizations involved in CBDRM formed the DRRNet Phils whose advocacy efforts eventually led to the enactment of Republic Act 10121. RA 10121, which was passed on 27 May 2010 is:

An Act Strengthening the Philippine Disaster Risk Reduction and Management System, Providing for the national Disaster Risk Reduction and Management Framework and Institutionalizing the National Disaster Risk Reduction and Management Plan ([Official Gazette.Gov.Ph](#))

Republic Act (RA) 10121, known as the Philippine law on DRRM, underscores the need for a comprehensive, multisectoral, and community-based approach to disaster risk management. The DRRM approach in the Philippines, as mandated by RA 10121, stresses the need to undertake interventions in four interrelated components: disaster prevention and mitigation, disaster preparedness, emergency response, rehabilitation and recover. It also stresses the importance of promoting and strengthening the participation of people and communities, especially sectors most vulnerable to disasters: poor and marginalized communities, women, children, PWDs (Bawagan, 2011.)

The “community-based” approach is key in the implementation of RA 10121. CBDRM is a “people and development oriented, comprehensive and participatory approach in reducing possible loses in the lives, properties, community resources and environment due to natural and human induced hazards” (Luna, 2007). The people and their communities are at the center of the CBDRM framework and approach – the analysis of people’s vulnerabilities, their individual and collective capacities in addressing the impact of the disasters, as well as in transforming structures that have made them vulnerable to disasters. CBDRM gives primacy to building the capacities of people and communities in the four aspects/processes – disaster prevention and mitigation, disaster preparedness, emergency response, and recovery and rehabilitation.

The following sections highlight the experiences of communities in undertaking CBDRM, particularly in terms of integrating CBDRM and processes of people’s empowerment, community development, comprehensive and participatory development planning and participatory local governance, the promotion of sustainable agriculture, and the building of local resilience to climate change.

Deriving from these experiences, this chapter will also present critical reviews of prevailing definitions of resilience and how the practices of grassroots communities and people-led CBDRRM are leading to emerging concepts of resilience that include people’s initiatives to challenge and transform structures that perpetuate their vulnerability, as well as efforts to promote sustainable development, social justice, and equity.

Building People's Resiliency to Disaster Risk and Climate Change

The Hyogo framework defines resilience as:

The capacity of a system, community or society potentially exposed to hazard to adapt by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase this capacity for learning from past disasters for better future protection and for improving risk reduction measures. (UNISDR, 2005. cited in Tan, 2010, p. 208)

Resiliency is the reverse of vulnerability. By focusing on resiliency, we place greater stress on what members of the community – individually and collectively – can do for themselves and how to enhance their capacities, instead of focusing on their vulnerability to disaster (Twiggs, 2009. cited in Polotan-dela Cruz et al., 2010, p. 2)

Building People's Capacities for Disaster Preparedness, Prevention, and Mitigation

Two aspects of DRM – disaster prevention and mitigation, and disaster preparedness – focus on a pro-active, continuing processes of building the capacities of communities for preventing, reducing, or mitigating the destructive impact of hazards. The building of early warning systems and mechanisms managed by the community is a key part of disaster preparedness, which hopefully also helps in reducing or mitigating the impact of hazards.

According to the ISDR:

Early warning systems empower individuals and communities threatened by hazards to act in sufficient time and in an appropriate manner so as to reduce the possibility of personal injury, loss of life, damage to property and the environment, and the loss of livelihood. The expression ‘people-centered early warning system’ is used to emphasize that warning systems must recognize human needs and human behavior, and must be developed with local participation from women and men (ISDR, 2007, p. 46, cited in Garcia, 2010)

The experience of the Social Action Center (SAC) of Infanta in enhancing early warning systems (EWS) of the municipalities of Infanta and General Nakar, Quezon province is a wellspring of lessons in this regard. Quezon is a province in Luzon region; it is located near the Sierra Madre Mountain Ranges and the Pacific Ocean. The towns of Infanta and Gen Nakar, in particular, are located along the Agos River. Given their geographical location, these municipalities experience typhoons as well as flashfloods, mudslides, and landslides (Garcia, 2010). Every year, the province of Quezon and the whole region of Southern Tagalog is hit by a strong typhoon that causes landslides and floods resulting in deaths, destruction of farmlands and homes of farmers and indigenous peoples. In 2004, typhoon Ibiang (international name

“Winnie”) led to the death of more than 1500 people from these municipalities. Quezon province is also among the ten poorest areas in the Philippines, which makes it more challenging for the people of Quezon province to cope with and recover from disasters (Luna, 2010).

The project of SAC-Infanta and Christian Aid in 2010 installed a community-based and people-centered systematic communication and early warning system (EWS). It included the following components: (1) developing risk knowledge through the systematic collection of data and risk assessment that can be used for prediction and weather forecasting; (2) developing hazard monitoring and early warning systems; (3) developing appropriate local systems for information dissemination and communication for communicating risk information and early warning; (4) building the community’s disaster response Capability (Luna, 2010).

Part of the EWS was setting up of a water level measuring station near the Agos river to be monitored by the communities, and utilizing simple instruments such as fabricated rain gauges, water level measuring tools, and meter tapes (Bawagan, 2011). An important component of the project was the development of codes, languages, and messages about disaster risk management that were easily understood by the local people (Garcia, 2010).

To be able to install technologies and systems that could be easily managed by the communities, an important part of the project was undertaking a series of capacity building workshops. Community members, parishioners, SAC staff, and local government staff learned to use participatory tools and methodologies for the HVCA – hazard, vulnerability, and capacity analysis (Garcia, 2010). Through these trainings, each village was able to develop their own spot maps showing the hazards and resources of the villages. These maps were set up in strategic places, which were visible and easily accessible to the village members (Luna, 2010). Special trainings on search and rescue and medical first aid were also undertaken (Garcia, 2010). So as to institutionalize and sustain the monitoring and early warning processes, the project also helped strengthen the Barangay (village) and Municipal Disaster Coordinating councils, and the formation of DRM volunteer groups (Luna, 2010).

This SAC Infanta project combined high-technology communication and indigenous systems for their Early Warning Systems. It was able to do this by linking up with agencies such as the Philippine Atmospheric, Geophysical and Astronomical Service Administration (PAGASA), Manila Observatory of the Ateneo de Manila University, the University of the Philippines – National Institute of Geological Science (UP-NIGS) (Garcia, 2010).

All throughout the project, people’s consultations, meetings, training workshops were conducted to ensure that the foundation and end result of this project were empowered communities. Key to this empowerment process was helping form and strengthen local/community organizations of farmers, women, indigenous people, and youth who would be at the forefront of the CBDRM processes and programs. Some of the local farmers’ organizations that were supported by the SAC-Infanta adopted sustainable agriculture as a strategy for building resiliency in food production and agriculture. Local organizations also continued to build their capacities not only for CBDRM but also in terms of climate change

adaptability with the help of NGO partners. Some communities have set up their own Quick Reaction Teams (QRTs), Disaster Risk Reduction and Management (DRRM), and/or Climate Change Resiliency (CCR) committees to focus on the continuing processes of building capacities for emergency response, preparedness, prevention/mitigation of the impact of hazards, and climate change adaptation

Building Resiliency Through Disaster Preparedness, Sustainable Livelihoods, and Sustainable Housing

In 2006, typhoon Reming (international name: Durian) caused flash floods and lahar flows in communities surrounding Mt. Mayon in Albay in the Bicol region, killing over 3000 people and destroying almost 114,000 homes. Most of those affected were poor communities and families (Tan [2010](#)).

Responding to this disaster, the Community Organization of the Philippines Enterprise Foundation Inc (COPE-Bicol), an NGO working with communities and basic sector organizations in the Bicol province, undertook in 2010 the pilot project “Building Disaster Resilient Communities” (BDRC) in cooperation with Christian Aid. The BDRC project aimed to integrate the CBDRR framework into community development work by building the capacities of communities for disaster preparedness, sustainable livelihood, and sustainable housing (COPE-Bicol & Corpuz, [2010](#)). The pilot project focused on four pilot communities: Barangay Anislag and Barangay Taysan, two resettlement sites for Typhoon Reming survivors; and Barangay Tagas and Barangay Binitayan, two high risk communities at the foot of Mount Mayon (COPE-Bicol & Corpuz, [2010](#)).

The two high risk areas had 280 families who chose not to leave their homes despite being vulnerable to possible flashfloods, landslides, and lahar flow from Mt Mayon during typhoons. They refused to leave their homes despite the high risks because their employment, livelihood sources, and the schools of their children were within those areas. Those in resettlement sites, some of them formerly residents of these two high risk barangays, had felt that government had neglected addressing their needs in the resettlement sites, particularly in regard to disaster resilient housing, health and sanitation, and livelihood (Tan, [2010](#)).

A series of Participatory Capacity and Vulnerability Analysis (PCVA) sessions were conducted by Cope-Bicol in the four barangays. Participatory methods such as focus group discussions (FGDs), key-informant interviews (KIIs), and various participatory rapid appraisal (PRA) activities such as social mapping, annual calendar of activities, income and expenditure charts, historical timelines engaged the active participation of various sectors of the community in the PCVAs (COPE-Bicol & Corpuz, [2010](#)). All these were undertaken in the resettlement sites and high risk communities. These activities helped the communities identify the needs, disaster risks faced by the barangays, as well as available resources and capacities to help them cope with disasters.

After the PCVA sessions, orientations on DRR and BDRC, the residents in the resettlement site in Barangays Anislag and Taysan identified their vulnerabilities such as:

- 1) lack of livelihood opportunities in the resettlement site, remoteness of the sites from the town proper where their livelihood sources were, 2) lack of basic social services, including water and health services, electricity, drainage systems, good roads; 3) poor housing materials (COPE-Bicol & Corpuz, 2010, p. 199)

At the same time, the PCVA sessions enabled the resettlement residents to discover and affirm their capacities, which was key to efforts in organizing themselves as leaders in their community building and community development processes. These capacities included:

- 1) a sense of community among the households; 2) strong organizational structures; 3) skilled community workers from their local organizations and NGOs in the region; 4) safe location of the resettlement site; 5) unlimited use of the lands in the resettlement sites (COPE-Bicol & Corpuz, 2010, p. 199)

After the PCVA sessions, the residents in the resettlement sites were able to undertake activities that helped reorganize, strengthen, and consolidate their local organizations. By the end of the pilot project, the two local organizations in the two resettlement sites – the Taysan United Homeowners Association (TUHOA) in Brgy Taysan, and the United Survivors Neighborhood Association (USNA) in Brgy Anislag, were reactivated and elected their new set of officers and committees (COPE-Bicol & Corpuz, 2010). Self-help groups for the repair and maintenance of the housing units, drainage systems, solid waste management, primary health care and sanitation were also formed. The local organizations and the residents also prepared their community development plan and disaster preparedness plan (Tan, 2010). Organic gardening/urban organic agriculture was also introduced in the resettlement sites to help the households grow their local sources of healthy and nutritious food. The local organizations also held dialogues and lobbying work with the provincial government. These dialogues and lobbying work initiated by the residents of the resettlement sites resulted in the local government providing more construction materials to help build typhoon resilient housing and resources to sustain the feeding programs for the children in the resettlement sites (COPE-Bicol & Corpuz, 2010).

In the high risk areas, Barangay Tagas and Barangay Binitayan, the work focused on capacity building in disaster preparedness and risk mitigation, including the setting up of Early Warning Systems. A series of trainings on weather forecasting, on community evacuation procedures, communication protocols, early warning systems, and contingency planning was undertaken (COPE-Bicol & Corpuz, 2010). These trainings were conducted in cooperation with COPE-Bicol and other partners of the COPE Network, government agencies in Bicol such as the Municipal Disaster Coordinating Council of Daraga, the local government of Daraga, and the Municipal Social Welfare and Development Officer (COPE-Bicol & Corpuz, 2010).

These processes also led to the formulation of the community disaster action plan or contingency plan wherein the community members play major roles in disaster preparedness (COPE-Bicol & Corpuz, 2010).

The local organizations in the four barangays worked together to form a resolution to create another Resettlement site because there were many families that still needed to be relocated. This resolution was submitted to the Municipality of Daraga. Resolutions were made for them to easily access the barangay and municipal calamity funds (Tan, 2010).

Building Local Resiliency and Food Security Through Sustainable Agriculture

An inspiring story of a disaster-affected community working toward disaster resiliency and food security is that of Barangay Sianon in the town of Badiangan, Iloilo Province. Barangay Sianon is a rice and sugarcane farming community. Poor irrigation facilities, the prevalent practice of monocropping, rising costs of agricultural inputs, trader-controlled markets, frequent episodes of drought or extreme rainfall resulting in low yields and low income for the households has rendered most of the households poor (PRDCI & Tiokno, 2010). Responding to the situation of farmers in Barangay Sianon, the PRDCI, through a project with Christian Aid, helped build the capacity of farmers for disaster preparedness, reduce the vulnerability of their livelihoods to the impact of droughts and typhoons, and find a way to build their resiliency.

The PRDCI staff initiated the project by undertaking Participatory Capability and Vulnerability Analysis (PCVAs) in three sitios or subvillages in Barangay Sinoan. The PCVA centered on enabling the communities identify the hazards that made their livelihood vulnerable and determining their strengths for disaster preparedness (PRDCI & Tiokno, 2010). From the PCVA processes, the farmers realized the need to shift to drought resilient farming by practicing Integrated and diversified farming (IDFS) and sloping agricultural land technology (SALT). Engaging in SALT would help reduce landslides, and the use IDFS would promote biodiverse cropping and organic farming (PRDCI & Tiokno, 2010). Biodiverse farming would be an alternative to monocropping, which tied the farmers to only one type of crop; this made their farms and livelihood more vulnerable to adverse impacts of hazards. To further enhance their local food security and resilience during disasters, they learned to maintain home gardens, the planting of rootcrops that survive flood and droughts, legumes that have longer shelf life and seed storage (Bawagan, 2011, p. 55) The community was also trained in vermicomposting so that they could make their own organic fertilizer with readily available local resources such as rice straws and animal dung.

Being long practitioners of monocropping and chemical-based farming the farmers in Brgy Sinoan initially doubted and resisted the idea of practicing sustainable agriculture (PRDCI & Tiokno, 2010). PRDCI slowly introduced to them sustainable agriculture through a series of community-based “hands on” trainings

and by setting up demonstration plots in community nurseries so that farmers could observe and compare the crops planted with organic inputs and the crops in their farms.

Another notable undertaking on building resilience through sustainable agriculture is the farmer-led Climate Change Resiliency (CCR) program of the MASIPAG. MASIPAG is a farmer-led national network of small farmers' organizations, NGOs, and scientists promoting sustainable agriculture or what is now usually called agroecological farming.

Because many of the communities of the MASIPAG farmers' organizations are often victims of typhoons, floods, drought, and extreme climate changes, many of the MASIPAG local farmers' organizations had already been undertaking disaster preparedness activities such as setting aside rice and corn seeds, planting disaster resilient crops, and practicing DIFS. In 2013, after many farmers in Visayas and Mindanao lost family members, homes, and livelihoods because of Typhoon Yolanda, the network decided to fully institutionalize their program for Climate Change Resilience or CCR.

Essentially, the entire MASIPAG program aims to build the capacity of farming communities for disaster risk mitigation, climate change adaptation, and the promotion of climate change resilient farming through sustainable agriculture or agroecological farming practices. The MASIPAG Program is composed of the following:

Collection, identification, maintenance, multiplication, and evaluation (CIMME) – and breeding of indigenous rice and corn varieties. CIMME enables farmers to have a steady supply of seeds every planting season; with this, they need not purchase seeds and are even able to share with other farmers locally adaptable seeds ([MASIPAG Website](#)). These indigenous varieties are secured in their community seedbanks and trial farms, which has at least 50 indigenous varieties. The farmers collectively monitor and determine which among the 50 varieties are more adaptable to their local environment. The CIMME and the practice of maintaining their local seedbanks and trial farms have made many MASIPAG farmers self-reliant in terms of having their own rice and corn seed reserves ([MASIPAG Website](#)).

The DIFS/DSAE (diversified and integrated farming systems/developing sustainable agro-ecosystems) program ensures that farmers grow not only rice but also vegetables, rootcrops, fruit trees, poultry, and livestock – these provide diversified food sources, better nutrition, additional sources of income, and food security during disasters ([MASIPAG Website](#)).

The local marketing and processing support (LMPS) program enables farmers to process vegetables, fruits, root crops, and herbs so that they can stock food with longer shelf life. During the pandemic, the women farmers of MASIPAG were able to produce noodles from squash, create turmeric powder, lagundi syrup, and other herbal medicines they used to cure common ailments during the Covid 19 pandemic. They were able to share these herbal medicines and healthier processed food with health frontliners and other community members. Food processing also enabled them to have additional sources of income ([MASIPAG Website](#)).

The conduct of education and training sessions on DRR and CCA, and on sustainable agriculture, are also part of the MASIPAG CCR program. Through the

trainings, farmers' organizations have developed their local DRRM plans, which include having their own seed reserves and their own calamity funds that they use for their emergency relief distribution. During the Covid 19 pandemic, some of the farmers' organizations were able to use their own food and seed reserves and calamity funds for creating their mobile hot meals and feeding programs that they conducted alongside trainings on community health and nutrition (Tan, 2021).

Underlying all of these programs is the MASIPAG farmers' practice of bayanihan – through seeds exchange, sharing of their surplus rice and vegetables to communities during disasters and during this Covid 19 pandemic.

Masipag farmers are aware of the root causes of their vulnerability to disasters and climate change – development policies that have not prioritized the socioeconomic well-being of small farmers, development aggression (open-pit mining, construction of large dams, conversion of rice lands into industrial farms/corporate plantations of cash crops such as banana, pineapple, rubber, etc.,) the massive promotion of GMOs such as GM corn and rice, which are dependent on chemical agricultural inputs that have harmed people's health and the environment.

As such, the key component of MASIPAG's CCR program is policy Advocacy. Through face to face or online sessions via mass media (radio) and social media platforms, MASIPAG conducts educational sessions or issues discussions on disaster management, climate change adaptation, and climate justice. Through their education and advocacy work, MASIPAG has been able to work with Local Government Units (LGUs) in enacting ordinances promoting organic farming, ordinances that ban the entry of GMOs that promote the use of chemical inputs that contribute greenhouse effect.

Reducing the farmers' vulnerability means building the adaptive capacity of the farmers and their communities in terms of strengthening their capacity in organizational building, providing access to resources, skills and technology, and changing practices, behavior and livelihood strategies (PPT presentation on MASIPAG CCR Program, MTDP, Feb, 2022)

Institutionalizing CBDRRM into Local Governance

RA 10121 is a major milestone in ensuring that communities play lead roles in DRRM and CCA. However, the enactment of this law is not a guarantee that the mandated local, regional, and national structures, processes, and budget for responding to disaster is effectively functioning. This was one of the major findings of the research project between the Dept of Science and Technology (DOST) and a team of faculty and students from the Dept of Community Development, College of Social Work and Community Development, University of the Philippines Diliman (DCD-CSWCD, UP Diliman). The action research was conducted a few months after the deadly and destructive typhoon Yolanda (Hayan) hit the Philippines in 2013.

The research project studied the experience four barangays affected by Typhoon Yolanda. Two barangays – Brgy Banaag in Guiuan, Eastern Samar, and Brgy

Ezperanza in San Francisco, Camotes Islands, Cebu – were hit by typhoon Yolanda but had low casualties and damages. The other two barangays – namely, Brgy Candahug in Palo, Leyte, and Brgy Sapao in Guiuan, Eastern Samar – suffered high casualties and damages. The action research project documented, analyzed, and drew lessons from the disaster preparedness structures, mechanisms, and measures that were present (or lacking) at the household, village, municipal level, which enabled (or did not enable) communities to respond to the impact of typhoon Haiyan. It studied how various activities and institutions (communities, LGUs, CSOs, individuals, academe) responded to the impact of the typhoon, the factors that facilitated or hindered the effectiveness of the response (Bawagan et al., 2015).

The research study showed that there was a low level of disaster preparedness in three of the four barangays, particularly Barngays Sapao, Banaag, and Candahug (Bawagan et al., 2015). The DRRM structures, institutional mechanisms, and DRRM plans mandated by law were not very functional in these barangays at the time of the action research. Much of the work focused on emergency response.

Only one out of the four barangays that were studied – barangay Esperanza in the municipality of San Francisco, Camotes Island, Cebu – experienced low casualty and damage because their CBDRRM structures, processes, and plans were in place. A key factor in their ability to survive typhoon Yolanda was their “purok system,” a community-based mechanism, which divides the villages into smaller units for communication and information dissemination during disasters and for mobilizing the communities for various service deliveries of the local government unit (Ponce de Leon, 2021). With the help of Plan International, the San Francisco Mayor was able to institutionalize CBDRRM using the “purok system.” The municipal DRRM office also had a permanent position office, office staff with DRRM plans, programs, and budget (Bawagan et al., 2015).

Being an *action research* project, the team from DCD-UP Diliman proceeded to respond to the identified needs of the four barangays by conducting a series of orientations, training workshops, and planning sessions on CBDRRM and CCA.

In the three barangays, which demonstrated limited disaster preparedness, an orientation on Community-based Disaster Risk Reduction and Management (CBDRRM) and initial CBDRRM planning was undertaken. The training introduced the barangay members to the basic concepts of DRRM: disaster preparedness, emergency response, disaster prevention, disaster prevention and rehabilitation, the different community, municipal, regional, and national DRRM structures and processes, and the content of the DRRM Act of 2010 of RA 10121. It also provided an overview of the processes and principles of community-based approaches to DRRM with a stress on the point that at the heart of DRRM are the people – building the people and communities’ capacities and promoting people’s participation in CBDRRM. The trainings led to the formulation of initial BDRRM plans and the formation or revitalization of their BDRRM councils of BDRRMCs

For Barangay San Francisco, Cebu, which was already practicing CBDRRM, the training focused on orientation and planning toward climate resilient agriculture and fisheries. It introduced the participants to key concepts in climate change and climate

change adaptation, and to ongoing climate change adaptations and climate resilient agriculture efforts of other municipalities (Bawagan et al., 2015.)

San Francisco gained international recognition, including the UN Sasakawa Asawd for Disaster Reducation in 2011 for their “purok system” in managing disaster risks (Reliefweb, 2011). At the same time, the purok system, used not only for the CBDRRM but as an LGU mechanism for service delivery and knowledge transfer, is being reflected upon and critically reviewed for its “top-down approach.” The purok system effectively spared the people of Barangay Esperanza from the destructive impact of Typhoon Yolanda. At the same time, as a community-based approach for people’s empowerment and governance it can be further enhanced by more spaces and opportunities for bottom-up people’s participation in decision making (Ponce de Leon, 2021).

A major output of the action research was the surfacing *of definitions and dimensions of “resilience” from the community members themselves*. Some of the definitions that surfaced include the following:

- *Having a safe and secure location*
- *Availability of basic services for health and shelter and economic resources such as land, income, savings, and livelihood options*
- *Solidarity among community members as expressed through damayan, bayanihan, protecting each other, where individual as well as collective safety are intertwined*
- *Having strong faith and spirituality*
- *Leadership felt by the community members; community members are cooperative for the common good*
- *A culture of safety and preparedness*
- *Environmental integrity to provide for the livelihood of community members*
- *Risk transfer mechanisms, e.g., insurance for crop, livestock, and life*
- *Enabling policies* (Bawagan et al., 2015, p. XIV)

These definitons show that the people in the barangay were aware of the root causes of their vulnerability – their homes were located in areas that were vulnerable to floods, typhoons, storm surges; their sources of income/livelihoods were unstable; they had limited access to basic social services; etc. These recommendations also show that the communities were aware of the responsibility of the government as duty bearers and that they have the right to call on their governments to provide basic social services and create conditions that would promote sustainable livelihoods. Likewise, these definitions of resilience from the people showed their awareness of the critical roles of indigenous forms of community support, collective action, and social solidarity locally known as damayan, bayanihan.

This action research also generated key recommendations for barangay officials and members for the LGUs, National Government Agencies (NGAs), the academe. Some of the key recommendations include:

1. For Local Government Units (LGUs) and National Government Agencies (NGAs) to continue developing the BDRRM plans and building the BDRRMCs
 2. Developing DRRM-CCA concepts and key messages using local and visual language
 3. Given the archipelagic character of the Philippines, to develop effective communication systems within, between the various islands and mainland
 4. Integrate DRR-CCA into school curricula
 5. Mainstreaming DRR-CCA into government structures and policies, emphasizing the need for pro-active rather than reactive programs, strategies, and policies (Bawagan et al., 2015)
-

Conclusion: Key Lessons in Understanding Resilience, Agency, and Social Transformation in the Context of CBDRRM Practices

In recent years, the term “resilience” used in the context of disaster risk management has been criticized for being “apolitical” or even for maintaining the status quo with its goals of “bouncing back” or “returning to its state prior a disturbance” (transition and resilience, p. 9), (climate change) adaptation, etc. According to Henfrey and Giangrand, Naresh in their article “Resilience and Community Action in the Transition Movement,” such definitions of resilience seem to

seek to normalize and perpetuate existing imbalances of power and/or transfer responsibility for environmental and social damages from their perpetrators to their victims (Henfrey & Giangrand, 2017, n p. 95).

Through conscientization and awareness raising, participatory processes (e.g., PCVA, etc.), and community organizing, the basic sector organizations and communities are more aware of the roots of their vulnerability as well as their collective capacities to address, challenge, and transform deeply rooted structures and policies that have perpetuated people’s vulnerabilities to hazards, climate change, and other social crises.

Increasingly, grassroots movements are redefining the concept and goal of resilience. An emerging concept is “community resilience” with the following characteristics:

Capacity for self-organization, suitable infrastructure, economic diversity and innovation, relationship to place, and the capacity to exercise agency through appropriate forms of leadership, suitable knowledge and skills and means to develop these further through learning, appropriate values and beliefs, engaged governance, and the ability to mobilise collectively through social networks (Helen Ross in Transition, p. 104)

These emerging definitions of resilience are reflected by the experiences and practices captured in the short narratives above, which underscore the following:

1. Grassroots/basic sector communities/organizations as agents, as partners, not only as disaster victims or survivors

It is important to go beyond the sense of being a victim or disaster-survivor and move to becoming an agent of change or acquiring a sense of agency (Tan, 2010)

Hence, for instance, the farmers' organizations of MASIPAG address the immediate concerns of emergency response, disaster prevention/mitigation, and climate change adaptation. At the same time, they are active in the campaigns for climate justice – actively joining local and international campaigns advocating for initiatives from the international community to compel industrialized countries to reduce greenhouse gas (GHG) emissions by shifting to renewal energy and more sustainable approaches to industrialization, and imposing sanctions on countries that caused massive environmental destruction especially in developing countries like the Philippines because of their unsustainable industries and businesses that prioritize profit over people (MASIPAG Luzon, 2017)

MASIPAG, like many other NGOs and CSOs in developing countries, is also undertaking researches and educational campaigns to raise people's awareness on the impact of chemical/industrial farming on the environment and food security of poor countries, researches on local sources of renewal energy, and suspension of policies that have adverse effects on people's health and livelihoods, the environment, such as the promotion of the construction of large dams, open pit mining, coal fired thermal plants and the like

2. Community organizing as the foundation of people-led CBDRRM and processes of building community resilience

Corpus underscored that community organizing is the key element in the BDRC pilot project and that all aspects – community social preparation, participation, mobilization – are linked to CO work. The BDRC project demonstrated that DRR and CO complement each other and must be integrated. In this project, integrating the community organizing process into DRRM helped in:

- (a) *Building a strong foundation for attaining community resilience among partner communities through capacity building activities and awareness raising*
- (b) *Helping vulnerable groups gain their confidence and realize their capacities for sustained active participation in program implementation*
- (c) *Development of shared ownership for the project among partner-beneficiaries*
- (d) *Surfacing and documenting the capacities and vulnerabilities of the residents in the four barangays, which formed the bases for their contingency plans and DRR plans* (COPE-Bicol & Corpuz, 2010 p. 206)

3. The importance of promoting local and indigenous processes of community/ collective – action such as “bayanihan” and “damayan”

In our conversations with the people in the resettlement sites Barangay Anislag and Barangay Taysan, they expressed their concern over families who were still in the high risk communities. One of the Mothers in the resettlement site said:

After gaining knowledge from the trainings, I felt a spontaneous willingness to re-echo (the trainings) to the communities we came from, especially to neighbors who are still living in the disaster prone areas. Now, I would like to involve myself more in community drills, QRTs and how to respond (Tan, 2010, p. 212).

Drawing from the same conversations with the people in the four barangays involved in the BDRC pilot project in Bicol, our research team realized that:

A basic element of the Filipino's resiliency is our fierce belief in the spirit of damayan and bayanihan, the power of collective community action that will always help us survive and rise up from disaster and tragedy. These are testimonies to the triumph of the collective human spirit, a testimony to the Filipino's brand of community resiliency (Tan, 2010, p. 213)

Learning from these stories of grassroots communities and people's organizations, we see that at the core of people-led CBDRM and people-led processes of achieving resilience are still the basic and fundamental processes of social awareness raising, community organizing, people's collective action, social solidarity for social justice, and sustainable development.

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Resilience Thinking in Disaster Governance 55

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Contents

Introduction	864
Disaster Governance	864
Vulnerability, Resilience, and Resilience Thinking	866
Approaching Resilience: Rethinking Development	867
Resilience Thinking in Disaster Governance	870
Resilience Thinking in Disaster Governance of India	871
Conclusion	873
References	873

Abstract

Resilience thinking argues that disaster governance must consider the drivers such as resource management, development, efficiency, and sustainability as root causes of vulnerability to disasters and devise strategies to address them. It aims at building community capacities to cope with disasters in the short term and mainstreaming and integrating disaster risk reduction strategies with developmental priorities in the long term. This chapter presents a case for the need of resilience thinking in disaster governance and assesses policy framework of disaster governance in India vis-à-vis resilience thinking. It argues for mainstreaming resilience thinking in a manner that leads to judicious resource management and sustainable development.

Keywords

Resilience thinking · Disaster Governance · Disaster Risk Reduction · Policy Framework

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Introduction

Disasters occur when community capacities are defied by forces more powerful than such capacities. Discourse on disaster governance evolved from response- and relief-centric approach to building capacities for prevention, mitigation, and preparedness to cope with disasters. The words vulnerability and resilience became prominent in this discourse. Vulnerability is understood as lack of capacities to cope with disasters and resilience is promoted as the ability to withstand disasters. Major global initiatives, treaties, agreements, and conventions reiterated this understanding of disaster resilience. The institutional frameworks of disaster governance of individual countries joined the bandwagon and built capacities for managing disasters.

If disasters are understood as events that have nothing to do with development and can be managed with a certain degree of capacity once they strike, such flawed understanding will do more harm than good. Development and disasters are related intimately. Not only are disasters the outcomes of our development efforts, but they can also wipe out years of development gains (Thompson, 2020; NDMP, 2019). Disasters are both the cause and product of development. The more a society embarks on the path of economic development, the greater is the vulnerability, and also the chances of disasters occurring. The fundamental flaw with current disaster understanding is that it doesn't consider development, vulnerability, and disasters as interrelated notions. This understanding must be reconsidered.

This chapter argues that disaster governance must consider the drivers such as resource management, development, efficiency, and sustainability along with the strengthening of disaster management capacities for achieving effective disaster risk reduction. This argument goes beyond building capacities for disaster preparedness and mitigation to a fundamental reconsideration of the development aspirations of individual countries and devising mechanisms to reduce vulnerabilities caused by the above mentioned drivers. It questions the very idea of sustainable development that talks about the unattainable task of balancing economic growth and environmental conservation. Popularly known as resilience thinking, this approach exposes the dangers of understanding disasters as “unavoidable occurrences that can be managed.” Disasters are neither unavoidable nor can be managed. This approach advocates that certain disasters can be avoided if the underlying drivers are recognized and addressed in time. It also argues for creating institutional frameworks of disaster governance for understanding and addressing the root causes of vulnerability, which eventually results in disaster resilience. The remainder of the chapter discusses the notions of disaster governance, resilience thinking, and how disaster governance is affected by resilience thinking. It also discusses resilience thinking in disaster governance in India as reflected in the policy framework.

Disaster Governance

Disaster Governance, a subset of Governance reflects the paradigmatic shift in disaster management from state-centric, hierarchical, monopolistic administrative structures and processes to plural, multi-actor, multi-institutional collaborative

mechanisms in which decision-making powers are dispersed outside government (Tierney, 2012; Thompson, 2020; Shahat et al., 2020). Management of disasters is the function of governments all over the world traditionally. In this traditional disaster management, governments assume proactive role from disaster prevention and preparedness to mitigation and response, set up institutional mechanisms from national level to local level and endow them with regulations and resources for effective disaster risk reduction. Communication flows in a hierarchical fashion from a centralized planning agency to the field offices that follow command and control orders meticulously. In simple words, disaster management functions on bureaucratic lines.

Effective management of disasters is beyond the capacities of governments as routine administrative structures, bureaucratic rules, and practices result in delay, prolong the processes and act as hindrances (Gupta, 2003). The traditional state-based action is no longer sufficient to address modern day disasters. This paved the way for a paradigmatic shift from traditional disaster management to decentralized, de-bureaucratized, plural, and collaborative institutional structures, processes and mechanisms with the active involvement and participation of non-state actors (Tierney, 2012). This paradigmatic shift is referred to as Disaster Governance.

Disaster Governance comes under the rubric of risk governance (Tierney, 2012). It refers to “a set of structural arrangements and processes through which coordinated decision making and action takes place across various institutional settings” (pp. 343). It goes beyond governmental settings, powers, processes, instruments, and capacities by engaging non-state actors of market and civil society operating at all levels and scales. Disaster Governance is also conceptualized in terms of the capacities of the human societies in taming risks related to disasters. This conception gives scope for framing disaster governance as a societal intervention that aims at mobilizing resources, skills, abilities, and knowledge “to translate risk reduction processes and decisions into collective action among multiple actors” (Thompson, 2020).

Disaster Governance consists of a set of norms (laws, regulations, standards, and frameworks), institutional actors (state and non-state actors such as government, businesses, and NGOs), and practices (preparedness, mitigation, response, collaboration, funding, etc.) that are designed to cope with disasters caused by natural, human, and technological agencies (Tierney, 2012). Natural agencies include natural forces like earthquakes, cyclones, tsunamis, floods, etc. Human agencies are the deliberate acts of human beings such as terrorism, naxalism, etc. Technological agencies include technological forces like transport accidents, nuclear explosions, etc. Disaster Governance aims at building disaster response capacities through partnerships, training communities to be disaster resilient, and putting forth multi-faceted disaster response mechanisms in saving lives and property. It also reflects the notion that weak disaster governance capacities are the primary drivers of disaster risks (Gupta, 2018).

Disaster Governance is shaped by both state actors, non-state actors and a variety of socioeconomic and political forces. Particularly, globalization is one prominent force that heavily influences Disaster Governance. International aid agencies,

monetary organizations, and regulatory agencies such as World Bank, IMF, and UNO are important factors that shape the contours of Disaster Governance, especially of the developing countries (Tierney, 2012; Shahat et al., 2020). Unlike developed countries that are properly equipped with disaster governance capabilities, the developing countries lack them. Literature on disasters argues that developing countries are inadequately equipped with resources, capacities, institutions (mainly local and community), and finances to put robust resilience mechanisms like those of developed countries (Thompson, 2020; Shahat et al., 2020). Coupled with the governance deficits such as corruption, lack of respect for the rule of law, weak environmental regulations, and lack of meaningful public participation in decision making, the weak nature of regulatory systems of developing countries increase the vulnerability to disasters in such societies (Guha, 2014; Syal et al., 2021). For overcoming these challenges, the developing countries are dependent on international agencies and institutions for disaster-related assistance. Newly emerging Non-Governmental Organizations and Civil Society Organizations from global to local level also have their effect on Disaster Governance (Syal et al., 2021).

Disaster Governance has become indispensable in the sphere of disaster risk reduction. It cuts across all the institutional and societal domains. It strategically links individual, institutional, and societal activities and arrangements with disaster-related problems and solutions for accomplishing the Disaster Risk Reduction mandate. It is the precondition for achieving vulnerability reduction and long-term disaster resilience. It facilitates disaster management actors in preparedness, mitigation, response, and recovery. In short, a government's ability to effectively address disasters depends on its ability to create sound governance systems and use their benefits (Thompson, 2020).

Vulnerability, Resilience, and Resilience Thinking

Vulnerability refers to the inability or diminished capacity of an individual, group, community, or government to anticipate, cope with, resist, and recover from disasters (Alexander, 2013; Thompson, 2020; McKeown et al., 2021). It is defined as the “propensity (of a society or community) to be harmed (by a hazard or disaster) but not being able to deal with the harm (causalities, property loss, or business interruption) given the social processes creating and maintaining that propensity” (Kelman et al., 2016, pp. 130). Traditionally, vulnerability was perceived as a condition caused by natural/environmental processes independent of human intervention or contribution. But it is realized that vulnerability is caused by a combination of social processes (cultures, traditions, and ideologies) and economic processes (poverty, income, and livelihood) in addition to natural processes (UNISDR, 2017). Human beings incessantly contribute to these social, economic, and physical processes and increase the susceptibility of individuals and communities to disasters. Since vulnerability is a product of multiple processes, measures required to address it should be multipronged. The focus should be on eliminating the conditions causing

vulnerability along with empowering communities with capacities to cope with disasters (Thompson, 2020).

The term resilience occupied the serious attention of scholars of disaster research (Walker & Salt, 2006; Alexander, 2013; Chandler, 2014; Thompson, 2020; McKeown et al., 2021). It refers to “the ability of a system to absorb disturbance associated with disasters and still retain its basic function and structure” (Walker & Salt, 2006, pp. 1). United Nations International Strategy for Disaster Reduction defines disaster resilience as “the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to, and recover from the effects of a hazard in a timely and efficient manner, through the preservation and restoration of its essential basic structures and functions” (UNISDR, 2009, pp. 10). These definitions consider the entities that respond to a disaster as “systems that strive to preserve and restore their integrity.” But, according to Thompson (2020), resilience is a system’s ability to “morph into a new condition to survive as it adapts to its changing or changed environment” (pp. 54). He viewed the system as a non-neutral, complex entity that constantly changes.

Of late, the notion of “resilience thinking” is evolving in disaster literature. Resilience thinking considers societies as complex systems that are in constant state of flux and resilience as a dynamic interplay between stability and change (Thompson, 2020). Resilience thinking aims at management of resources of a social-ecological system in a manner that continually adapts itself through cycles of change while trying to maintain system integrity at the same time. The definition given by Intergovernmental Panel on Climate Change aptly captures the essence of resilience thinking. It defines resilience as “the capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation” (Rangwala et al., 2018, pp. 10). Simply put, resilience thinking is premised on the question of “how resilience in governance systems can be strengthened through the processes of social learning and adaptation” (Duit, 2016, pp. 368).

Approaching Resilience: Rethinking Development

On the basis of how vulnerability is perceived by a society, resilience thinking can be divided into two approaches. One approach argues to build capacities of disaster resilience without considering the underlying drivers of vulnerability that lead to disasters. Capacities and capacity building occupies central position in this approach. Capacities refer to the ability of a community to manage, accommodate, and adapt to disasters. Capacity varies from individual attributes like skills, knowledge, and leadership to collective attributes such as resources, infrastructure, and relationships (UNISDR, 2017). Capacity building aims at equipping individuals, communities, and governments with capacities (skills, knowledge, and resources) to make them disaster resilient.

According to this approach, it is impossible to identify the causes of vulnerability of a system to disasters because of the complexity and hence, any such attempt to fix vulnerabilities would actually result in more vulnerabilities as unintended consequences of such attempts (Chandler, 2014). Rather than identifying and addressing the root causes of vulnerabilities, this approach considers them as random unavoidable occurrences, also called as “black swan” events (McKeown et al., 2021) (‘Black swan’ events are those events which could not have been foreseen prior to their actualization. The global financial crisis of 2007/08 and COVID 19 Pandemic are examples of black swan events.). It takes more resources to explore the causes of vulnerability than to address it by building capacities due to the complex nature of the system. Hence this approach argues that it is better to adapt to complexities of the system and build capacities to respond to disasters through agency (Chandler, 2014). David Chandler proposed the notion of post-liberal agency-centric capacity building by taking it away from the purview of community (McKeown et al., 2021). In simple words, resilience thinking in this approach shifts focus from efforts toward understanding and reducing vulnerabilities to capacitating systems to adapt to and cope with change. It aims to equip societies with predesigned coping responses that can be put into effect once a disaster strikes.

The other approach perceives that vulnerability is the main driver of disasters and hence communities must work toward making their societies non-vulnerable by identifying and addressing the drivers underlying those vulnerabilities. Although, the drivers that cause vulnerability greatly vary from society to society, certain common factors can be listed such as resource management, efficiency, development, and sustainability. The concept of resilience needs to be understood in the context of these factors. The way resources are managed (or mismanaged) by human societies is the fundamental root cause of vulnerability. Resources are consumed indiscriminately in the name of human progress and development. Efficiency in the optimization of resource use has become the ultimate goal of human beings. The impact of decline in resource base on ecosystem services is not taken into account in this quest for optimization of resources. Walker & Salt (2006) in their classic work on Resilience thinking, calls this as “business as usual” approach, which is characterized by the absence of consciousness in human societies about valuing their ecosystems. Business as usual approach revolves around the notion that “efficient use of resources will result in sustainability.” Brian and Salt opposed this conception and argued that efficiency doesn’t result in sustainability and resilience of a system. In their words “the more one optimizes the elements of a complex system of humans and nature (social-ecological systems) for some specific goal, the more he diminishes that system’s resilience (pp. 1). This drive for efficient, optimal use of resources reduces the capacities and renders the total system vulnerable to disasters (Services such as life support, regenerative, cleansing, and aesthetic services that nature provides are collectively known as ecosystem services by Walker & Salt, 2006. Ecosystem services are crucial for the survival of human societies.).

Development is another factor that contributes to vulnerability of societies. Normatively, development is conceived as progress made by human society in

enlarging people's choices for achieving the qualities of a good life. Traditionally, these qualities were defined in terms of economic well-being, such as income, livelihood, and economic growth. Initial development models didn't consider social and political aspects such as inequalities, lack of voice and access to power and resources, etc. (Thompson, 2020). A multidimensional approach to development emerged, including economic, social, and political aspects. In this sense, development is defined as "the capacity of the systems and their processes to facilitate growth, inclusiveness and opportunities for all" (Thompson, 2020, pp. 41). The notion of development gave license to humans to exploit Mother Earth indiscriminately. "Development at any cost" became motto and the quest for development continued unabated without considering the costs of exploiting nature. Natural resources such as land, air, water, flora, and fauna are taken for granted in this developmental fiasco as if they are infinite resources. This "anthropocentric approach" toward natural resources exacerbated their degradation and increased the vulnerability of communities to disasters (Ramesh, 2010; Guha, 2014).

Sustainability and sustainable development are also related to vulnerability. Sustainability added ecological perspective to development discourse. It aims at replacing indiscriminate use of resources with responsible and judicious use of resources without disturbing developmental interests. It promised that the needs of future generations will not be compromised due to the developmental needs of current generations (Najam et al., 2006; Wingqvist et al., 2012). But in reality, sustainability and sustainable development are of little concern for most of the countries. The notion of sustainable development is misconceived in the sense that it is impossible to balance both developmental requirements and ecological concerns (Thompson, 2020). If sustainable development is condensed to the slogan of "reduce, reuse and recycle" without finding recourse to our insatiable desire for resource consumption, it would distort societal capacities to withstand disasters and increase vulnerability.

Vulnerability is also not uniform across all sections of society. Vulnerability increases as we go down the social hierarchy from affluent to poor and marginalized sections. Issues like poverty; social inequalities and exclusion; gender discrimination; disparities in health, education, and income; and lack of access to power are the drivers that render a considerable chunk of the population vulnerable to disasters. This is the major reason for dissimilar vulnerabilities within similar communities.

The above mentioned drivers such as resource management; efficiency; development; sustainability; poverty; social inequalities and exclusion; gender discrimination; disparities in health, education, and income; and lack of access to power are root causes of vulnerability to disasters. Any disaster risk reduction effort that ignores these drivers of vulnerability results in myopic goals, wrong priorities, and wastage of resources. Hence, this approach argues that we should redesign our disaster governance strategies for reducing the vulnerabilities of societies to disasters. Such an approach would automatically make communities and societies resilient.

Resilience Thinking in Disaster Governance

The questions of vulnerability and resilience are the questions of Governance. These questions are related to the capabilities of Governance in creating and maintaining sustainable social-ecological systems rather than optimizing resource consumption. The world we see today is witnessing increased vulnerabilities and reduced capacities of disaster governance. The inherent ability of social-ecological systems to adapt to changes is fast diminishing due to “thresholds” (Walker & Salt, 2006) and result in disasters. In other words, disasters are manifestations of inherent development problems. The ways we perceive vulnerability, resilience, and disasters and the models we apply to govern them are flawed (Walker & Salt, 2006; Thompson, 2020).

The year 2015 became an important milestone in the evolution of resilience thinking in disaster governance with Sendai Framework, Sustainable Development Goals, and the Paris Agreement of United Nations Framework on Climate Change. Sendai Framework (2015–2030), successor of Hyogo Framework (2005–2015) “marks a definitive shift globally towards comprehensive disaster risk management aimed at disaster risk reduction and increasing disaster resilience going far beyond disaster management” (NDMP, 2019, pp. 59–60). The Sendai Framework urges that disaster risk governance should stress on recognizing the social and environmental drivers of vulnerability and adapting measures to manage resources in a manner that leads to disaster risk reduction. The framework also emphasized on strengthening disaster governance. It urges that there should be coordination among various institutions and meaningful participation of various stakeholders in disaster governance. Sustainable Development Goals (SDGs) is another important global initiative that is linked with resilience thinking. Although SDGs are not directly related to disaster governance, the achievement of these goals (especially the goals of Climate Action) substantially provide favorable atmosphere for achieving disaster risk reduction and building resilient communities. Paris Agreement of 21st session of Conference of Parties (COP21) to United Nations Framework Convention on Climate Change (UNFCCC) adopted in 2015 ponders upon the notions of vulnerability and resilience at length. Article 7 of the agreement exclusively provided for strengthening resilience and reducing vulnerability to climate change. Specifically, the article declared that countries should work for “building the resilience of socio-economic and ecological systems through economic diversification and sustainable management of natural resources” (UN, 2015, pp. 11).

As reflected in the above mentioned major global initiatives, resilience thinking mandates national governments to restructure their disaster governance institutions, policies, and mechanisms in a manner that not only build adaptive capabilities to manage disasters but also identify and address underlying drivers of vulnerability to disasters in the long run. These initiatives also urge individual countries to integrate resilience thinking in their policy frameworks and build institutional mechanisms of disaster governance at all levels to effectively manage disasters.

Resilience Thinking in Disaster Governance of India

Resilience thinking in Disaster Governance of India reflects the paradigmatic shift from management to reduction of disaster risks by focusing on the underlying drivers of such risks. The Government of India incorporates the provisions of major global initiatives on climate change and disaster management such as the Sendai Framework and the Paris Agreement in the policy framework of disaster governance meticulously from time to time. The policy framework of disaster governance in India includes the Disaster Management Act, 2005, the National Disaster Management Policy, 2009, and the National Disaster Management Plan, 2016 (revised in 2019). The policy framework provides for institutions, regulations, and mechanisms of disaster governance at national, state, and local level.

Disaster Management Act, 2005 provides for institutional framework of disaster management at the national, state, and local level in the form of National Disaster Management Authority, State Disaster Management Authority, and District Disaster Management Authority. It also provides for institutions like the National Executive Committee, the National Institute of Disaster Management, the National Disaster Response Force, etc. With the formulation of Disaster Management Policy, 2009, there is a paradigm shift “from the erstwhile relief-centric response to a proactive prevention, mitigation and preparedness-driven approach for conserving developmental gains and to minimize loss of life, livelihood and property” (NDMP, 2009, pp. 1). The policy adopted an integrated approach to disaster management by building partnerships with various stakeholders such as local bodies, civil society, communities, businesses, and media (Gupta, 2018). Both the Disaster Management Act, 2005 and the Disaster Management Policy, 2009 talk about vulnerable communities and building capacities to address disasters but do not talk about the underlying drivers of vulnerability and ways to reduce vulnerabilities among communities.

There has been a clear cut change in the resilience thinking at policy level in India as reflected in the policy framework of disaster governance, post 2015. The National Disaster Management Plan of 2019, which is a dynamic, evolving document, brought considerable maturity in resilience thinking at the policy level. The plan reflects the philosophy of the Sendai Framework, the Sustainable Development Goals, and the United Nations Framework on Climate Change in the policy framework with regard to reducing disaster risks. It highlights the need for “enhancing coherence, reinforcement and coordination among all the major global initiatives to reduce vulnerability to hazards and enhance resilience, promoting governance systems to manage disaster risks aggravated by climate change impacts and making development resilient to various disaster risks” (pp. 66).

Vulnerability and resilience are the overarching themes throughout the National Disaster Management Plan of 2019. The plan urges governments to not only build resilience capacities of communities but also to fundamentally reexamine the aspects of resource management, development, efficiency, and sustainability. The plan

recommends for shift from indiscriminate use of resources for survival and development to judicious and sustainable use of resources. This kind of change in policy thinking is a healthy sign toward building resilient communities. The following statement from the plan aptly summarizes the resilience thinking of Disaster Governance in India. The plan says:

Climate change has increased vulnerability and reduced resilience of ecosystems globally with potentially far reaching impacts on human well-being. There is, therefore, a need to foster a greater understanding of the links between biodiversity conservation, ecosystem services, climate change and other disasters risks (NDMP, 2019, pp. 56).

The plan also admits that vulnerability doesn't impact communities uniformly. It says that economically and socially weaker sections of the society are vulnerable to disasters and within these vulnerable sections, women, children, and elderly people are more vulnerable. The coping capacities of these sections to disasters are also limited due to structural inequalities and social exclusion. Although the plan mentions about the challenges of social marginalization, social exclusion, and other inequalities as causes of dissimilar responses of similar communities to disasters in the face of vulnerability, addressing those challenges is beyond the purview of disaster governance (pp. 73). The plan is limited only to catering to different needs of different sections of society before, during, and after disasters. But Disaster Governance proponents argue that resilience means not only making resources available but also making them accessible to all sections of the society so that the impact of vulnerabilities can be lessened (Thompson, 2020; McKeown et al., 2021).

Resilience thinking that aims at judicious use of resources and long-term sustainability needs to be institutionalized. The prospects of immediate survival and development compromise long-term sustainability and endurance and fling communities into the vicissitudes of vulnerability. It is time for governments at the national and state level in India to translate this resilience thinking into action. Effective institutional framework of Disaster Governance is a fundamental pre-requisite for reducing disaster risks and building resilient communities. Countries that do not have effective institutional framework of Disaster Governance tend to fail in governing disasters. The National Disaster Management Plan, 2019 admits that it is challenging to create institutional framework at different levels of governance that integrates the disaster risk reduction goals of major global initiatives. The plan suggested two ways for creating effective institutional framework of disaster governance in India. One, building a more comprehensive resilience agenda in mutually reinforcing manner that integrates the goals of major global initiatives and two, mainstreaming resilience thinking and synchronizing it with development policies.

Mainstreaming of disaster risk reduction refers to “the incorporation of risk management and climate adaptation as an intrinsic feature of all developmental efforts” (NDMP, 2019, pp. 89). It requires all development policies, programs, and activities of governments at all levels to incorporate disaster risk reduction as an integral part, rather than having separate disaster management policies. It also requires the institutionalization of disaster risk reduction in the programs and

activities of every development agency. Sound integration of resilience thinking and disaster risk reduction with developmental priorities can enhance disaster resilience, reduce risks, and promote development. The Government of India started taking active steps to mainstream disaster risk reduction in India. NITI Aayog assumed leadership role to help governments at all levels in this process. However, these steps are largely project based and need to be scaled up to all developmental sectors and agencies (Gupta, 2018).

Conclusion

Disasters are both cause and product of development. Building community capacities is not simply resilience as capacities can be defied and neutralized by the drivers that multiply vulnerability. Resilience thinking advocates an approach that aims at building community capacities to cope with disasters in the short term and mainstreaming and integrating disaster risk reduction strategies with developmental priorities in the long term. Major global initiatives on disaster governance reflect this resilience thinking. The policy framework of disaster governance in India is also in sync with such thinking. The need of the hour is to create an institutional framework that mainstreams resilience thinking in a manner that leads to judicious resource management and sustainable development. Such an institutional framework must also recognize dissimilar capacities within similar communities due to differential nature of vulnerability, work toward addressing inequalities that cause vulnerability, and strengthen the political agency of the most vulnerable communities.

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Migration and Its Impact on the Rural Economy During Covid-19

56

Pranav Kumar Anand

Contents

Introduction	876
Migration and Status of Agricultural Labor	877
Covid-19 and Rural Economy	879
Challenges of Migrant Laborer	880
Policy Implications	882
Conclusion	882
References	883

Abstract

The Covid-19 pandemic and the lockdown imposed in its wake in 2020 dealt a severe blow to the livelihood and living conditions of migrant agricultural laborers in India. As the supply chain of food grains ruptured and total immobility brought the country to a standstill, this significant labor pool was left stranded far from home, unable to fend for themselves or their kin. Living in the grim shadow of those desperate months, it is crucial to examine not only the factors culminating in the humanitarian crisis engendered by the harsh and unplanned lockdown imposed by the Indian state but also to understand the context in which these workers have historically operated as a pivotal bulwark that bolsters the Indian economy. According to the Food and Agriculture Organisation, 2020 migrant workers play a crucial role in the constituting and running of agri-food systems and value-chain systems, and invariably affect market prices across the globe. These varying modes of production and diverse farming practices tend to, in turn, affect differences in wage rates, and in patterns of interstate and interdistrict migrations, undertaken to seek employment opportunities and livelihood of different social groups. Conversely, the migrant agricultural laborers within their home states have also been adversely affected because of the unavailability

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of non-farm activities. It is, thus, crucial to examine this sector-wide crisis and to seek creative ways to address the issue at the policy level, in order to ensure the creation of employment opportunities and sustainable systems that ensures the welfare of this pivotal workforce.

Keywords

Migrant Labor · Reverse Migration · Rural Economy · Covid-19 · Social Category

Introduction

The outbreak of the novel coronavirus (Covid-19) has resulted in unprecedented health as well as economic crisis globally, even as we still continue to grapple with the ever-changing nature of the virus. The impact of the pandemic has been especially brutal on the marginalized sections of society in the aftermath of the shutdown of commerce and transport across urban and rural areas. The pandemic-induced lockdown in India perpetuated a massive economic shock, halting every aspect of life. The lockdown started across the country on 24 March 2020 and is still going on in one form or another. Border closures, large-scale quarantine, and transport disruptions enforced during the lockdown resulted in acutely restricted access to food as well as to means of production and purchase. Although agricultural activities were exempted from such restrictions, the agricultural value chain also ended up facing large-scale disruptions. Agriculture and allied industries, which are central to the Indian economy, contribute nearly one sixth of the Indian National Income and provide employment opportunities to approximately 50% of the workforce (NABARD, 2020). The agricultural sector is fundamental for ensuring national food security, in addition to feeding into the growth of secondary and tertiary sectors of the economy through interlacing strands between the three-tier economic structures. However, since the lockdown, production in the agricultural sector has been under a great strain due to the shortage of agricultural labor, which in turn is bound to impact and disrupt planting, harvest, and other farming operations. The Covid-induced lockdown triggered reverse migration of laborers in northwestern agro-dominant states like Punjab, Haryana, and Uttar Pradesh (Singh, B., et al. 2020). Most of whom are predominately from marginalized social groups such as Scheduled Castes and Scheduled Tribes. In India, a sizeable portion of seasonal migrant laborers employed in agriculture and allied activities belong to historically deprived sections of society, especially among the Scheduled Castes and Scheduled Tribes.

Estimates suggest that nearly one million laborers have returned to their homes with little to no prospects of returning to geographies of employment in the near future (Chaba & Damodaran, 2020). The pandemic and the ensuing lockdown created an acute shortage in the supply of labor in agro-dominant states like Punjab, Haryana, and others, creating a vacuum that threatened the harvest and post-harvest

operations. The region-wise differences in soil quality, climatic conditions, and cropping patterns create disparity in the development of regional agricultural activities and their modes of production.

Migration and Status of Agricultural Labor

In many developing countries like India, agriculture-related migration generally traverses from low-income areas to high-income ones. The demand for agricultural labor during the peak seasons, i.e., harvest and planting, often cannot be met by the local labor pool, thus workers from low-employment areas are sought. Mishra (1952) writes that underemployment in a particular area leads to the migration of agricultural laborers to other areas, provided that these areas have optimal conditions such as large-sized landholdings, adequate irrigation facilities, and a large number of landowners from noncultivating castes who do not cultivate their land themselves.

Migration has long been ingrained into the livelihood cycle of economically depressed classes across India. It is now recognized that migrating for work is a part of routine livelihood strategy for the underprivileged sections of society and does not only happen in times of distress or emergency (Mc Dowell & De Haan, 1997). Among the different categories of migrant workers in India, seasonal workers employed in agriculture and related activities who undertake rural-to-rural interstate and interdistrict migration belong predominantly to Scheduled Castes (SC) and Scheduled Tribes (ST) categories; their historically distressing socioeconomic conditions render these workers among the most deprived sections in the rural hierarchy. According to the National Sample Survey (2007–2008), 35% of ST males migrating to other states were involved in the agriculture and related activities; among the SC, this figure was estimated to be 23%, while other caste groups recorded 13% males migrating seasonally as agricultural laborers. When nationwide mobility was brought to a grinding halt in March 2020, it was this section that faced the major brunt of the unplanned lockdown. The 100 million-strong migrant workers, who are estimated to form 20% of India's workforce, were the worst sufferers of all – they were stranded in their places of work without food, wages, and shelter (Economic Survey, 2016–2017). Images of thousands upon thousands of workers trudging on roads and highways to reach home truly visualized this marginalized population to the public for the first time.

The migration of agricultural laborers occurs both seasonally and permanently, depending on the availability of work in a given area, which is directly related to the prosperity of the region. Skilled agricultural laborers tend to migrate from poor regions to prosperous ones, a process which is often encouraged by their relatives and village peoples, who are themselves seasoned migrants to these regions. This organic network acts as the centripetal force that accelerates the rate of migration (Gupta, 1988; Gupta & Bhakoo, 1980). Such migrant laborers constitute the foundation of the workforce in the northwestern states, particularly Punjab, Haryana, and Uttar Pradesh, which are considered the “breadbaskets” of the country. Punjab and Haryana contribute nearly 50% of the staple food grains that are procured and

distributed by the Government of India; production deficits in these states due to the shortage of agro-labor have a huge impact on national food security (Chauhan et al., 2012; DFPD, 2015). Acute labor shortages in farming activities in a state is bound to impact the plantation of labor-intensive crops like rice/paddy, which is sown in a narrow temporal window in the month of July. The dependency on migrant labor for such seasonal, intensive, and physically demanding work escalates during the rice (*kharif* or monsoon season) and wheat (*rabi* or winter season) plantation time. Punjab alone requires 50-million-person days for planting monsoon crops, particularly rice (Dhillon & Vatta, 2020). Punjab and Haryana contribute 65% of the total wheat and 34% of the total rice in food stocks, which are then procured by the Food Corporation of India and other procurement agencies. Thus, any adverse impact on the production of agricultural produce in these states significantly impacts national food security, inducing fear and paranoia. The phenomenon of reverse migration and scarcity of labor induced by the pandemic has become a leading factor in exacerbating the present-day agricultural crisis in India.

Agricultural wage rates in states with high demand and low supply of laborers have increased while wages in states that saw an influx of migrant laborers saw a steep decline due to surplus of labor. However, in the aftermath of the pandemic, the dynamics of supply and demand in rural areas show a mixed trend due to the outflux of laborers from agriculturally advanced regions to their influx into relatively backwards regions. Even before the pandemic, the socioeconomic conditions of agricultural migrant laborers were far from ideal, as they had to work long hours with minimum wages. Generally, though, food and shelter were provided by the landlord throughout the period of stay during the working season in farming lands. Landlords, too, preferred migrant laborers to local ones because;

- a) They could haggle over wages with migrant laborers to crank up their own profits.
- b) Reduce the risk of laborers switching over to other farmers during the working season, which local workers often tended to do. Oftentimes, personal rapport, long-running interactions and fair economic exchanges induced migrant laborers to work for the same farmers year after year. The main interest for the migrant laborers was the promise of receiving a lump sum to take back home at the end of each cycle (Roglay et al., 2001).

Most workers engaged in the agricultural industry are vulnerable groups of daily wagers who earn just enough to sustain themselves for short periods of time. They have no income security in case of job loss, due to which they are unable to cope with any form of recession. In the initial phase of the March 2020 lockdown, when 21 days' cessation of all forms of activity and travel was enforced, hordes of workers descended upon bus and railway stations, desperate to leave for their native states. The central government was forced to rethink the travel restrictions and to make special arrangements when millions took to the roads and highways, walking thousands of kilometers to reach the safety of their homes. Not only were these journeys arduous, they often resulted in death for those undertaking them, and in heartbreak for those watching them on television screens in the comfort of their

homes. These desperate caravans, seen for the very first time since the Partition, spotlighted the utter misery of this otherwise invisible sector of migrant workers, who constitute the foundation of the national workforce.

Covid-19 and Rural Economy

Covid-19 and the ensuing economic devastation threatened to turn into a humanitarian crisis in the face of the mass exodus of migrant workers back to their villages. Moreover, this reverse migration has put a lot more pressure on the already challenged and ailing rural economy. The pandemic has taken a massive toll on communities and geographies of origin, as the perpetually under-resourced local government bodies are now faced with the daunting task of accommodating, providing, and meeting the socioeconomic needs of the returnees. Most of these migrant workers are landless or hold only a small piece of land, which acutely hampers their chances of building a robust agricultural practice in their native region (Kukreti, 2020).

Lamentably, the pandemic came at a time when the already-embattled Indian economy was facing a steady economic slowdown. The complete lack of policy/policies for the welfare of such a large chunk of the workforce is very concerning, to say the least, and its utmost urgency is the need of the hour. In the wake of the lockdown, the All India Agricultural Workers Union (AIAWU), which has the highest membership of agricultural laborers in India, has put forward its demands to address the deteriorating conditions of farm laborers. The union is now pressing the government to provide food and shelter to the out-of-work populace, especially as now these workers are unable to afford even basic necessities. AIAWU is also demanding that the government must replenish funds for schemes like MGNREGA, which has been neglected over the years; the union has pointed out that the mandate of the scheme, which guarantees hundred days of employment to all rural household under the Rural Employment Guarantee Act, 2005, must be made available to potential beneficiaries.

The agricultural sector cushions the national economy and needs to be foregrounded at the level of policy-making and its execution, especially after the disastrous impact of the lockdown on the Indian economy. The sector still holds the promise of employing thousands who have lost their means of livelihood due to the pandemic-engendered crisis, alongside the tremendous responsibility of feeding the entire population of the country. NABARD's Impact Assessment report for the year 2020 stated that the total agricultural area sown under all the major *kharif* crops was expected to yield higher than the corresponding period of 2019. Quite remarkably, things did turn out this way. As per the above report, the impact of the 2020 lockdown was low-key on crop production because the major crops of the *rabi* season, like wheat, mustard, gram, and the like, were harvested in most states by the end of April 2020 (NABARD, 2020). This respite was possible due to the fact that the agricultural sector was largely exempted from the major restrictions imposed during the initial phase of the lockdown, as mentioned earlier.

By all accounts, MGNREGA did help in providing wage-based employment to some of the returning migrant workers by rolling out projects in rural areas to absorb the additional labor force (Narayani, 2020). However, many of the migrant workers who returned to their villages during the lockdown may still wish to remain there. Therefore, their immediate needs for food, shelter, and the provision of temporary employment opportunities in their native places must be addressed at the policy level. States like UP, Bihar, Uttarakhand, Chhattisgarh, and Jharkhand saw a large influx of migrant workers during the lockdown. The lockdown restrictions have led to a drying up of jobs and incomes, and so, there is an urgent need to reorient national as well as regional migration policies in such a way that they aid the process of providing assistance and protection to the migrants arriving in their native place from distant geographies of work. Resilient food systems need to be established and activated through adequate funding to curtail food insecurities so that the renewed pressure on local systems created by the arrival of the returning populace can be reduced too. Migrant workers, especially agricultural workers, form the backbone of the Indian economy; sadly, they are also among the most vulnerable groups in India. Their needs and grievances deserve serious attention and creative policy solutions.

The International Labour Organization (ILO), 2015 provides a framework for Decent Work Agenda that can help in curtailing the adverse impact of Covid-19 on the national workforce. The primary focus areas of the Decent Work Agenda are as follows: job creation, rights at work, social protection, and social dialogue with gender equality. Target 8.8 of ILO's Sustainable Development Goals (SDGs) 2030 also aims to "protect labour rights and provide safe and secure working environments for all workers, including migrant workers, in particular, woman migrants and those in precarious employment."

Challenges of Migrant Laborer

The challenges and problems faced by the migrant labor workforce during the lockdown necessitate the urgency for the universalization of the Decent Work Agenda of ILO. As things stand, there are very few safety nets for this labor pool and so, the state needs to intervene on multiple fronts to ensure the welfare of those being dispossessed of their health and livelihood. In the National Sample Survey Office report (2007–2008), it was revealed that temporary labor migration within India is seven times higher than permanent migration and that in the poorest households (those of Scheduled Castes and Scheduled Tribes), temporary migration is up to sixteen times higher than permanent migration. In the destination regions, migrants help sustain many industries and sectors, and without the migrant workforce, many industries would not be able to survive in the face of the sheer shortage of local labor skilled in the said work. These workers have historically been underpaid and overworked, owing to which sustaining themselves beyond a short period is impossible for this exploited section; the pandemic-engendered lockdown

only highlighted the glaring lack of safety net for these workers and the complete absence of safe channels of migration. Migrant workers are unrecognized at the local, regional, and national levels, and are therefore often overlooked at the official policy level itself. Due to the sudden shutdown of secondary and tertiary sectors during Covid, employability, income, food security, shelter, etc., were critical. The plight of migrant workers and their distressing experiences during the lockdown evidence the contrariness of their lived reality to the egalitarian principles enshrined in the constitution. India's labor protection framework fails to adequately address the challenges faced by the informal sector workforce, who constantly move around to varied destinations in search of work. They are at the risk of further marginalization, exclusion, and being invisible if the very frameworks that can prevent the violation of their rights (like labor codes) are not implemented effectively. It has been seen that the implementation of policies such as Pradhan Mantri Shram Yogi Maan-Dhan or other health benefits schemes for unorganized workers state or local governments exclude the migrant laborers who come from other states and do not have the domicile of the current state. However, some states like Kerala have welfare policies for migrant workers named the Awas scheme, Interstate Migrant Workers Welfare Scheme, and the Apna Ghar Hostel Scheme. There is an urgent need for a major revamp and strengthening of regulatory institutions and justice delivery architecture to assist in the survival and healthy living conditions of workers.

Today, India faces multidimensional problems that must be addressed to ameliorate the plight of migrant laborers. The informality of India's economy, along with rigidly layered social structures and poor working conditions, has all come to be intricately woven together to create an impassable wall that this workforce is unable to scale. Therefore, it is now the onus of policymakers to conceptualize policies keeping in mind the multiple facets of the labor conundrum; such policies must be holistic in their definition and implementation, or else they will fall shamefully short of addressing the demands of the changes needed.

The first step to prevent the further worsening of migrant workers' situation is to reorient the question of informality and the divisions that characterize India's labor markets. Limited employment opportunities in the formal sector of the Indian economy compel a vast majority of workers to seek employment in the informal economy, especially among migrants. The government of India has attempted to tackle this problem by trying to gather the much-needed data on the migratory workforce through the recently established National Database (Nanda, 2020). The goal is to register unorganized laborers and migrant workers and subsequently facilitate employment and better access to welfare benefits. Moreover, the lack of access to medical insurance and portability of ration cards pending for years and decades was an important game-changer. Additionally, the announcement of Skill Development plans seems to have laid the groundwork for an exhaustive initiative that will target the returning migrant workers in 116 districts across the country (Shukla, 2020). The idea behind these initiatives is to allow workers to access work based on their existing skills and also re-skilling and upskilling them to correspond to the needs of the current job market.

Policy Implications

The said trend highlights most of the workers migrating from rural areas to urban areas for better employment apart from other reasons such as natural disasters. It has become the usual practice of small and marginal farmers or laborers who do not have land and has to work on daily wages on the agricultural land of the others. Here they did not get a handsome amount and get only fewer job opportunities due to the neglected attitude of the government toward rural development. Migrant workers who moved to urban areas have to suffer in their day-to-day living due to the high market rates, especially for three basic things, food, shelter, and clothes (Rogaly & Thieme, 2012). They are marginalized to avail of the so-called living standards of elites; even they have to live in ghettos and under the flyovers, which do not have access to electricity, clean water, and safe house.

Moreover, recently the Covid-19 pandemic made the life of migrants in India miserable. During the lockdown, India had its largest exodus since independence, with over ten million people trekking thousands of kilometers to rural areas, the reverse migration due to no jobs, rising conditions of famine for them, and fears of getting affected by the virus (Suresh et al., 2020). Many of them died not by the virus but on the journey to reach home by foot. As a result, the labor force participation rate dropped from 42.9% in January 2020 to 35.57% in April. In April, unemployment rose to 23.52%, with both rural and urban areas feeling the pinch (Yadav & Priya, 2021). Further, citing the problems faced by the migrants and criticism faced by the people, the government in the name of NITI Aayog drafted a policy named National Migrant Labour Policy. Earlier the Indian government resolved in December 2020 to build a database of migrant workers, including those in the informal economy. This policy wanted to overcome the previous policies, for example, the Interstate Migrant Workers Act, 1979, which only caters to the laborers who migrated through contractors without including independent migrants. This policy acknowledges the migration of labor as an integral part of the nation's development. It has also recommended increasing wages and preparing a central database to fill the gap between demand and supply for the utilization of maximum benefit of social welfare schemes and to build migration resource centers. However, this policy does not go into the underlying causes of inadequate labor law execution, which are tied to the political economics of recruitment and placement. The document makes a passing mention of unfair recruitment practices, but there is no examination of why the system exists and how it is allowed by company and enterprise employment structures. It makes no mention of gender disparities in the workplace. Thus, we can say that migrant laborers are still a vulnerable group of society by being marginalized by government help and a high standard of living.

Conclusion

Covid-19 not only brought into focus the dangerously precarious plight of migrant labors but also foregrounded their immense contribution to the development of the nation and its economy. The need of the hour is to strengthen the rural economy

through creative planning, financial investments, and sustained ministration so that labor migration to agro-dominant states in search of work opportunities can be transformed into an informed, safe, and sustainable process that further strengthens the foundations of the Indian economy. The aim should be to reduce distress migration and promote safe migration, a kind of migration that is propelled by significantly improved working conditions and fair wages. The amelioration of the migrant agricultural worker is possibly one of the first steps needed to strengthen the promising agricultural sector to ensure that this symbiosis continues unabated.

From time immemorial, India has been an agriculture-centered economy, its rich land made even more fertile by the blood and sweat of its agricultural workers. Even at this moment in our country's history, when the economy was almost brought down to its knees by the aftereffects of the novel coronavirus pandemic and the crippling lockdown that ensued, it was the agricultural sector that became the life buoy that kept the Indian economy afloat. Despite suffering devastating personal crises and losses, the agricultural workforce has aided immensely in the nation's gradual but steady resurgence. As a nation, we owe it to the tillers of the soil to ensure that their interests are protected, just as they have always protected ours.

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An Assessment of the Disaster Prevention and Mitigation Tasks of the Barangay (Village) Disaster Risk Reduction and Management Committees of the River Basin Communities in Southern Philippines

57

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Contents

Background of the Study	886
Objectives of the Study	888
Related Literature	889
Disaster Prevention and Mitigation and Recent Advances	889
Research Methodology	890
Research Design	890
Research Environment	890
Respondents and Data Gathering	891
Summary of Findings	892
What Is the Level of Performance of the BDRRMCs Considering Disaster Prevention and Mitigation?	892
To What Extent Do the Independent Variables Explain the Variations in the Level of Performance of the BDRRMCs?	896
What Are the Issues and Concerns that Surfaced in Relation to the Level of Performance of the BDRRMCs Considering Disaster Prevention and Mitigation?	897
Conclusion	898
Recommendation	899
To the Future Researchers	899
References	900

Abstract

Climate-related hazards are phenomena that demand all governments to be at all times on high alert. Governments should undertake measures that would eliminate or at least mitigate their impact to protect their constituents. This study

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utilized three researcher-made data gathering tools. Results revealed that the tasks of the Barangay (Village) Disaster Risk Reduction and Management Committees (BDRRMCs) in the river basin communities on disaster prevention and mitigation were partially accomplished. As a whole, the performance of the BDRRMCs is generally satisfactory (3.65). This is broken down into formation of structures and systems (satisfactory = 3.62) and institutionalization of policies and plans (satisfactory = 3.65).

The findings further revealed the highly significant impact of the following BDRRMC performances: Punong Barangays' (Heads of Villages) educational attainment and years in the service and the community's experience in floods. The FGD responses indicated that the TRB barangays have major issues and concerns considering the implementation of DRR tasks: putting up of the DRRM structures and systems, communication, commitment of the Barangay officers, and limited budget. There is a cogent need for all government offices handling the DRRM functions to provide appropriate attention at the Barangay level for the proper implementation of the DRRM Plan.

Keywords

Community · Disaster prevention · Mitigation · Climate-related hazards

Background of the Study

From 1900 to 2014, 136 floods and 314 storms hit the Philippines, inundated communities, claimed lives, lost billions, and crippled the economy. In 2011, tropical storm (TS) *Sendong* (international name, *Washi*) devastated *Misamis Oriental*'s major city of *Cagayan de Oro* and several communities in the two river systems, i.e., the *Tagoloan River Basin* (TRB) and *Cagayan de Oro River Basin* (CDORB), including the coastal towns under the *Macajalar Bay Development Alliance* (MBDA) from *Laguindingan* to *Kinoguitan*. Though not as strong as *Sendong*, another TS *Vinta* (aka *Timben*) entered PAR 4 days before Christmas of 2017 and claimed 75 lives in Region 10, and because of flash floods coming from headwaters upland, about 200 families evacuated to *Sta. Cruz* and *Natumolan*, both in *Tagoloan, Misamis Oriental* (*Citizens' Disaster Response Center, 2017*).

The study focuses on the Barangays (Villages) in the Tagoloan River Basin (TRB). The basin is the thirteenth (13th) largest river system in the Philippines and has a total area of about 180 thousand hectares of waterways, plateaus, canyons, and valleys which starts from the province of *Bukidnon* covering five (5) municipalities and one (1) city, then down to *Misamis Oriental*'s three (3) municipalities or a total of 26 barangays, and finally discharges an annual run-off of 4106 MCM onto *Macajalar Bay* through its main drainage – *Tagoloan River* (Regional Development Council, 2005). Most (57%) of TRB is forest, while the remaining proportion is disposable land (Regional Development Council, 2005).

Disaster prevention and mitigation is everyone's concern. Threat to safety and security is the new norm faced by the LGUs. In same breadth, climate-related hazards, especially in the villages within the area of the Tagoloan River Basin, are now part of the realities of life. Stoker (1998) contends that the local governments have expanded increasingly their authority in the dispensation of local services. Governance perspective sees an increased involvement of the private and voluntary sectors in service delivery and strategic decision-making. Responsibilities that were previously the near exclusive role of government have been shared (Stoker, 1998). Because of this, Local Government now draws attention to private sector to be part of the solution to the problems besetting the community while increasing the machinery of the LGU.

Section 2 of RA 10121 amplifies the policy of the State on disaster risk reduction and management. It spells out the aspirations of the Republic to uphold the people's constitutional right to life and property by addressing the root causes of vulnerabilities to disasters. Among other directions being set by this law is to strengthen the capacities of the LGUs and communities in disaster prevention and mitigation from the impact of disasters. In declaring the State policy on DRR Management, it recognizes that the State could not achieve its purpose without decentralizing the powers, responsibilities, and roles at the regional and local levels. Section 5 of the Implementing Rules and Regulations of RA 10121 states that the Barangay leaders shall ensure the participation of at least two (2) Civil Society Organization (CSO) representatives from existing and active community-based people's organizations representing the most vulnerable and the marginalized groups in the Barangay DRRMC.

One of the four priority areas of the Barangay Disaster Risk Reduction and Management Committee is on disaster prevention and mitigation, the first pillar of the DRRM program. Disaster prevention and mitigation refers to the activities that would avert or lessen/limit the occurrence of adverse effects of hazards. This would cover the role of the BDRRMCs on the formation of DRR structures and systems (organizing of BDRRMC, adoption of BDRRM Plan, Evacuation Plan, etc.) and institutionalization of policies and plans (ensure the BDRRMC structure is complete with personnel, establishment of emergency hotlines, and others).

To ensure clarity of the roles of the Local Governments in disaster risk reduction and management, Joint Memorandum Circular No. 2013-01 of the National Disaster Risk Reduction and Management Council, Department of Interior and Local Government, and Department of Budget and Management was issued to define and enumerate the particular functional/priority areas of the DRR program that can be funded by the Barangay's 5% DRRM budget. Based on this order, only the given tasks in the four DRR priority areas the 5% DRRM budget can be utilized and released. The same priority areas in disaster risk reduction and management program in disaster prevention and mitigation of the BDRRMC are utilized as the main indicators of the study in order to consider, review, and assess on the performance of the Barangay Disaster Risk Reduction and Management Committee, particularly on its first priority area in disaster prevention and mitigation.

Objectives of the Study

The objective of the study is to review, assess, and determine the performance of the BDRRMCs in the Tagoloan River Basin Barangays based on the instructed tasks on disaster prevention and mitigation outlined by the National Disaster Risk Reduction and Management Council for the smallest Local Government Units (Barangays) to implement at their respective communities. Hence, Fig. 1 shows the relationship of the variables of the study vis-à-vis the mandated DRRM tasks, specifically on disaster prevention and mitigation and the characteristics of the TRB barangays and the immediate past Punong Barangays and the three climate-related hazards. The dependent variable is the level of performance of the Barangay Disaster Risk Reduction and Management Committees on disaster prevention and mitigation on the following Barangay DRRM framework: (a) formation of structures and systems and (b) institutionalization of policies and plans. The level of BDRRMC's performance refers to the rating of the Barangay leaders of the relevant actions and activities initiated and other roles and responsibilities carried out by the BDRRM committees in pursuing its mandated functions on disaster prevention and mitigation considering the existing guidelines of the implementing rules and regulations of RA 10121.

The study sought to determine the level of performance of the Barangays in the river basin communities as regards the level of compliance on the mandates issued by the higher authorities on disaster prevention and mitigation. As the forefront in the disaster risk reduction management of the government, these Barangays were charged with the formation of structures and systems and institutionalization of policies and plans in their respective jurisdictions. The particular functions of the

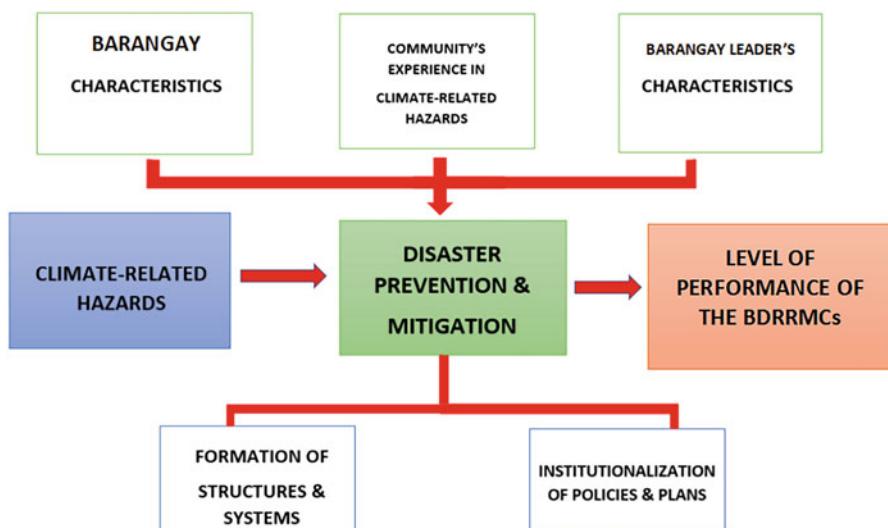


Fig. 1 Schematic diagram showing the relationship of the variables of the study

BDRRMCs on disaster prevention and mitigation were assessed on the respondents' ratings of the performance of the BDRRMCs. Barangay characteristics are limited only to the populations and the budgets of the TRB barangays as these would help explain in the variations of the variables in the performance of the BDRMCs. Furthermore, community's experience in climate-related hazards (CRHs) was assessed to test the level of performance of the BDRRMCs since the DRRM framework in the government was established to ensure that appropriate preventive measures of the LGUs would be in place to protect the citizens from and to mitigate the disastrous effects of climate-related hazards. Accordingly, the three climate-related hazards (floods, heavy rainfall, and unseasonal/erratic rain) are the natural hazards that frequented the most in the TRB communities which were also considered to form part in the study. Punong Barangays' characteristics (educational attainment, age, gender, and years in the service) were also considered to check which of these independent variables explain the variations in the performance of the BDRRMCs.

The results of the study would benefit the stakeholders in understanding as to which of the variables would explain a better performing BDRRMC. Pointedly, these variables would provide clearer explanations on the variations in the performance of BDRRMCs in the villages of the Tagoloan River Basin.

More specifically, the following questions were sought for answers to determine the level of performance of the BDRRMCs, considering disaster prevention and mitigation:

1. What is the level of performance of the BDRRMCs considering disaster prevention and mitigation?
2. To what extent do the independent variables explain the variations in the level of performance of the BDRRMCs?
3. What are the issues and concerns that surfaced in relation to the level of performance of the BDRRMCs considering disaster prevention and mitigation?

Related Literature

Disaster Prevention and Mitigation and Recent Advances

According to the United Nations International Strategy for Disaster Reduction (2018), between 1998 and 2017, climate disasters accounted for 91% of all 7255 recorded disasters in the whole world. Among them, floods were the most frequent, at 43% (Wallemacq & House, 2018). Therefore, if there are no substantial measures, climate disasters will bring about serious damages to people's mobility and life resulting in economic losses.

In recent years, influenced by climate change and human activities, natural disasters have become more frequent, causing increasingly great losses (IPCC, 2014). One important task of government with regard to disaster prevention and mitigation is to reduce damage loss and guarantee people's livelihood through fiscal

expenditure. For this reason, the appropriate proportion of government's fiscal expenditure on disaster prevention and mitigation has become a difficult issue of public concern (Sawada & Takasaki, 2017). If the proportion is too low, it is not conducive to implement disaster-preventing and mitigating measures; if the proportion is too high, it will crowd out other investment expenditures, which does not contribute to the sustainable development of economy and the continuity of government's disaster reduction work (Benalia et al., 2016).

To be an effective and responsive local government unit, it must be directed by competent officials. In the case of the Barangay Government, it must be constituted with capable Barangay officials who could handle the management of a village effectively, such as planning and fiscal administration (DILG-LGA, Guide for Punong Barangays/Barangay Leaders, 2018).

Research Methodology

Research Design

This study used the descriptive research design. It involves the descriptions and evaluation of the existing conditions related to the performance of the Barangay Disaster Risk Reduction and Management Committees in the Barangays of the Tagoloan River Basin on disaster prevention and mitigation. According to Best and Kahn (2006), this design allows some type of comparison, contrast, and uncovering of relationships between existing non-manipulated variables in the study.

Statistical Tools

The findings, analysis, and interpretation of the data gathered, the following statistical tools, were employed:

Frequency, percentages, mean, and standard deviation. These were used to answer the objectives 1 and 2.

T test and F test. These tests were used to determine significant differences in the level of performance of the BDRRMC considering the independent variable of the study.

Multiple Linear Regression Analysis (MLRA) and MLRA with dummy variable.

These techniques were used to determine the extent to which the independent variables explain the variations in the level of performance of the BDRRMC. All the MLRAs in this study met the assumption on multicollinearity of the independent variables, indicating that these variables are not collinear.

Research Environment

The study covers the eight local government units within the Tagoloan River Basin. Three are municipalities within Misamis Oriental Province located downstream of

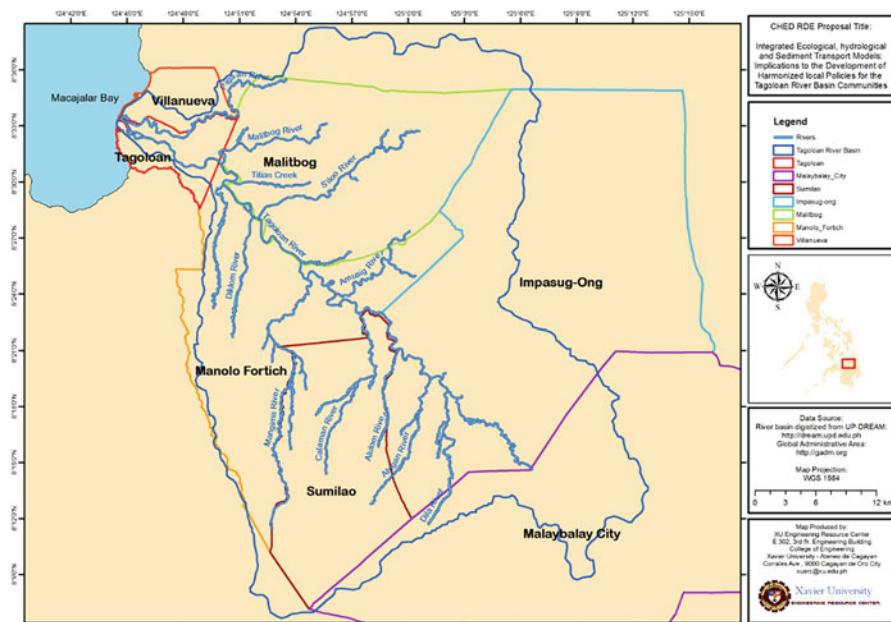


Fig. 2 Map showing the municipalities included in the study

the basin, while five belong to the Bukidnon Province, upstream of the Tagoloan River Basin; both provinces are situated in Southern Philippines. A total of 152 respondents are from 26 Barangays (Villages), constituting the 8 municipalities. The main rivers of TRB are the following: Tagoloan River, Malitbog River, Siloo River, Titian River, Mangima River, Alulum river, Amusig River, and Dila River as shown in Fig. 2.

This study utilizes Cochran's formula in the determination of the sample size, where $\alpha = 0.05$, $Z = 1.96$, and a margin of error $E = 0.103$. The sample size, $n = 152$, was allocated to the different barangays where the barangay council members and other members of the BDRRMCs from the private sector were chosen randomly and the Punong Barangays, the Secretaries, and the Treasurers comprised the remaining respondents.

Respondents and Data Gathering

The 152 respondents of the 26 Barangays in this study were chosen randomly. Each one was given the question form. These were duly filled out during the scheduled data gathering per batch of respondents supervised directly by the researcher and trained staff. Two focused group discussions (FGDs) were also conducted for selected respondents to address objective 3. The FGD results also triangulated the quantitative findings of the study.

Summary of Findings

What Is the Level of Performance of the BDRRMCs Considering Disaster Prevention and Mitigation?

Table 1 presents the ratings of the respondents on the level of performance of BDRRMCs considering *disaster prevention and mitigation*. More than 50% of the respondents rated their barangays to have a very satisfactory to excellent BDRRMC, 25% gave a satisfactory rating, while 22.37% rated their BDRRMC from very low to low level. In general, the level of performance of the BDRRMCs, considering disaster prevention and mitigation, in the TRB barangays is at the satisfactory level (3.65).

As shown in Table 1, some sub-indicators for the level of performance of the BDRRMCs on Creation of Structures and Collation of Barangay Data were rated as generally accomplished (82–98%) to indicate the level of performance of the BDRRMC. These are the following: *Barangay Emergency Response Team (BERT) creation* (82.24%), *information on Risk Assessment of the barangay* (82.29%), *baseline data on number of houses* (86.18%), *Barangay Risk Map Data* (92.11%), and the exceptionally attained task that was on creation of BDRRM Committee (98.03%).

However, majority of the indicators for the creation of BDRRMC structures and collation of barangay data were considered by only 42–56% of the respondents to have been accomplished as indicator of the level of performance of the BDRRMC. These are on the following sub-indicators: *baseline data on value of houses in the barangay* (49.34%), *value of properties* (42.11%), *livestock* (50%), *crops* (55.26%) in the barangay, *accomplishment of Barangay Disaster Readiness Checklist* (55.92%), and *maintained and updated databases (including directory of key offices)* (56.58). Low level performance of the TRB barangays in terms of these sub-indicators may be indicative of the limited resources and lack of technical expertise of the people running the affairs of the barangay. Valuation of houses and properties requires technical knowledge as to how to appraise and make appropriate assessment. Collation and updating of barangay database need trained

Table 1 Level of performance of the BDRRMCs considering disaster prevention and mitigation

Level of performance	Frequency	Percent (%)
Excellent (4.60–5.00)	36	23.68
Very satisfactory (3.70–4.59)	44	28.95
Satisfactory (2.80–3.69)	38	25.00
Low (1.90–2.79)	27	17.76
Very low (1.0–1.89)	7	4.61
Total	152	100.00

Mean: 3.65

Standard Deviation: 1.01

Description: Satisfactory

personnel. Shah et al. (2019) pointed out that human resources, in general, and expert and trained personnel, in particular, play a crucial role during and after the disaster. They reported that institutions in disaster-prone areas lack staff available for Disaster Risk Reduction.

On the additional functions of the Punong Barangay, the indicators of the level of performance of the BDRRMC, considering *disaster prevention and mitigation*, present a very satisfactory level. These are reflected in the percent of respondents who considered its sub-indicators to have been accomplished, namely: *Installation of Barangay Risk Map in conspicuous places (55.92%)*, *designated a Public Information Officer (PIO) (50.66%)*, *appointed at least 2 CSO representatives to the BDRRMC (63.16%)*, *designated a dedicated officer to man the operation center (63.82%)*, and *displayed disaster-related signages, markers in strategic locations (63.16%)*. Only one sub-indicator was rated by the respondents as generally accomplished, namely: *ensured the inclusion of VDRRM Plan in the Annual Investment Program (AIP) (85.53%)*.

As to the establishment of Disaster Risk Reduction Management System, the respondents rated this indicator at the satisfactory level of performance of the BDRRMC. Majority of the sub-indicators for establishment of DRRM System were considered to have existed in their barangays by the respondents (55–78%) as indicators of the level of performance of the BDRRMC. These are the following: *Incident Command System (ICS) (55.26%)*, *24/7 functional Operation Center System (58.55%)*, *establishment of an Early Warning System (75%)*, and *development of a System of Family/Community Preparedness and Response Measure (78.29%)*. Only one sub-indicator was rated by the respondents as generally accomplished, namely: *Annual Budgeting System of the Barangay duly complied with at least 5% allocated for the BDRRM Fund (88.16%)*.

As regards the institutionalization of policies and plans, a component of the disaster prevention and mitigation, which is at the satisfactory level, respondents considered some sub-indicators to be present in their barangays. Majority of the sub-indicators for BDRRMC functions on DRR Policies and Plans also exist in the TRB barangays, according to 46–78% of the respondents indicating some level of accomplishment of the BDRRMC. These are on the following: *Barangay Climate Change Action Plan (40.13%)*, *quarterly conducted drills to test the Contingency Plan (46.05%)*, *ensured the participation of the members of the community on the drills conducted (53.29%)*, *contingency plan per hazard (66.45%)*, *Emergency Hotlines and Communication Plan (69.74%)*, *BDRRMC Staffing Complement (73.68%)*, and *Evacuation Map (78.29%)*. These sub-indicators are connected to capacitate those who are engaged or implemented preparedness plan and those who are responsible for carrying rescue and relief operation (Nazli, et al., 2014). Crafting a plan for climate change, contingency plan per hazard, and communication plan require deeper knowledge on the effects of the environment degradation and the surrounding issues.

Indicators	% Mean	Desc
A. Formation of Structures and Systems	3.62	Sat
A1. Creation of BDRRMC Structures & Collation of Barangay Data	3.54	Sat
Punong Barangay had issued orders for the creation of the following:		
1. BDRRM Committee	98.03	
2. Barangay Emergency Response Team (BERT) creation	82.24	
3. Information on Risk Assessment of the Barangay	82.29	
4. Baseline data on number of houses	86.18	
5. Baseline data on value of houses in the barangay	49.34	
6. Baseline data on value of properties in the barangay	42.11	
7. Baseline data on livestock in the barangay	50.00	
8. Baseline data on crops	55.26	
9. Accomplishment of Barangay Disaster Readiness Checklist	55.92	
10. Barangay Risk Map data	92.11	
11. Maintained and updated databases, including directory of key offices	56.58	
A2. Additional Functions of the Punong Barangays in DRRM	3.74	Very Sat
PB has assigned DRRMC functional personnel and installed appropriate BDRR markers:		
1. Appointed at least 2 CSO Representatives to the BDRRMC	63.16	
2. Designated a dedicated officer to man the Operation Center	63.82	
3. Designated a Public Information Officer (PIO)	50.66	
4. Ensured the inclusion of BDRRM Plan in the Annual Investment Program (AIP)	85.53	
5. Installation of Barangay Risk Map in conspicuous places	55.92	
6. Displayed disaster-related signages, markers, and directional signs in Strategic locations	63.16	
A3. Establishment of Disaster Risk Reduction Management System	3.59	Sat
Barangay Leader had issued order for the following:		
1. Incident Command System (ICS)	55.26	
2. Establishment of an Early Warning System	75.00	
3. 24/7 functional Operation Center System	58.55	
4. Annual Budgeting System of the Barangay duly complied with at least 5% allocated for the BDRRM Fund and 30% of which was segregated for the Quick Response Fund	88.16	
5. Developed a system of family/community preparedness and response measure	78.29	
B. Institutionalization of Policies and Plans	3.65	Sat
B1. BDRRMC Functions on DRR Policies & Plans	3.53	Sat
The BDRRMC had adopted the following Disaster-Related Policies & Plans:		
1. BDRRM Plan	87.50	
2. Barangay Climate Change Action Plan	40.13	
3. Contingency Plan per Hazard	66.45	
4. Evacuation Map	78.29	
5. Emergency hotlines and Communication Plan	69.74	
6. Quarterly conducted drills to test the Contingency Plan	46.05	

(continued)

7. Ensured the participation of the members of the community on the drills conducted	53.29	
8. The BDRRM Committee ensured the enforcement of a policy that the Committee has complete functional personnel with corresponding tasks and functions	73.68	
B2. BDRRMC Functions on IEC	3.84	Very Sat
BDRRMC had acted on the following:		
1. Disseminated to the public, families and individual advisories, bulletins, flyers and other IECs with basic information on different hazards bulletins, flyers and other IECs with basic information on different hazards	86.18	
2. Published & disseminated emergency hotlines	69.74	
3. Barangay-wide information campaign on the Emergency Balde	50.66	
4. Coordinated with LDRRMO for the release of weather advisories and emergency bulletins	76.97	

Furthermore, only one sub-indicator was rated by the respondents as generally in placed, namely: BDRRM Plan (87.50%). This indicates a higher level of performance of the BDRRMC on this aspect. Kusumasari (2012) argued that the local government plays an essential role in introducing, managing, and implementing different disaster management initiatives. The core in disaster risk reduction effort is having to craft a BDRRM Plan and design an Evacuation Map as part of the disaster prevention and mitigation measures.

Table 1 also shows the BDRRMC functions on IEC at a very satisfactory level (3.84). These can be attributed to the existence of the following sub-indicators in the TRB barangays, as indicated by the respondents: disseminated to the public, families, and individual advisories, bulletins, flyers, and other IECs with basic information on different hazards (86.18%) and coordinated with LDRRMO for the release of weather advisories and emergency bulletins (76.97%). In these aspects, the BDRRMC is functional. However, only 50.66% of the respondents specified that the barangay-wide campaign on the Emergency “Blade” was in place. This finding does not conform to the government mandate on the massive campaign for disaster preparedness, such as flood. This is perhaps due to the general topography of the TRB barangays which are mountainous, and the households are at some distances from each other contributing to the difficulty of a barangay-wide campaign. This also requires inspection of the presence or absence of the emergency “blade” in every household, to monitor the effectiveness of this barangay-wide campaign.

On the other sub-indicator, 69.74% of the respondents specified that publishing and disseminating emergency hotlines was present in their barangays. The data imply that, to some extent, these practices/guidelines exist in the TRB barangays, which is an indication of the BDRRMC performance. As the barangays are located in a river basin, these practices/guidelines are expected to have been fully in place. With the rapid improvement of technology, messaging and information dissemination are more attainable even in remote areas. Stewart and Rashid (2011) and Nakamura et al. (2017) argued that use and access to information and comprehension

of instruments designed to support decision-making, both at the institutional levels and the individual/household, can help in risk management.

To What Extent Do the Independent Variables Explain the Variations in the Level of Performance of the BDRRMCs?

Table 2 shows the results of the initial and final Multiple Linear Regression Analysis (MLRA) between the dependent variables and the three set of independent variables (barangay characteristics, characteristics of immediate past PBs, and the community's experience in climate-related hazards). The null hypothesis stating that the independent variable does not explain the variation in the dependent variable is rejected ($F = 16.33^{**}$). The final model $\hat{y} = 0.52 + 0.49X_1 + 0.04X_4 + 0.02X_6$ is highly significant. The variables in the model, PB's educational attainment and years in the service, and community's experience in floods explain 23% of the variation of the level of performance of the BDRRMC in disaster prevention and mitigation. In fact, for every increase in the educational attainment of the Punong Barangays in the TRB barangays, the level of performance of the BDRRMC in disaster prevention and mitigation increases by 0.49 holding PB's years in the service and community's experience in floods constant. Similarly, for every year increase in the PB's years in the service, the level of performance of the BDRRMC in disaster prevention and mitigation increases by 0.04 holding PB's educational attainment and community's experience in floods constant. Furthermore, for a unit increase in community's experience in floods, the level of performance of the BDRRMC in disaster

Table 2 Multiple linear regression analysis between the independent variable and the level of performance of the BDRRMCs in disaster prevention and mitigation ($n = 152$)

Independent variables	Regression coefficients ^a	T values
X_1 : Educational attainment	0.38	3.22 ^b
X_2 : Gender	-0.36	-1.68 ^d
X_3 : Age	-0.01	-1.32 ns
X_4 : Years in service	0.03	2.12 ^c
X_5 : BDRRM budget	-0.0000009	-0.88 ns
X_6 : Experience in floods	0.01	2.54 ^b
X_7 : Experience in heavy rainfall	-0.007	-2.01 ^c
Initial MLRA	Final MLRA	
Adjusted R ² : 0.25 adjusted R ² : 0.24	Adjusted R ² : 0.23	
F value: 8.02 ^b F value: 10.72 ^b	F value: 16.33 ^b	
Final model: $\hat{y} = 0.52 + 0.49X_1 + 0.04X_4 + 0.02X_6$		

Dependent Variable: Level of Performance of the BDRRMCs in Disaster Prevention and Mitigation

Legend: ^aRegression coefficients generated at the initial MLRA; *ns* not significant ($\alpha \geq 0.10$)

^bhighly significant ($\alpha \leq 0.01$)

^csignificant ($0.01 < \alpha \leq 0.05$)

^dsignificant ($0.05 < \alpha < 0.10$)

prevention and mitigation increases by 0.01 holding PB's educational attainment and years in the service constant.

The findings imply that the level of performance of the BDRRMCs in disaster prevention and mitigation is explained by the PB's educational attainment, years in the service, and the community's experience in floods. The BDRRMC's tasks in disaster prevention and mitigation would require PB's understanding of some technical and administrative functions, such as formation of BDRRMC structures and systems, establishment, and institutionalization of DRR policies. The facilitation of these functions becomes more efficient for Punong Barangays with higher educational attainment. Haslam et al. (2005) explained that effective education provides high level knowledge to individuals which enable them to analyze different situations and respond accordingly.

Moreover, the PB's years in the service also contribute significantly to the BDRRMC's performance considering disaster prevention and mitigation. PBs with more years in the service are more exposed to the work and functions of the smallest local government office. This type of exposure would lead them to find better options to carry out the disaster prevention and mitigation function resulting to a more performing BDRRMC. Similarly, the community's experience in floods explains significantly the BDRRMC's performance in its disaster prevention and mitigation role. Barangays with more experience in floods are more likely to prepare for a similar future occurrence and generate more cooperation from the constituents for a better disaster prevention and mitigation program and activities. The community's experience in floods, such as personal experience when it comes to presence or absence of preparation in flooding situations, can be an effective tool.

Furthermore, these results on the level of performance of the BDRRMCs considering disaster prevention and mitigation have clearly proved that when these attributes are present of a Punong Barangay and the community, better BDRRMC service is expected. Experience, both personal and communal, in the barangay office in a flood-prone area (river basin), can provide an impactful direction of the BDRRMC's performance on disaster prevention and mitigation. Similarly, PB's educational attainment distinctly explains the BDRRMC's performance as PB with higher education has an advantage in having better understanding in the basic skills in administrative work. Matyas and Pelling (2015) point out that organizational resilience implies learning and therefore not returning to the previous position.

What Are the Issues and Concerns that Surfaced in Relation to the Level of Performance of the BDRRMCs Considering Disaster Prevention and Mitigation?

The FGD responses reveal that to certain extent, some of the TRB barangays have formed the BDRRM structures and systems and institutionalization of policies and plans of the DRRM framework. However, issues and concerns were aplenty considering implementation. Generally, these are in the absence of putting up of the DRRM structures and systems, communication system aspect (including IEC), and

commitment of the Barangay officials to DRRM functions, and the most common is the very limited budget for DRRM.

Conclusion

As a whole, the performance of the BDRRMCs in the TRB barangays, considering *disaster prevention and mitigation*, is generally satisfactory. This is broken down into formation of structures and systems (satisfactory) and institutionalization of policies and plans (satisfactory). The findings clearly show the need for the river basin communities to improve the level of performance of the BDRRMCs, particularly on disaster prevention and mitigation. The results are indicative of a common problem persisting in the barangays where there is deficiency in administrative skills, particularly in setting up and strengthening the BDRRMC policies, systems, and structures. The laws and administrative orders may be present; however, issues on how to effectively put every intention of these mandates into actions still remain to be fully seen. There is an apparent gap between the law (RA 10121) and the capacity and the effectiveness of the Barangay leaders to comply with and enforce the law. Further, there is a cogent need for all government offices handling the DRRM functions to provide appropriate attention at the Barangay level for the proper implementation of the DRRM Plan.

Furthermore, the results of the study point to the highly significant impact of the following on the level of performance of the BDRRMCs: Punong Barangay's educational attainment and years in the service and the community's experience in floods. The latter would develop higher consciousness on the negative effects of climate-related hazards, which can be an effective tool in advancing a much improved barangay's disaster prevention and mitigation measures. The facilitation of the BDRRMC functions, such as the formation of the BDRRMC structures and systems, establishment, and institutionalization of DRR policies, is better for communities that have Punong Barangays with higher educational attainment and longer years of experience and longer community experiences in floods.

The FGD responses indicated that the TRB communities have major issues and concerns considering the implementation of DRR tasks, such as putting up of the DRRM structures and systems, communication system aspect (between higher LGUs & barangays), and commitment of the barangay officers to DRRM functions. These results validate the earlier conclusion that the BDRRMCs were just performing fairly in complying the mandates of the law and DRR guidelines.

Moreover, the BDRRMCs were deficient in their tasks, particularly in ensuring the participation of the community, which can include private individuals and organizations on the conduct of drills, appointing representatives from Civil Society Organization to the BDRRMC, involving the community in adopting the family guide on disaster preparedness, coordinating with other institutions or organizations for additional equipment during disasters, and enlisting volunteers. These functions are articulations of a policy that the role of the BDRRMC can no longer be done by the LGU alone but by institutional arrangements with the private sectors as partners

in finding solution to the threats posed by climate-related hazards. As theorized by Stoker (1988), governance refers to a set of institutions and factors that are drawn from, but also beyond, governance. Responsibilities that were previously the near exclusive role of government are better off to be shared. As an enabler in establishing the DRR structures and systems, the BDRRMC has in its authority to increase the membership of the Committee to include key individuals or organizations for the furtherance of the intentions of RA 7160 and RA 10121.

Recommendation

River basin communities should have higher standards and rules in disaster risk reduction and management, considering various hazards that frequent this place. At least, if residents are allowed to reside and own lands in flood-prone areas, the government should institutionalize the rules of engagement in preparing and protecting the public from ill effects of climate-related hazards. Entrusting the Barangays with higher responsibilities in disaster prevention and mitigation should come with full complement of support in terms of strengthening their capacities and needed infrastructure and resources. Corollary to this, it should also strictly implement the administrative obligations on the LGU officers through imposing accountability.

To the Future Researchers

Conduct a study on the implementation of RA 10121, focusing on the operational relationship between the involved government agencies and the local government units, whether the existing DRRM framework is compliant to and is effectively enforced pursuant to the PDRRM law and its implementing rules and regulations. Determine also the effectiveness and functionality of the local DRR and Management Councils.

This study is not without *limitations*. It is the level of performance of the DRRM Committees in the Barangays of the Tagoloan River Basin that was looked into. This was limited to the first task of the BDRRMCs in disaster prevention and mitigation. Moreover, considering climate-related hazards are wide in scope, in this study, only floods, heavy rainfall, and unseasonal/erratic rain were considered. The respondents were those who have direct knowledge on the affairs of the Barangay DRRM Committees. The higher LGUs (municipalities/cities/provinces) were not included in this study since the management of the DRRM 5% fund is the exclusive domain of the barangay governments based on the existing laws. The same laws vest distinct authority to the barangays on the management of the DRRM Committees. Hence, the study is limited only to the TRB BDRRMCs.

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Disaster Risk Reduction with Special Reference to 2018 Kerala Floods and Approaches to Reduce Flood Vulnerability at River Basin

58

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Contents

Introduction	904
Disaster Risk Reduction	907
Inadequate Flood Management Provisions in Planning	908
Lack of Master Plan for the Management and Control of Water Resources	909
Failure of the State in Bringing Legislation for Identifying and Demarcating Floodplains	909
Flood Hazard Map Not Complying with the Standard	910
Dearth of Rain Gauges and Flood Forecasting	910
Dam/Reservoir Management	916
Sand and Stone Quarrying, Construction Activities, and Deforestation	916
Encroachment of River Space	917
Shrinking Wetlands	918
Approaches to Reduce Flood Vulnerability at River Basin	919
Methods to Reduce Flood Vulnerability	920
Structural and Nonstructural Measures	920
Structural Measures	920
Nonstructural Measures	921
Conclusion	922
References	923

Abstract

India being a disaster-prone country is affected by various disasters every year. The unplanned urbanization and environmental degradation have led to climate change, which in turn has led to the rapid increase in extreme natural response thus increasing our vulnerability to different disasters. Among these disasters, flood is one of the deadliest and destructive natural disasters that India faces. The recurrence of floods differs geographically as some places are more prone than

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the rest. Kerala is one of the disaster-prone states of India. This south-western state received 42% excess rainfall than the normal from 1 June to 19 August 2018 causing widespread floods across the state. The floods and landslides created havoc all across the state leading to the loss of 445 lives and large-scale destruction to infrastructure, socioeconomic sector, and to the environment. The 2018 Kerala flood was the worst one in nearly a century. It shook the core of the people's confidence in the ecological foundations. The havoc caused by the 2018 Kerala flood was not only the result of unprecedented downpour but there were other reasons also which turned it more disastrous. To decrease the brunt of any disaster we have a systematic approach of disaster risk reduction (DRR), where after identifying and assessing the risk we take adequate measures to reduce the risk of a disaster.

Keywords

Disaster · Vulnerability · Unplanned Urbanization · Floods and Disaster Risk Reduction

Introduction

Disasters being as old as human civilizations have become part of our lives (Parsa & Zehra, 2020). Since ages disasters are creating havoc and sufferings for mankind. Now with the increase in risk drivers like poverty, inequality, rapid unplanned urbanization, environmental degradation, weak governance, and climate change, the frequency of these disasters have increased many folds in past 20 years. In the year 2020 and 2021, a total number of 430 and 401 natural disasters took place, respectively, across the globe (Jaganmohan, Global number of natural disasters events 2007–2021, 2022b). The fatalities recorded in these 2 years were 15,071 and 10,000, respectively (Jaganmohan, Global number of deaths from natural disasters 2007–2021, 2022a). The India floods were the deadliest disaster in 2019 with 1750 fatalities (Department, 2020). In the year 2020 India lost around 87 billion dollars to climate disasters (Nandi, 2021).

With the increase in vulnerability the ratio of people living in flood-prone areas is going up at a rapid scale. With rapid urbanization and climate change this number could annually increase up to 54 million (Global flood toll to rise by 2030, 2015). It is estimated that by 2050 this population will reach up to 1.3 billion, which is equal to the 15% of the world's population. This figure indicates an increase of 0.3 billion over the present and it counts both coastal as well as river flooding (Willem Ligvoet, 2014). The World Resources Institute 2015 reports that annually the river flooding affects 21 million people across the globe.

Kerala, which is popularly called as the “Gods own country” is a land rich in natural resources. It is a narrow land belt in the south-western border of the Indian Peninsula. The Western Ghats surround the state from the east and the Arabian Sea from the west. From physiographic point of view the state of Kerala can be

categorized in to three zones, viz., the lowlands, which comprises of coastal areas where the elevation is from below the sea level up to 8 m. The second one is the midland, where most of the plantation and agricultural activities are carried out. These midlands are located at an altitude between 8 m and 75 m above mean sea level (amsl). The third zone is the highland in which forests come. The elevations in such zones go up to 2700 m amsl (Kumar, 2018).

The state of Kerala is vulnerable to various hazards and is classified as a multiple-hazard-prone state. The unique geographic location, high density population, and weather pattern makes Kerala prone to many severe natural and human-induced disasters.

The state experiences various types of recurrent disasters, which lead to the loss of lives, destruction of environment, damage to property, loss of livelihood, and disruption of economic activities ((KSDMA), n.d.). The Kerala State Disaster Management Plan (KSDMP) points out 39 types of hazards that have the potential to cause disaster.

Among various hazards, Kerala is more prone to flooding, which affect people, environment, infrastructure, and economic activities as shown in the Fig. 1. With the increase in risk drivers, the state faces recurring riverine floods (Kerala State Disaster Management Authority, 2016).

The state of Kerala is a land of rivers and rains with two main seasons of rain; “Edavapathi,” which is the Southwest monsoon and arrives either at the end of May or during the initial days of June and the other one is the Northeast monsoon also called as “Thulam,” which hits the State in mid-October. Annually, the heavy monsoon rains are part of the State but in 2018 the Southwest monsoon had a different and devastating impact as it produced a disastrous flood (State Relief Commissioner, 2018).

Annually, the State of Kerala receives an average rain of about 3000 mm and almost 90% of this rain occurs during the 6 months of monsoon period. From 1 June to 18 August 2018, Kerala received unprecedented rainfall, which resulted in severe flooding. The expected downpour from 1 June to 19 August was 1695.5 mm but as per the Indian Meteorological Department (IMD) data, Kerala received 2346.6 mm amount of rain for the same period. The amount of rainfall that the state received was about 42% higher than the normal average. But what turned it more disastrous was its skewed distribution; during the month of August the downpour went up by 164% from the normal, which resulted in the inundation of 13 out of 14 districts with 7 of them (Wayanad, Thrissur, Pathanamthitta, Kottayam, Idukki, Ernakulam, and Alappuzha) severely affected ((GOI), 2018). The intense and excessive rains occurred during 1–20 August. During this time the state received about 771 mm amount of rainfall. This caused various landslides and forced the discharge of surplus water from 37 dams throughout the state, thus worsening the flood impact. There were around 341 landslide incidents recorded from 10 districts, and the district of Idukki was the worst hit by 143 landslides (Bank, 2018). These disastrous floods and landslides caused colossal damage to the state by destroying houses, bridges, roads, power supplies, and other infrastructure.

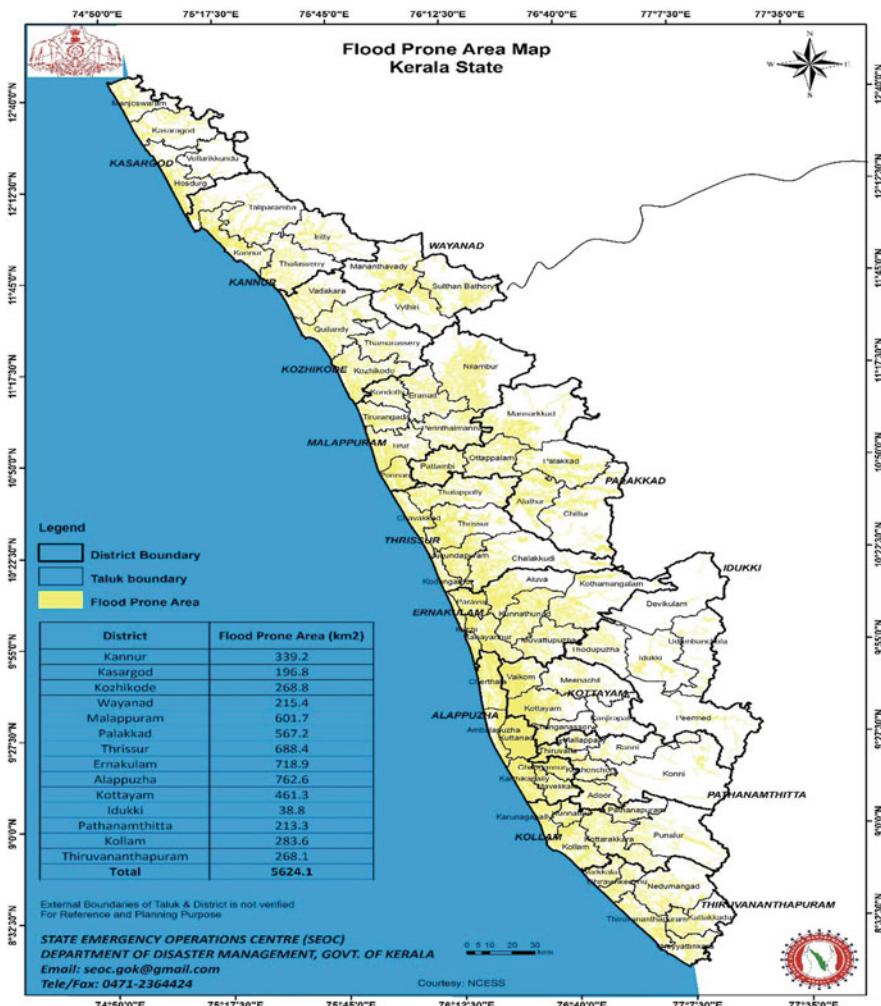


Fig. 1 Flood prone areas. Source (KSDMA)

The 2018 floods created havoc across the state of Kerala leaving behind large-scale devastation and destruction. It was the worst ever flood in the history of Kerala since 1924 flood. This devastating flood was listed among the five major extreme flooding events in the world between 2015 and 2019 by the World Meteorological Department. The flood affected the entire rural area of the state, which comprises 52.30% and a population of around 33.5 million. There were 339 lives lost and large-scale destruction was reported to infrastructure and environment. The Cochin International Airport, one of the busiest airports of India, also got inundated, which led to the suspension of its operations for 15 days from 15 to 29 of August 2018 (State Relief Commissioner, 2018).

Table 1 Losses incurred by different sectors

S.No.	Sector	Loss incurred (Millions)
1	Housing, land, and settlements	54,430
2	Health and nutrition	6,000
3	Education and child protection	2,140
4	Agriculture, fisheries, and livestock	44,4980
5	Water, sanitation, and hygiene	13,310
6	Transportation	1,00,460
7	Electricity	3,530
8	Other infra facilities	24,460
9	Environment	1,480
10	Irrigation	14,830
11	Employment and livelihood	38,960
12	Disaster mitigation	1,100
13	Gender and social inclusion	350
14	Local governance	320
15	Integrated water resource management	240
16	Culture and heritage	800
Total		3,07,390

Source (Express T. N., [2018](#))

The disastrous floods and massive landslides induced large-scale damage to infrastructure like houses, railways, bridges, roads, electricity, and communications networks. Crops and livestock got washed away, which had a severe impact on both the livelihood and lives of tens of thousands across the state. According to a report of need assessment (PDNA), which was jointly prepared by a development program of UN (UNDP) and the Kerala administration, the state suffered a massive loss of around INR 3,07,390 million ([World Bank, 2018](#)). An estimate shows that Kerala lost around 2.6% of gross state domestic product (GSDP) to floods. The administration at the central level announced it as a Level III Calamity ([Rai, 2019](#)). Losses in different sectors which the state suffered are shown in Table 1.

Disaster Risk Reduction

Disaster risk reduction is the practice of mitigating risk associated with various disasters by systematically analyzing and minimizing the causal factors. It focuses on preventing future disaster risk, reducing the existing risk, and managing residual risk. This helps to increase resilience and to achieve the goal of sustainable development. Some prominent examples of disaster risk reduction are: reducing the vulnerability of people, minimizing the exposure to various hazards, proper land management, adequate and effective preparedness, etc. ((UNISDR, [n.d.](#))).

In this regard, the Sendai Framework for Disaster Risk Reduction 2015–2030, which came after the Hyogo Framework for Action (HFA) 2005–2015, was the first

significant agreement, which offers Member States with concrete actions to preserve development benefits from disaster risk.

Following the 2015 third United Nations World Conference on Disaster Risk Reduction, the United Nations General Assembly adopted the Sendai Framework for Disaster Risk Reduction 2015–2030 (UNDRR, [n.d.](#)). This framework provides a setup to reduce the risks associated with disasters. To prevent new disasters and minimize the existing risk from disasters, the Sendai Framework for DRR has outlined seven global targets and four priorities for action.

The following are the four priorities of action that provide a way for reducing the risk associated with disaster.:.

- (i) Understanding the risk associated with disaster
- (ii) Managing the disaster risk by building disaster risk governance
- (iii) Creating disaster resilience by investing in disaster reduction
- (iv) Building preparedness for adequate response and to “Build Back Better” in terms of recovery, reconstruction, and rehabilitation ([Nations, 2015](#))

When we study about the risk reduction measures adopted by the state of Kerala, we find that the government had not taken up the priorities set by the Sendai Framework seriously. Various lapses on the part of administration were noticed in the management of the 2018 floods. The measures of disaster preparedness and response taken by the Government of Kerala were insufficient and inadequate. The various constraints found in the management of 2018 floods are discussed in the following:

Inadequate Flood Management Provisions in Planning

In 1987, the Government of India’s issued a National Water Policy (NWP), which was amended in 2002 and again in 2012. Flood management was contemplated and incorporated in the NWP. To reduce the loss of life and property due to floods, the NWP 2002 proposed the states to come up with a Master Plan for managing and controlling of floods in flood-prone basins, including proper flood cushions, and stringent rules of settlements and commercial activity in floodplain zones.

The State Water Policy (SWP), which was drafted by the Water Resources Department in July 2008, does not take into account the issue of flood management in the state. The provisions in the Government of India’s Water Policy that emphasized flood preparedness, upgradation of flood forecasting system by adopting real-time data acquisition related to forecasting models, evolving reservoir operating procedures for flood cushion, and expanding the preparedness level for unforeseen and unanticipated floods were not incorporated in the State Water Policy of Kerala. In the report of the Comptroller and Auditor General of India titled “Preparedness and Response to 2018 Floods in Kerala,” some serious issues like lack of laws for floodplain demarcation, water body and wet land encroachments, the lack of flood forecasting stations, and insufficient desiltation actions were discovered. Flood

controlling methods were not included in the State Water Policy, indicating that flood management issues were accorded a low priority (Shaji, 2021).

Lack of Master Plan for the Management and Control of Water Resources

Micro watershed was regarded the basic unit in the State Water Policy (SWP) 2008, and the river basin was deemed an integrated unit of micro watersheds. In the 2008 State Water Policy, micro watershed was deemed as the primary component and the river basin an integrated component of micro watersheds. It intended formation of a master plan at the state level for managing and developing water resources by action plans in each micro watershed, sub-basin, and river basin in a hierarchical way. In addition, master plans for the state's major rivers were to be produced, which would serve as the foundation for any river-based initiative. A State Level River Authority was also to be established to coordinate all river basin-related operations. The State Level River Management Authority is yet to be established, and its absence meant that there was no institutional structure in place to ensure coordination between different implementing agencies and to monitor the prioritization of projects. The master plan has been completed for only one river, the Chaliyar, as well as two of the five tributaries of the Bharathapuzha river. As a result, the master plans for 42 of the 44 rivers have yet to be created, despite the fact that they are included in the State Water Policy. Lack of master plans for the state's major rivers means that work regarding flood control functions on an ad hoc basis (CAG, 2021).

Failure of the State in Bringing Legislation for Identifying and Demarcating Floodplains

Floodplain zoning methods focus on identifying and demarcating the places that are likely to be affected by the floods. It also identifies the sort of developments that are permitted in these zones so that in case of floods, the damage is minimized if not evaded.

For flood plain zoning legislation, the Government of India published a model draft for all the states in 1975. This model suggested creating a Flood Zoning Authority, surveying floodplains and prohibiting or restricting the use of such areas. Regarding the flood management, there is a guideline from the National Disaster Management Authority, which talks about the regulation of floodplain zoning (Express T. I., 2022). But unfortunately, the state of Kerala has yet to establish the legislation regarding floodplain zoning. Furthermore, the state's floodplains have not been demarcated (The Hindu, 2021). Legislation with regard to identifying and demarcating floodplain zones would have allowed the government to take preventative actions against anticipated encroachment in floodplains, which could have proved very helpful for the state government in flood management efforts.

Flood Hazard Map Not Complying with the Standard

Flood Hazard Mapping is an important tool, which helps in identifying areas that are at the risk of flooding and also assists in prioritizing the measures of mitigation and response. Kerala had a flood-prone area of 14.52% of its total land area. Despite this, there was no large-scale flood hazard map in the state (Shaji, 2021). In June 2013, the Government of India expert committee for scientific assessment of flood prone areas in the country classified those flood-affected locations that have a 10-year return period as “flood prone areas.” This committee suggested every state to form a regional committee, which apart from other things would be in charge of identifying flood prone areas of the state using the methodology developed by them. So, in September 2016, the State Government of Kerala drafted a Disaster Management Plan for the state but the map selected by the state administration for this plan was generated long back in the year 2010 on 1:50,000 scale using satellite imagery by the National Centre for Earth Science Studies (NCESS). Despite the fact that the expert committee in 2013 established the flood return period (10 years) as the yardstick for identifying an area as flood prone, yet the state administration continued to bank on the map generated in 2010 by NCESS, which does not stick to the criteria laid down by the expert committee; thus the state lacks the large-scale flood hazard map.

Dearth of Rain Gauges and Flood Forecasting

Rain gauges are tools that meteorologists and hydrologists use to collect and measure the amount of liquid precipitation that falls over a specific area over a specific time period. Rainfall measurement at various key places is necessary due to considerable spatial variability of rainfall. The location of rain gauges in an area with high spatial variability in rainfall is very important for accuracy in rainfall estimation. Therefore, the density of rain gauges is critical in determining how much rain falls in a given area.

A study was conducted by the Indian Institute of Science (IISc) Bangalore on 2018 Kerala floods with target as the Periyar River Basin, one of the largest river basins of the Kerala state, which covers a distance of 5400 km². The study noticed that the Indian Metrological Department had suggested a minimum requirement of 32 rain gauges for rainfall estimation in this area but only 6 gauges were available (Express T. I., 2022). The dearth of rain gauges resulted in lack of real-time data on spatially disturbed rainfall, which caused a detrimental impact on forecasting.

Flood forecasting encompasses level forecasts and inflow forecasting. When the water level in a river reaches a pre-determined alert level, level forecasts are issued (which normally is 1 m lower than the danger level but also banks on the risk perception of a specific area). The level forecasts assist user agencies in determining mitigation measures such as evacuation and the relocation of people with their mobile property to safer places. Inflow forecasting is utilized by different reservoir

and dam agencies in ensuring optimal reservoir operations for risk-free management of flood downstream as well as to ensure that reservoirs have enough capacity to meet demand during non-monsoon period.

In 2021, an audit report prepared by the Comptroller and Auditor General of India on Preparedness and Response to 2018 Floods in Kerala noted that in 2011 the Central Water Commission (CWC) had asked the administration of Kerala to provide the list of populated towns and reservoirs that require flood forecasting and inflow forecasting stations, respectively. But the state administration did not provide the required information, so despite the fact that by 2017 CWC had established 275 flood forecasting stations across the country, none of these stations were established in the State of Kerala (Express, The New Indian, 2021). This failure of the state administration resulted in non-installation of flood forecasting systems in the state, which led to loss of the data that the administration could have used for effective flood forecasting.

The unavailability of adequate flood forecasting system led to inaccurate predictions in the state. The heaviest spells of rain that caused the greatest floods in the state of Kerala took place from 8 to 17 August. The contrast of rain forecast and the actual rain received is shown in Table 2.

The table distinctly shows that the downpour received by Kerala was absolutely unprecedented. Although heavy to very heavy rainfall was predicted for most districts on 8 August, the prediction limit exceeded too far, and torrential rains lashed Idukki and Wayanad. Although on 8 August there was a heavy to very heavy rainfall prediction in maximum districts, the prediction limit surpassed too much and heavy rains of severe nature lashed Idukki and Wayanad. On 9 August 2018, while there wasn't any serious alert requiring actions, the rainfall was of category red and orange (heavy to very heavy) in seven districts (Idukki, Wayanad, Kozhikode, Malappuram, Palakkad, Kottayam, and Pathanamthitta). Likewise on the 10th, 11th, and 12th of the same month, while red alert was issued for five to eight districts only very light to light rainfall was received.

On 15 August, which was the most pivotal day for Kerala, a forecast predominantly for yellow was issued in the State with only four districts to fall in category red and one district in orange, but the entire state had extremely heavy downpour with 18 districts falling in the red category. On 16 August 2018, prediction was issued that seven districts were receiving red and seven oranges, but the actual rain was yellow in three districts, one orange district, one green, and nine red districts. Therefore, the rains received by Kerala were much more than the predicted rains in critical days, which led to floods in the state. When comparing the daily district-wise rainfall prediction with the actual rains, a huge disproportion is witnessed.

This unanticipated and very high intensity of downpour led to severe overland flow causing the saturation of top layer of the soil, heavy landslides, wreckage flows, and erosion. This situation forced the rivers to exceed the levee areas and cause wide-scale destruction and loss of lives and property (State Relief Commissioner, 2018).

Table 2 District wise forecast and real analogy

Districts	Day-to-day rain forecast (24 h earlier forecast for each day)												
	8-8-2018	9-8-2018	10-8	11-8	12-8	13-8	14-8	15-8	16-8	17-8	18-8	19-8	20-8
Kasaragod	Orange	Green	Yellow	Yellow	Orange	Yellow	Yellow	Red	Orange	Yellow	Green	Green	Green
Kannur	Orange	Green	Red	Red	Red	Orange	Yellow	Red	Red	Red	Yellow	Green	Green
Wayanad	Orange	Yellow	Red	Yellow	Yellow	Green							
Kozhikode	Orange	Yellow	Red	Red	Red	Orange	Yellow	Yellow	Red	Red	Yellow	Yellow	Green
Malappuram	Orange	Yellow	Orange	Red	Red	Orange	Yellow	Yellow	Red	Red	Yellow	Yellow	Green
Palakkad	Orange	Yellow	Red	Red	Red	Orange	Yellow	Yellow	Red	Red	Yellow	Yellow	Green
Thrissur	Orange	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Orange	Red	Red	Yellow	Yellow	Green
Idukki	Orange	Yellow	Red	Yellow	Green								
Ernakulam	Orange	Yellow	Yellow	Red	Red	Orange	Orange	Orange	Red	Red	Red	Yellow	Green
Kottayam	Orange	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Orange	Orange	Orange	Yellow	Yellow	Green

Alappuzha	Orange	Yellow	Yellow	Red	Red	Orange	Orange	Orange	Orange	Yellow	Yellow	Green
Pathanamthitta	Yellow	Yellow	Orange	Yellow	Orange	Yellow	Yellow	Orange	Red	Yellow	Yellow	Green
Kollam	Yellow	Yellow	Yellow	Yellow	Green	Green	Yellow	Orange	Orange	Yellow	Green	Green
Thiruvananthapuram	Yellow	Yellow	Green	Green	Green	Yellow	Orange	Yellow	Green	Green	Green	Green

Actual rainfall received from 08 Aug 2018 to 22 Aug 2018

Districts	8-8-2018	9-8-	10-8	11-8	12-8	13-8	14-8	15-8	16-8	17-8	18-8	19-8	20-8
Kasaragod	Green	Green	Green	Green	Yellow	Orange	Red	Green	Yellow	Green	Green	Green	Green
Kannur	Orange	Green	Green	Green	Yellow	Yellow	Red	Yellow	Yellow	Green	Green	Green	Green
Wayanad	Red	Red	Yellow	Green	Yellow	Orange	Red	Orange	Orange	Yellow	Green	Green	Green
Kozhikode	Orange	Red	Green	Green	Yellow	Orange	Red	Red	Yellow	Green	Green	Green	Green
Malappuram	Orange	Red	Yellow	Green	Green	Yellow	Orange	Red	Red	Yellow	Orange	Green	Green

(continued)

Table 2 (continued)

Palakkad	Yellow	Red	Yellow	Green	Yellow	Orange	Red	Red	Orange	Yellow	Green	Green
Thrissur	Orange	Green	Green	Green	Green	Green	Red	Red	Red	Green	Green	Green
Idukki	Red	Red	Red	Yellow	Green	Orange	Orange	Red	Red	Red	Orange	Green
Ernakulam	Yellow	Yellow	Green	Green	Yellow	Green	Red	Red	Orange	Green	Green	Green
Kottayam	Orange	Red	Orange	Green	Green	Yellow	Red	Red	Red	Orange	Green	Green
Alappuzha	Yellow	Yellow	Green	Green	Green	Green	Red	Red	Yellow	Green	Green	Green
Pathanamthitta	Yellow	Red	Yellow	Green	Yellow	Orange	Red	Red	Red	Orange	Green	Green
Kollam	Yellow	Yellow	Yellow	Green	Green	Green	Red	Red	Yellow	Yellow	Green	Green
Thiruvananthapuram	Green	Green	Green	Green	Green	Green	Red	Yellow	Green	Green	Green	Green

COLOUR CODE		SEVERITY OF RAINS (MM)	
Green	No alert	Rains of light to moderate intensity (2.50-15.50mm)	Light rains (2.50-15.50mm)
Yellow	Be watchful and stay updated	Rainfall of heavy intensity at isolated places	Moderate rains (15.0-64.40mm)
Orange	Be alert and remain prepared	Rainfall of heavy to very heavy intensity at isolated places	Heavy Rains (64.50-115.50mm)
Red	WARNING (action needed)	Rainfall of heavy to very heavy intensity at many locations	Very heavy rains (115.60-204.40mm)
			Excessively Heavy Rains (More than 204.50mm)

Source: (State Relief Commissioner, 2018)

Note: Rain forecast announced daily at 13:00 h was treated as the forecast for next day (The 14 Aug 2018 adjusted rain prediction received at 2000 h was treated as the forecast for 15 Aug 2018)

Dam/Reservoir Management

Majority of the big reservoirs in the state were filled with almost 90% of their capacity on 8 August. It shows that in any case, it was essential to make releases from reservoirs. Kerala has many reservoir storages and even before flooding (8 August) the level of many of these reservoirs was very high. The storage level of seven major reservoirs, i.e., Periyar, Parambikulam, Malampuzha, Kakki, Kallada Idamalayar, and Idukki was higher than it should have been.

On 8 August 2018 six (out of seven) dams were brimmed up to 90% of their full reservoir level (FRL). Parambikulam had reservoir storage of 99.5% to its FRL while in Malampuzha, Idukki, Kallada, Kakki, and Idamalayar, the storage on the same day was 97.8, 92.5, 97.3, and 90.5% of their FRL. Periyar was the only major reservoir in the state with a storage level of below 80% of its FRL. Surplus (40–50%) rains took place from the month of May to August, which resulted in high storage of water.

Heavy and extreme rainfall after 8 August lead to the shortage of reservoir capacity to contain the additional increased flow forcing the discharge of a considerable volume of water in a short period of time. On 9 August 2018 after issuing the red alert, the gates of reservoir Idukki were thrown open to discharge water. This blending of excessive rain and water release from reservoir aggravated the floods in the state (Vimal Mishra, 2018).

The CAG report of 2017 has castigated deficient emergency action plans (EAPs) and other reservoir operating manuals. The report points out that the dams miss the “rule curves.” Rule curve is the level of water in a dam that can be retained safely. Each dam is likely to have a particular rule curve, which, besides other things, instructs the filling of a dam in the monsoon season that improves flood controlling and moderation for downstream areas. Most of the dams in the state were nearly brimming by July end, which is an outright contravention of rule curve, as the month of July is the midway of Edavapathi or Southwest Monsoon. This filling up of reservoirs by July end was an open call for flood calamity (Rai, 2019).

Moreover, in response to an RTI query, the CWC disclosed that not a single dam in the entire state of Kerala was checked ahead of the monsoon arrival. It also mentions that only two dams were inspected prior to monsoon in the year 2015, four in 2016, and 2017 while the post-monsoon inspection was carried for two dams in 2015, five dams in 2016, four dams in 2017 and 2018, respectively (Kuttappan, 2018).

Sand and Stone Quarrying, Construction Activities, and Deforestation

On 31 August 2011 an expert panel of Western Ghats Ecology Expert Panel (WGEEP) led by Madhav Gadgil gave a report about the Western Ghats fragility to Ministry of Environment Forest and Climate Change (MoEF&CC). This report had suggested to categorize the 140,000 square kilometer area of the Western Ghats

within three zones; Ecologically most sensitive zones (ESZ1), in which many places will fall in “no-go” like special habitats, water bodies, sacred groves, and areas rich in biodiversity; the second category will be of ecologically more sensitive zones (ESZ2), in which futuristic development of major roads and railway tracks shall not be permitted, with the exception of being essentially required; and ecologically sensitive zones (ESZ3), in which construction of infrastructure and new developmental projects may be allowed but with “strict ecological regulations” (Rai, 2019). The report had warned that illegal mining, stone quarrying, construction activities, and deforestation had promoted huge encroachment of rivers and other water bodies in the state and had called for urgent corrective measures but all such warnings were overlooked. As a result of deforestation and infrastructural expansion, construction activities have become rampant and unplanned, resulting in slope modification, excavations, and quarries (Sangomla, 2018). These activities were devastating in terms of natural slope destabilization induced by the elimination of vegetative cover, which led to landslides. During the floods of 2018, these slopes were washed away at various places, resulting in a large sediment flux in the rivers. Apart from increasing slope instability, many structures downstream, such as roads and bridges, interrupted the natural course and reduced the width of various rivers by acting as a “barrier” to water and sediment movement. This led to “drainage congestion,” as there was not sufficient space to allow flood waters to pass safely. This aggravation of channels with sediments exacerbated the flood situation by inundating the nearby areas.

Another report known as “Kasturi Rangan Committee report” classified 37%, which comprises of almost 60,000 km² of Western Ghats, as ecologically sensitive and for its notification the suggestions were passed to the environment ministry. It was only in the year 2017 that the said ministry declared 57,000 km² of this area as ecologically sensitive. In this area all ventures related to mining, high polluting industries, and vast constructions were banned. This act opened up a large part of this sensitive area to various ventures like mining and constructing reservoirs/dams, etc. (Staff, 2018).

Latest research carried by the KFRI shows that there are around 5,924 quarry units across the Kerala. Another report published by Global Forest Watch said that the state of Kerala has had large-scale forest disappearance in recent years. Kerala lost forest land of 7,187, 9,722, and 6,237 hectares in the year of 2016, 2017, and 2018, respectively (Sen, 2020). All these factors added more risk to the hazard prone state of Kerala and turned 2018 floods more devastating.

Encroachment of River Space

Kerala, like many other parts of the country, has suffered major encroachment of river space due to uncontrolled and ill-planned urbanization, which has progressively converted the lush and permeable floodplains into human settlements. This has not only restricted floodwater infiltration for groundwater recharging and excess rainfall accommodation, but it has also put a significant population and infrastructure at risk.

The Kerala Nadhi Samrakahsna Samithi discovered considerable encroachment on the Chaliyar River, with the encroachers largely being businesspeople. The encroachment has occurred in the municipalities of Feroke and Ramanattukara, as well as the villages of Olavanna and Pantheeramkavu in Kozhikode and Vazhayur in Malappuram (SR, 2019).

In the Alappuzha district, the Uttarapalliyar River has also been significantly encroached upon. The Kerala high court has intervened in this matter, stating that the river has been encroached upon on a large scale, resulting in significant river constriction (Sharma, 2018). River Periyar, which is known as the lifeline of Ernakulam, has also been encroached at various stretches due to the misgovernance of authorities. During the last few years, around 200 residential complexes have sprung along the river bank. Due to the inaction of the government around 25 acres of encroachment have been observed along the Perumbavoor-Aluva section alone (Sunil Kumar M. K., 2011).

The president of Confederation of Real Estate Developers Association of India (CREDAI) Mr. Antony Kunnel says that the River Management Fund in Ernakulam alone had over Rs 100 crore in the year 2010. Despite no shortage of funds, the authorities ignored the request to survey and demarcate the river boundaries. According to the Coastal Regulation Zone (CRZ) Act, any structure must have a 100-meter setback from the river. However, this regulation has been violated time and again due to the callous approach of the government (Sunil Kumar M. K., 2011).

Shrinking Wetlands

The state of Kerala is widely known for its wetlands. These wetlands not only grant livelihood to thousands of residents in the forms of agricultural produce, fiber, fish, fuel, and fodder but also act as a sponge in flooding conditions. But these wetlands are diminishing very rapidly. Large-scale reclamation, encroachment, deforestation, and pollution are causing wetlands to shrink. In 2004, there was around 328,402 ha of wetlands in Kerala, which was reduced to around 160,590 ha in 2015 (Preetha and Laladhas 2017). A study by Kerala State Council for Science, Technology and Environment revealed that around 50% of wetlands and paddy fields in Thrissur district have been reclaimed in the last 30 years. As per this study, in the year 1970 there were 734.32 km² of wetlands in the district that have been reduced to just 381.29 km² now (Chronicle, 2017). Similarly, in Thiruvananthapuram the area of wetlands was around 2261.726 in the year 1965, which was reduced to just 724.42 in the year 2019 (Aiswarya Philip, 2018).

All these lapses show that the administration of Kerala is seriously lacking in disaster risk governance and needs immediate measures to manage and mitigate the risk. The administration has to act according to the priorities set by the Sendai Framework for disaster risk reduction with more focus on disaster risk governance. Not only should there be policies and legislation for risk reduction but also proper mechanism and coordination between various institutions involved in this. Adequate measures should also be taken for effectively involving community in risk reduction measures.

Approaches to Reduce Flood Vulnerability at River Basin

To reduce the flood vulnerability at river basins, the key component is to know the behavior of such floods. It is the fundamental element in identifying solutions to reduce the impact of these floods. Floods may be caused by both internal and external sources within the river basin. There are various factors that force floods at river basins as shown in Fig. 2.

River floods occur when the river channel's conveyance capacity is insufficient for the flow that must pass. In these scenarios, flood waters seek a passage over land. The flow could pass through urban areas, industrial areas, agricultural land and others. Such a flow can be quite harmful, especially if it occurs unexpectedly. The speed with which a flood hits has a significant impact on the amount of damage it causes. Flash floods, which are commonly described as floods that come within 6 h of the start of a driving factor such as heavy rainfall, are the most dangerous in terms



Fig. 2 Flood drivers at river basin. Source (Verwey Adri, 2017)

of human lives. Even in developed countries with a high level of flood protection, flash floods can cause fatalities.

Methods to Reduce Flood Vulnerability

Flooding risk can be addressed in various ways by taking a proactive approach that incorporates both nonstructural and structural solutions. Flood risk is comprised of three contributing factors: exposure, hazard, and vulnerability.

$$\text{Hazard} \times \text{Exposure} \times \text{Vulnerability} = \text{Flood Risk}$$

As we can see that the risk of flooding can be lowered by reducing the hazard, exposure, and/or vulnerability. Any hazard may be reduced largely through structural measures, whereas exposure and vulnerability can be modified primarily through nonstructural methods. Figure 3 shows various methods by which flood vulnerability can be reduced.

Structural and Nonstructural Measures

Flood risk can be reduced in different ways by using a proactive approach that combines structural and nonstructural interventions. The aim of structural and nonstructural flood measures is to reduce flood risk and it can be done through mitigating hazard, vulnerability, and exposure. The most effective way to reduce hazard is through structural measures while the primary way to change exposure and vulnerability is through nonstructural measures. Over the last few years, both structural and nonstructural methods have acquired a lot of recognition for being flood preventive measures.

Traditionally, structural methods have been used to prevent flooding. From hundreds of years, dikes were created along the rivers to protect against flooding and inundation. Later on, when the benefits of delaying runoff became clear, other sorts of civil engineering projects, such as those aimed at improving flood retention capacity, were also implemented. Flood protection can be achieved through a wide range of structural methods mentioned in the following:

Structural Measures

1. Building of embankments and dikes
2. Building of Storm surge barriers
3. Setting up polders along with pumps
4. Building of diversion canals
5. Building of reservoirs
6. To Increase capacity of channel conveyance



Fig. 3 Methods of flood vulnerability reduction. Source ([Verwey Adri, 2017](#))

7. Developing dry polders and detention basins
8. Developing sand barriers and coastal lagoons
9. Developing elevated highways
10. Terrain elevation in new urban projects

Nonstructural Measures

The following nonstructural measures also play a vital role in reducing flood hazard.

1. Reforestation at river basins
2. Agricultural Regulations
3. Improved river basin infiltration
4. Enhanced reservoir operating rules

5. Flood zoning and mapping
6. Guidelines for infrastructure development in floodplains
7. Flood forecasting and warning system
8. Flood insurance
9. Public awareness and training

The exposure of a region/area to floods is determined by the infrastructure, economic activities, magnitude of encroachments in watershed areas, river banks and beds, and the level of urbanization. To mitigate the exposure, various steps can be initiated to safeguard existing infrastructure and to minimize the future developmental projects. The various measures that help in reducing the exposure are as follows:

1. Regulations and planning for land use
2. Building floating houses
3. Construction of flood-resistant structures
4. Resettlement and acquiring property

The report of the Comptroller and Auditor General points out that it was poor governance that turned these floods so disastrous. Many flaws on the part of planning, reservoir management, flood forecasting, and capacity building have been mentioned in this report.

Conclusion

The devastating flood of August 2018 created havoc across the state of Kerala and made a devastating impact on its socioeconomic environment. Many risk drivers, viz., extreme rainfall, poor dam management, sand and stone quarrying, deforestation, etc., turned this flood more calamitous. It was more a result of poor human management than nature's fury. Even after the Western Ghats Ecology Expert Panel's regular warnings, the administration didn't take adequate measures to regulate the abuse of Coastal Zone regulations. The devastation exposed the failure of the administration in ensuring adequate measures of mitigation and preparedness. The recent report by the Comptroller and Auditor General (CAG) has chastised the State administration for shortcomings in policy and infrastructure that hampered the response for this flood. The report states that it was poor governance that turned these floods so disastrous. The administration showed failure in planning, reservoir management, flood forecasting, and capacity building measures. Kerala being a disaster-prone state, it is imperative that the administration must act upon the targets and priorities set by the Sendai Framework for Disaster Risk Reduction 2015–2030 to prevent future disasters and minimize the existing risk from other disasters as well. The administration needs to be proactive and bring all the stakeholders together to put a joint effort in this regard. The Sendai Framework helps to mitigate the existing risk and prevent new ones based on the concept of

“Build back Better,” integrated water resources management, people-centric approach, judicious use of natural resources, use of latest technology, innovation, and knowledge. Disasters will happen and we cannot stop them but what we surely can do is to minimize their impact so that the loss of lives, damage to property and infrastructure, and loss to the environment is as minimal as possible.

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Evaluation of Reconstruction Practices

59

Akanchha Singh

Contents

Introduction	928
Gujarat Reconstruction and Rehabilitation Policy: Livelihood Support Program	928
Damage and Loss Assessment	929
Livelihood Restoration in Gujarat	929
Needs of Vulnerable Population	933
Quantum of Loss	934
Industry	934
Post Disaster Assistance for Industrial Units	934
Role of NGO	935
Kerala	935
Uttarakhand Floods 2013: Impact on Livelihoods	938
Nature of Uttarakhand Disaster: Natural or Man-Induced?	938
Structural and Regional Imbalance	938
The "Sustainable" Alternative	941
Fani Cyclone: Loss to Livelihood	943
Damage and Loss to Fishery Sector	944
Cyclone Recovery	946
Recovery Strategy	946
Resilient Livelihoods	946
Livelihood Support	947
Strategies of Livelihood Restoration and Promotion	947
Types of Assistance	947
Conclusion	949
References	950

Abstract

It has been clearly established that livelihood is a crucial component of recovery, only next to housing reconstruction in importance. The aim of any recovery

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exercise is to restore lives and livelihoods of the people, refurbish institutions and social networks. Moreover, the recovery exercise is aimed to “build-back better.” This means that the effort is not just to restore the system to pre-disaster levels but rather to address the underlying systemic risks and vulnerabilities that led to the disaster in the first place. Such an intervention will help in preventing future disasters. NGOs have come to play a complementary role in livelihood restoration by providing finance, market intelligence, re-skilling and up-skilling disaster survivors. In case of Gujarat, intervention by SEWA transformed lives of unskilled women survivors and also aided in their psychosocial recovery. In terms of support to agriculture, industry, and services the reconstruction exercise has been evaluated by placing the emphasis merely on the number of beneficiaries, discounting for factors like assistance as proportion of damage, beneficiaries as proportion of people affected, etc. There seems to be consensus across policy documents that livelihood assistance can potentially ensure food security and enable housing reconstruction; however concomitant focus has not been given to the same.

The attempt through this chapter is to revisit the experience of post-disaster livelihood restoration.

Keywords

Livelihoods · Disaster · Recovery · Reconstruction

Introduction

From the Needs Assessment reports and financial resource allocation it is clear that livelihood is a crucial component disaster recovery, only next to housing reconstruction in importance.

The aim of any recovery exercise is to restore lives and livelihoods of the people and refurbish institutions and social networks. Moreover, the recovery exercise is aimed to “build-back better.” This means that the effort is not just to restore the system to pre-disaster levels but rather to address the underlying systemic risks and vulnerabilities that led to the disaster in the first place. Such an intervention will help in preventing future disasters.

Gujarat Reconstruction and Rehabilitation Policy: Livelihood Support Program

Under this, the government included credit supply for self-employed, provisioning workshops and infrastructure for artisans, farm input, support to industries, traders, and tourism sector.

Damage and Loss Assessment

The damage and loss assessment exercise was entirely government led. The team comprised of a government engineer, an official of the state government department, and a headmaster. The mandate of the team was to look at losses to houses, public buildings and infrastructure (Table 1).

As is evident, housing loss made up the majority share of total losses about 52%, followed by productive sector (20.6%), which includes agriculture, industry and services, and infrastructural losses (15.7%) (Table 2).

As regards the three sectors of economy, primary sector has registered maximum losses (53.8%), followed by the tertiary sector (35.4%) and manufacturing sector (10.7%). The aggregate loss to sectors of economy is estimated at INR 28423 crore (Table 3).

Even when it is primary sector that has faced the major brunt of the disaster (53.8% of total economic losses), in the estimated recovery cost share it lags behind at 22.2%. Industries (all categories put together) account for 73% of total recovery cost share. While it may be argued that cost of plant machinery and equipment is bound to be capital intensive, even then financial estimation is seemingly disproportionate. It seems to ignore the revival needs of the primary sector and service sector alike viz. a viz. the static and dynamic losses that these sectors have witnessed (Table 4).

As regards livelihood restoration, information provided is severely limited. Only data on number of beneficiaries has been released. It does not reveal what proportions of affected people have received these benefits in reality. Besides, there is no clarity on quantum of assistance provided; the figures vary from source to source. However, there is an indication that the support provided is meager with respect to damage. In some cases, such support served to be only of “token” significance (Tables 5, 6, 7, and 8).

In terms of support to agriculture, industry, and services, the reconstruction exercise has been evaluated by placing the emphasis merely on number of beneficiaries, discounting for factors like assistance as proportion of damage, beneficiaries as proportion of people affected, etc. The effort seems to be to readily declare the reconstruction exercise as a success without confronting more nuanced challenges.

Livelihood Restoration in Gujarat

The reconstruction policy document at its very beginning underlines that livelihood restoration is the thrust area of rehabilitation program. The document acknowledges the economic realities of Kutch region in accepting the significance of handicrafts. A revolving fund of INR 15 crore for working capital assistance was instituted. SIDBI announced a refinance scheme on concessional terms and conditions. The rehabilitation policy clearly states that it will seek the “active participation” of commercial banks, International Finance Institutions, and microfinance agencies in livelihood restoration activities. The UNDP, ILO all were roped in for different works.

Table 1 Gujarat earthquake, 2001: Sector-wise asset losses and reconstruction cost (Rs. crore)

Sector	Asset losses	Percentage to total asset losses	Reconstruction cost	Percentage to total reconstruction cost	Reconstruction shortfall
Housing	5166	52.1	5148	48.7	-0.3
Health	219	2.2	279	2.6	27.4
Education	670	6.8	837	7.9	24.9
Total (social sector)	6055	61.1	6264	59.2	3.5
	0.0				
Irrigation	186	1.9	419	4.0	125.3
Rural water supply	233	2.4	451	4.3	93.6
Municipal infrastructure	140	1.4	209	2.0	49.3
Public buildings and monuments	339	3.4	442	4.2	30.4
Power	186	1.9	456	4.3	145.2
Transport	321	3.2	358	3.4	11.5
Ports	98	1.0	121	1.1	23.5
Telecommunication	51	0.5	121	1.1	137.3
Total(infrastructure)	1554	15.7	2577	24.4	65.8
	0.0				
Agriculture and livestock	544	5.5	344	3.3	-36.8
Industry	339	3.4	205	1.9	-39.5
Services	1163	11.7	930	8.8	-20.0
Total (productive sector)	2046	20.6	1479	14.0	-27.7
	0.0				
Environment	256	2.6	256	2.4	0.0
Grand total	9909	100.0	10,575	100.0	6.7

Source: Data from World Bank and Asian Development Bank, 2001; Percentage of Asset Loss = (Sectoral Asset Loss/Grand Total) × 100 Reconstruction shortfall = ((Asset Loss – Reconstruction cost)/Asset Loss) × 100

Table 2 Total financial loss (Rs. crore)

Type of loss	Financial loss
Primary loss	15,308
Secondary loss	3048
Tertiary loss	10,067

Source: Gujarat State Rehabilitation Policy, Government of Gujarat

Table 3 Estimated overall cost of reconstruction (Rs. crore)

Sector	Subsector	Reconstruction cost	Percentage share
Industries	Small, medium, and large	475	52.7
	Rural and cottage	190	21.1
	Agriculture	200	22.2
	Tourism	36	4.0
	Total	901	

Source: Data from World Bank and Asian Development Bank, 2001

Table 4 Category-wise beneficiary

Component	Number of sanctioned beneficiaries
Rural and Cottage Industry	
Loan/assistance for self-employed	14,862
Tool kits to artisans	18,668
Tool kits to handicraft artisans	12,934
Looms for handicraft artisans	3419
Toolkit for masons	27,000
Working capital assistance for handloom weavers	3794

Source: GSDMA, Government of Gujarat

Table 5 Handicraft parks and *Kendras*

Number sanctioned
Permanent worksheds
Handloom and handicraft parks
Gramudyog Vikas Kendra

Table 6 Industry-wise (Number of units)

Industries	Number of units
Subsidy assistance to small industries	2162
Cash assistance to small cabins and shops	13,190
Subsidy and interest subsidy to services and trade	4421

Table 7 Number of beneficiaries in agriculture and hospitality

Agriculture	No. of beneficiaries
Input kits	58,163
Assistance for on farm structure	46,872
Assistance for irrigation assets	78,890
Hotel/Restaurants (Services)	
Rehabilitation of affected tourism units	69

Table 8 Women's livelihood

Number of women covered under Livelihood Restoration Project	16,127
Source: The Kutch Earthquake 2001, National Institute of Disaster Management (2004)	

Schemes announced for livelihood support are:

1. Short-Term Recovery Assistance

It promised to provide loan up to INR 2 lakh to self-employed people. Those who were employed in village and cottage industry, commercial banks and financial institutions would provide loans with subsidy.

Under the scheme, toolkit up to INR 2500 was to be provided to self-employed workers.

For temporary construction of work sheds, support of up to INR 5000 was to be provided, which was reported to be grossly inadequate.

Provision of assistance up to INR 24000 was made for toolkit for handicraft artisans.

2. Long-term Economic Assistance

Under this scheme, permanent worksheds of 20–25 sq. m were promised for each artisan. Also, the Rural Industries Development Centre was proposed at 50 locations for providing infrastructure to the tune of INR 4.5 crore. Besides, 24 mini handloom-handicraft parks at an estimated cost of INR 1 crore each (with 50% government assistance) were promised. Additionally, eight district level handloom- handicraft parks with a per unit cost of INR 2 crore each were also to be set up.

A Revolving Fund of INR 15 crore was to be created for rehabilitation of self-employed in village and cottage industries.

3. Assistance for Revival of Agriculture

For those engaged in agriculture sector, an immediate assistance of INR 15000 was provided. In case farm equipment were damaged or destroyed, assistance was provided in the range INR 2500–10,000. In case of damage to irrigation assets, the government promised to compensate 50–60% of the restoration cost subject to a ceiling of INR 1 lakh.

4. Assistance for Revival of Industry

Special package was announced for salt farmers, which promised to compensate them up to INR 5000. Besides, assistance up to 60% of repair and reconstruction cost was announced for all micro, small, and medium enterprises in seismic zones IV and V with a ceiling of INR 60 lakh. Outside the zone, assistance was provided up to 50% or INR 30 lakh whichever was greater. Assistance of 20 lakh (Zone IV, V) and

Table 9 Tax exemption in Gujarat

Sl. No.	Category of investment	Exemption under sales tax (%)	Time period for exemption
1	Investment up to INR 10 crore	100	5 years
2	Investment in the range INR 10–50 crore	100	7 years
3	Investment more than INR 50 crore	100	10 years

Source: Gujarat State Reconstruction Policy Document

10 lakh (other zones) for 2 years was given for interest liabilities to pending loans. Stamp Duty exemption was also provided on financial transactions, royalty was exempted on materials, which were produced or utilized in Kutch. Additionally, relief to trade, services – like retail outlets, nursing homes and restaurants. The rehabilitation policy acknowledges the significance of tourism sector to the economy of Kutch. In order to revive the tourism sector, the government promised to pay up to 60% of the cost of repair/reconstruction subject to the ceiling of INR 60 lakh.

Special Incentive Scheme (2001–2004) was announced by the Gujarat State Government to trigger industrial development in Kutch. Under this scheme cent percent tax exemption was provided for various categories of investments (Table 9).

This was in addition to excise exemption scheme declared by the Central government.

Such tax sops were expected to revive the economy of Kutch.

For salt pan workers, relief was provided in the range of INR 3000–5000. For shop owners with damaged property, benefits were provided between INR 3000 and 6000. In case of artisans in cottage industries and self-employed, subsidy assistance was provided to the tune of 60% of loans for working capital subject to a ceiling of INR 2 lakh. For handloom weavers, assistance was provided at INR 10,000 per handloom weaver. The reconstruction policy document asserts that livelihood assistance can potentially ensure food security and enable housing reconstruction. At the same time, housing reconstruction can ensure that home based-economic activities like weaving, handicraft, etc., may resume. The livelihood section of the reconstruction policy document ends in anticipation to throw up greater opportunities of employment.

Needs of Vulnerable Population

In the wake of the earthquake, livelihood restoration strategies thus conceived were three pronged: immediate restoration of livelihood; enhancing the skills of artisans; and empowering the artisans to market their skills. Additionally, schemes for small scale industries and agriculture were also introduced. Assistance was provided in the form of free kits, allowance for structural damage, working capital assistance, subsidized loans, training, and market.

In the post disaster scenario landless laborers and marginal farmers need greater support from the State. They ought to be reskilled and provided alternative livelihood options.

Quantum of Loss

Due to massive earthquake in Gujarat (2001), agriculture was severely affected. Two years of drought preceded the earthquake and therefore it was a dual tragedy. The official statistics of state government of Gujarat pegs total damage and loss at INR 544 crores. The loss of assets and infrastructure in private sector and public sector agriculture was estimated to be INR 510 crores and 35 crores, respectively. Major damage was reported in irrigation assets such as pumps, tube wells, water storage tanks, farm equipment, inputs, and livestock. The public sector loss component included loss to government agricultural university, dairy cooperative building, etc. Output losses were estimated to be to the tune of INR 230 crores mostly due to late harvesting of crops, lack of timely irrigation, and provision of farm storage.

Industry

Industrial units and machinery were damaged in districts like Kutch, Rajkot, Bhavnagar, Surendranagar, Patan, and Jamnagar. More than 3000 small-scale and numerous medium and large-scale enterprises were assessed to have suffered a collective damage of INR 340 crores.

Gujarat Industrial Development Corporation estates in Bhuj and Ajnar suffered tremendous damage. In Gandhidham and Kutch wood-based industries suffered damage, in Rajkot ceramic-based industries. The Indian Farmer Fertilizer Cooperative Limited (IFFCO) at Kandla was also affected. Large number of people in Kutch who depended on handicraft and handloom lost their livelihood. Total industrial losses was estimated to be around INR 1800 crore.

Post Disaster Assistance for Industrial Units

In case of small, medium, and bigger industrial units, which were situated in seismic zone IV and V, cash assistance to the tune of 60% of total investment with an upper limit of INR 60 lakh rupees was provided. Additionally, provision was made for zero interest loan for 2 years on working capital and exemption from electricity and stamp duty. The Reserve Bank of India also simultaneously announced various relief packages to be provided by banks to affected population. It involved relaxation of norms in payment of impending loans and sanction of fresh loans on lenient terms to those who had suffered losses.

Role of NGO

Under the Livelihood Security Project for Earthquake-affected Rural Households in Gujarat, Self-Employed Women's Association (SEWA) played an instrumental role restoring livelihoods for informal women workers. SEWA had empanelled close to 5 lakh women workers out of which 1 lakh are registered with IFAD. Under the livelihood assistance scheme, SEWA *Mahila Gram Haats* were created in addition to SEWA Trade Facilitation Centres. These centers helped in transforming local skills of women community like hand embroidery, crafts into a sustainable and commercially viable livelihood model. The facilitation center provided detailed market intelligence regarding demand of crafts, forums to sell products, and desirable product destinations. It is interesting to know that women in Kutch were traditionally engaged in unskilled agricultural labor; though they had training in handicraft and weaving over generations, they had little knowledge to channelize their expertise for income. SEWA presented an innovative model to create productive avenues for women survivors of disaster (Table 10).

Kerala

As regards sector-wise damage to livelihood, horticulture has registered maximum losses (77%) followed by agriculture (14%), and livestock (8.2%) (Table 11).

Table 10 Sector-wise estimated damage to livelihoods

Sectors	Financial losses (INR crore)	Percentage of total loss to livelihood
Agriculture	26	14.2
Horticulture	140	77
Fisheries	0.8	0.4
Livestock	15	8.2
Tourism-linked livelihoods	Not estimated	
Micro, small, and medium enterprises	Not estimated	

Source: Rebuild Kerala Initiative, 2018; Government of Kerala

Table 11 Category-wise affected workers, Kerala 2018

Category	Total workers (in lakh)	Affected workers (in lakh)	Percentage of workers affected	Days lost	Total man days lost (lakh)	Daily wage rate INR	Wage lost (INR crore)
Male workers	90.7	51.7	57	13	672	770	5100
Female workers	36.4	20.7	57	13	270	430	1165
Total	127.1	72.4	NA	NA	942	NA	6265

The disaster database of Kerala is more robust than that of Gujarat and Uttarakhand. In the two previous disasters, only number of beneficiaries and affected population was mentioned not clarifying what proportion of affected people were actually compensated in any manner (Table 12).

Kerala is also one of the first states for which Post Disaster Needs Assessment methodology as mandated by three international organizations was undertaken. The UNDP report puts seven districts of Kerala in the “100 per cent category”; these are Pathanamthitta, Alapuzha, Kottayam, Idukki, Ernakulum, Thrissur, and Wayanad. Thiruvananthapuram and Kasaragod were not affected. All other districts were affected to various degrees (Table 13).

Around 57% workers (both male and female) have suffered wage loss during the floods. Total wage loss registered is to the tune of INR 6265 crores (Table 14).

Table 12 District-wise affected population

District-wise affected population				
District	Percentage of affected population	Per capita GSDP	Total income loss	Income loss as percentage of per capita GSDP
Thiruvananthapuram	0	166,736	0	0.0
Kollam	46	186,988	940	0.5
Pathanamthitta	100	135,850	657	0.5
Alapuzha	100	185,171	1626	0.9
Kottayam	100	164,840	1347	0.8
Idukki	100	187,252	845	0.5
Ernakulam	100	204,472	2842	1.4
Thrissur	100	173,514	2284	1.3
Palakkad	60	136,840	985	0.7
Malappuram	43	121,633	940	0.8
Kozhikode	11	145,993	216	0.1
Wayanad	100	132,045	455	0.3
Kannur	20	149,395	316	0.2
Kasaragod	0	138,161	0	0.0
Kerala	57	2,228,890	13,453	0.6

Source: UNDP Kerala Post Disaster Needs Assessment 2018

Table 13 Person days and wage loss

Projected person days and wage loss during Kerala floods							
Category	Total workers (in lakh)	Affected workers (in lakh)	Percentage of workers affected	Days lost	Total man days lost (lakh)	Daily wage rate INR	Wage lost (INR crore)
Male workers	90.7	51.7	57	13	672	770	5100
Female workers	36.4	20.7	57	13	270	430	1165
Total	127.1	72.4	57	13	942	NA	6265

Of all the sectors infrastructure has been greatly impacted and its recovery needs also constitute a majority (Table 15).

The table shows that uninsured losses make up nearly 96% of total losses. In order to compensate for uninsured losses, the survivors have to rely on ex-gratia grants and government assistance (Table 16).

HLEC considered the proposal put forward by ACS (LSGD) amounting to 1002 crore and decided to approve projects to the tune of Rs. 250 crore in the existing financial year (Table 17).

Table 14 Percentage share of disaster impact and recovery needs

Percentage share of disaster impact and recovery needs(Sector-wise)

	Sectors	Disaster impact	Recovery needs
1	Productive	17	15
2	Social	18	20
3	Cross-cutting	27	14
4	^a Infrastructure	38	51

Source: UNDP Kerala Post Disaster Needs Assessment 2018

^aInfrastructure includes subsectors of water, transportation, power, and irrigation

Table 15 Percentage share of insured/un-insured losses

Percentage share of insured and uninsured losses		
1	Insured loss	4
2	Uninsured loss	96

Source: UNDP Kerala Post Disaster Needs Assessment 2018

Table 16 Proposal by Local Self Government Department

Proposal by ACS (Local Self Government Department) for sectorial investment	Rs. in crore
Farm livelihood	260
Non-farm livelihood	327
Community livelihood fund	303
Socioeconomic intervention	112
Total	1002

Source: Minutes of the 5th Meeting of the High Level Empowered Committee (HLEC) of Rebuild Kerala Initiative held on 6th July 2019

Table 17 Category-wise quantum of loss

Sl. No.	Category of loss	Quantum
1	Agriculture	20,401 ha
2	Livestock (cows, sheep, buffaloes, goats, poultry)	18,000 animals
3	Micro, small, and medium enterprises affected	64,000 units
4	Horticulture	15,536 ha
5	Loss to fisheries and tourism industry	

Source: Compiled from various reports of Uttarakhand State Disaster Management Authority

Uttarakhand Floods 2013: Impact on Livelihoods

Nature of Uttarakhand Disaster: Natural or Man-Induced?

The Uttarakhand disaster was significant not just for its scale but also for the reasons that exacerbated the impact of this disaster. A study of the economic history of the Uttarakhand illustrates that the tug of war for the region's resources can be traced back to the colonial era. On the one hand lay the community's customary rights over forests as source of livelihood while on the other hand laid the colonial interest in commercial exploitation of these forests. The latter through dynamics of power overrode the former with time. In the post-independence era, forests continued to be viewed as revenue generators. Mountainous areas failed to attract planner's attention in the early years as they were unable to generate surpluses. Even when Uttarakhand was made into a separate state on the premise that mountainous regions deserve special attention, the government narrowly pursued policy of industrialization in plains for the overall development of the state. Despite decent economic growth, social indicators like life expectancy, female literacy, and poverty rates fared dismally as compared to national averages.

Structural and Regional Imbalance

It is clear that in the decade leading to the floods (2002–2013), secondary and tertiary sectors were growing at a higher rate as compared to the primary sector, which employs close to 70% workforce in the state. In the 4 years preceding the deluge, growth rate had started declining before finally plateauing (Fig. 1).

The chart traces sectoral composition of GSDP over the decade leading to the disaster. It is evident that the share of secondary sector has seen a considerable rise, while agriculture has contracted. This is at a time when the dependence on agriculture has remained nearly constant.

For greater clarity we can contrast the case of Uttarakhand with the all-India scenario. It is seen that the industrial sector is contracting albeit very steadily. As opposed to this, in the same period, the contribution of agriculture sector to GDP (all India) has declined marginally (Figs. 2 and 3).

The state has shown high growth rate in recent years. It reached 6.7% in 2012–2013, from 2.9% in 2000. In the same period per capita income tripled. In sectoral composition, the share of services and industries has increased while that of agriculture and allied activities has concomitantly declined.

Primary sector in Uttarakhand is well diversified across major components of agriculture, forestry, and mining. However, the State has attained a low growth rate of less than 2% in almost all components of primary sector including agriculture. The growth in secondary sector has been on account of growth in construction and energy generation. The literature points out that developments in both sectors have detrimentally impacted the fragile ecology of the Himalayan state, which aggravated the impact of disaster.

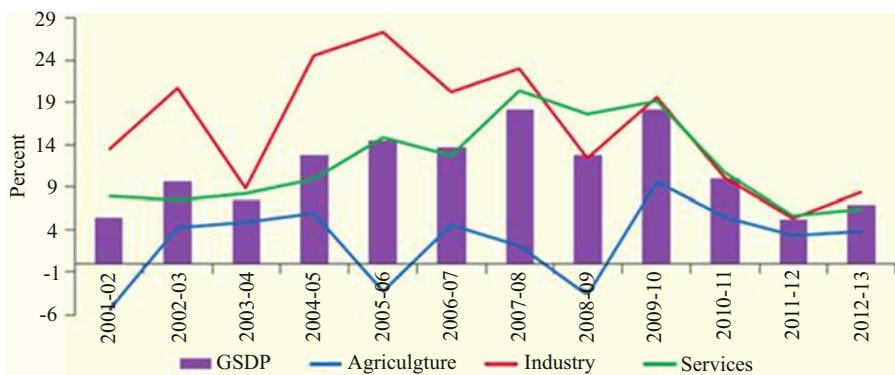


Fig. 1 GSDP growth rate at (2004–2005) prices, Uttarakhand

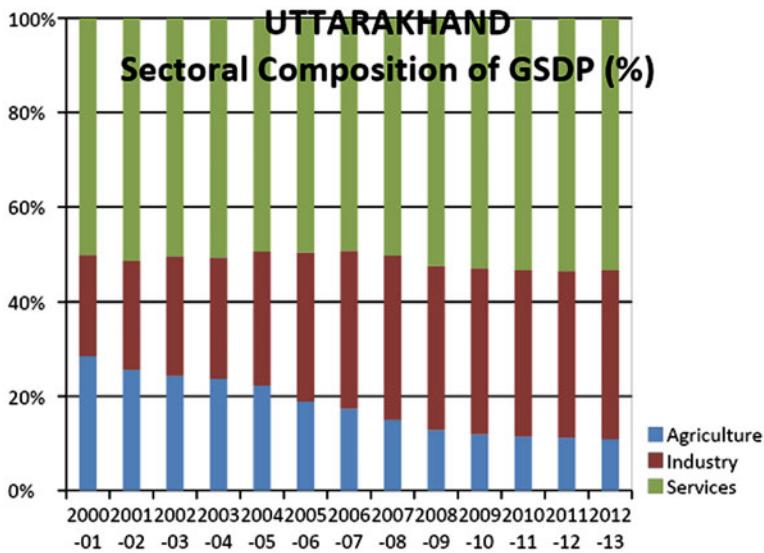


Fig. 2 Sectoral composition of GSDP Uttarakhand. (Source: CSO)

Uttarakhand largely depended on primary economic activities. However, after delineation of the separate state of Uttarakhand, state led industrialization robbed focus from the primary sector, which was the mainstay of the mountainous districts. Between 1993 and 2013, the contribution of primary sector to overall Gross State Domestic Product of the state declined by a whopping 72% (Oxfam India, 2014). In real terms, while primary sector grew at 22%, secondary and tertiary sectors grew at 245 and 168%, respectively in the decade 2003–2013. Furthermore, industrialization, which focuses on construction of roads, tunnels, bridges, dams, etc., interferes with the fragile ecology of the state and enhances its vulnerability to disasters putting lives and livelihoods in danger. Industrialization is pursued by diverting forest land

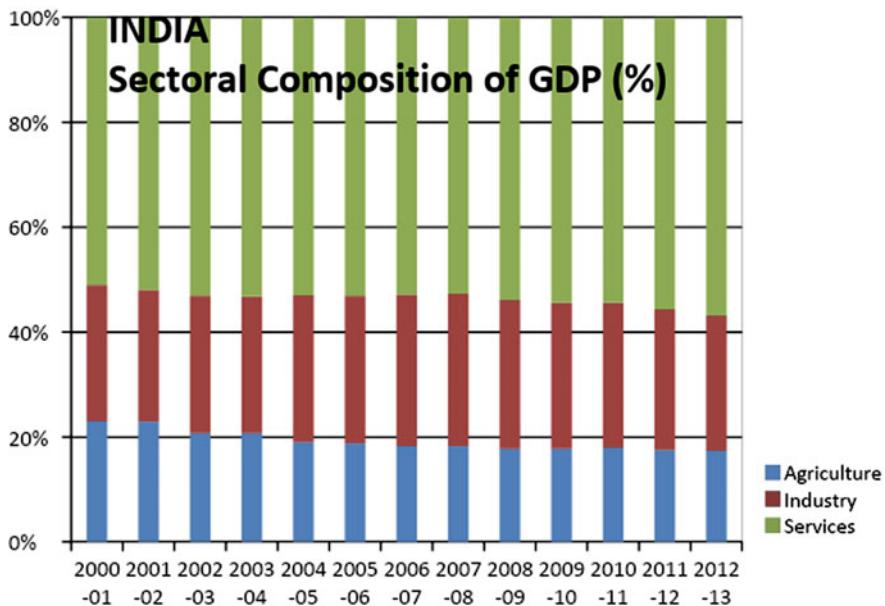


Fig. 3 Sectoral composition of GDP, India. (Source: CSO)

to non-forest uses. A host of environmental laws had been openly flouted in the process of industrialization, which was manifested in the unprecedented impact of the calamity.

More than half of Uttarakhand's workforce is engaged in agriculture. Meanwhile agriculture sector clocked the lowest growth rate during 2003–13. The concomitant contribution of agriculture to GSDP fell steeply from 16.7% to 7.8% during the same period. This clearly shows that households that are primarily dependent on agriculture have not been faring well over the decade leading to devastating floods of 2013. Financial instability is known to augment vulnerability, which impedes the coping capacity of communities to withstand disasters. A characteristic feature of the state's economy is that recent thrust toward industrialization-led growth is restricted to the plains alone. This is true even when there exists enough empirical evidence to substantiate successful sustainable natural resource-based industrialization in mountainous regions. Thus, the state suffers from regional imbalance, which has a tendency to amplify disaster losses.

Seventy-two per cent of the working population in mountainous districts is dependent on agriculture while only 35% in plains practice agriculture. The low rates of growth in agriculture impact the mountainous districts more harshly than the plain districts, which are experiencing industrialization-led growth. To top it all, 93% of all farmers in mountainous districts belong to the small and marginal category. Moreover, a meager 10% of the Net Sown Area in mountainous districts is irrigated as opposed to 84% in plain districts. Additionally, there also exist disparities in landholding size across various social groups.

Clearly, the kind of development pursued post attainment of statehood has benefitted all but those in whose name the struggle for statehood was justified in the first place. The state was formed on the premise to pursue development, which is locally suited and sustainable. However, it ended up borrowing the mainstream economic growth-led development model being practiced in dissimilar geographical locations across the country. There is a reason to believe that faulty development practices may have augmented the vulnerability of the mountainous regions, which exacerbated disaster consequences.

In the post disaster context, lack of land, livestock, and other livelihood assets poses a huge challenge in restoring lives of the people. In the case of Uttarakhand, the tourism-based economy was completely shattered. Operators of eateries, hotels, taxi and bus drivers, tourist guides, porters, and vendors were without business for days together.

The CAG in its report (2009) highlighted that contracts for developing hydroelectric plants were handed out to inexperienced players. For instance, textile manufacturers, agro processors were given contracts to build hydroelectric projects. The report further underlined that the state machinery to tackle disasters was dysfunctional. The nodal body for managing disasters at the state level had been instituted in 2007 but never met. At the time of audit, there was no document in place, which could guide the functioning of the State Disaster Management Authority. Even prior to 2013 deluge, there had been episodes of 27 major landslides, which had claimed close to 400 lives. The Geological Survey of India had identified roughly 100 villages, which were at a high risk. However, no attempts were made by the state government to relocate the villagers to safer places.

Oxfam India (2014) report highlights that a huge proportion of buildings, which were swept away in the flood and associated landslide were in reality illegal construction. Usually, construction is prohibited in a buffer of 200 m from the river bank. Shockingly enough, the State's *Vidhan sabha* building, Doon University campus and a government employee colony were partially situated in Rispana river bed. There was little motivation on the part of the government to eliminate such illegal construction as it was itself complicit.

The “Sustainable” Alternative

Given the experience of floods in 2013, it is advised that the mountain state pursues development, which is ecologically sensitive. An environmentally sensitive development model would entail more equitable growth in sync with the environment albeit at a lower rate.

It would augur well for the state to prioritize afforestation and link it with livelihood options. Community participation in ecosystem conservation is vital. Therefore *Van Panchayats* should be institutionalized, incentivized, and encouraged to protect forests. Attempts should be made to adhere to the tenets of Forest Rights Act, 2005 in both letter as well as spirit. Mountainous agriculture has long been

ignored; there should be a dedicated attempt to introduce cultivation of high value horticulture crops, processing of agro-produce, establishing market linkages to make mountainous agriculture remunerative.

Small, marginal farmers and landless laborers should be reskilled on priority basis in the aftermath of a disaster. While it is important to make agriculture profitable, it is equally important to diversify livelihood options for the poor, marginalized, and vulnerable population.

Community based eco-tourism, which combines environmental protection with local livelihoods, should be the way forward. It also has the potential to generate host to non-farm employment opportunities – tourist guides, cooks, caretakers, trekkers, porters, etc.

In case of loss of Common Property Resources, compensation to community must be made. The program for rehabilitation and recovery will yield best result if the plan is approved by *Gram Sabha* at various stages of its implementation. If beneficiaries of reconstruction process are involved in the decision-making process, it will increase transparency and it is likely that there will be a higher degree of acceptance of resultant projects. Additionally, effort should be made to consider voices of marginalized groups including women in order to design a wholesome plan, which is sensitive to needs of one and all.

System of governance should be decentralized and autonomous bodies like Biodiversity Management committees, Van *panchayats*, and Self Help Groups should be empowered.

Firstly, attempt should be made to improve the stock and quality of natural resources in the region like forest, river, soil, etc. Secondly, livelihood options that are suited to the geo-climatic situation of the site must be endorsed. For instance, Uttarakhand is suited for horticulture, apiculture, and floriculture. Agro processing industries with value chains and adequate market linkages can be set up. The ownership of such cooperatives and industries can lie with the community so that they become both the beneficiaries and custodians of the environment. Thirdly, schemes dedicated to rural development (like employment generation (MGNREGA), watershed management, afforestation) can be used to augment both the stock as well as quality of common property resources. These resources can be nurtured to be sources of remunerative livelihoods, which can be leveraged in post-disaster context. For example a healthy forest cover is not only an ecological imperative in mountainous region but also foundation for a range of sustainable livelihood options.

Fourthly, regions with fragile ecology should opt for community-based tourism. “Home stays” are part of popular culture in countries like Japan. It disperses the tourism pressure across the region. Besides, community becomes the direct beneficiary of revenue generated. The community-based tourism model enables deeper cross-cultural exchanges between the hosts and tourists (Table 18).

Table 18 Employment, livelihoods, and social protection

Sl. No.	Category of loss	Quantum
1	Workers affected	49 lakh
2	Micro, small, and medium enterprises affected	830 units
3	Assets impacted under MGNREGS	5367 units
4	Number of KVIC board units affected	139 units
5	Number of vending zones and markets affected	20,900 units

Source: PDNA, OSDMA

Table 19 Agriculture, fisheries, and livestock

Sl. No.	Category of loss	Quantum
1	Area of perennial crop damaged	19,734 ha
2	Number of fishermen affected	150,000
3	Traditional marine fishing boats damaged	6416
4	Number of fishing settlement affected	50
5	Number of fishing ponds affected	2524
6	Number of aquaculture ponds affected	157
7	Number of fishing harbors affected	3
8	Fish landing centers affected	6

Source: PDNA, OSDMA

Fani Cyclone: Loss to Livelihood

Data on category wise quantum loss shows that MSME and Khadi industry was affected. Close to five million workers were affected to various degrees due to the cyclone. Besides, market zones also suffered (Table 19).

Districts with maximum crop losses (up to 94% of total crop lost) are Puri, Khurda, Jagatsinghpur. Approximately 25 lakh large animals were affected in addition to 54 lakh poultry birds and 10 lakh small animals.

Agriculture livestock and fisheries remained one of the worst affected sectors. Total loss was estimated at INR 3033 crore. Recovery needs were estimated at 2615 crore. Agriculture sector (including horticulture) accounted for more than half of total loss in this sector. Losses to standing crops would amount to prolonged production losses post-disaster. Due to large-scale agricultural losses, it was projected that rural incomes would remain depressed for a long time.

As is illustrated by figures above, the livestock sector also suffered greatly amounting to 40% of total losses in the sector. It has led to production losses in that there was shortage of milk, meat, egg, and other animal products.

Damage and Loss to Fishery Sector

It includes damage and loss up to 5% of the total losses in the sector. The Chilka fishery registered the maximum losses. The revival and restoration of assets in fishery and aquaculture should be the top priority for the government. The medium- and long-term recovery strategy must entail registering all aquaculture and inland fishery units, strengthening of value chain in fisheries sector and up-skilling of fishermen. As a preparedness measure, the need to adhere to and strengthen to Coastal Regulation Zone guidelines cannot be overemphasized. People living adjacent to coastal areas have a rather precarious existence. Measures should be taken to reduce the exposure to recurrent hazards like storm surges, cyclones, and coastal flooding while as an adaptive measure alternative livelihood should be promoted (Table 20).

Seventy per cent of all affected workers are in the horticulture sector, followed by agriculture and fisheries. Odisha is a top performer under the National Horticulture Mission and leads in floriculture, plantations, fruit, and spices cultivation (Table 21).

In terms of total quantum of losses too, the horticulture sector registered maximum losses to the tune of INR 266 crore, it was followed by the agriculture sector, fishery, and livestock industry (Table 22).

In case of quantum losses to enterprises in Odisha, the MSME sector suffered the maximum losses followed by tourism and handicraft industry (Table 23).

Table 20 Percentage of affected workers

Sl. Number	Sector	Number of workers affected	Percentage to total affected workers
1	Agriculture	23,056	14.4
2	Horticulture	113,180	70.7
3	Poultry	1331	0.8
4	Livestock	3673	2.3
5	Fishery	18,917	11.8
6	Total	160,157	100

Source: PDNA, OSDMA

Table 21 Losses to Agriculture and Allied Sectors, Odisha 2019

Agriculture and allied sector losses brought about by Fani cyclone 2019			
Sl. No.	Sub-sector	Number of Affected Workers	Livelihood Loss (INR crore)
1	Agriculture	23,056	34.6
2	Horticulture	113,180	266
3	Fisheries	18,197	13.5
4	Poultry	1331	0.04
5	Livestock	3673	2.6

Source: PDNA, OSDMA

Table 22 Estimated losses for enterprises

Estimated damage and loss for enterprises					
Sl. No.	Enterprises	Affected workers	Damage (INR crore)	Wage loss (INR crore)	Total (damage +wage loss) INR crore
1	Handicrafts	70,900	221.6	29.6	251.2
2	Tourism	63,291	156.5	123	279.5
3	Handloom	47,208	98.4	18	116.4
4	MSME	830	310	26	336
5	State livelihood mission	109,815	22	37	59
6	MGNREGS	5637	43.2	47	90.2
7	KVIB	139	0.42	0.11	0.53
8	Market, vending zone	20,900	45	15	60

Source: PDNA, OSDMA

Table 23 Estimated income loss from Fani cyclone

Estimated income loss from Cyclone Fani, 2019			
District	Percentage of population affected	Number of days lost	Total income loss (INR crore)
Angul	20	3	54.5
Balasore	20	3	35
Bhadrak	20	3	19.2
Cuttak	50	15	713.4
Dhenkanal	20	3	22.1
Ganjam	20	3	60.6
Jagatsinghpur	20	3	26.5
Jajpur	20	3	34.4
Kendrapara	20	3	16.2
Keonjhar	20	3	46.8
Khurda	50	15	818.5
Mayurbhanj	20	3	38.1
Nayagarh	20	3	10
Puri	100	60	2210
Overall			4105.3

Source: Compiled from Damage, Loss and Needs Assessment Report, Fani Cyclone 2019

In case of total days lost and total income loss, coastal districts of Puri, Khurda, and Cuttak suffered the maximum. The total income loss was estimated to be around INR 4105 crore.

Cyclone Recovery

Post Disaster Needs Assessment was conducted jointly by the World Bank, Asian Development Bank, and the United Nations. The Department of Economic Affairs was the nodal body managing the assessment exercise in India.

These international organizations reported the total reconstruction need in Fani Cyclone to be INR 29,315 crore. The report put the total damage at INR 16,465 crore and total loss at INR 7717 crore. The state government demanded assistance to the tune of INR 5277 crore. The central government, however, released only one tenth of the recovery needs of the State.

Recovery Strategy

The Government of Odisha received appreciation for significantly bringing down causalities of the 1999 Odisha super cyclone (about 10,000) to less than 100 in Fani 2019. Prior to this Odisha has already tackled Phailin cyclone successfully in 2013. However it has to be understood that much of the success attributed to the coastal state is on account of better preparedness strategies. While improving, preparedness can go a long way in mitigating disaster impact; it is well established that there are limits to preparedness. Thus a holistic disaster risk reduction exercise would focus on improving preparedness, mitigation, and recovery strategies. While the goal of zero mortality may soon become a reality for the state, the cause of concern is the rising losses to livelihood and housing. A comprehensive disaster risk governance would entail robust preparedness and recovery strategies.

Usually the physical and discernable losses as a result of disaster eclipse its deeper impact. While damage to infrastructure assumes primacy, the harsh reality is that subsequent disasters rob livelihoods and push people below poverty line. Disasters tend to augment inequality in already unequal societies. Thus a comprehensive recovery strategy should aim at mitigating systemic risks and vulnerabilities of society.

The government of Odisha has promised to build “resilience” in Housing, Livelihood, and Infrastructure.

Resilient Livelihoods

For long-term sustainable development, special care has to be taken that economic growth is commensurate with an increase in livelihood opportunities. While Odisha has made substantial progress in reducing poverty from 58% in 2005 to 33% in 2012, repeated cyclones push more people below the poverty line. There is a need to diversify livelihoods options and expand the social protection coverage.

The recovery strategy is usually envisaged in three stages: short term, medium term, and long term. The short-term strategy should entail providing cash assistance to survivors, restoration/replacement of damaged livelihood assets. Employment

Guarantee scheme under MGNREGA can be used to create livelihood assets. Formalizing the informal sector would also go a long way in mitigating future risks. The recovery phase should be used to up-skill existing workers. Near universal financial inclusion would help in providing monetary relief post-disaster. Needs of vulnerable sections should be top priority.

Livelihood Support

As coastal districts suffered overwhelming losses, fisher folk were worst affected. Subsidies for losses generally are given to those who own boats. In the process those working at seas without ownership of boats are easily overlooked.

Women headed houses are more vulnerable. There are small-scale economies where women are disproportionately engaged: vegetable selling, running small shops, and drying fish need to be compensated well.

Strategies of Livelihood Restoration and Promotion

Livelihood Promotion involves a range of interventions aimed at assisting people to put available assets to productive usage for earning a living. Livelihood promotion is different from livelihood restoration in that it aims to strengthen opportunities and look at sustainable and resilient livelihood options.

Experience of reconstruction in Indonesia shows that a rapid and sizeable injection of cash assistance through community-driven reconstruction model has the potential to boost economic recovery. Owner-driven reconstruction model allows individuals to customize housing design to suit needs of a workspace in case of household units.

The first step in livelihood restoration is rebuilding productive assets, which would support livelihoods. In the aftermath of disasters, when limited savings are exhausted, people are forced to resort to adverse coping mechanisms such as distress sale of assets and foregoing meals. In the absence of economic assistance, indebtedness increases.

Types of Assistance

Individual Cash grants

It seems to be the easiest and most popular method of providing relief to disaster survivors. However there are concerns about transparency and misuse of assistance. Besides, deciding the threshold of cash assistance is also challenging. It is difficult to determine what level of assistance would be enough for beneficiaries to resume economic activities.

Evidence from Myanmar has shown that targeting the vulnerable sections while providing cash grants is a useful strategy. It is also essential to monitor the impact of providing cash grants on beneficiaries.

Cash assistance is advantageous in that it transfers decision making to the beneficiaries who, ideally, would know best what they want. In the absence of supply side constraints, cash assistance is also capable of triggering growth. Even from an administrative perspective, providing direct cash assistance is the most transparent mechanism of giving benefits to survivors post-disaster.

However, an important limitation of direct cash assistance is that money which is sometimes intended to repair/buy productive assets is used to purchase daily necessities and repay debts. It is difficult to monitor cash usage. Studies have suggested that linking cash assistance to asset recovery is the best way forward.

Material Assistance

It is the most suitable measure when damaged asset needs to be repaired or replaced immediately. Material grants are a viable alternative when cash injection is likely to lead to inflation; there is considerable degree of corruption, and targeting beneficiaries is a difficult task. This method is successful when beneficiaries are made partners in identifying and selecting the materials they need. This mechanism was adopted by All India Disaster Mitigation Institute in case of *Bhuj* earthquake. The institute came up with a Livelihood Relief Fund (LRF), which was essentially a demand-driven scheme for asset replacement. AIDMI focused on the most marginalized sections who are often overlooked in other assistance schemes. In this case, the beneficiaries themselves identified the assets they needed, then they negotiated with the vendors for the lowest price, then AIDMI purchased those assets. Beneficiaries were empowered through the entire process. The institute was able to help more than 10,000 poor women, minorities, and informal laborers. In the case of the India Ocean Tsunami, the government rushed to buy boats for fishermen with the intention that this would trigger immediate growth. However, this haste led to an oversupply of boats, which were unsuitable to the technical and cultural sensibilities of the beneficiaries. Also experiences world over have shown that material assistance without due consultation with beneficiaries has achieved limited success.

Short-Term Income Generating Activities

It becomes vital to support disaster survivors, both for their economic as well as psychological well-being. Regular wages can help survivors meet their daily needs. Two important ways of creating short-term employment post-disaster are Cash for Work (CFW) and Public Work Employment initiatives. CFW is usually labor intensive aimed at recovery exercise. CFW initiatives have been successful largely when they were owned and led by community members where they determine the type of works, level of wages, and identification of beneficiaries.

CFW projects should aim at including most deprived sections. It is ideal for unskilled labor-intensive works, which are required in the aftermath of disasters. Examples of works include: restoration of public facilities, restoration of social infrastructure, reclaiming agricultural land, etc. AIDMI, while working on CFW

program in Gujarat, helped participants to upgrade their skills and to equip them for sustainable livelihood options.

Public Works Employment Schemes

It is used to engage disaster survivors into large-scale public works usually involving reconstruction activities. It differs from Cash for Work programs wherein participants identify the type of work, as in this case the government identifies the type and nature of work. Technical and managerial support is provided externally and workers are only given wages. Usually medium-term projects are implemented under this scheme. The Asian Development Bank recommends dam construction, laying irrigation infrastructure, dredging ports, agriculture terracing, road construction, etc., as part of public works employment scheme.

Community Block Grants

These grants are provided as a social fund to a group intended at building both social and physical capital. Community decides where and in what manner these funds would be invested. These funds are usually catered to vulnerable categories like women and chronically poor population.

The advantage of this scheme is that it puts community at the center of reconstruction exercise and government becomes a facilitator. This type of community-sensitive reconstruction approach has seen enormous success in the developing world. In the 1999 Orissa Super-cyclone, this strategy was widely used to rebuild fishing infrastructure. It was agreed that if funds were disbursed to individual households, it would not have been sufficient to rebuild boats. Providing lump sum amount to the community as a whole allows individuals to negotiate for best output. This fund helped in building the organizational capacity, assets, and livelihoods of community. Besides, resources were also procured locally, which gave rise to demand.

Conclusion

In post-disaster context, livelihood options should be seen in two different time frames: short term and long term. The aim should be to promote sustainable long-term livelihood opportunities. Besides, housing reconstruction and livelihood restoration should be seen in a continuum rather than separate entities, as it has been observed that some housing units also double up as economic work spaces.

While planning for livelihood restoration is underway, sustainable and diversified options should be considered in order to mitigate prospective losses. Experience in South Asia illustrates that MSMEs have been successfully leveraged for livelihood restoration. Livelihood promotion post disaster should be in sync with the long-term developmental goals of the State to the extent possible. This ensures smooth policy gradation and harmonization of short- and long-term strategies.

Microfinance Institutions play a significant role in rural contexts in livelihood provisioning. These institutions should be supported to undertake livelihood

promotion activities post-disaster. Micro-credit is a viable alternative to high interest informal loans and also keeps borrowers out of debt.

Of late, NGOs have been complementing the government's efforts in restoring livelihoods of survivors. Such a partnership has been beneficial and should be reinforced.

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Response to Disaster Challenges of Senior Citizens: Trajectories of Building Resilience

60

Saheli Guha Neogi Ghatak and Santosh Kumar

Contents

Introduction	952
Vulnerability of Senior Citizens During Disaster	953
Review of Literature	954
The Rationale	955
Objectives	956
Method	956
Results and Interpretations	958
Conclusion	962
References	964

Abstract

Senior citizens are one of the vulnerable groups who suffered maximum at the time of disaster based on preparedness, response, and repossession. The different review of the literature identifies deficiencies in research on various issues of vulnerabilities of senior citizens during disasters and prepares strategies for handling those situations (Fernandez et al., *Prehospital Disast Med* 17(2): 67–74, 2002). In response to various disaster challenges of senior citizens, disaster resilience can be prepared. However, the present study attempts to ascertain and categorize the different challenges of senior citizens during the disaster and also to prepare the framework of disaster resilience of senior citizens with reference to the Amphan Cyclone in Kolkata. Thirty (UNDP, <https://ocm.iccrom.org/sdgs/sdg-11-sustainable-cities-and-communities/sdg-115-reduce-adverse-effects-natural-disasters>, 2015) senior citizens were interviewed based on purposive sampling, and data was analyzed based on quantitative and qualitative

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understanding. The present study was an attempt to develop a resilience framework on the basis of senior citizens' *individual capacity* and excluded community and state resilience planning. It was found that the senior citizens have faced various infrastructural, physical, psychological, social, and economic challenges during the disaster and the level of vulnerability of senior citizens to the disaster was different on the basis of age, gender, health, economic condition, social support, availability of caregiver, etc. The disaster resilience framework was also created based on the five (5) P's – *Protect, Pack, Plan, Proceed, and Place*. True disaster resilience can be achieved through proper planning and inclusiveness of senior citizens.

Keywords

Disaster · Amphan Cyclone · Senior citizens · Challenges · Disaster resilience

Introduction

Population aging is considered one of the chief demographic problems of India at present. Ninety (90) million senior citizens (As a social category, "senior citizens" means any person, being a citizen of India, who has attained the age of 60 years or above. From the perspective of taxation, any individual resident who is 60 years or above in age but less than 80 years at any time during the previous year is considered as senior citizen for income tax purposes.) are projected to increase up to three-hundred and fifteen (315) million which will become 20% of the total population by 2050 (UNFPA-BKPAI- 2011/2014 1; United Nations, 2013). This growing part of senior citizens will be affected by disasters in the future. The Disaster Risk and Age Index anticipates the amplified rate and power of disasters which will affect the senior citizens also. The senior citizens are still not included in disaster planning in spite of a universal promise to include them. To address the vulnerabilities among the defenseless section of the society, the effort of a comprehensive Disaster Risk Reduction Policy (DRR) has been initiated (UNDRR, 2018). Senior citizens also have a right to be encompassed, included, and get a dignified life as they are a valuable resource for society (Help Age India report, 2019).

Demographic changes, urbanization, migration, climate change, and the increasing rate of disasters have affected the well-being of senior citizens (WHO, 2008). Senior citizens have to experience explicit vulnerabilities in terms of social, physical, and mental well-being during disasters. Senior citizens experience isolation, social and economic marginalization, esoteric information, and a dearth of appropriate post-emergency support amenities. Though senior citizens can meaningfully interpose to the preparedness, response, and recovery from disaster, their competencies are not properly utilized (Chan, 2020).

Disaster management involves a systematic procedure of preparation, organization, guidance, and control of all the disaster-affiliated activities at every stage – alleviation, preparation, retaliation, and recovery. The involvement of individuals,

communities, and local- to national-level authorities is essential for proper disaster management. The involvement of senior citizens in disaster management plans and processes is possible through proper consideration of disaster risk management systems for senior citizens. An inclusive approach to disaster preparedness is required to protect lives and promote equity and human rights for senior citizens (Help Age International report, 2019).

Vulnerability of Senior Citizens During Disaster

Senior citizens are reckoned to be vulnerable to emergency situations, based on the preparation, response, and recovery phase. The senior citizens, especially from BPL categories, marginalized, and disabled groups of people, are primarily susceptible to disasters (Buckle, 1999, p. 23). Senior citizens suffer from loss of function and different physical challenges which disrupt their everyday life. The senior citizens who function well before the disaster have their situation also aggravated during the disaster. The vulnerability of senior citizens differs based on certain situations:

Senior citizens suffering from chronic diseases: Common chronic health problems of senior citizens are mainly diabetes, COPD, hypertension, heart problems, and arthritis. During a disaster, the supply of health-care services and medicines is destroyed; nutritional requirements are also affected based on the hindrance of water and food supply. Disaster-related stress and physical excursion increase chronic diseases.

Precursory health problems or unaddressed health problems can quickly become critical for senior citizens during a disaster and even threaten their survival. Senior citizens who are dependent on home-based care services in their everyday life have to suffer most during the disaster situation and recovery.

Senior citizens suffering from restrictions in movement, disability, vision, and hearing: Constrained mobility of senior citizens increases vulnerability, and as such this segment of the population suffers from the threat of a potential disaster and is prone to difficulties in evacuating during a disaster situation.

Visualization, hearing deficiencies, movement-related problems, and cognitive problems of senior citizens make them more nervous and stressed to realize recovery procedures and instructions during the emergency. Moreover, the loss of spectacles or flexibility assistants during emergencies can upsurge dependence on others and put helpless senior citizens in a doubly jeopardized situation.

Senior citizens suffering from mental health issues: Senior citizens with dementia and any other mental health issues are more at risk during a disaster. According to a WHO report, emotional stress is the major health effect in post-disaster, in addition to different psychosomatic symptoms such as sleep and eating disorders, fatigue, depression, anxiety, loneliness, and social withdrawal (WHO report, 2008).

The general health of healthy senior citizens can be harshly threatened after the disaster. Continual exhaustion, interrupted sleep, impaired mobility, meagre diet, dehydration, hypothermia, hyperthermia, infections, and physical suffering excessively affect senior citizens. In unacquainted environments, weak senior citizens can

develop perplexity or confusion. Changes in medicinal regimes along with increased trauma and anxiety can hastily lead to dependency on others.

Other issues: Migrated or homeless senior citizens face more problems during the disaster. Senior citizens with low education lack communication messages before, during, and after disasters, and senior citizens who face various *changes* in life such as widowhood, retirement, and loss of significant others lack the ability to cope with daily life, intensifying the vulnerabilities of senior citizens (Brown et al., 2017). Senior citizens with *agism* are discriminated against, a negative view predominates, and old age is considered a time of loss and helplessness; old women are often victimized against their gender and other factors like disability. In situations like pre- and post-disaster, even elderly women have been identified as being prone to sexual violence and gender-based violence which ultimately puts them at greater risk (Streubert Speziale & Carpenter, 2011). It was observed that the senior citizens suffering from loneliness, social disconnectedness, depression, and distrust are vulnerable to suicide, especially during pandemics (Wand et al., 2020).

Review of Literature

As per the World Health Organization (WHO) Report (2008), “Senior citizens are resources for their families and communities, particularly during times of crisis. Their years of experience can make them models of personal resilience and sources of inspiration and practical knowledge. They give voluntary aid, care for grandchildren or neighbours, and participate in support or recovery initiatives. Including older persons in planning for and responding in emergencies thus benefits the whole community.”

The combined cases of experiences of senior citizens during the disaster event were reported by the WHO. Various experiences of senior citizens related to the Indian Ocean earthquake and tsunami (2004), the heat wave in France (2003), the Chernobyl nuclear power plant accident (1986), and the Lebanon armed conflict (2006) were reported by the WHO (2008).

Senior citizens with former exposure are apt to disaster preparedness. Morrow (1999) focused that the senior citizens having prior exposure to stressors during the disaster which are similar in character develop more psychological tolerance.

Ngo (2001) found that senior citizens having previous disaster exposure and fewer responsibilities and obligations experience lower psychological vulnerability. Other research also focused that prior exposure to an event across a community of all ages leads to lower psychological problems (Sattler et al., 2000).

The experience of all the senior citizens during a disaster is not the same; numerous factors generate a disproportionate impact on senior citizens, such as insufficient amenity provision, the reluctance of senior citizens to escape and protect themselves during the disaster, support and information for senior citizens, overseeing the consequence of disaster for senior citizens which lead to more misery, interruption of social support and social networks for enabling senior citizens to survive and recover, exclusion by policymakers, and self-exclusion to lessen the

disaster risk. As per the Help Age India Research Report, 2010, though senior citizens have equal rights like other age groups, still the problems and competencies of senior citizens are frequently ignored during disaster situations. According to the Help Age India report, after the Asian tsunami disaster, surprisingly only less than 1% of the funds were stipulated for senior citizens (Help Age International Report, 2014).

Four key factors are important for disaster management:

1. Communication – providing understandable, accurate, and practical information on time.
2. Coordination – confirming complementary action.
3. Education – increasing consciousness and knowledge about disasters.
4. Inclusion – confirming policies and activities on the basis of the needs, capacities, and vulnerabilities.

The Rationale

Natural disasters affect inhabitants of disaster-prone zones as a whole, but senior citizens are recognized as one of the extremely affected groups (Sanderson & Sharma, 2016). The senior citizens comprised 11.5% of the world's population (Bodstein et al., 2014), and 10.1% of the population in India [NSO, 2021] is a big portion of disaster sufferers (Farajzadeh et al., 2017) with high morbidity and mortality rates (Thomas et al., 2014).

Age inclusion in disaster risk reduction (DRR) has gained momentum in the Madrid International Plan of Action on Ageing (MIPAA), 2002, which was also endorsed by the United Nations General Assembly. The MIPAA has called attention to the need to "build a society for all ages" and address the different issues of elderly people in the twenty-first century. Three major priority action areas were recommended: (a) senior citizens and development, (b) advancing health and well-being of senior citizens, and (c) empowering and supportive environments for senior citizens.

With the succession of Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters (HFA) by the Sendai Framework for Disaster Risk Reduction 2015–2030, four immediate, important action areas were recognized within its framework. They are (a) understanding disaster risk, (b) strengthening disaster risk governance, (c) investing in disaster reduction for resilience and increasing disaster preparedness for effective response, and (d) to "Build Back Better" in recovery, rehabilitation, and reconstruction. The framework acknowledges the realizable capacities and contribution of senior citizens and mentions: "Older persons have years of experience, knowledge, skills and wisdom, which are invaluable assets to decrease disaster hazards and they should be involved in the design of policies and mechanisms, including for primary warning before a disaster."

The Sustainable Development Goals of 2015 – the outcome document of the “2030 Agenda for Sustainable Development” – denotes the outcomes of the Sendai Framework and prospects for achievement of Sustainable Development Goals (SDGs) through DRR. As per SDG Target 11.5, “By 2030, a significant decrease of the figure of deaths and people affected and considerably reduce the direct financial fatalities relative to the global GDP caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations” (UNDP, 2015). Again, in line with the Sendai Framework for Disaster Risk Reduction 2015–2030, SDG Target 11.b says: “By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement,” which will enhance the holistic disaster risk management at all levels.

Moreover, SDG Goal 13 emphasizes that climate change maximizes disaster risk and increases disaster risk management (DRM) costs. The Sendai Framework, an international document adopted by UN members, demands strengthening the assessment of disaster hazards and surveillance, including climate change scenarios and integration of disaster risk reduction (DRR) measures with climate change awareness programs. Senior citizens, women, and children are worst hit by climate change, and it has become significant to incorporate them in the plan of action.

The National Policy for Senior Citizens (NPSC), 2011, also focused on disaster safety of senior citizens. One of NPSC’s significant areas of intervention, 2011, was to offer equivalent access to food, shelter, meditational care, and other amenities to senior citizens during and after natural disasters and emergencies.

While various international bodies have given importance to the issues of vulnerabilities of senior citizens during the disaster, the present study was an attempt to understand various issues of vulnerabilities of senior citizens living in Kolkata, West Bengal, during the Amphan Cyclone Disaster.

Objectives

1. To identify the different challenges of senior citizens during the Amphan Cyclone* disaster in Kolkata.
2. To prepare the framework of disaster resilience for senior citizens.

Method

Variables

Senior citizens: The Maintenance and Welfare of Parents and Senior Citizens Act, 2007, endorsed by the Government of India demarcated a senior citizen as a person who has accomplished the age of 60 years or above (Parents and Senior Citizens Act, 2007).

Disaster: The Disaster Management Act, 2005, describes a disaster as a catastrophe, mishap, calamity, or grave manifestation in any locality that results in a significant loss of life or misery.

Disaster challenges: Problems faced by individuals during the disaster.

Disaster resilience: The Hyogo Framework for Action defines “disaster resilience as the capacity of individuals, communities and public and private organisations to organise themselves to learn from past disasters and reduce their risks to future ones, at international, regional, national and local levels” (UNISDR, 2005).

Sample

30 senior citizens (15 males and 15 females) were taken based on purposive sampling from Kolkata (KMC area) in West Bengal.

Sample Selection Criteria

- (a) **Selection of area:** Area affected most during the Amphan Cyclone in the municipal areas of Kolkata, West Bengal, i.e., South Kolkata, Borough 10, Ward No. 8 s2; Borough 14, Ward No. 124.
- (b) **Selection of respondents:** Senior citizens aged 60 years and above and who have suffered due to loss of physical resources, psychological stress, and the associated health-related disorders during the Amphan Cyclone.

Tools Used

The general information schedule consists of open-ended and close-ended questions on sociodemographic status, different issues of vulnerability during the Amphan Cyclone Disaster, and their preparedness (building resilience).

Data Collection

Data were collected through face-to-face interviews in November to December 2021.

Data Analysis

Data were analyzed on the basis of both qualitative and quantitative perspectives. The descriptive statistics model was used for quantitative understanding, and narratives were used for qualitative understanding.

*The Amphan Cyclone was a powerful super cyclone that caused various damages over East India in May 2020. The highest wind velocity was 240/km which continued for 1 minute. It has one of the costliest effects was approximately 13.6 billion dollars were fatalities due to this cyclone. In India, the cyclone-affected areas are Andaman, Odisha, Kolkata, and North and South 24 Parganas of West Bengal. Thousands of trees were uprooted, electricity and telecommunication collapsed, houses flattened, and vehicles collapsed. Many of the Kolkata city roads were flooded, and 14 million people were without a power supply. As per the report of *The Hindu*, the Ministry of Earth Sciences described the Amphan Cyclone as the

“Worst over for India” amidst the pandemic (Halder et al. (2021). The Amphan Cyclone was also categorized as a “super cyclonic storm” by the [India Meteorological Department](#).

Results and Interpretations

Table 1 shows the sociodemographic profile of Amphan-affected senior citizens living in Kolkata, West Bengal. Most senior citizens in this sample belonged to the 70–74 years of age group (53.3). The educational background of the respondents shows that most (43.3) of the respondents are graduates; most of the senior citizens

Table 1 Sociodemographic profile of senior citizens

	Male (N = 15) No. (%)	Female (N = 15) No. (%)	Total (N = 30) No. (%)
Age (in years)			
65–69	03 (20)	04 (26.6)	07 (23.3)
70–74	09 (60)	07 (46.6)	16 (53.3)
74 and above	03 (20)	04 (46.6)	07 (23)
Educational status			
Illiterate	00	01 (06.6)	01 (03.3)
Primary	01 (06.6)	03 (20)	04 (13.3)
Secondary	02 (13.3)	04 (26.6)	06 (20)
Graduate	08 (53.3)	05 (33.3)	13 (43.3)
Postgraduate	01 (06.6)	01 (06.6)	02 (06.6)
Professional	03 (20)	01 (06.6)	04 (13.3)
Economic status			
No income	00	01 (06.6)	01 (03.3)
Less than Rs. 10,000	01 (06.6)	01 (06.6)	02 (06.6)
10,001–20,000	04 (26.6)	09 (60)	13 (43.3)
20,001–30,000	07 (46.6)	02 (13.3)	09 (60)
30,001 and above	03 (20)	02 (13.3)	05 (16.6)
Marital status			
Married	04 (26.6)	2 (13.3)	06 (20)
Unmarried	06 (40)	03 (20)	09 (60)
Widow/widower	04 (26.6)	10 (33.3)	14 (46.6)
Divorce/separated	01 (06.6)	00	01 (03.3)
Caste			
General	08 (53.3)	09 (60)	17 (56.6)
SC	04 (26.6)	03 (20)	07 (23.3)
ST	00 (0)	01 (06.6)	01 (03.3)
OBC	03 (20)	02 (13.3)	05 (16.6)
Family type			
Living alone	06 (40)	07 (46.6)	13 (43.3)
Living with family	09 (60)	08 (53.3)	17 (56.6)

Table 2 Challenges faced by senior citizens during the Amphan Cyclone Disaster

Challenges faced (multiple responses based on yes response)	Male (N = 15) No. (%)	Female (N = 15) No. (%)	Total (N = 30) No. (%)
Infrastructural issues			
Electricity	15 (100)	15 (100)	30 (100)
Telecommunication	15 (100)	15 (100)	30 (100)
Drinking water	15 (100)	15 (100)	30 (100)
Water facilities, sanitation, use of the toilet, bath, hand-wash, etc.	15 (100)	15 (100)	30 (100)
Health facilities	15 (100)	15 (100)	30 (100)
Physical issues			
Breathing problem	07 (46.66)	06 (40)	13 (43.3)
Chronic diseases, lack of caregiver, physiotherapist	08 (53.3)	09 (60)	17 (56.66)
Psychological issues			
Trauma	04 (26.6)	06 (40)	10 (33.3)
Anxiety	08 (53.3)	11 (73.3)	18 (60)
Depression	07 (46.6)	09 (60)	16 (53.3)
Loneliness	04 (26.6)	12 (80)	16 (53.3)
Frustration	08 (53.3)	09 (60)	17 (56.6)
Helplessness	11 (73.3)	10 (66.6)	21 (70)
Social issues			
Isolation	12 (80)	10 (66.6)	22 (73.3)
Lack of social support	14 (93.3)	09 (60)	23 (76.6)
Lack of caregiver	07 (46.6)	12 (80)	19 (63.3)
Restriction on activities	12 (80)	12 (80)	24 (80%)
Economic issues			
Lack of cash	12 (80)	08 (53.3)	20 (66)
Banking/ATM facilities	10 (66.6)	09 (60)	19 (63.3)

belong to the middle class as their monthly earnings are between Rs. 20,001 and 30,000; in case of marital status, most of the male senior citizens, i.e., 40%, are unmarried, and among females, 33.3% belong to the widow category. Regarding caste, most (56.6%) senior citizens belong to the general category; 60% of male and 53.3% of female senior citizens live with family, but 40% of male and 46.6% of female senior citizens live alone.

Table 2 shows various challenges of senior citizens during the Amphan Cyclone Disaster. It has been reported that the senior citizens have faced different infrastructural, physical, psychological, social, and economic issues during the Amphan Cyclone in Kolkata. 100% of the respondents have faced infrastructural problems related to electricity, telecommunications, drinking water, water facilities for sanitation, and health facilities; some of the senior citizens have faced different physical problems too such as breathing problems and problems related to chronic diseases as there was the unavailability of caregivers and physiotherapists, and the COVID-19

situation during the disaster increased the problem of senior citizens more. The respondents also reported various psychological problems: 33.3% of senior citizens have suffered from trauma, 60% of respondents have suffered from anxiety, 53.3% of them have faced depression and loneliness, 56.6% have faced frustration, and 70% of senior citizens have faced helplessness. Among the social problems that have also been reported by the respondents are isolation (73.3%), lack of social support (76.6%), lack of caregivers (63.3%), and restriction on activities (80%) due to the COVID-19 situation during the Amphan Cyclone. Some of the economic problems such as lack of cash (66%) and lack of banking or ATM facilities (63.3%) have also been identified by the respondents.

Mrs. Dhar, a 69-year-old widow and mother of NRI son, lives alone. She states that she had to struggle a lot during the Amphan Cyclone. She brought water from the water tank which is supplied by the Kolkata Municipal Corporation (KMC), for three days. However, she could manage only five bottles of water which helped her fulfil the need for drinking and also for overall routine occupations.

Mr. Sarkar, a 72-year-old widower, has been passing through the bouts of anxiety and frustrations during and after the Amphan Cyclone amidst COVID-19, 2020. As he was a COVID survivor too, he did not receive proper medical care from his family and doctor. He felt extreme isolation and was stranded in one room, and the disaster situation made him further feel left out.

The stress process model (Pearlin et al., 1990) proposed that a primary objective stressor disturbs the person through its influence on the secondary stressors a given individual experiences and appraises as challenging. As per the stress process model, the Amphan Cyclone also has created stress on the senior citizens, and they suffer from different challenges. The Amphan Cyclone arrived during the COVID-19 pandemic, and the senior citizens who had more risk of COVID infections become more vulnerable during the Amphan Cyclone Disaster. The lockdown and threat of COVID infection had already made seniors isolated from their family and the society, and the Amphan Cyclone made them more anxious and stressed not only for themselves but also for their family members.

Table 3 shows the opinion of senior citizens about disaster resilience during the Amphan Cyclone Disaster in Kolkata. Based on the responses of the respondents, disaster resilience can be categorized into five (Chan, 2020) “P” categories: *Plan, Pack, Protect, Proceed, and Place*.

The senior citizens have *planned* for the Amphan Cyclone based on the information received from news channels and print media (63.3%), children or relatives (60%), neighbors or friends (66.6%), and local clubs and local parties (50%).

After getting the information about the cyclone, they have *responded* on the basis of preparing themselves and their family members by packing dry foods (33.3%), storage of drinking water (40%), storage of candles and battery-operated torches (23.3%), storage of medicines (33.3%), and informed caregiver (50%).

The respondents *protected* themselves during the Amphan Cyclone Disaster by switching off the main electric board (73.3%), closing doors and windows (83.3%),

Table 3 Respondent's opinion about disaster resilience during the Amphan Cyclone Disaster

Disaster resilience (multiple responses based on yes response)	Male (N = 15) No. (%)	Female (N = 15) No. (%)	Total (N = 30) No. (%)
Plan			
News through TV channels, print media, etc.	12 (80)	07 (46.6)	19 (63.3)
Children or relatives informed	08 (53.3)	10 (66.6)	18 ((60))
Neighbors informed	04 (26.6)	06 (40)	20 (66.6)
Local clubs and political parties announced	08 (53.3)	07 (46.6)	15 (50)
Pack			
Storage of dry nonperishable foods	02 (13.3)	08 (53.3)	10 (33.3)
Storage of water (drinking and other usages)	02 (13.3)	10 (66.6)	12 (40)
Storage of candles, battery-operated torches	01 (0.6)	06 (40)	07 (23.3)
Storage of medicines	06 (40)	04 (26.6)	10 (33.3)
Informed caregiver	06 (40)	09 (15)	15 (50)
Protect			
Switch off the main electric board	12 (80)	10 (66.6)	22 (73.3)
Close doors and windows	11 (73.3)	14 (93.3)	25 (83.3)
Keep all the important documents in a safe place	04 (26.6)	05 (33.3)	09 (30)
Store sufficient cash amount	08 (53.3)	04 (26.6)	12 (40)
Proceed			
Stay in relatively empty rooms in the house	09 (60)	12 (80)	21 ((70))
All family members stay together	07 (46.6)	07 (46.6)	14 (46.6)
Place			
Supported by children and other relatives	08 (53.3)	09 (60)	17 (56.6)
Supported by neighbors	04 (26.6)	05 (33.3)	09 (30)
Supported by local club members	04 (26.6)	04 (26.6)	08 (26.6)
Supported by local political party members	08 (53.3)	07 (46.6)	15 (50)
Supported by NGOs	03 (20)	05 (33.3)	08 (26.6)
Supported by govt. – Provide water, other services	05 (33.3)	06 (40)	11 (36.6)
Self-recovered	06 (40)	07 (46.6)	13 (43.3)

keeping all important documents in a safe place (30%), and storing sufficient cash amounts (40%).

Respondent's opinions about staying in relatively empty rooms in the house (70%) and all family members staying together (47%) can be largely categorized under *Proceed*.

And the respondents have been *placed* with their families with the support received from children and other relatives (56.6%), neighbors (30%), local club members (26.6%), local political party members (50%), NGOs (26.6%), government policy (36.6%), and self-recovered (43.3%).

Mrs. Chatterjee, a 66-year-old widow, living with family, informs that she had taken necessary arrangements to face the cyclone as she was informed by her son and neighbors

about the cyclone, she had stored extra water both for drinking and for other usage and also candles, and she had located all the flower pots in the proper place and also stored some extra medicines.

Mr. Roy, a 74-year-old retired school teacher, living alone, states that after Amphan Cyclone, he was helped by the local club members to place him in his house as one big tree had fallen over it and broke one of the walls, and being alone, he was very helpless to take any action. The local club members and party members helped him during the emergency.

The Habitat for Humanity India, an NGO, successfully implemented resilience campaign which also focuses on the five (Chan, 2020) P's – the topmost five tasks to carry out during a disaster. The five (Chan, 2020) P's are *Protect, Pack, Plan, Proceed, and Place: Protect your valuables. Pack essentials like food, water, and medicines. Plan your evacuation route in advance. Proceed to evacuate the elderly, disabled, and children. Place your family at a disaster reprieve center.* The P stands for Pathways to Permanence, habitat's disaster risk reduction and response approach to assist families standing in the path of disasters to find lasting solutions to their shelter needs (Habitat, NGO report, 2015).

A qualitative research-based study among 17 focus groups who suffered from disaster risks focused that the senior citizens aged 65 or older can contribute a lot during the disaster in terms of their experience, funds, and relationship-building capacity. They can prepare themselves and also support others during a disaster. Specifically, senior citizens can initiate and mobilize social capital in their locality during a disaster. Senior citizens can contribute significant assets to disaster response (Howard et al., 2017). Thus, the present study also prepares the framework for disaster resilience on the basis of five (Chan, 2020) "P" categories – *Plan, Pack, Protect, Proceed, and Place* – based on the experience of the senior citizens in Kolkata during the Amphan Cyclone.

Conclusion

This study attempted to understand the different challenges of senior citizens during disasters and to prepare the framework of disaster resilience for senior citizens. Senior citizens of Kolkata were interviewed on the basis of purposive sampling to understand their challenges during the Amphan Cyclone in 2020 and also their coping strategies during that emergency.

The larger conclusion one can draw from the data on demographic profile is that the socioeconomic locus of the senior citizens explains their vulnerability during the disasters. The lower the rung is, the higher the vulnerabilities. Ardalan et al. (2009) suggested that socioeconomic and cultural backgrounds have had an enormous influence on senior citizens' vulnerability and their reaction to a disaster (Ardalan et al., 2009). The result of the analysis also shows that the senior citizens have to face different challenges during the Amphan Cyclone which can be categorized into five categories: *infrastructural, physical, psychological, social, and economic.*

Senior citizens have faced different infrastructural problems related to electricity, telecommunications, drinking water, water facilities for sanitation, and health

facilities; physical problems like breathing problems and problems related to chronic diseases as there was unavailability of caregivers and physiotherapists; psychological problems such as trauma, anxiety, depression, loneliness, frustration, and helplessness; social problems which include isolation, lack of social support, lack of caregivers, and restriction on activities due to the COVID-19 situation during the Amphan Cyclone; and economic problems like lack of cash and lack of banking or ATM facilities.

The stress process model (Pearlin et al., 1990) supports the findings of the challenges of senior citizens during the Amphan Cyclone. The Amphan Cyclone created stress on the senior citizens which resulted in different challenges for them during the disaster. The COVID infection and lockdown situation had already put the seniors into isolation from their family and society, and Amphan made them more anxious and helpless not only for themselves but also for their family members. Seniors had become triply jeopardized due to their age, COVID infections, and Amphan Cyclone.

The present study also tried to prepare one framework of disaster resilience on the basis of the experience of senior citizens during the Amphan Cyclone, and based on the responses of the respondents, a disaster resilience framework was prepared which can be understood in terms of five (Chan, 2020) “P” categories: *Plan, Pack, Protect, Proceed, and Place*. The *plan* is possible through the information received before the disaster which comes with under-*preparedness*; *pack* leads to the storage of essential goods; *protect* suggests various protective measures which together come under *response*; *proceed* recommends taking initiatives for protection; and *place* suggests the regaining previous situation come under the *recovery* process of resilience building.

Building resilience is a process of supporting communities to accomplish change and be better prepared to resist and recover from social, environmental, and economic stresses. The resilience-building approach recognizes that communities have proficient information about their local environment and are best positioned to observe, learn, experiment, and respond to the risks they face. Resilience-building activities cover an extensive range of sectors, including gender, disaster risk reduction (DRR), livelihoods, health, social protection, and natural resource management (Help age International, 2015).

Zhu et al. (2017) found that attaining better resilience and managing disasters are possible through understanding various vulnerabilities among the senior citizens, and those need to be identified from their own unique perceptions (Zhu & Sun, 2017).

The Active Ageing Framework suggests the approach to mainstreaming the reflections of senior citizens into the disaster management system. The active aging process enhances opportunities for health, participation, and security to augment the quality of life of senior citizens. The activity theory (Havinghurst, 1961) which is a functionalist approach asserts that successful aging can be attained only by continuing their roles and relationships which can be related to the making of a framework for integrating the needs and contributions of senior citizens into disaster management programs (Help age International, 2015).

It is true that the vulnerability of senior citizens is started acquiring attention at present, but a proper policy framework is yet to develop in relation to the particular needs of the senior citizens. Unique capacities and contributions of senior citizens should be recognized for preparing policies for disasters. It is important to keep in mind that a large segment of senior citizens with vulnerabilities needs to be addressed, and proper disaster resilience needs to be implemented by utilizing the experience of senior citizens.

One of the significant conclusions and thus a profound recommendation could emanate from the fact that the state government must be updated with the infrastructure and logistical preparedness for facing any natural disaster situation, since the state is located in a disaster-prone geographical area. Extending the arguments of the pre-preparation, it would also be important that, in line with pre-, during, and post-disasters, the psychological preparation of the disaster-prone population must also be in place. In fact, the post-traumatic counselling of the population is the most critical stage.

The present study has limitations. The sample size was small due to the lack of proper identification of respondents who had suffered most during the Amphan Cyclone. Though the basic criteria for selection of respondents were 60 years, researchers have found that the respondents 65 years and above are those who have suffered more during the cyclone in Kolkata. The major focus of the research was to understand the challenges and prepare the framework of disaster resilience for senior citizens on the basis of the qualitative experiences of the respondents and different categories of challenges, and the disaster resilience framework was developed by analyzing the qualitative answers of the respondents. The Hyogo Framework for Action defines “disaster resilience as the capacity of individuals, communities and public and private organisations to organise themselves to learn from past disasters and reduce their risks to future ones, at international, regional, national and local levels” (UNISDR, 2005). But the present study was an attempt to develop a resilience framework on the basis of senior citizens’ *individual capacity* to learn from past disasters and reduce their risks in the future; the research did not address a community, public, and private organization framework. In spite of these limitations, the study provided valuable insights for finding out the different challenges of senior citizens and tried to develop one framework of disaster resilience on the basis of five (Chan, 2020) P’s.

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Local Governance in India During a Pandemic: A Case for Granting Agency to Municipal Governments

61

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Contents

Introduction	968
Rise of Independent Urban Local Governance in India: From Constitutional Oblivion to Existence	969
COVID-19 and the Role Played by Municipalities in Pandemic Management	972
Challenges Faced by Municipalities During the Pandemic: Structural Fault Lines Drawn to the Fore	975
Need for Granting Agency to Local Governments: A Key Lesson Learnt from ULB's Pandemic Management in India	979
Conclusion	982
References	983

Abstract

Municipalities (city governments) in India are deeply embedded within the societies they serve. They are at the forefront of coordinating essential services during a disaster, such as the COVID-19 pandemic, by providing food security to vulnerable populations and setting up quarantine facilities, housing, sanitation, public works maintenance, and so on. This is despite the fact that most municipalities have no power to act autonomously in their functional areas and rely heavily on grants and transfers from state and central governments to perform their routine civic functions. Although the *Constitution (Seventy-fourth Amendment) Act, 1992*, obligates states to empower municipalities with functions, finances, and functionaries, only a few states have taken steps to empower municipalities through decentralization and devolution of powers. Most state

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governments treat municipalities as their extension and not as an “institution of self-government” that should be considered an autonomous unit within the federation. This chapter highlights how the current governance structure of cities has proved ineffective in mitigating the impact of disasters like the COVID-19 pandemic. It argues that a lack of agency on the part of municipal governments over their administrative and financial relationships with states has resulted in them being institutionally disempowered and depoliticized. Policy recommendations following this line of thinking will conclude this chapter.

Keywords

Local government · Indian Constitution · COVID-19 pandemic · Decentralization · Autonomy

Introduction

The stress-testing provided by the COVID-19 pandemic (the pandemic) has magnified several shortcomings in India’s highly centripetal government structure and exposed fault lines in legislative and governance frameworks in dealing with public health emergencies (ORF Colaba Edit 2021). Both central and state governments were confronted with archaic laws and obdurate governance structures that were hard-pressed in dealing with a dynamic situation that needed prompt redressal. Through lessons learnt with the onset and management of the pandemic from March 2020 till now, scholars in different fields of study are now able to assess and understand how they might go forward in improving India’s public health emergency framework (VIDHI, 2021). Though diverse in their fields, they indicate the role of state capacity and provide useful lessons from the pandemic.

The common thread connecting these lessons is that India is too large, complex, and diverse to be run by centralized decrees. Hence, decentralization and devolution of powers to local governments enshrined in part IX (panchayats) and IXA (municipalities) of the Indian Constitution is essential for preparedness, management, and mitigation of disasters like the pandemic (James, 2020). At the outset, it should be noted that the focus of this chapter is on municipalities, i.e., urban local governments, and not on panchayats (rural local governments). The role of municipalities, from managing lockdowns to planning for the reception of an influx of migrant labors, was forefront throughout the pandemic (MOHFW, 2020). It demonstrated to policymakers that municipalities need to be comprehensively empowered to provide the last-mile delivery of government services. It has become further evident that municipalities should not be seen as mere providers of basic civic amenities but actual custodians of the urban local governance in India.

Although this idea of decentralized governance through municipalities has been in “constitutional existence” from the early 1990s, most state governments overlook the principles of federalism when it comes to sharing powers with these bodies (Jha, 2022a, b). In fact, there are overwhelming roadblocks to better urban governance in

India. The reasons include a broken state-local governments relation, disempowered third-tier government, and a political establishment that is oblivious to developing an institutional framework that would make municipalities independent in forms, functions, and finances (Ahluwalia, 2019; Oommen, 2020). Unless institutional reforms are put in place to address these challenges, the process of devolution of powers and finances to municipalities in keeping with the obligation under the 74th Amendment to the Indian Constitution will never be realized.

This chapter demonstrates the need for these reforms by highlighting the impotence of India's municipal institutions during the pandemic. The chapter starts by briefly explaining India's urban governance model. It uses the COVID-19 pandemic as a case study to demonstrate the importance of decentralized governance in cities during a disaster. In doing so, it also highlights challenges faced by municipalities during crises. It argues that the lack of agency on the part of municipal governments over their administrative and financial relationship with states affects their preparedness during a disaster like the current pandemic. The chapter concludes by arguing that decentralization and devolution of powers and finances should be the axis around which reforms should be implemented and imagined for urban local bodies functioning during a disaster.

The authors acknowledge that the urban governance in India is part of the State List of the Constitution, which makes administrative frameworks and regulations of municipalities vary across states. However, experts have highlighted that municipalities across India face various challenges that justify the adoption of a uniform approach towards issues (Second Administrative Reforms Commission, 2007). Therefore, the chapter uses examples of the functioning of various municipalities during the pandemic across the country. Furthermore, the chapter interchangeably uses the term municipalities and urban local bodies (ULBs) to maintain coherency and uniformity in the use of terminologies.

Rise of Independent Urban Local Governance in India: From Constitutional Oblivion to Existence

The evolution of urban governance in India is of a more recent origin. As the country moves away from the aphorism "India lives in its villages" to "India lives in its cities," the quality of governance will be increasingly determined by how urban local bodies govern themselves (Jha, 2020a, b). Although framers of the Indian Constitution after much debate inserted *Art. 40* in the *Directive Principles* obligating state governments to organize panchayats in rural areas (Constitution of India, 1950 art. 40 (The State shall take steps to organize village panchayats and endow them with such powers and authority as may be necessary to enable them to function as units of self-government)), no corresponding duty was imposed on states concerning urban governance (Constitution Assembly of India Debates 1949). The only reference to urban self-government could be found in Entry 5 in the State List of the Indian Constitution (Constitution) that placed the responsibility of urban developments on state governments (Constitution of India, 1950 [Seventh Schedule – List II (State

List) – Entry 5: Local government, that is to say, the constitution and powers of municipal corporations, improvement trusts, districts boards, mining settlement authorities and other local authorities for the purpose of local self-government or village administration.]). This lack of constitutional obligation to empower local governments in cities and towns coupled with a political system that is heavily biased towards the rural sector resulted in the neglect of urban areas across India (Kazmin, 2016). This is so notwithstanding the fact that the country has witnessed an uninterrupted urbanizing trend since 1911 at an average of 2.09 percent per decade (Jha, 2020a, b).

In the first five decades following independence, urban governance was characterized by incomprehensive and inadequate municipal laws and near-absolute administrative, functional, financial control of state governments over ULBs (Jha, 2020a). Political meddling in the functional and financial domain of ULBs and usurping of elected leaders of ULBs from the planning function of cities got institutionalized across the country. Wherever some modicum of the civic role was given to ULBs, the state ensured that all final approvals were retained. Bhattacharya (1976) further notes that in the post-independence era, “the state government followed an ambivalent policy towards the municipal rule while ceding powers on papers but putting checks and restraints on exercising power by the local bodies.” In hindsight, most Indian states did not meet the necessary conditions of independence, decentralization, and devolution of powers and finances required for the effective functioning of ULBs (Aijaz, 2008).

With cities being the drivers of India’s economic growth, this lack of institutional empowerment of ULBs started affecting governments’ aim of improving the quality of life of a rapidly growing urban population. India’s planners and policymakers soon realized that urban local governments need to promote popular participation, engage in social transformation, and equally distribute resources to spur economic growth in cities (Muttalib & Ali, 1982). The first concrete step on this front was taken in 1985 when a separate Ministry of Urban Development was set up in the center to develop a uniform urbanization policy in India. After that, based on the L.M. Singhvi Committee (1986) report, the central government introduced the *Constitution 64th Amendment Bill 1990* in the Parliament to provide constitutional status to rural and urban local bodies. Though the Bill was passed by the Lok Sabha, the lower house of the Parliament, it was defeated in the Rajya Sabha, the upper house of the Parliament, in 1989 due to concerns over ULBs usurping powers of state governments.

In 1992, the central government (the government) introduced a new bill based on the previous amendment bill with few modifications to accord constitutional status to local governments. The bill was finally enacted as the *Constitution 74th Amendment Act (CAA)*, which inserted chapter IXA in the constitution and formally recognized ULBs as the third level of government. The CAA stipulated three levels of municipal bodies to be set up in the country and dealt with issues

relating to their structure and composition, reservation of seats, elections, powers, functions, and finances (The Constitution (74th Amendment) Act, 1992 inserted Part IX (s. 243P – 243ZG) in the Indian Constitution). A notable development was the mandate that state governments would transfer to local governments a set of specified functions under *Schedule XII* of the Constitution (The Constitution (74th Amendment) Act, 1992 s. 243W). It included subject matters relating to urban planning, public health, water supply, sanitation, and waste management – all of which aimed to increase the participation of local communities in the decision-making of their cities and towns. Another positive development brought in by the CAA was the introduction of mandatory reservations for women, scheduled castes, scheduled Tribes, and other backward classes (Ahluwalia, 2016).

Furthermore, to transform ULBs into “self-governing institutions,” laudable innovations were injected by the CAA: wards committees for administrative decision-making in large cities, independent State Election Commission for transparent civic elections, and State Finance Commission for suggesting measures to strengthen municipal finance (Constitution of India, 1950 ss. 243P – 243ZG). Possibly the most important effect of the CAA was that ULBs had an independent right to existence irrespective of political dispensation in power at the state level. States also faced judicial ire whenever they attempted to dissolve a ULB, played foul with their political autonomy, or were hesitant to implement the CAA provisions in letter and spirit (Pranoy Roy v State of West Bengal, W.P. No. 6063(W) of 2015 (Calcutta High Court directed the state to hold local elections within reasonable time); PUCL v State of Nagaland, Civil Appeal No. 3607/2016 (Supreme Court of India asked the state government to implement 33% women reservation in local bodies); Mohansingh Tanwani v State of Maharashtra, AIR 2002 Bom 39 (Bombay High Court quashed the state order that dissolved the Dhule Municipal Council without providing any reasons)).

From a citizen’s perspective, autonomous and independent ULBs represent a quintessential avenue for addressing concerns and are usually the first point of contact to avail government services. Many opinion polls have shown that Indian citizens have comparatively higher trust in their local governments than other elected officials and, thus, are most likely to approach them in times of crisis (Azim Premji University, 2019). This proximity and trust between ULBs and citizens develop a true state-local and citizen action, particularly in times of crisis. Therefore, it is not surprising that policymakers and scholars consider ULBs a vital cog in India’s institutional framework of disaster management (Pal, 2014). The critical role played by ULBs during the COVID-19 pandemic further demonstrates the importance of local governments in disaster response.

In the next section, the role played by municipalities during a disaster will be discussed by highlighting the work done by them during the current pandemic. This will demonstrate the importance of third-tier governments in cities and echo the significance of decentralized governance for disaster management.

COVID-19 and the Role Played by Municipalities in Pandemic Management

An unintended but welcome consequence of the struggle against the pandemic is the acknowledgment by governments that decentralization is critical to successfully preventing, detecting, and managing diseases in urban areas. But without meaningful powers to act autonomously, the third tier of government would fail to maintain the health infrastructure during public health emergencies (Nivedita & Viswanathan, 2021). This realization, however, did not come in the early stages of the pandemic. When the crisis unfolded in March 2020, the central government responded by retaining all powers relating to the management of the pandemic (Kumar, 2020a, b). In the absence of bespoke public health laws, the government resorted to statutes such as the *Disaster Management Act, 2005* (DMA) and *Epidemic Diseases Act, 1897* (EDA) (DMA was written after the Indian Ocean Tsunami and dealt with natural calamities. The expansive definition of the term ‘disaster’ under s. 2(d) of the act allowed the central government to respond to the infectious disease under its ambit. EPA was passed during the British colonial rule in India and was written to contain the plague when the idea of the state was radically different from what it is now). Strikingly, none of these statutes were enacted to deal with public health emergencies (Bhatia, 2020). Multiple guidelines and binding executive directions were invoked under these statutes, sometimes daily, to deal with the changing demands of the pandemic. Under s.10 of the DMA (The Disaster Management Act, 2005 s. 10), the government declared a national lockdown in late March 2020 without consulting the states, despite the fact that the Constitution grants states the power to legislate with respect to public health.

Khorakiwala (2021) argues that such excessive centralization soon had a detrimental effect “across all sectors, leading to confusion, delay in response and a miscalculation of the local response required versus the national and/or state-level response being implemented.” The ensuing migrant crisis laid bare the hollowness of India’s disaster management system. Furthermore, the disempowerment of state and local governments through multiple directions and advisories under DMA and EPA exposed a striking disregard for federal principles by the central government (Shringare & Fernandes, 2020). For instance, in April 2020, the central government directed state governments not to procure Personal Protective Equipment (PPE) and other safety kits as it promised to procure and distribute the kits itself. Many states subsequently experienced a massive shortage of safety kits resulting in many frontline workers testing positive for COVID-19 (Suryawanshi, 2020).

The situation was only rectified after 68 days of nationally mandated lockdowns when states were allowed to manage the pandemic more locally. A few state governments followed the position taken by the central government and centralized pandemic management by invoking s.2A of the EDA (Kaur & Gupta, 2020). Several states, however, immediately enacted regulations under EDA permitting a decentralized response to pandemics through ULBs in cities (For example, Bihar Epidemic Diseases COVID-19 Regulations; Uttar Pradesh Epidemic Diseases COVID-19 Regulations 2020, Delhi Epidemic Diseases COVID-19 Regulations,

2020). Many states also made local governments nodal agencies for coordinating various aspects of pandemic management: information dissemination, managing lockdowns, dealing with vaccine hesitancy, and making provisions for access to basic amenities like food and medicines for vulnerable communities (Aiyer, 2020; Sahoo, 2020). The state of Odisha went a step further and delegated powers of the district collectors under s.51 of the DMA to the heads of local governments to fight the pandemic (Editorial, 2020). Realizing the futility of a centralized approach in pandemic management, the central government also issued a notification, titled the “Micro Plan for Containing Local Transmission of Coronavirus disease (COVID-19),” that placed local governments at the forefront of community mobilization and ensuring active surveillance (Micro Plan for Containing Local Transmission of Coronavirus Disease (COVID-19) <https://www.newindianexpress.com/nation/2020/apr/09/as-per-new-circular-states-depend-on-centre-to-procure-covid-19-medical-equipment-2128010.html>).

With a very high level of citizen’s trust in local governments, the state governments found the delegation of pandemic-related work to ULBs an obvious advantage. Local governments like municipalities soon became the common thread that connected most issues relating to the management and mitigation of the pandemic. In addition to their existing civic duties, ULBs have been entrusted with the task of addressing the migrant labor influx for the last 2 years. This includes offering to workers testing facilities, ensuring that those who tested positive for COVID-19 were in isolation, ensuring the running of community kitchens, and providing monetary support. Essential medical duties were also delegated to ULBs, such as coordinating with the government in contact tracing, organizing health check-ups, and ensuring scientific management of medical transport system and disposal of waste. In addition, local governments have played a leading role in sustaining labor supply and critical food supply chains during the pandemic (Sahoo, 2020).

The work done by ULBs during the pandemic reminded central and state governments of their two distinct strengths of the former. The first is the possession of local-level knowledge which makes them eminently suitable to deal with a grave crisis like the pandemic. Due to ULBs proximity to citizens, it is essential that disaster management frameworks include a level of government that is the first point of contact for most citizens and thus is best placed to know about their mobility, social security, and health needs. For example, one reason for Kerala’s early success in pandemic management was the leadership and coordination effort of local governments to ensure containment of the COVID-19 crisis. ULBs in Kerala ensured that every resident arriving from outside the state during the pandemic were greeted by auxiliary health workers in their house. Then basic information such as their names, travel details, and existing health issues were documented. For the next 14 days, District Coordination Centers called the residents to enquire about their existing and new health issues (Kapur & Panicker, 2020). There is no doubt that such hyper-local coordination efforts and engagement with a community, which is vital for pandemic management, could only be made by institutions like ULBs.

Second, on an administrative front, the effective implementation of the national and state government decisions under the DMA is dependent on the ground-level implementation of such decisions by local governments like ULBs. In India's disaster governance framework, however, the DMA paved a path for the formation of federated statutory agencies at central (National Disaster Management Authority: *s.3*), state (State Disaster Management Authority: *s.14*), and district levels (District Disaster Management Authority: *s.25*). The rigidity of representation in these bodies has significantly limited the participation of local elected representatives in the disaster management committee.

Although a few Indian cities like Mumbai, Pune, Chennai, Jaipur, etc. have a bespoke disaster management cell to deal with emergencies, they are an exception. Most Indian cities have not put in place bespoke governance and structural framework to deal with disasters like the COVID-19 pandemic. Even among the cities with a modicum of disaster management structure in their ULBs, the institutional efficiency and planning are questionable. For example, Mumbai has two District Disaster Management Authorities, one for the city and one for the suburbs. There is also a Greater Mumbai Disaster Management Authority formed in 2011, helmed by municipal commissioners and other essential personnel from police, railways, and other government departments. However, these District Disaster Management Authorities have never held a meeting and have not placed a district disaster management plan in the public domain (Bhide & Kamble, 2020).

The above issues are ironic as ULBs were in constitutional existence long before the enactment of the DMA. The effect of this legal absence of a clear mandate for ULBs in disaster management made the scope for institutional building for disaster mitigation limited. That is why most ULBs lack accessible infrastructure like disaster-resilient offices, personnel, and technology and have limited knowledge of how to blend national disaster management plans with the development plans of cities and towns (Pal, 2014). However, ULBs in the last 2 years, through their active role in pandemic governance, have shown that decentralized governance can effectively overcome a crisis even in the densest and most poorly served urban habitats (Desai, 2021). It became clear that they remain the best bet for providing institutional arrangements during disasters at a constant level.

Undoubtedly, the devolution of powers to ULBs during the pandemic is a positive development and may go a long way in institutionalizing the principle of democratic decentralization in India. However, long-time observers of Indian politics and administration are treading with caution in believing that the pandemic will radically alter the centralizing tendency in state-local government relations (Rajagopalan, 2020). Questions have been raised regarding ULB's institutional capacity to continue with the torrent of duties delegated to them by central and state governments for managing the response to the pandemic (Udas-Mankikar, 2022). This is because even before the pandemic, ULBs in most Indian cities were grappling with severe problems concerning the devolution of powers and stretched municipal finances (Meloche & Vaillancourt, 2015). With cities having the unenviable tasks of executing the ambitious agendas of governments' post-pandemic response, serious introspection must also be made on challenges faced by municipalities during the pandemic.

In the next section, light will be shed on some of those challenges faced by ULBs during the pandemic. The focus is on identifying the structural fault lines and institutional lacunas that plagued ULBs functioning during the pandemic.

Challenges Faced by Municipalities During the Pandemic: Structural Fault Lines Drawn to the Fore

When the COVID-19 pandemic hit India, it was expected that cities and towns would become hotspots and would have significant outbreaks. The concentration of informal settlements combined with social, financial, and environmentally unsustainable development had already put unmanageable pressure on the provision of cities' civic amenities and services (Gore & Gopakumar, 2015). ULBs were already stretched both functionally and financially even before the pandemic. As they could only perform a modicum of their already designated civic functions, doubts were raised regarding their ability to manage the pandemic response. These reservations came to the fore when the central government and state governments after the initial period of centralized pandemic response made local governments nodal bodies for pandemic response in their jurisdictions (Shringare & Fernandes, 2020).

As discussed in the previous section, ULBs across the country did a laudable job in pandemic management despite challenges and were successful in fending off the first wave of the pandemic. However, the fierce intensity of the second wave, which peaked in April and May 2021, exposed deep fissures and fault lines in India's urban capacity to deal with such an unprecedented catastrophe. There were disparities in how urban India sought to combat the pandemic. ULBs' success in response to the pandemic depended "partially on their existing capacity, the devolution of power, and level of trust the state ha[d] traditionally placed on them" (Kapur & Panicker, 2020). ULBs in states that have historically granted political, functional, and financial decentralization of powers to local governments were more successful in managing the crisis. For instance, the common thread between the much-lauded and successful Mumbai-Dharavi and Kerala models of pandemic governance was their reliance on resilient local governments and community participation (Krishnakumar, 2020; Lewis, 2021).

For example, from the initial stages of the pandemic, the urban local government for Mumbai, the Brihanmumbai Municipal Corporations (BMC), focused on building hyper-local pandemic mitigation measures decentralized capacities (Lewis, 2021). Under the overall supervision of the elected leadership, the corporations established ward-level COVID-19 war rooms, which adopted a 360-degree approach to ensure ambulances, ICU beds, uninterrupted oxygen supplies, and all critical medicines. For Dharavi, a heavily congested slum area, the BMC permanently stationed its workers to sanitize public toilets (the most common are of contact and spread of virus) and liaised with community leaders to provide food to residents who had lost their jobs and income (Lewis, 2021). The Mumbai-Dharavi model of aggressive tracking and testing, which was blended with a robust social security net,

soon became a lesson for Global South cities with large, highly congested slum sprawls and was applauded by the World Health Organisation (Awasthi, 2020). The BMC's relative success in managing the crisis was also lauded by the Bombay High Court and the Supreme Court of India. Arguably, the BMC realized the potential of the concept of decentralization and the devolution of powers as envisaged in the CAA.

A similar decentralized governance structure for pandemic management was found in Kerala. The state government mobilized its vast army of volunteers with the aid of local governments to monitor every aspect of pandemic mitigation. For example, while the majority of states in India scrambled to manage the mass movement of migrant workers and to avert a humanitarian disaster, Kerala leveraged its local government to take care of its informal workers by providing food and basic amenities, setting up community kitchens, collecting information on workers, and opening relief camps (Vora, 2020). However, barring these islands of excellence, the majority of ULBs in the country struggled in their pandemic management. The difference can be gauged by comparing the experience of ULBs in Delhi, which saw an unprecedented crisis in its services, despite being situated in the national capital with access to excellent health infrastructure and direct support from the central government.

When the pandemic peaked across India in April–May 2021, Delhi witnessed an average of 28,000 daily cases. In fact, it was among the region that had recorded some of the highest reported deaths in the country. Although the impact of the second wave of the pandemic was devastating across the country, Delhi's problem got exacerbated because of its complex governance structure (Kumar et al., 2021). To begin with, Delhi has a multiplicity of overlapping sub-national jurisdictions delivering health functions, including the Delhi government, New Delhi Municipal Council, three municipal corporations of Delhi, and the Cantonment Board. There was constant power struggle between these bodies during the pandemic – a phenomenon referred to as “conflictual federalism” (Sahoo, 2020). For example, the three municipal corporations of Delhi, which became the fulcrum of pandemic management in the national capital, saw an unprecedented shortage of essential medical supplies, staff, and hospital beds due to exploding cases and a lack of coordination between ULBs and government. The increased demand for hospital and ICU beds, oxygen, and essential drugs laid bare the unpreparedness of the government machinery to deal with the unprecedented challenges posed by COVID-19 (Kumar et al., 2021). Soon, ward afterward started reporting stories of death and despair. The situation was so dire that the Supreme Court of India, in a rare intervention in policy issues during the COVID-19 pandemic, reprimanded ULBs in Delhi for their abject failures in controlling the pandemic (In Re: Cognizance for Extension of Limitation Suo Moto Writ Petition (Civil) No. 3 of 2021). Similar stories of despair were reported from various ULBs across the country (Ara, 2021).

Another crisis that grappled ULBs was the deterioration of their finances due to the pandemic, impacting their ability to provide services to local communities (Dugal, 2021). To understand the impact on India's ULBs, the Reserve Bank of India (RBI) conducted an online qualitative survey of 141 municipal corporations

between July and August 2021. The analysis found fiscal stress built up across these entities, with revenue falling and expenditure rising, forcing cutbacks across non-essential categories (Dugal, 2021). Several municipal corporations had to cut expenditures in other areas to make funds available for the Covid-19 response. They mobilized additional funding from grants (from states and the center), reserves, borrowing, municipal funds, donations, and contributions, which amplified their structural constraints of raising money (Ali, 2021). This is when the responsibilities of local governments towards the delivery of civic functions had increased considerably. There is no doubt that these additional expenditures will force ULBs to cut down their development spending and use their reserves and other contingency funds.

When viewed through the lens of constitutional law, these disparities in ULB's response to the pandemic can be attributed to factors, such as lack of devolution and decentralization of powers and lack of finances. In a way, the pandemic has revived awareness of an issue that never really went away – the fact that since coming into constitutional existence, the progress towards decentralization and autonomy for ULBs has been painfully slowed due to numerous systematic bottlenecks and institutional challenges (Corbridge et al., 2012; Panagariya, 2014). This is mainly because ULBs in India maintain their presence only as administrative units (with separate municipal acts, election commissions, planning committees, and finance commission) and are not able to operate as independent urban institutions due to the lack of funds and functions devolved to these bodies. Moreover, there is no uniformity in this regard across the country, as states have resorted to varying levels of decentralization and devolution of powers to ULBs.

According to the *Devolution Report* (2016), published by the Ministry of Panchayati Raj, Government of India, certain states such as Kerala, Maharashtra, and Karnataka have transferred relatively more powers to local bodies. Kerala leads by example with the *Kerala Municipalities Act, 1994*, which creates ward committees with detailed provisions for their formation, functioning, and facilitation of community participation (Kerala Municipalities Act, 1994 s. 42). The state has also transferred as many as 26 departments to ULBs. Karnataka and Maharashtra have adopted similar decentralized governance mechanisms by creating ward committees in cities like Bengaluru and Mumbai (Kaur & Gupta, 2020). The former has also delegated 17 functions to ULBs under s.243W of the constitution (Nivedita & Viswanathan, 2021). The common theme running across these states is conferring ULBs with exclusive power to administer certain matters, including the running of dispensaries and public health centers.

In hindsight, these delegations of power proved to be visionary as ULBs of these states were in a comparatively better position to tackle the pandemic than their counterparts in other states. Another innovation of CAA that helped ULBs of these states in their work during the pandemic was the presence of District Planning Committees (Constitution of India 1950 s. 243ZD). During the pandemic, these committees effectively coordinated between rural and urban centers for patient transfers, notifying the availability of beds and maintaining the supply chain for the transport of life-saving drugs from one district region to another. The Devolution

Report (2016) suggests that most states either have not formed a committee or have failed to prepare integrated plans. Moreover, real decentralization has a long way to go in India, with several states having transferred as few as three functions to ULBs. So, it should not come as a surprise that ULBs in states like Kerala and Maharashtra were more successful in pandemic management than others.

Furthermore, when it comes to ULB's fiscal devolution, autonomy, and functions, the situation is damning. The State of Municipal Finances in India (2019) report shows the precarious financial health of Indian urban local bodies, with a majority of them not having enough money to pay the salaries of their staff or perform basic civic functions. There can be two main reasons for this. First, most local bodies cannot generate enough funds from their internal sources due to limited capacity to impose taxation on their subjects (The High-Powered Expert Committee for Estimating the Investment Requirements for Urban Infrastructure Services, 2011). This makes them heavily reliant on the devolution of funds from the central and state governments in the form of transfer and grants, making them unable to embark on development activities independently. The second reason is the lack of delegation of adequate financial powers to ULBs by state governments. The power to determine the revenue base for local bodies lies with state governments, which over the years have only permitted ULBs to collect property taxes or water tariffs, but not land zoning, which can unlock substantial revenue (IDR, 2020). Even the property tax, which is the largest source of revenue, is not enforced correctly due to ambiguous taxation norms, lack of reliable records, archaic assessing systems, and state interference in property tax rates (Atreya, 2020).

In addition to this, there is a disparity in state approaches to municipal finances. States like Kerala have devolved 35% of state's development budget to local governments so that communities can define and implement their developmental priorities. The state government even allows the professional tax proceeds to go to local bodies that can invest them in priority areas like health and education (Sharma & Visakha, 2020). Similarly, ULBs in Karnataka are allowed to independently raise funds under the *Karnataka Municipal Corporations Act, 1976* (KMC). The new *Bruhat Bengaluru Mahanagara Palike Act, 2020*, which replaces the KMC's provisions for governing Bengaluru, further increases the taxation powers of the Corporations by allowing them to impose taxes on professions and entertainment (*Bruhat Bengaluru Mahanagara Palike Act, 2020* s. 142). When the pandemic struck in these states, ULBs could mobilize resources quickly for pandemic mitigation. This was in stark contrast to ULBs in states like Uttar Pradesh, Uttarakhand, Bihar, Jharkhand, Rajasthan, and Haryana, where due to poor financial conditions ULBs could not even provide basic services during the pandemic (State of Municipal Finances in India 2019). As a result, these states suffered a devastatingly high fatality rate during the pandemic's second wave in India.

The structural and institutional fault lines of ULBs exposed during the pandemic should not have come as a surprise. In every decade of their constitutional existence, the recurring themes in criticism of urban governance in India have been the same, i.e., there is a lack of financial devolution and autonomy for ULBs, and that cities are only politically decentralized but not functionally so (De souza, 2003; Oomen, 2014). Even

after 30 years, state governments' institutional inertia and apathy toward ULBs remain unchanged. This is despite ULBs having acquired a host of new responsibilities over this period, including city development planning, city mobility planning, city sanitation planning, e-governance planning, and now pandemic mitigation planning. Ahluwalia (2019) rightly notes that to address the challenges of urbanization in India, "state governments have an important role to play not only in transferring functions, funds, and functionaries but also in providing an enabling environment through legislative and institutional reform." In hindsight, municipal governments lack agency in their relationship with state governments, which renders them institutionally disempowered.

The following section will discuss how ULBs lack agency regarding their functions and finances in their relationship with state governments, which ultimately affects their day-to-day functioning. The focus will be on identifying structural changes through which agency could be granted to ULBs in their administrative and financial relationships with state governments.

Need for Granting Agency to Local Governments: A Key Lesson Learnt from ULB's Pandemic Management in India

The pandemic management by various levels of government in India has made it amply clear that the core problem faced by the Indian republic during an evolving crisis like a pandemic is its highly centripetal governance structure. Ideally, disasters like the COVID-19 pandemic need to be tackled in a highly decentralized manner – at the city, village, and block level supported by institutions that are not merely constitutional but also functionally empowered. Nevertheless, the elected representatives at the helm of these institutions do not have the functions and finances to deliver good governance. Rajagopalan (2020) notes that "local governance has four constitutional aspects – form, functionaries, function, and finances. India has done a great job with the former two, but not the latter."

Generally, the blame for such dysfunctional institutions, sometimes rightly, can be traced back to the nation's founders, who had failed to create a constitutionally mandated local government. However, as discussed earlier in this chapter, this deficiency has been corrected through the enactment of the CAA in 1992. In reality, the CAA has only provided constitutional recognition to ULBs but has not empowered them to do their functions in the letter and spirit of the legislation. The reason for the latter can be attributed to a fundamental but deliberate error on the part of political leaders when the CAA was enacted. Through the usage of the term "shall" in some places and "may" in others in the CAA, the legislators left the extent of devolution of functions and empowerment of these bodies at the discretion of states. Such discretionary delegation of the subject matter ended up in a whole array of interpretations that suited the immediate needs of states (Jha, 2020a, b). For example, the Act indicated that there should be a clear demarcation between Nagar panchayats, municipal councils, and municipal corporations in towns and cities (Constitution of India 1950, art. 243Q). Such demarcation should be based on the

region's population, demographic density, revenue, and non-agricultural activities. In reality, states have not followed any semblance of uniformity when making these delineations. Large settlements are still termed villages, and smaller towns have been upgraded to cities. Critics have argued that such considerations are because of reluctance on the part of rural political leaders to accept the municipalization of villages due to perceived loss of power and revenue (Jha, 2020a, b).

Naturally, this has caused structural and functional problems in ULBs because state governments' decisions have been driven by political expediency rather than considerations of good governance. Recognizing the detrimental effect of the discretion given to states in determining functions of ULBs, both the National Commission to Review the Working of the Constitution (2002) and Second Administrative Reforms Commission (2007) have recommended amendments to the Constitution to tweak ULBs constitutional design. The amendment should provide that state legislatures shall, by law, mandatorily vest ULBs with such powers and authorities that enable them to function as institutions of self-government. However, without this change, ULBs have been tied to state governments' discretionary interpretation of various provisions of the CAA. It would be safe to conclude that ULBs have no decision-making powers concerning their working with state governments, hence the usage of the term "lack of agency." This is generally reflected in ULB's administrative and financial relationships with state governments.

- **Lack of agency in administrative relationship with state government:** There is no doubt that the failure of state governments to spell out a well-defined functional domain for ULBs has led to challenges in governance and a lack of autonomy for ULBs in Indian cities. However, beyond this structural fault in ULB design, the pivotal reason for the lack of agency of cities and towns in their administrative relationship with states is the presence of parastatals (A parastatal is a state-owned company with a distinct legal form, generally created to undertake a city function such as water supply, city transport or urban planning). These governmental agencies were initially set up on the recommendation of international organizations to perform functions generally reserved for municipal governments, such as slum development, water delivery, housing, and other essential civic functions (Jha, 2020a, b). Due to the limited capacities of urban governments in cities after independence, the parastatals run by experienced bureaucrats supplemented the capacity of municipal bodies. Over time, irrespective of the rising capacity of ULBs in cities, parastatals got institutionalized. For instance, in cities like Bengaluru and Mumbai, there is an agglomeration of agencies carrying out specialized functions despite some of the best run ULBs of the country overseeing the city's civic functions (For example, in Bengaluru, Bengaluru Development Authority is responsible for land regulation and the Karnataka Slum Clearance Board is responsible for slum rehabilitation. In Mumbai, development work is undertaken by Municipal Corporations of Greater Mumbai and Metropolitan Regional Development Authority).

Such a polycentric governance system creates multiple challenges for the administration of cities, including wastage of resources and overlapping functions

with ULBs (Pethe et al., 2011). As parastatals are not only managed by state governments but also accountable to them, their intrusion into ULB's functional domain leads to erosion of autonomy for the ULBs. Most importantly, it challenges the authority and accountability of ULBs. If the third tier of government has no authority over its functions and instead its powers are vested in officials appointed by the State government, then local governance would be reduced to mere symbolism. This lack of agency was widely seen during the pandemic when many ULBs across the country were hard-pressed to do functions that they had systematically been deprived of in the pre-pandemic era. It is high time that certain functions are made exclusively the domain of ULBs and those that need to be shared with state governments be specified for resolving this agency problem. Experts have also "recommended that the municipality be responsible for providing civic amenities in its jurisdiction and if a parastatal exercises a civic function, it should be accountable to the municipality" (Second Administrative Reforms Commission, 2007).

- **Lack of agency in financial relationship with state government:** In the financial domain, Indian ULBs are among the weakest globally, with municipal revenue accounting for just one percent of the GDP in 2017–2018 (Indian Council for Research on International Economic Relations, 2019). As discussed in the previous section, a triple whammy of the low tax base, lack of capacity to raise revenue, and an obdurate state government that limited effective devolution of revenue to ULBs have contributed to the financial apathy of ULBs. Even the structural innovations of the CAA, like the establishment of State Finance Commissions, have failed to bring certainty, clarity, and consolidations in the transfer of revenue to ULBs (Report of the Working Group on Urban Governance 2018). Although the Fifteenth Finance Commissions for 2020–2021 recommended Rs 90,000 crore in grants for local bodies, such a massive transfer of resources does not resolve the fundamental problems underpinning ULB's financial relationship with states.

ULBs are never part of financial negotiations between states and central government when done under the auspices of constitutional or supra-constitutional bodies like the Finance Commission and NITI-Aayog. For example, in the last decade, India's political class traversed the political divide to create a new indirect taxation regime called Goods and Services Tax (GST) in India. During the negotiation, state governments had little inclination to devolve even a small part of the revenue from GST to the third tier of government (Ahluwalia et al., 2014). This was so even after the proposal for the GST (which subsequently did materialize) to subsume all local taxes, including Octroi, advertisement, etc. This has left many municipalities financially weaker than before, relying on government grants for performing their mandates. Therefore, it is unsurprising that ULBs struggled to provide essential services during the pandemic.

It is evident from the discussion above that there is a clear case for raising the financial autonomy and reforms of municipal finances to provide better public services to citizens. Apart from the reform needed in the structural relationship of ULB's fiscal devolution, autonomy, and functions vis-à-vis state government,

ULBs must also become serious about augmenting their revenue through various resources and stop the temptation of fiscal slippages that routinely occur in their budget. RBI's (2021) latest state finance report showed that 30 to 35 percent of the 221 ULBs surveyed are severely stressed fiscally, and more than 50 percent of them have reported declining revenue. A significant reason for this precarious fiscal position remains the structural issues, i.e., low diversification of ULBs tax resources on account of the non-devolution of subject matters by the state government to ULBs. However, the RBI's study also shows that the ULBs are increasingly committing a higher expenditure than their revenue receipts, making them increasingly dependent on grant-in aids and transfer of funds from upper tiers of the government for their routine functions.

A host of reforms have been recommended by constitutional and statutory bodies like the Finance Commission and Securities and Exchange Board of India (SEBI), taking note of the fiscal imprudence of ULBs and the need to augment internal resources of ULBs. For example, the 15th Finance Commission has recommended two entry-level conditions for ULBs to access the increased grant recommended by it, i.e., notifying the floor or minimum rates of property tax to improve internal revenues and timely submission of audited accounts. To augment the internal revenue of ULBs, SEBI also has relaxed norms for "Issue and Listing of Debt Securities by Municipalities (commonly known as MUNI bonds), which allows ULBs to raise capital from the securities market. Implementing the National Municipal Accounts Manual (NMAM) to ensure correct, complete, and timely recording of municipal transactions is another major initiative to increase fiscal and reporting transparency among ULBs in India. RBI (2021) report has further outlined a series of reforms like revitalizing the municipal bond market, boosting developmental/infrastructure finance and green finance, and exploiting land-based financing opportunities for self-sufficiency of ULBs in India. Going forward, it is imperative that reforms in devolution and financial autonomy for ULBs must be done in conjunction with the strengthening of ULB's governance structure and empowering them to raise their resources.

Conclusion

The COVID-19 pandemic has highlighted the importance of reimagining urban governance by taking efficient preventive and risk-mitigating measures and building systemic resilience in our cities. In India, this reflection could be done by going back to the drawing board to tweak the constitutional design of ULBs to make them functionally and financially empowered. The fissures that emerged in ULB pandemic management are a timely reminder that India's urban agglomerations should rely on decentralization and devolution of functional and financial governance for creating solid cities and towns.

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Disaster Risk Reduction Through Waterlogging Prevention in (Southwestern) Bangladesh

62

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Contents

Introduction	988
Bangladesh and Waterlogging	989
Waterlogging in the Southwest Region of Bangladesh	990
Causes of Waterlogging	990
Extent	990
Implications: Poverty Pockets	991
Climate Change and Sea-Level Rise (SLR) to Worsen Waterlogging	992
Prevention Strategies for Risk Reduction to Waterlogging	992
Institutional, Policy, and Regulatory Framework	992
Relief and Rehabilitation	993
Structural/Physical Interventions	993
Projects and Programs	994
Success and Failures	994
Conclusion	995
References	996

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Abstract

Waterlogging is a long-duration slow-onset disaster and experienced in many parts of Bangladesh. Several areas in the eastern and western coastal zone suffer from extensive and permanent waterlogging. The southwestern region, with a population of 40 million, is experiencing persistent waterlogging for 2 to 6 months each year for the last 30 or more years. This can be attributed to its geographical location, polderization, death of upstream rivers, hydro-morphological changes, siltation in rivers, encroachment of riverbanks, illegal structures, and unplanned aquaculture. More than a million people are seriously affected each year. Disaster risk through waterlogging is expected to become worse because of sea-level rise, increased precipitation with the changing climate, subsidence inside polders, and sedimentation of peripheral rivers. Prevention strategies include policy and institutional interventions, relief and rehabilitation, and infrastructural measures. Seven infrastructural measures have been proposed: construction of the Ganges barrage, maintenance dredging of the Gorai River, tidal river management, pumping and drainage improvement, revitalization of regional rivers, adaptive land use, and depolderization. Tidal river management (TRM), a locally grown concept, is widely appreciated as one of nature-based solutions but is found to have implementation complexities. Many programs and projects have been undertaken. Overall results have remained mixed, despite increased budgetary resource allocations.

Keywords

Waterlogging · Disaster · Climate change · Tidal river management · Polderization

Introduction

Bangladesh is one of the most disaster-prone countries in the world. The country is also impacted by global climate change. Prevention for risk reduction from natural and climate related disasters is seen as prerequisite as Bangladesh is transitioning from a lower- to a middle-income country. This chapter focuses on one of the natural disasters, waterlogging in Bangladesh.

The aims of this chapter are to elaborate on:

- (a) Nature, extent, and causes of waterlogging in general but focusing on the southwestern region
- (b) Plans and programs undertaken to prevent waterlogging
- (c) The success or failures of implemented programs

This chapter is based mostly on literature review, analysis of secondary data, field visits, and interaction with waterlogged communities.

Bangladesh and Waterlogging

Bangladesh has a tropical monsoon climate with an annual average rainfall of 2200 mm. Over 60% of annual rainfall occurs in 4 months (May to August). During this period, Bangladesh often experiences extreme flooding. Waterlogging is also experienced in many parts of the country, specially within the polders of the coastal zone. Polders are lowlands encircled by dykes or embankments to prevent tidal flooding and salinity intrusion. Polders, in recent times, have been blamed for causing waterlogging.

Definitions and types of waterlogging vary. Technically, waterlogging is a situation when groundwater level touches plants' root zone. Waterlogging, in general, is a form of flooding within embankments where water stays stagnant on ground for any period up to 6 months.

There are at least three types of waterlogging experienced in Bangladesh: urban, rural, and coastal.

Urban waterlogging occurs due to increased built up areas, intense rainfall over a short period of time, and inadequate capacity of drainage networks resulting in increased runoff. All major cities of Bangladesh including Dhaka, Chattogram, Sylhet, Khulna, Pabna, Tangail, Jashore, and Cox's Bazar (Subrina & Chowdhury, 2018; Rahaman et al., 2020) experience waterlogging. Urban waterlogging is short-lived, from a few hours to even 2 weeks. In Dhaka, loss of wetlands and floodplains has also aggravated the problem.

Rural waterlogging occurs during high rainfall events coupled with high water levels of the surrounding rivers. In rural areas, roads, embankments, and other infrastructure are constructed without adequate drainage provision. Waterways are also getting silted up and often encroached upon.

In contrast, **coastal waterlogging** is a slow-onset predictable disaster, happening every year for 2 to 6 months. In the southeast coast especially in Noakhali district, over the past decades, both natural and man-made land reclamation have occurred. This has elongated drainage path and lowered drainage gradient causing waterlogging in the area. In contrast in the south west coast especially in Satkhira, Jashore, Khulna, and Bagerhat districts, waterlogging is mainly due to polderization. The coastal zone of Bangladesh is mostly poldered (embanked) and has disturbed and altered hydro-morphological setting.

Waterlogging is causing huge **economic losses** (BBS, 2016; Quddusi, 2017). During the 2009–2014 period, waterlogging caused US\$ 31 million in property damages yearly (BBS, 2016) which, if prevented, could have the GDP volume increased by 0.02% per year. In 2017 alone, Chattogram, the port and industrial city, suffered economic damages of US\$ 71 million (Quddusi, 2017).

After brief introduction of definition, types, and economic losses, this paper elaborates on waterlogging in the southwest region of Bangladesh identifying areas, root causes, extent, socioeconomic impacts, and expected impacts of climate change; following through prevention strategies in terms of regulatory and institutional interventions, relief and rehabilitation, and projects and programs; and concluding with a discussion on successes and failures.

Waterlogging in the Southwest Region of Bangladesh

The southwest region has several morphologically active tidal rivers. They are the main drainage network for coastal polders and low-lying depressed areas (beels). Huge quantity of silt is deposited into the river system as tide flows in from the sea. On the other hand, freshwater flows from the upper Ganges system help to flush the sediment, and thus, drainage capacity of tidal rivers is maintained naturally. In the early 1960s and 1970s, this natural process was disrupted substantially after polderization. Coastal polders prevented sedimentation on the low-lying lands but caused sedimentation in the peripheral rivers of polders. In addition, these tidal rivers received increased sedimentation due to reduced dry season freshwater flow caused by withdrawal of water upstream.

Causes of Waterlogging

Many authors have identified causes of waterlogging in the southwest region. These can be summarized as polderization, hydro-morphological changes in tidal river system, death of upstream rivers (e.g., Mathabhangha River), siltation and encroachment of rivers, poorly executed infrastructures, road networks inside polders, illegal structures, unplanned aquaculture, low topographic slope, and sea-level rise (FAO, 2015; Awal & Islam, 2020; Tahsin et al., 2020).

The Food and Agriculture Organization (FAO, 2015) also indicated that institutional bottlenecks are as equally important to cause waterlogging. Institutions are weak to manage water-related infrastructure, including uncoordinated canal excavations by various agencies, unlawful permission to build aquaculture ponds on natural canals, and operation and maintenance (O&M) of sluice gates.

Extent

Many studies have elaborated and reviewed the extent of waterlogging in southwest Bangladesh (FAO, 2015; Tareq et al., 2018; Awal & Islam, 2020). Satkhira, Jashore, Khulna, and Bagerhat districts have routinely experienced localized and prolonged waterlogging during the annual monsoon season. FAO (2015) has mapped waterlogged areas in eight Upazilas (subdistricts) using satellite images and ground truthing (Fig. 1) indicating different extent in different years.

Tareq et al. (2018), using Landsat TM images for the years 1989, 2000, and 2011, revealed that waterlogged area in Tala Upazila has increased from 0.7% in 1989 to 34% in 2011. There was an increase in 63% of water bodies during 1989–2000, which expanded to 77% during 2000–2011.

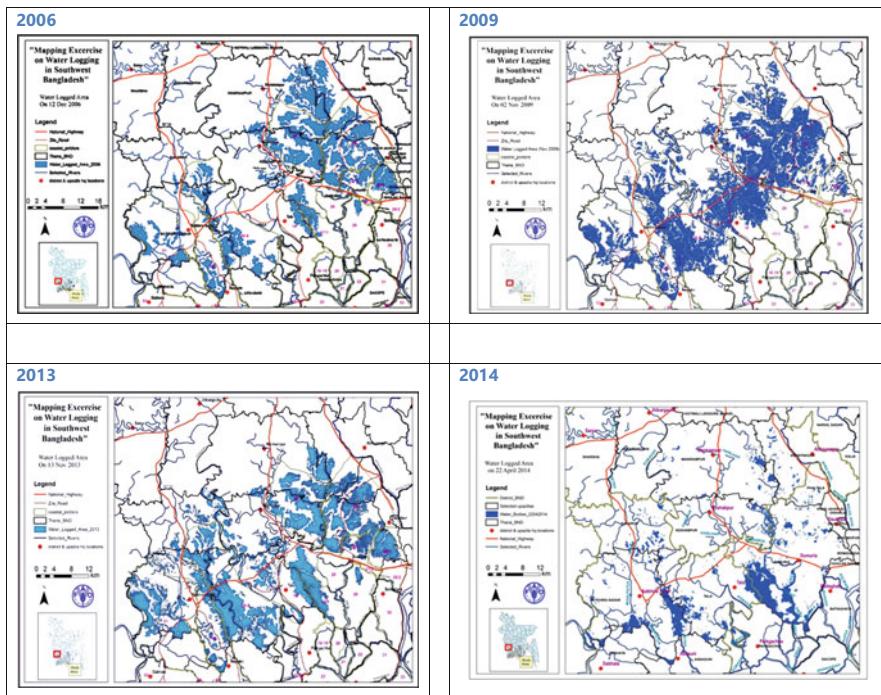


Fig. 1 Mapping of waterlogged areas in the southwest region in different years (FAO, 2015)

Implications: Poverty Pockets

More than one million people were seriously affected due to waterlogging in 2011 and 1.3 million in 2016 (Awal & Islam, 2020). Islam et al. (2020) found that waterlogging impacts livelihood including crop failure and damage, disruption in coping mechanism, physical and mental illnesses, loss of income, and increasing level of debt.

The effects of waterlogging are loss of property, lack of access to essential services (such as water and food), and damage to infrastructure. At the homestead level, the impacts are the loss of shelter, less access to safe food and water, and loss of basic services such as health and education. Women and children are becoming more vulnerable due to increased frequency and extent of waterlogging. Some areas, in fact, are new ecologically vulnerable poverty pockets.

In waterlogged areas, people are adapting (Shaibur et al., 2019) to various alternatives. For example:

- Moving temporarily or permanently to other places
- Modifying their bamboo or cottage-type houses to tin-shed or semi-brick type
- Changing food habit from cooked food (rice and fish) to dry food (flattened or puffed rice)
- Changing profession from farmer to rickshaw or van puller in nearby towns
- Practicing floating, mixed, hanging, or shifting agriculture

Climate Change and Sea-Level Rise (SLR) to Worsen Waterlogging

Waterlogging is expected to become worse because of the joint effects of sea-level rise and increased precipitation in the changing climate, subsidence inside polders, and sedimentation of peripheral rivers (Sarkar et al., 2021). Haider et al. (2021) have shown, using long-term satellite images and applying numerical model, that certain areas will be completely waterlogged in an end-of-century scenario.

Bangladesh ranks 164 out of 180 countries in 2019 (ND-GAIN, 2022) in the Notre Dame Global Adaptation Index (ND-GAIN). Bangladesh is the 26th most vulnerable country and the 24th least ready country. This means Bangladesh is vulnerable to climate change but not ready to combat its effects.

Prevention Strategies for Risk Reduction to Waterlogging

Strategies for prevention can be described through three aspects: (a) institutional and policy interventions, (b) relief and rehabilitation, and (c) structural/physical interventions (projects and programs).

Institutional, Policy, and Regulatory Framework

Many government and nongovernmental agencies have direct and indirect roles, but lack of coordination among agencies has been identified as the main institutional bottleneck. These institutions tend to work only within its own areas of competence, within its own comfort zone. Institutions have their own understanding of the nature and complexities of the waterlogging problem. They lack understanding of interdisciplinary solutions accommodating environmental, social, and economic considerations. The Programming Division of the Bangladesh Planning Commission and the UNDP has proposed a coordination mechanism between and among different institutional stakeholders to address waterlogging in three districts (PD/BPC and UNDP, 2018). However, the proposal is yet to be implemented.

Bangladesh's regulatory framework for disaster management comprises of the relevant legislative, policy, and best practices. The framework includes the following:

- Disaster Management Act 2012
- National Disaster Management Policy, 2015
- Disaster Management (Committee Formations and Functions) Rules, 2015
- Standing Order on Disaster, 2019
- National Plan for Disaster Management, 2021–2025, 2021
- Disaster Management (Fund Management) Rules, 2021
- Guidelines at all levels as best practice models

As per the Disaster Management Act 2012, persistent waterlogging is considered as one of the natural disasters. In September 2015, the government of Bangladesh (GoB) has adopted the Disaster Management Policy. Policies for reducing risk from waterlogging are identifying waterlogged risk areas and affected communities, adopting long-term plan, devising modern early flood warning system, and re-excavating rivers and canals.

Translating the Disaster Management Policy, the eighth FYP (Five-Year Plan: 2021–2025) of the government of Bangladesh emphasizes on the implementation of the Bangladesh Delta Plan for better management of natural disaster incidence including waterlogging. The target of the eighth FYP is to reduce waterlogging from existing 2.5% to 0.25% of the coastal area and to reduce persons vulnerable to waterlogging from 0.9 to 0.1 million by 2025.

Relief and Rehabilitation

To support poor and marginal communities, the government has established the safety net programs that include funds for Food for Work (Kabikha), Test Relief (TR), 100-day employment generation scheme, Vulnerable Group Feeding (VGF), and Vulnerable Group Development (VGD). Some of these funds are spent on activities that are relevant to waterlogging. For example, food is distributed through the VGF scheme to waterlog-affected communities, which help build resilience. The 100-day employment generation scheme reduces economic vulnerability through job opportunities and income generation for waterlogged communities. Some of the SSNP (social safety net programs) funds are also spent on activities relevant to water management/waterlogging. The government and NGOs initiate relief efforts in the waterlog-affected communities.

Structural/Physical Interventions

To address waterlogging in the southwest region, the Bangladesh Delta Plan 2100 (GED, 2018), a long-term integrated and holistic plan, has proposed seven infrastructural measures: (a) construction of the Ganges barrage to improve drainage capacity of regional rivers; (b) maintenance dredging of the Gorai River, the main freshwater source; (c) tidal river management (TRM); (d) mechanical pumping of

waterlogged areas; (e) revitalization of regional rivers; (f) aquaculture in waterlogged areas; and (g) depolderization (removal of dykes) of certain polders.

While all these measures have certain merits and demerits, some are also cost-prohibitive. Of these, the TRM process is an example of building with nature and a resilient measure for waterlogging, river sedimentation management, and subsidence. TRM can be applied in a cyclic way, though not all areas are suitable. Tidal river management could become standard procedure for coastal polders. This would counterbalance subsidence and reduce the problem of waterlogging. Reinhard et al. (2022) have found that pumped drainage, through cooperative investment, increases farmers' income in waterlogged areas.

Tidal river management (TRM) allows natural movement of tide from the river to an embanked low-lying area through a link channel. During flood tide, sediment-laden water enters to the low-lying area where the sediments are deposited due to reduced velocity and long duration of storage. During ebb tide the tidal water flows out of the low-lying area with reduced sediment load and erodes the riverbed and bank at the downstream. The natural movement of flood and ebb tide in the river and low-lying area increases the drainage capacity/conveyance of the river through scouring and supports the river navigability. Deposited silt raises the low-lying area considerably.

Projects and Programs

The Programming Division-Bangladesh Planning Commission and UNDP (2018) has undertaken an analysis of projects and programs implemented in three waterlog-affected districts. There were 352 projects implemented over the past 15 financial years. The number of projects, relevant directly or indirectly to waterlogging, in the 3 districts was estimated as 135, the average number being 9 each year. The GoB is continuing routinely to implement projects/programs under the Annual Development Plan (ADP).

An analysis of resource allocations and budgets (PD/BPC and UNDP, 2018) in three districts (Khulna, Satkhira and Jessore) shows a positive picture. The ADP expenditure has increased in real terms since 2001/2002.

- The government has spent 15% of total allocations in waterlogging-relevant projects. The overall ADP budget was US\$ 1.64 billion at current prices.
- The budget has grown at 10.7% in 2015/2016 over 2001/2002 at current prices, which has exceeded inflation rate. Thus, there is a real growth.

Success and Failures

Of the seven strategic structural/physical interventions to prevent waterlogging described above, five – maintenance dredging of the Gorai River, tidal river management, pump and drainage improvement, revitalization of regional river, and land

use adaptation – have been and still are being implemented. The IMED (Implementation Monitoring and Evaluation Division) of the Bangladesh Planning Commission routinely evaluates and prepares in-depth reports (IMED/PC, 2022). On the Gorai River Dredging and Bank Protection Project, the IMED has noted the upward trend of water flow and decreased salinity in the dry season but emphasized on regular maintenance dredging to sustain results. On the drainage improvement of upper Bhadra River, Horihar River, Buri-Bhadra River, and adjacent khals in Manirampur and Keshabpur Upazila, Jashore (2018–2021), the IMED has noted improved flow of water and reduced waterlogging but recommended deployment of permanent workforce for O&M and TRM management in certain beel areas. On the Southwest Area Integrated Water Resources Planning and Management Project, the IMED has noted increased crop production but declined fish production. This decline is, however, mitigated with increased production through culture fisheries.

Hence, results have remained mixed. However, the tidal river management (TRM) is appearing as one important nature-based solution to reduce waterlogging. Uttaran (2013) has documented process of conceptual development of the TRM as a local, people-centered innovative approach to remove sedimentation through letting sediment to settle in the beels. Seijger et al. (2019) revealed that tidal river management is quite different (local, natural, complex) from mainstream engineering strategies. They concluded that tidal river management has strategic potential, though is hardly recognized in master plans. Bangladesh Delta Plan 2100 supports the concept of TRM but did not propose any new project beyond the current portfolio (Nicholls et al. 2020).

Many studies have found initial successes but recorded challenges due to lack of proper compensation plan, bitter experiences from TRM officials, conflicts within project-affected people, equity issues, improper management, overextended duration of TRM, political reasons, etc. (FAO, 2015; Mutahara et al., 2019; Lázár et al., 2020).

Lázár et al. (2020) have applied Delta Dynamic Integrated Emulator Model (Δ DIEM) to explore the outcomes of four contrasting and plausible development trajectories under different climate and socioeconomic scenarios to the end of the century. TRM has the potential for increased environmental and economic sustainability. The coastal zone can remain habitable and agriculturally productive until 2100 at least if the potential of the TRM can be fully exploited.

Conclusion

More than a million people are affected annually by waterlogging in Bangladesh, particularly in the southwest region. This is continuing for the last 30 years or more. As Bangladesh is aiming to navigate as one of the middle-income countries, it has set in its eighth Five-Year Plan to reduce waterlogged area from existing 2.5% to 0.25%. This is an ambitious target, but efforts are already underway to implement projects and programs, and budgetary allocations have been increasing gradually. However, routine efforts are not seen as adequate as impacts of climate change and sea-level

rise are making the waterlogging situation worse. Hence, while infrastructural measures are implemented, efforts also needed to be placed on institutional coordination. Waterlogging, a recognized long-duration disaster, in Bangladesh is preventable and manageable.

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Disaster Management in Jammu and Kashmir: Tracing the History of Relief and Rehabilitation Amidst Destruction

63

Mohit Sharma and Neerja Vyas

Contents

Introduction	1000
Part I	1001
Disasters in Jammu and Kashmir	1001
Earthquakes	1002
Landslides	1002
Snow Avalanches, Snow Storm, and Snow Fall	1002
Flash Floods	1003
Part II	1004
Institutional Mechanism for Disaster Management in Jammu and Kashmir	1004
National Disaster Response Fund (NDRF) and State Disaster Response Fund (SDRF)	1005
Part III	1006
2014 Floods in Jammu and Kashmir	1006
Relief and Rehabilitation	1008
Providing Safe Passage to the Affected Population	1008
Food and Other Supplies	1009
Water Treatment Plants, Drinking Water Supplies, and Medical Assistance	1009
Telecommunication, Electricity Connectivity, and Fuel Stocks	1009
Road Communication, Restoration of Bank Facilities	1010
Ex Gratia Amount to the Victims	1010
Discussion and Conclusion	1010
References	1011

Abstract

Since primitive times, humans are trying to establish harmonious relationship with nature, and it has always been a constant struggle which speaks volumes

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about the survival and adapting techniques of the species. In last few years, it has been observed that frequency of natural disasters has increased manifold and we humans are collectively liable for this blatant interference with nature which has caused mammoth loss of lives and material over the centuries. In the region of Jammu and Kashmir, various kinds of disasters have been a recurring phenomenon affecting human lives and devastating the economies. The union territory (UT) of Jammu and Kashmir is the northernmost region of India and is considered to be one of the most picturesque lands on the planet. But the region has been unfortunately plagued by various natural disasters ranging from earthquakes, destructive floods, snow blizzards, avalanches, landslides, to wind storms, all owing to its peculiar topography, rugged terrain, extreme weather conditions, and unique geographical and geo-climatic settings, which has always caused a huge loss of human lives and property. This chapter attempts to chronologically trace the major disasters of Jammu and Kashmir region and understand the role of government in mitigating the disasters. This study critically examines the various policy documents, orders, and by-laws which have been framed and implemented from time to time by the government of the day. The study also looks into the role of various government agencies, i.e., National Disaster Response Force and State Disaster Response Force (SDRF), and other associated government departments.

Keywords

Disaster Management Plan · Rehabilitation · NDRF · SDRF

Introduction

We have only experienced terrible calamities with human impact on a scale never previously witnessed in recorded history during the first half of the twenty-first century (Kunstler, 2007).

These include December 26, 2004, tsunami in Indian Ocean, which, despite impacting much less developed coastal countries around the world, killed 283,106 people, and the Hurricane Katrina flooding, which claimed over 3,000 lives across all nationalities (Morris, 2012). More people were at risk as a result of the hurricane's winds destroying a major area of the southern part of United States, which had undergone extensive coastal expansion in past few decades, than the once isolated barrier-island settings (Bush et al., 1996). Humans are ultimately at the mercy of nature, despite emergency management and disaster preparedness efforts to reduce loss of property and human lives by advance planning and public policy intended to prevent individuals from putting themselves in unnecessary danger. Disasters, both natural and man-made, have been more frequent during the past century (Smith, 2013).

Due to its varied geo-climate, the Indian subcontinent is susceptible to a variety of natural disasters. Every year, India has a number of significant natural catastrophes that affect millions of people, especially in isolated communities, and cause

hundreds of fatalities. Natural disasters are still a significant hazard to everyone on Earth, and they might have considerably severe consequences for property and human life (Aini & Fakhrul-Razi, 2010). A sharp reminder of the link between weak governance and human casualties has been provided by severe natural disasters. Natural and human disasters have an especially devastating impact on emerging economies. For instance, the tsunami of 2004 claimed the lives of 227,898 people, primarily in three economically developing but politically volatile countries: India, Indonesia, and Sri Lanka. Similar to this, Haiti earthquake in 2010 affected close to three million people and killed between 46,190 and 316,000 people (Pal, 2021).

Part I

Disasters in Jammu and Kashmir

The severe climate and topography of union territory (UT) of Jammu and Kashmir have made it particularly vulnerable and prone to many natural calamities. Devastating earthquakes, catastrophic avalanches, massive floods, and numerous landslides have all occurred in the area (SDMP, 2017). A series of catastrophic events have devastated the region, including the damage brought on by the 2014 floods, the landslides and flash floods in 2010, and the earthquake in 2005 (Gupta et al., 2012). Jammu and Kashmir, a recently created union territory (UT) in India's far north where disasters caused by nature and humans have the greatest effect on individuals and make it more vulnerable. The death toll due to various disasters at the national level and Jammu and Kashmir from 2005 to 2018 is shown in Table 1.

Table 1 Natural disaster-related fatalities in India and J & K between 2005 and 2018

Natural disaster-related fatalities			
S. No	Year	Jammu and Kashmir	India
1	2005	1157	22,415
2	2006	345	21,502
3	2007	278	25,153
4	2008	307	23,993
5	2009	226	22,255
6	2010	575	25,066
7	2011	314	23,690
8	2012	321	22,960
9	2013	308	22,759
10	2014	518	20,201
11	2015	387	10,510
12	2016	280	8,684
13	2017	127	7143
14	2018	131	6891

Source: Government of India, National Crime Records Bureau, Ministry of Home Affairs

In addition to anthropogenic or man-made calamities, J & K is vulnerable to natural disasters. Srinagar and Jammu, both cities, are in seismic zones IV and V. The usual occurrences include avalanches, traffic accidents, and landslides along the highways. Floods have also repeatedly destroyed the economy and affected everyday life of the people. Following is a brief description of a few disasters.

Earthquakes

The westernmost portion of India's Himalayan mountain range is located in Jammu and Kashmir. It has a Medvedev–Sponheuer–Karnik earthquake intensity scale of VIII to IX or higher and is designated as being in seismic zones IV and V. Zone V includes the districts of Kashmir North and Kashmir South. Zone IV includes the districts of Jammu, Kathua, Udhampur, Poonch, Reasi, Ladakh, Leh, and Tribal Territory. Districts in Jammu and Kashmir that make up a large chunk are located in the seismic zone V. Pulwama, Ramban, Shopian, Budgam, Bandipora, Anantnag, Baramulla, Ganderbal, Kulgam, Kupwara, Srinagar and Kishtwar districts are located in the seismic zone V, while the remaining districts are in the seismic zone IV. Since the earthquake database in India is presently lacking, particularly for earthquakes that occurred during the period (before 1800 A.D.), these seismic zones provide a general indication of the earthquakes in each district and should be updated frequently (Fig. 1).

Landslides

In addition to earthquakes, landslides are a widespread and unique geological danger in the area. The size of the mass movement in Jammu and Kashmir ranges landslides to soil movements. Another type of large-scale movement, known as solifluction, is frequent on the snow-topped hills. Flash floods in Jammu and Kashmir are responsible for some of the larger landslides, especially in confined river gorges. These flash floods in the area cause landslides, which ultimately endanger the stability of the hill as a whole. Due to numerous improper development activities, the state's geologically young, unstable, and delicate rocks are now much more vulnerable. Anthropogenic activities such as deforestation, ill-conceived road building and terracing, and encroachment on steep mountain slopes have increased the incidence and severity of landslides. A huge landslide would hit a portion of the state almost every year, causing flooding, fatalities, damage to homes, roads, and other transportation infrastructure, as well as loss of agricultural land (Fig. 2).

Snow Avalanches, Snow Storm, and Snow Fall

Some of the main routes in Jammu and Kashmir like the upper higher ranges in Kashmir Valley are extremely susceptible to avalanches. Avalanches are rarely

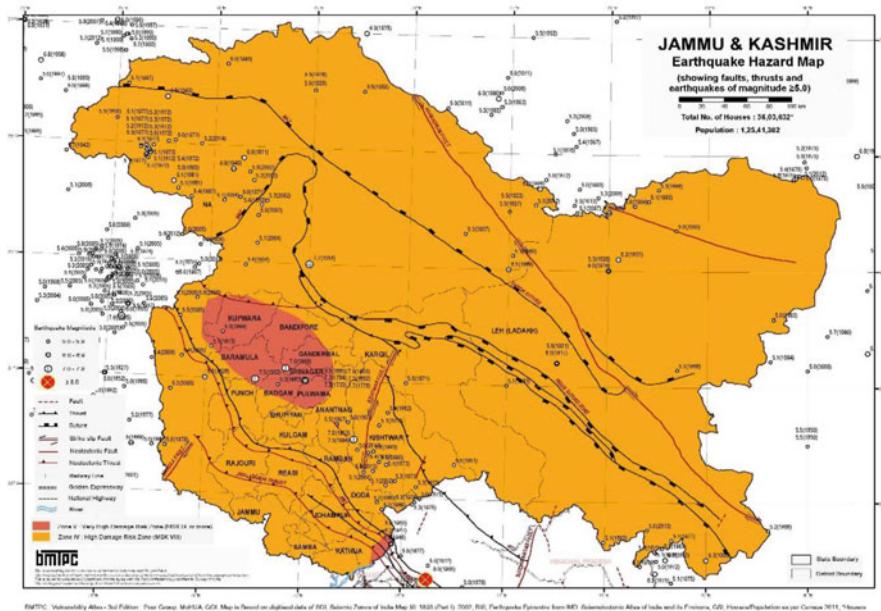


Fig. 1 Earthquake hazard map of Jammu and Kashmir. (Source: *Vulnerability Atlas of India, third edition 2019*)

watched attentively and typically happen within a short time frame of 1 to 2 minutes, making them highly challenging to forecast. The Kashmir Valley has snowfall and rain during the winter due to winds coming from the Mediterranean Sea. The zone's altitude determines the level of coolness. Avalanches have killed several people in the state during the past few years.

Flash Floods

Flash floods are a common hazard in the state because they are short-lived extreme events that typically happen under stationary or slowly moving thunderstorms and last less than 24 hours. This phenomenon has caused a tremendous loss of property and human life in various parts of the region due to the rapid velocity of the stream, which can wipe away all barriers in its path. Floods can also happen throughout the summer when there is a period of continuous rain followed by a sunny day that melts the snow. A district that was dry a few hours before could quickly change into a lake if an embankment is damaged or topped.

Jammu and Kashmir is considerably different from the rest of the nation in terms of its topography, social environment, climate, strategic location, and economics. The region is prone to a variety of hazards, including man-made disasters like road accidents and fires, as well as natural disasters. Table 2 provides statistical data on the number of fatalities brought on by various disaster events in the region.

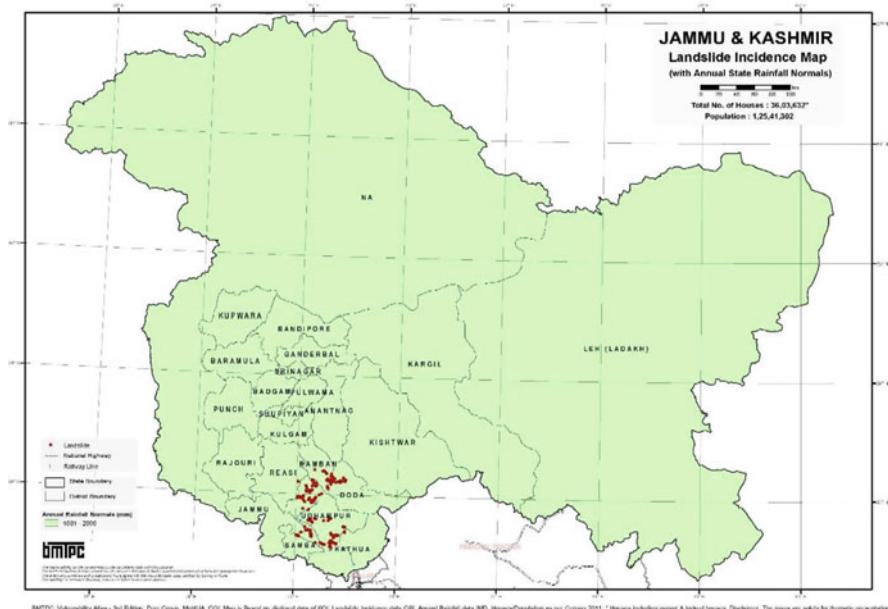


Fig. 2 Landslide incidence map of Jammu and Kashmir. (*Source: Vulnerability Atlas of India, third edition 2019*)

Table 2 Major disasters in the state during 2005–2014

Month/year	Disaster	Impact/loss of life
February 2005	Snow blizzard at Waltengu Nad (Kulgam District)	175 deaths and 128 families affected
October 2005	Earthquake at Baramulla and Poonch	953 deaths and 418 injured
September 2009	Drought 2009 (Kharif)	18 districts affected
August 2010	Cloudburst at Leh	257 deaths and 424 injured
September 2014	Floods in Kashmir and Jammu	257 deaths and 424 injured

Source: State Disaster Management Policy, Annual Report to GoI, Data of Relief and Rehabilitation Department

Part II

Institutional Mechanism for Disaster Management in Jammu and Kashmir

The state of Jammu and Kashmir was among the first several states in the country to introduce laws for natural disasters. For the improvement of villages, towns, and other areas in the state that were affected by natural calamities, the Jammu and

Kashmir Natural Calamities Destroyed Areas Improvement Act was passed in 1955. The Act's accessibility did not, however, yield many benefits. The government has initiated many programs in the state to reduce the loss of property and human life caused by devastation since the National Disaster Management Act of 2005 was passed. The State Disaster Management Authority (SDMA), the State Executive Committee (SEC), and the District Disaster Management Authorities have already been established by the Government of Jammu and Kashmir in accordance with the provisions laid down in the Disaster Management Act, 2005. Under the supervision of Lt. Governor, the State Disaster Management Authority is functional and working properly. The State Executive Committee, chaired by the Chief Secretary, has also been established. Companies of the State Disaster Response Force (SDRF), which has been established, are getting ready for field work and deployment. By offering capacity-building in terms of tools and instruction, the Fire & Emergency Services (F&ES) and SDRF's present facilities will be strengthened. The Deputy Commissioners have also established the District Disaster Management Authorities. By performing the necessary actions, such as appointing staff, establishing offices, allocating financial resources, etc., all these bodies must be made operational.

In its present state, the State Disaster Management Authority in Jammu and Kashmir is an ongoing, autonomous institution engaged in daily activities related to policy, planning, oversight, implementation, coordination, quality control, and activities related to monitoring, evaluation, documentation, etc. In each district, the District Disaster Management Authority (DDMA), led by the Deputy Commissioner, has been established. The Chief Executive Officer of the DDMA is the Additional Deputy Commissioner of the concerned district. At the district level, the DDMA will serve as the planning, coordinating, and implementing body for disaster management. It will also take all required actions to manage disasters in compliance with the standards established by SDMA. The local authorities, such as urban local bodies, panchayats, development authorities, etc., will see to it that their officers and staff are equipped to handle disasters and conduct relief, rehabilitation, and rebuilding operations in accordance with the regulations.

National Disaster Response Fund (NDRF) and State Disaster Response Fund (SDRF)

A fund established under section 46 of the Disaster Management Act of 2005 is known as the National Disaster Response Fund (NDRF). These guidelines have been created in accordance with section 46(2) of the Disaster Management Act of 2005 (DM Act, 2005) in order to supplement funds from the State Disaster Response Fund (SDRF) and to enable quick assistance in the event of severe disasters. Cyclone, drought, earthquake, fire, flood, tsunami, hailstorm, landslide, avalanche, cloud-burst, and insect attacks are examples of natural disasters that are considered to be of a severe nature by the Government of India and necessitate spending by a state government above the balances in its own State Disaster Response Fund (SDRF). These disasters will qualify for immediate relief assistance from NDRF. The major

fund available to state governments for responses to declared disasters is the State Disaster Response Fund (SDRF), established under Section 48 (1) (a) of the Disaster Management Act, 2005. For general category states/UTs and special category states/ UTs (North East States, Sikkim, Uttarakhand, Himachal Pradesh, Jammu, and Kashmir), the central government contributes 75% and 90%, respectively, of the SDRF allocation. According to the Finance Commission's recommendation, the annual central contribution is distributed in two equal installments. Only expenses related to giving immediate help to the victims may be covered by SDRF. Disasters like cyclone, drought, earthquake, fire, flood, tsunami, hailstorm, landslide, avalanche, cloudburst, pest attack, frost, and cold waves will be covered under SDRF. Subject to the condition that the state government has listed the state-specific natural disasters and notified clear and transparent norms and guidelines for their response, a state government may use up to 10% of the funds available under the SDRF for providing immediate relief to victims of natural disasters that they consider to be "disasters" within the local context in the state and which are not included in the notified list of disasters of the Ministry of Home Affairs (SEC). Based on the recommendation of 12th Finance Commission Calamity Relief Fund and National Calamity Contingency Fund (NCCF) were created. The below-mentioned tables provide all the statistical data of relief as provided by different response funds from time to time in Jammu and Kashmir.

Part III

2014 Floods in Jammu and Kashmir

Heavy rainfall, cloudbursts, inadequate river capacity to discharge water, and insufficient drainage capacity to transport away rainwater to streams are the main causes of floods (Kale, 2004). Natural catastrophes slow down progress. Communities frequently lack the ability to recover from such unanticipated events. Among all of the natural calamities, floods are the most frequent and pervasive. Floods possess great threat to India, making it the world's most affected flood-prone region where about 40 million hectares is plagued by floods (Raghavulu, 2014). Aside from the loss of life, flooding damages homes, properties, the public sector, and industries, causing significant physical and monetary costs. Floods are the most feared of all natural disasters because of their aftereffects, which include the suffering of survivors, the spread of infections, the lack of access to essentials like drinking water and medicine, and the destruction of homes. Numerous factors, like as population growth, fast urbanization, an increase in building in flood plains, and global warming, might be blamed for this (Dang et al., 2011). According to the data available with the Ministry of Home Affairs, the Government of Jammu and Kashmir stated that substantial loss to life and property was caused in many sites throughout the state during the week ending September 3, 2014, and 10 out of 22 districts in the state reported receiving more rainfall than usual. With the exception of Samba and Poonch districts, all the remaining districts (including two

districts of Ladakh) experienced higher-than-average rainfall throughout the ensuing week, from September 4 to September 10, 2014. In the Shopian district, the surplus rainfall was 2,953%, while in the Srinagar district, it was 1,410%. Due to the heavy rains, landslides and embankment breaches inflicted severe damage on numerous districts around the Kashmir Valley, Jammu region, and, in particular, Srinagar district, which was scorched by nature. State played the major role in disaster management to provide logistical and financial support (MoHA). Table 3 shows the damages reported in Jammu and Kashmir during the 2014 floods in the respective districts of both Kashmir and Jammu divisions (Tables 4 and 5).

In addition, 2.54 lakh numbers of houses were damaged and 6.51 lakh hectares of crops was also affected in Jammu and Kashmir. The infrastructure, which includes the telecommunications, power, health, and fuel distribution networks as well as the water supply system, was also severely impacted.

Table 3 Provides the details of allocation and releases of SDRF and NDRF during the years 2010–2011 to 2021–2022

Details of allocation and releases of SDRF and NDRF during the years 2010-11 to 2021-22				
State	Year	Allocation under State Disaster Response Fund (SDRF) (including center and state share)	Release of center share under SDRF	Release from National Disaster Response Fund (NDRF)
Jammu and Kashmir	2010–2011	172.46	77.605	0.00
	2011–2012	181.08	0.00	0.00
	2012–2013	190.13	77.605	0.00
	2013–2014	199.64	423.93	43.53
	2014–2015	209.62	278.50	0.00
	2015–2016	255.00	229.50	0.00
	2016–2017	268.00	241.20	0.00
	2017–2018	281.00	0.00	0.00
	2018–2019	295.00	252.90	0.00
	2019–2020	310.00	405.00	0.00
Total (Rs. in crores)		2361.93	1986.24	43.53

Source: Data compiled from Disaster Management Division, Ministry of Home Affairs, Government of India

Table 4 Provides the details of release of center's share of Calamity Relief Fund (CRF) as recommended by the 12th Finance Commission during its award period 2005–2006 to 2009–2010

State	Year	Allocation under Calamity Relief Fund (CRF)	Center share released under CRF	Release from National Calamity Contingency Fund (NCCF)
Jammu and Kashmir	2005–2006	64.84	64.84	309.77
	2006–2007	66.72	66.72	0.00
	2007–2008	68.68	68.68	13.51
	2008–2009	70.75	70.75	0.00
	2009–2010	72.90	72.90	0.00
Total (Rs. in crore)		343.89	343.89	323.28

Source: Data compiled from Disaster Management Division, Ministry of Home Affairs, Government of India

Table 5 Shows the damages reported in Jammu and Kashmir during 2014 floods

Affected area	Damage	Extent of damage	
Districts affected	10	Kashmir Division	Budgam, Anantnag, Kulgam, Pulwama, and Srinagar
		Jammu Division	Reasi, Poonch, Jammu, Rajouri, and Udhampur
No. of villages affected	5642	Kashmir Division	2469
		Jammu Division	3173
No. of human lives lost	287	Kashmir Division	91
		Jammu Division	196

Source: 182th report on Rescue, Rehabilitation and Reconstruction in the aftermath of the floods and landslides in Jammu and Kashmir

Relief and Rehabilitation

As per the data provided by the Ministry of Home Affairs, following activities of relief and rehabilitation were performed by the state government with the help of various agencies/departments which includes Indian armed forces, NDRF and SDRF personnel, central forces, Red Cross, Food Corporation of India, public health engineering department, medical department, electricity department, banking employees, etc.

Providing Safe Passage to the Affected Population

The Ministry of Home Affairs also provided information on the rescue and relief efforts made in the state after floods and landslides. In order to conduct search and rescue efforts, the Indian Army, IAF, Navy, NDRF personnel, and central forces were also sent. Over 2.90 lakh people were rescued to safer locations, and 2.92 lakh people were evacuated to safer locations by all authorities. Only the military forces were able to save about 2.14 lakh persons. While CRPF teams saved 27,420 people, NDRF teams saved 50,815 people. The committee was made aware of the Army's deployment of 329 columns, or around 30,000 soldiers, and 224 boats. 53 helicopters and 30 transport aircraft were deployed by Indian Air Force. The Army additionally sent out 17 helicopters. Additionally, the Indian Navy deployed three MARCOS troops. With the essential engineer supplies and equipment, 15 engineers from the Indian Army were dispatched. 955 people from 22 NDRF teams, together with the required tools and equipment, were sent to help the state government with search and rescue efforts. From September 6 to September 25, 2014, the Indian Air Force and Army conducted more than 3000 air missions.

Food and Other Supplies

Food packets Food packets and other critical items were air-dropped as part of the relief operations. To the impacted areas, supplies of food, baby food, water, and medications were sent. Relief camps were set up in various locations. 4226 tents and 1,67,300 blankets were given. 4500.25 tons of stuff, including 1492.4 tons of food and ready-to-eat packets, and 605 tons of water was supplied. IAF dropped 1,31,500 food packs as of September 24, 2014. The Army created 13 camps in Jammu division and six relief camps in Kashmir Valley. 1664 tents were provided by the Indian Red Cross Society. They also sent 1000 kitchen sets and 750 tarpaulins. The state government received 17 dewatering pumps and sent them to Srinagar. There was enough food grain in stock at every depot in J & K. Without receiving payment in advance and on a top priority basis, FCI supplied food grains to the state government in accordance with its needs. The state government of J & K hoisted 997 tons of wheat and 43,873 tons of rice during the month of September 2014 for distribution under PDS/flood relief in Kashmir Division. The impacted families have received free rations for 6 months.

Water Treatment Plants, Drinking Water Supplies, and Medical Assistance

Regarding the availability of drinking water, the state government reported that in the city of Srinagar, almost 80% of water supplies have been restored. In Jammu City, the water supply has been restored to about 90% (i.e., 40 MGD out of 45 MGD). 28 water treatment facilities with a total volume of roughly 6,00000 liters per day have been airlifted and given to the state government. The Army delivered oxygen cylinders and medical help. The Army also provided a mobile oxygen-generating plant. There were 23 different kinds of medications sent, including ORS, IV fluid, paracetamol syrup, antipyretics, antidiarrheal, antibiotics, and antispasmodics. A total of 170 metric tons of medications was delivered. In addition, J & K received 30000 vitamin A bottles, 35 lakh chlorine tablets, 7.5 lakh oral polio vaccine doses, 13.25 lakh measles vaccine doses, 3000 doses of anti-rabies vaccine, 500 vials of anti-snake venom, 25 MT of bleaching powder, and 1 lakh sanitary napkins. There were 51 specialist doctors in total working at Kashmir's hospitals, including 22 physicians, 13 pediatricians, 10 gynecologists, and six anesthetists. Decomposer malathion in the amount of 500 kg was sent to the state from Bathinda by road.

Telecommunication, Electricity Connectivity, and Fuel Stocks

In the state, telecommunications connectivity has largely been recovered. The telecoms, however, are still occasionally erratic. People who were stuck were given free access so they could phone their homes. Most of the state's power supply

has been restored. All government and private hospitals, water supply stations, and aid camps now have power. In Jammu, all 17 damaged 33/11 kV substations have been fixed. Of Kashmir's 36 damaged 33/11 kV substations, 34 have also been repaired. There was enough fuel on hand in Srinagar. However, more motor spirit, high-speed diesel, and LPG were transported into the valley by road. As of October 4, 2014, around 3.2 lakh LPG cylinders have arrived in Srinagar. Of the 45 ROs in Srinagar, 42 were presently in use. The state government told the Ministry that there was no shortage of petrol, diesel, LPG, and kerosene in the valley.

Road Communication, Restoration of Bank Facilities

BRO sent 1462 personnel, 20 bulldozer, 24 excavators, and 18 JCBs to the state in order to restore road communications. Significant roads had been made available for traffic. Of the 745 bank branches in Kashmir Division, 708 were open and operating, and 854 ATMs were also operational out of the total. Whereas all branches and ATMs in Jammu division were operational.

Ex Gratia Amount to the Victims

The announcement of special assistance of Rs. 1000 crore to Jammu and Kashmir by Prime Minister provided much relief to the victims by using the amount in rehabilitation of the flood-affected population in both regions. In addition, ex gratia payments of Rs. 2 lakh to each of the surviving family members of the deceased and Rs. 50,000 to each of the severely injured people were provided from the Prime Minister Relief Fund. The state government has 1105.6 crore in their SDRF available to cover the costs of rescue and relief efforts.

Discussion and Conclusion

Union territory of Jammu and Kashmir is the northernmost region of India and is considered to be one of the most picturesque lands on the planet. But the region has been unfortunately plagued by various natural disasters ranging from earthquakes, destructive floods, snow blizzards, avalanches, landslides, to wind storms, all owing to its peculiar topography, rugged terrain, extreme weather conditions, and unique geographical and geo-climatic settings, which has always caused a huge loss of human lives and property. This chapter attempts to chronologically trace the major disasters of Jammu and Kashmir region and understand the role of government in mitigating the disasters. This chapter critically examined the various policy documents, orders, and by-laws which have been framed and implemented from time to time by the government. The chapter also looked into the role of various government agencies, i.e., National Disaster Response Force and State Disaster Response Force, and other associated government departments.

There are, however, few studies that have examined the immediate aftermath of particular environmental disasters. Studies on the relief and rehabilitation of victims amidst the devastation caused by disasters are scarce. This chapter discussed the natural disaster in Jammu and Kashmir and traced their history of relief and rehabilitation in the region. The legal structure for the rehabilitation of disaster victims appears to be inadequate, and neither an institutional framework nor a policy document is present to support the worst victims of disasters due to the ongoing territorial conflict in Jammu and Kashmir, which periodically causes different battles to be waged between two countries. Government attention is diverted from helping victims of natural disasters to the rehabilitation of armed conflict victims in Jammu and Kashmir owing to territorial conflict. The review of the various legal provisions suggests that the framework for the rehabilitation of disaster victims is insufficient. The government should make a bold and constructive move to establish effective programs in Jammu and Kashmir and to develop a legislatively based policy statement that focuses on the rehabilitation of disaster victims.

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Role of Local Governments in Disaster Management

64

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Contents

Introduction	1014
Insights from Literature on the Role of Local Governments in Disaster Management	1016
Objective, Methodology, Study Area	1018
India's Institutional Architecture for Managing Disasters	1018
International Collaboration and Leadership	1019
Legal Provisions for the Role of Local Governments	1020
Disaster Management Act of the Government of India	1020
State Disaster Management Policy	1021
Case Study of Odisha	1022
Disaster Profile of Odisha	1022
Disaster Management in Odisha	1024
Gaps and Suggestions	1025
Separate Department for Disaster Management	1025
Village and Panchayat Disaster Management Committee	1030
Panchayat Disaster Response Fund	1030
Panchayat Disaster Management Plan	1030
Conclusion	1030
References	1031

Abstract

From the very beginning of the twenty-first century, the world has witnessed many natural disasters. The Sendai Framework for Disaster Risk Reduction 2015–2030 has emphasized on formulating disaster management plans at international, national, regional, and local levels. It also urges the use of traditional,

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indigenous, and local knowledge and practices for the disaster risk assessment and preparation of disaster mitigation plans and management disasters. The national disaster management policy of India 2009 describes that the local authorities should ensure the capacity building of their officers and manage disasters and carry out relief, rehabilitation, and reconstruction activities in the affected areas. It also calls for setting up a specific institutional framework for dealing with disasters in megacities. The Odisha government has made provisions to prepare the village-level disaster management plans and national, state, and district-level plans. In this context, we critically appraise the progress of India in empowering the local governments for effective management of disasters at the local level. We argue that it is high time to formally add the responsibility of disaster management by the local governments in the eleventh and twelfth schedules of the constitution. In line with the National Disaster Management Fund and State Disaster Management Funds, local governments should be provided with special Disaster Management Funds. A dedicated department should be created for managing various types of disasters. All disaster-prone villages should have a Village Disaster Management Committee, and panchayats should have a Panchayat Disaster Management Committee.

Keywords

Natural disasters and their management · Local government · Intergovernmental relations

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Introduction

The Sixth Assessment Report (AR6) of the Inter-Governmental Panel on Climate Change (IPCC) forecasts that global warming will reach or exceed 1.5 °C between 2021 and 2040 as compared to the mean temperature of the pre-industrial level (1850–1900). This would cause an inevitable rise in multiple climate hazards and present multiple risks to ecosystems and humans. However, the level of risk will depend on vulnerability, exposure, socioeconomic development, and adaptation. The mid- to long-term risks (2041–2100) assessment points out that risks to natural and human systems would increase manifold compared to the currently observed levels (IPCC, 2022).

India is one of the ten most disaster-prone countries in the world. Both natural and human-induced factors are responsible for making India a disaster-prone nation. 27 of the 36 states and union territories of India are disaster-prone. Almost 58.6 percent of the country's landmass is prone to moderate to very high earthquakes. Over 12 percent of the land is prone to floods and river erosion. Of the 7516 km long

coastline, close to 76 percent is prone to cyclones and tsunamis. Sixty-eight percent of the cultivable area is vulnerable to drought, and hilly areas are at risk from landslides and avalanches (NIDM, 2014).

The High Power Committee on Disaster Management of India has listed 31 types of disasters under five major categories, namely, (1) water and climate-related disasters, (2) geological-related disasters, (3) chemical, industrial, and nuclear-related disasters, (4) accident-related disasters, and (5) biological-related disasters. Of all these five major categories of disasters, we focus only on the natural disasters coming under the broad category of one and two. Under the water and climate-related disasters come (a) floods and drainage management, (b) cyclones, (c) tornadoes and hurricanes, (d) hailstorms, (e) cloud burst, (f) heatwave and coldwave, (g) snow avalanches, (h) droughts, (i) sea erosion, (j) thunder and lightning, and (k) tsunami. Under geological-related disasters come (a) landslides and mudflows, (b) earthquakes, (c) dam failure/dam bursts, and (d) mine disasters.

Based on the observed cyclonic activities from 1891 to 2019, five cyclones developed over the north Indian Ocean region in a year, with an average of four cyclone activities developing over the Bay of Bengal and one cyclone activity developing over the Arabian Sea. However, the east coast has witnessed an increasing number of cyclones in recent years (MoEFCC, 2021). The Bay of Bengal Coast witnesses a substantially higher (five to six times) cyclones frequency than the Arabian Sea coast. Out of the total 618 cyclones formed during 1891–2008, 78% were over the Bay of Bengal coast, and only 22% were over the Arabian Sea. The incidence of cyclonic storms reaching Tamil Nadu and Andhra Pradesh is high during the northeast monsoon season, i.e., October–December, whereas the highest annual number of severe storms occurs on the Odisha–West Bengal coast (NIDM, 2014). India is also witnessing increasing trends in the heatwave over most weather stations except a few stations in the plains along foothills of the Himalayas, southern parts of central India, and east India during the period 1961–2019. There was a decreasing trend in coldwave days at most stations (MoEFCC, 2021). There is also an increasing trend in human fatalities due to lightning and thunderstorms in recent years.

Considering the increasing risk of natural disasters in India, the government needs to strengthen the institutional capacity and redesign to minimize the damages and losses of property and human causalities. The Sendai Framework for Disaster Risk Reduction 2015–2030 states that along with the crucial roles of national and state governments, the active role of the local governments and communities is essential to reduce disaster risk. Against this backdrop, we examine the roles played by the local governments and other local actors in disaster management and suggest a few measures to strengthen the existing institutional architecture. We have done a case study of two cyclone-prone Panchayats of Odisha, India, and examined the roles played by the villages, Panchayats and Panchayat Samitis, and other local actors in the management of cyclones. While appreciating the roles played by the existing local actors, we observe a few gaps and suggest a few proposals for strengthening the local disaster management institutions.

Insights from Literature on the Role of Local Governments in Disaster Management

The Super cyclone of Odisha in 1999, the earthquake of Gujarat in 2001, and the Tsunami of Tamil Nadu in 2004 triggered the urgency to set up a robust disaster management plan in India. This led to the enactment of the Disaster Management Act (DMA) 2005. In order to achieve the goals prescribed in DMA 2005, two things are essential, i.e., (i) incorporating the Urban Local Bodies and Panchayati Raj Institutions (PRIs) in disaster risk planning and management and (ii) enhancing the capacity by giving training to the local authorities. Though there are several provisions in the Disaster Management Act 2005, several gaps exist between the policy and practice. Although the government of India has formulated several well-intentioned policy measures for Disaster Risk Reduction (DRR), they are implemented only at the national level and state levels. These policies are kept only in pen and paper at the local level (Ogra et al., 2021). The Disaster Management Act 2005 is not free from lacunas. Sarkar and Sarma (2006) pointed out that the Act neglected some essential aspects such as disaster classification and declaration of disaster-prone zones. It has not spelled out the responsibilities of the local government clearly and has not prescribed any substantive provisions for them. The DMA 2005 needs amendments to consider that disaster management should be a long-term development-oriented plan.

Tyagi (2010) argued a need for a paradigm shift in disaster management planning in India. Equal importance should be given to all three tiers of government for disaster management. He further stresses that disaster management planning cannot be successful without a poverty alleviation program. A comprehensive strategy is needed where human development, disaster management, and poverty alleviation programs will be incorporated to mitigate the impact of natural disasters. There is evidence that countries with more decentralized government structures experience fewer casualties during natural disasters (Skidmore & Toya, 2013). The decentralization of government structure in the Philippines by integrating urban disaster management bodies and local disaster management bodies has succeeded in reducing disaster loss (Gera, 2018). Political decentralization and fiscal decentralization help reduce the death rates due to disasters. Political decentralization without fiscal decentralization is meaningless, so giving only responsibility to the local government will not serve the purpose. The financial allocation should be made for the local government to accelerate the process of disaster management (Iqbal & Ahmed, 2015).

The initiatives of local communities for assessing disaster risk help in decision-making, sharing information, and enhancing communication between different stakeholders. Hence incorporating local communities at every level of disaster management helps New Orleans combat natural disasters more smoothly (Marie Col, 2007). Community-based disaster management, which includes local administration, organizations, community leaders, civil groups, and public sector officers, proved very helpful in disaster management, mainly in floods in Thailand (Yodsuban & Nuntaboot, 2021). In a study, Vij et al. (2020) found out that the disaster risk

reduction process was more effective when the international NGOs started giving importance to the community-based disaster management approach. In 2017, a new Act was legislated in Nepal. More financial and administrative powers were transferred to the local government to maintain cooperation and coordination among local, provincial, and federal governments for better disaster management. Capili (2003) observed that a community-based disaster management policy should be adopted as the national disaster management policy in the Philippines. Edris and Nibedita (2021) stressed the role of district-level disaster risk management in Bangladesh. It is argued that a district-level disaster management committee is essential for incorporating the local government into the disaster management process more actively. There is a need for a paradigm shift in urban disaster management where the municipal government should play a central role in managing urban disaster risk (Filippi, 2022).

A mixture of traditional knowledge and management skills with traditional disaster governance skills will be more helpful in combating the emergencies. Coordination between top administrations and the local elected officials helps deal with disasters more efficiently. The responsibilities and duties of the local government should be mentioned to avoid any confusion. The local government should be included in every stage of disaster response planning, i.e., pre-disaster, during the disaster, and post-disaster response. Dan and Gordon (2005) found out that New Zealand, Australia, South Africa, and Canada have adopted the multi-level disaster management plan, which empowers the municipal and local government actors. This has helped in making the cost-effective disaster reduction plan in these countries. The civil contingencies Act 2004 strengthened the relationship between different stakeholders. It enhanced the role of local government in disaster management, which provided excellent results to Greater Manchester, the UK, in the field of disaster management (Kathryn & Karl, 2017). Raungratanaamporn et al. (2014) pointed out that the collaboration among different actors such as government, NGOs, communities, and private organizations is very effective for flood management in Thailand. As there is a close relationship between the community and local government, it will be beneficial to implement ground-level policies.

Lack of communication between different agencies and lack of integration among the different levels of government are significant barriers to effective disaster management in Sri Lanka (Abdeen et al., 2021). Crossweller and Tschakert (2021) pointed out that resources are utilized efficiently through shared responsibility among different levels of government. Sharing economy model can also be effective in disaster management in Iran (Seddighi & Baharmand, 2020). Sharing responsibility between different actors of government at different levels helps in disaster management policy in Australia (Atkinson & Curnin, 2020). Rustinskyah (2021) suggested that strengthening social capital, which includes the villagers, people from outside the village, the local government, and private sector, helps in the flood disaster management in eastern Java province.

In California, the role of local government has changed from only being agents of state government to working independently on their own with more critical responsibilities (Waugh, 1994). Provincial governments play crucial roles in distributing

disaster relief in China (Freeman & Thompson, 2009). Local government and municipalities play a significant role in climate governance in South Africa (Du Plessis & Kotzé, 2014). Gerber (2015) pointed out that the local government plays a crucial role in viewing climate change as the most dreadful hazard for the people and suggests various policies for the hazard management process. The emergency program Act of British Columbia, Canada, has a significant feature for placing the local government at the center of emergency management. The local government can announce any emergency if it fulfills the criteria of the emergencies Act. In Japan, under the Disaster Relief Act of 1947, the governor can give the absolute authority of relief activities to the municipalities for the effective distribution of relief. It is found that much of the local resources are allocated for disaster preparedness than recovery, which creates problems in the inefficient working process of the local government (Henstra, 2010).

Additionally, the local government has low revenue-generating power than the higher-level government, limiting the local governments' capacity to manage the disasters independently. Therefore financial allocation should be made for the local government from the central government (Tierney et al., 2001). Gallagher and Hartley (2017) have pointed out that after a natural disaster, the debt level of households reduces as the households use the relief money for repayment of the debt instead of rebuilding their home. This can be checked if the local government will be given more power and responsibility to verify whether people are using the relief money for rebuilding their homes or for any other purpose.

Objective, Methodology, Study Area

In this chapter, we have critically examined the roles played by the Panchayati Raj Institutions and other local actors in disaster management and suggested necessary changes to strengthen the institutional architecture for disaster management.

For this purpose, we have done a case study of the Pipili and Gop Block of Odisha, India, which were severely affected by the Fani very severe cyclone on May 05, 2019. We did a semi-structured interview with the Block Development Officer, Panchayat Development Officer, Panchayat Secretary, Sarpanch, Ward member, Auxiliary Nurse Midwife (ANM), Anganwadi Worker, Accredited Social Health Activist (ASHA), Primary School Teacher, and Gaon Kalyan Samiti President of four panchayats, namely, Rathapurushottampur, Saraswatipur, Jasuapur, and Gop. Figure 1 shows the location of the study area.

India's Institutional Architecture for Managing Disasters

The Disaster Management Act 2005 outlines the responsibilities of the union, state, and local governments [Panchayati Raj Institutions (PRIs) and Urban Local Bodies (ULBs)]. Keeping in view of the federal character of the nation, India has created a decentralized institutional architecture for the effective management of disasters at

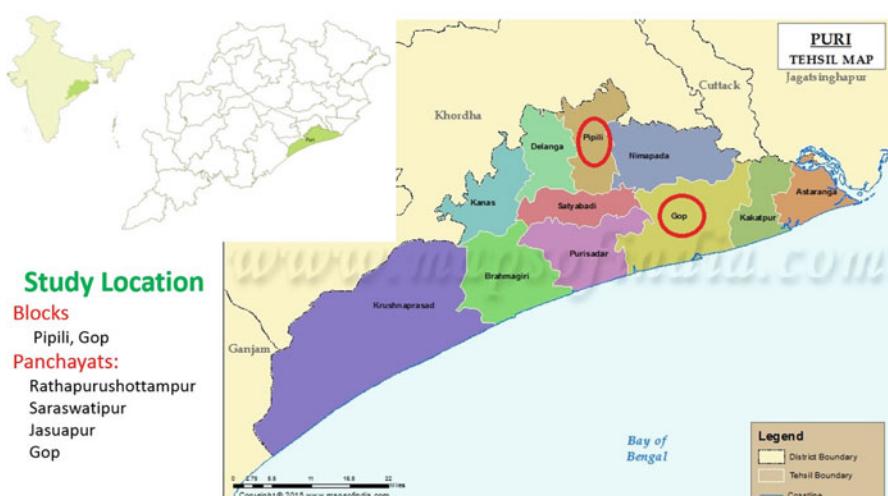


Fig. 1 Study location map

all levels. However, the state governments play bigger role compared to the national government. Although the Union government provides financial support, the respective state governments take the responsibility of evacuation before the disaster, rescue operations during the disaster, and providing relief and payment of compensation after the disaster. Funds for the disaster management, distribution of relief, and payment of compensation are drawn from National Disaster Response Fund (NDRF) and State Disaster Response Fund (SDRF) as per the rule books. Figures 2 and 3 provide the graphic representation of the institutional architecture of the disaster management system at the national and state levels, respectively. Keeping in view the efficient management of the disasters by the state government of Odisha, we have presented the institutional network of the Odisha Disaster Management Authority (OSDMA) in Fig. 3.

Over the years India has strengthened the capacity of early warning system, disaster forecast system, disaster relief centers, workforce for evacuation and rescue operations, and post-disaster operation and management practices. Due to the continuous efforts of the government, the public awareness regarding the standard operating procedures during the disaster has improved significantly. The multi-pronged approach of both national and state governments, the human casualties due to disasters have declined substantially.

International Collaboration and Leadership

The Union government has been taking up initiatives to exchange ideas between countries regarding disaster management and mitigation practices. Similarly, for strengthening the disaster forecasting system and early warning system and

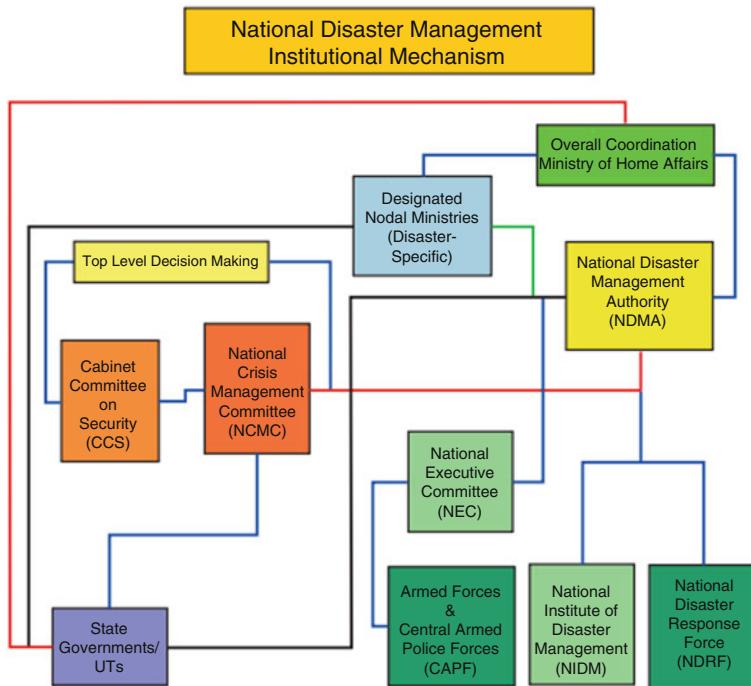


Fig. 2 National-level disaster management – basic institutional framework. (Source: NDMA (2019))

exchange of data, governments have partnered with both the national and international research institutes and other leading agencies. India has also taken the leadership to form the Coalition for Disaster Resilient Infrastructure (CDRI) in September 2019.

Legal Provisions for the Role of Local Governments

Disaster Management Act of the Government of India

CHAPTER VI of the Disaster Management Act (DMA) 2005 describes the role of the local authorities in disaster management: The DMA has made provision for the following functions to be rendered by the local authorities: “(1) Subject to the directions of the District Authority, a local authority shall (a) ensure that its officers and employees are trained for disaster management; (b) ensure that resources relating to disaster management are so maintained as to be readily available for use in the event of any threatening disaster situation or disaster; (c) ensure all construction projects under it or within its jurisdiction conform to the standards and specifications laid down for prevention of disasters and mitigation by the

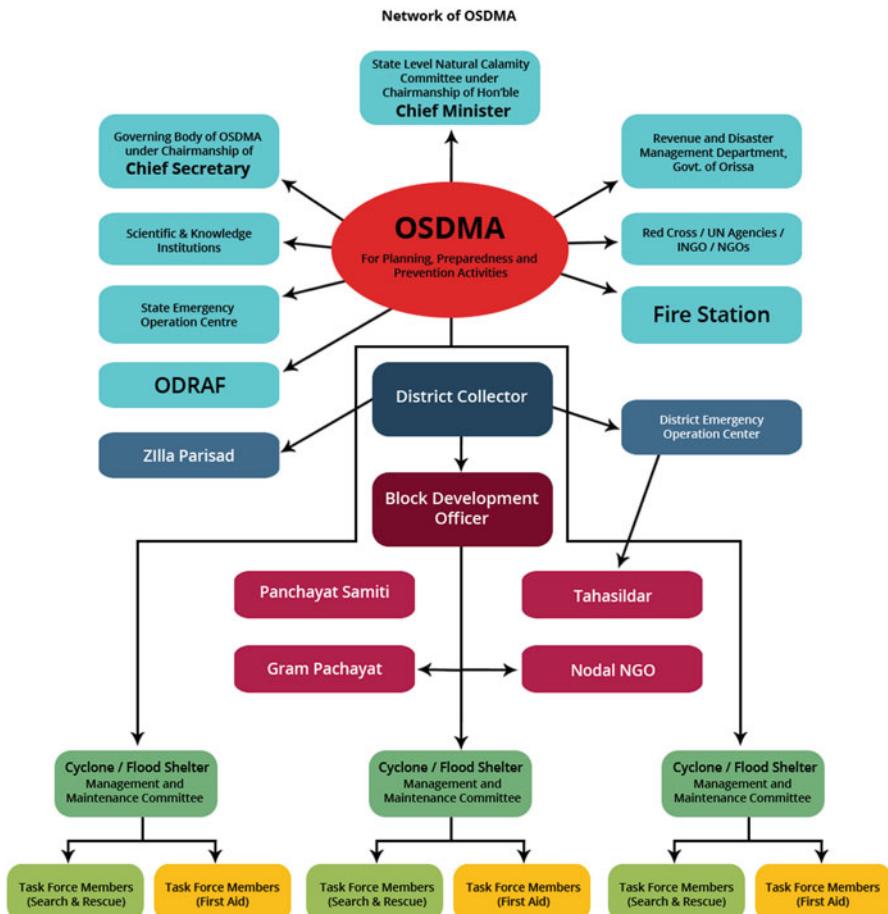


Fig. 3 Institutional framework for disaster management in Odisha

National Authority, State Authority, and the District Authority; (d) carry out relief, rehabilitation, and reconstruction activities in the affected area following the State Plan and the District Plan.” The DMA also empowers the local authority to take other measures necessary for disaster management.

State Disaster Management Policy

Odisha’s disaster management policy makes provision to decentralize the management of disasters to the Block and Gram Panchayat/municipality levels and strengthen their institutional and functional capacities. For this purpose, the policy prescribes the involvement of the Panchayati Raj Institutions and Urban Local Bodies in the pre-disaster phase, the response phase, and the recovery and

rehabilitation phase of a natural disaster. Due to the physical proximity to the people, local governments enjoy the comparative advantage of assessing the vulnerability of the households, intensity of the disaster, and prompt reach out to the worst affected people. Therefore the state disaster management policy gives emphasis to empower the local governments (GoO, 2005).

The government of Odisha brought an ordinance on December 24, 2021, to amend the Odisha Grama Panchayats Act (OGPA) 1964 and The Odisha Panchayat Samiti Act (OPSA) 1959. The state government has expanded the powers of the Panchayats provided under clause 44 (h), which requires the Panchayats to take measures to control the spread of epidemics and other infectious diseases. The amendment empowers the Panchayats to prepare the disaster management plan at the village and Gram Panchayat level, integrate the same with the Panchayat development plan, build the capacity of all stakeholders, facilitate and carry out the relief, rehabilitation, and reconstruction activities, in disaster-affected districts in accordance with the state and district plan. The amendment also allows the Panchayats to undertake other measures as may be necessary for disaster management. The amendment to OPSA 1959 has expanded the Panchayat Samiti's powers to make development plans and added disaster management and all other powers vested to the Panchayats.

Case Study of Odisha

Disaster Profile of Odisha

Odisha ranks in fourth place in the composite Hazard Index of Indian states that includes the indicators namely, earthquake, landslide, flood, drought, cyclone, tsunami, avalanche, heatwave, coldwave, coastal erosion, lightning, forest fire, fire, and industrial hazard (NIDM, 2018). Table 1 presents the incidence of cyclones in Odisha between 1737 and 2021. In recent years the maximum number of cyclones has made landfall in Odisha. Odisha also maintains a unique record of managing the cyclones most effectively by minimizing the number of human casualties. From time to time, the United Nations has lauded the disaster management strategy, especially the ambitious mission of zero casualties and massive evacuation operations.

Along with the high risk of cyclones, Odisha is also highly vulnerable to floods, heatwaves, drought, and lightning.

Flood: The 482-km-long coastline of Odisha exposes the state to floods, cyclones, and storm surge. The floods are usually caused due to heavy rainfall in monsoon seasons and the flow of water from neighboring states of Jharkhand and Chhattisgarh. The flat coastal belts with poor drainage, high degree of siltation of the rivers, soil erosion, breaching of the embankments, and spilling of floodwaters over them cause severe floods in the river basin and delta areas.

Heatwave: Odisha faced an unprecedented heatwave situation in 1998; the state recorded the death of 2042 persons. In the subsequent years, due to massive awareness campaigns, the number of casualties has fallen drastically.

Table 1 Incidence of cyclones in Odisha between 1737 and 2021

Sl. no	Date/year	Category of cyclone	Landfall place
1.	7–12 October 1737	Super cyclone	Crossed West Bengal Coast over Sundarbans and had an impact over Odisha
2.	31 October 1831	Very severe cyclonic storm	Crossed Odisha Coast near Balasore. Loss of life 50,000
3.	2–5 October 1864	Very severe cyclonic storm	Crossed West Bengal Coast near Contai and had an impact on Odisha
4.	1–2 November 1864	Very severe cyclonic storm	Crossed Andhra Pradesh near Machilipatnam and had an impact on Odisha
5.	22 September 1885	Super cyclone	Crossed Odisha Coast at False Point, Loss of life – 5000
6.	14–16 October 1942	Very severe cyclonic storm	Crossed West Bengal Coast near Contai and had an impact on Odisha
7.	8–11 October 1967	Very severe cyclonic storm	Crossed Odisha Coast between Puri and Paradeep
8.	26–30 October 1971	Very severe cyclonic storm	Crossed Odisha Coast near Paradeep. Loss of life 10,000
9.	14–20 November 1977	Super cyclone	Crossed Andhra Coast near Nizampatnam and had an impact on Odisha
10.	4–11 May 1990	Super cyclone	Crossed Andhra Pradesh Coast about 40 Km S-W of Machlipatnam and had an impact over Odisha
11.	25–31 October 1999	Super cyclone	Crossed Odisha Coast near Paradeep at noon of October 29
12.	12–14 October 2013	Very severe cyclonic storm “Phailin”	Crossed Odisha Coast near Gopalpur on the evening of October 12
13.	12–14 October 2014	Very severe cyclonic storm “Hudhud”	Crossed Andhra Pradesh Coast at Vishakapatnam and impact on south Odisha
14.	10–12 October 2018	Very severe cyclonic storm “Titli”	Crossed Andhra Pradesh Coast at Palasa and severely affected south Odisha
15.	03 May 2019	Extremely severe cyclone “FANI”	Crossed Odisha Coast near Puri
16.	8–10 November 2019	Very severe cyclonic storm “Bulbul”	It affected the coastal districts of Odisha
17.	20 May 2020	Super cyclonic storm “Aman”	Crossed West Bengal Coasts. It affected the coastal districts of Odisha
18.	23–26 May 2021	Severe cyclonic storm “Yass”	Crossed between Paradip (Odisha) and Sagar islands (West Bengal)
19.	3–5 December 2021	Cyclonic storm “Jawad”	Landfall near Puri district (Odisha)

Source: SRC ([n.d.-a](#))

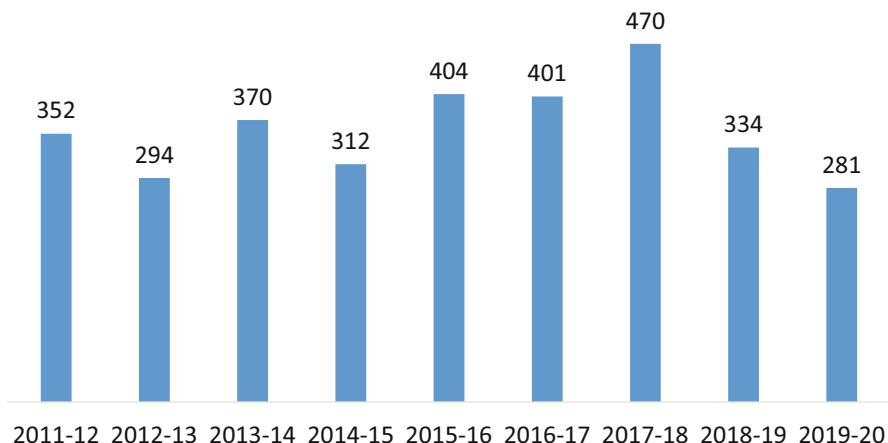


Fig. 4 Total number of deaths due to lightning in Odisha during 2011–2020. (Source: SRC ([n.d.-b](#)))

Drought: About 70 percent of the total cultivated areas in the state are prone to drought. Though Odisha receives an average annual rainfall of 1500 mm, there are wide variations from year to year. The state records at least one severe drought in every decade. Odisha has faced drought for most of the years since the latter half of the 1990s. 47 out of 314 blocks are found to be chronic drought-prone zone.

Lightening: In recent years, the number of deaths due to lightning is showing a rising trend. Figure 4 shows the number of deaths reported during 2011–2012 and 2019–2020. The state government is taking several measures to create awareness regarding the risks of lightning and thunderstorms and the protocols to be followed in these situations.

Disaster Management in Odisha

In case of inputs received from the meteorological department and any other sources regarding the possibility of a disaster such as a cyclone, the Chief Minister conducts a review meeting of the top officials. The entire state machinery is alerted to remain prepared for all eventualities. Top officials of each department review the situation of each department under the leadership of the Chief Secretary and the Special Relief Commissioner. The district collectors of the potentially affected districts are alerted to prepare people's evacuation to safe places and keep the relief materials ready. National Disaster Response Forces from the center and Odisha State Disaster Response Forces (ODRAF) are sent to the most vulnerable places to remain prepared for rescue operations. In case of the severity of the disaster, top officials from the state level are deputed to the possibly most affected districts. Based on the instructions of the district collector, all Block level officials are alerted to mobilize all workforce and other resources at the village and Panchayat level. The Block

Development Officer serves as the nodal officer to coordinate among the line departments, elected representatives – Sarpanch, ward members – volunteers (called Aapda Mitras), non-governmental organizations (NGOs), self-help groups, auxiliary midwife nurse (ANM), Accredited Social Health Activists (ASHA) workers, and Anganwadi workers. The BDO assigns the responsibilities to each person, monitors the local level, and updates the situation to the higher authorities.

Table 2 summarizes responsibilities taken up by all actors at the local level before the disaster, during the disaster, and after the disaster.

Gaps and Suggestions

The 73rd and 74th constitutional amendments seek to transform the PRIs and ULBs into self-governments. Due to increasing frequency of disasters, the Panchayats should play an active role in disaster management and mitigation. The Disaster Management Act 2005 provides only agency functions for the disaster management. This needs to change immediately. Panchayats should be provided with the statutory power to manage the disasters. Therefore, the 11th and 12th schedules of the constitutions should be amended to add the disaster management powers. Similarly, Chapter VI of DMA, 2005 should be amended to insert the explicit role of local governments in disaster management. During the COVID-19 pandemic, grassroots institutions played a crucial role in managing the health and migrant workers' crises. The state government of Odisha has recently amended the legislation to transfer the responsibility of disaster management to the Panchayat Samitis and Panchayats. However, Panchayats lack the financial powers for this purpose. Similarly, Panchayats do not have a disaster management plan. All villages do not have a disaster management plan. Keeping in view the increasing frequency of the disasters, PRIs and ULBs should be strengthened to manage the disasters effectively. We provide the following suggestions to strengthen the disaster management system at the local level.

Separate Department for Disaster Management

The revenue and disaster management are looked after in a single department. Due to the rise in the frequency of disasters, the department's workload has gone up substantially. Disasters are no more confined to specific seasons. During both summer and monsoon seasons, cyclones and floods occur in different parts of the state. Lightning and thunderstorms are also occurring during the summer and monsoon seasons. In recent years the number of deaths due to lightning has been increasing. There is a need to create awareness on the safety protocols to be followed during lightning and thunderstorms. The heatwave in summer and coldwaves in winter also need special preparedness by the administration. Early warning and the creation of awareness about all kinds of disaster requires a dedicated workforce. Continuous update of disaster management plans at the village, Panchayat, block,

Table 2 Role of various stakeholders at village, Panchayat, and Panchayat Samiti level in the disaster management

	Evacuation of people to safe places	Arranging dry food and preparation for cooked food	Monitoring the health of pregnant women and children	Shifting pregnant women in advanced stage to hospitals	During the disaster	Evacuation of people to safe places	Check the safety of rivers or other water bodies
Evacuation of people to safe places	√	×	√	√	√	√	×
Arranging dry food and preparation for cooked food						√	×
Monitoring the health of pregnant women and children	×	×	×	×	√	√	×
Shifting pregnant women in advanced stage to hospitals	×	×	×	×	√	√	×
During the disaster							
Evacuation of people to safe places	√	×	√	√	√	√	×
Check the safety of rivers or other water bodies	×	×	√	√	√	√	×

(continued)

Table 2 (continued)

Post-disaster											
Assessment of damage and losses and report to the higher authorities	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Distribution of relief materials	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Reporting of the excluded affected people and facilitating in getting the compensation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Monitoring the reporting of deaths and water-borne diseases	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Distribution of medicines if needed	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗

Source: Authors' compilation based on field survey

and district levels is required to identify the vulnerable locations and households. Regular training and capacity building of the workforce, starting from village level volunteers to the top-level State administrates, is essential for effective disaster management. In the aftermath of the disasters, estimation of damage and losses and payment of compensation remains a sensitive issue. This needs to be dealt by a special department. The existing fire brigades and state-level disaster mitigation forces can be brought under one department and supplemented with more workforce to strengthen the disaster management and mitigation department. To ensure better coordination, district collectors at district level and Block Development Officer/Tehsildar at block/taluk levels can be kept as nodal officers.

Village and Panchayat Disaster Management Committee

All disaster-prone Panchayats should form the Village Disaster Management Committee (VDMC) in each village under the leadership of ward members. The VDMC should include the Ward member, at least five volunteers from the village, and five members from self-help-group (SHG), ASHA, and Anganwadi workers. Similarly, at the Panchayat level, a Panchayat Disaster management Committee (PDMC) should be formed under the leadership of the Sarpanch. The PDMC should include the Sarpanch, Panchayat Executive Officer, Gram Sathi of all villages, ward members, one SHG member from each village, ASHA, and Anganwadi worker from each village.

Panchayat Disaster Response Fund

In line with the National Disaster Response Fund and State Disaster Response Fund, a separate fund should be created at the Panchayat level (Panchayat Disaster Response Fund) and Panchayat Samiti level (Panchayat Samiti Disaster Response Fund) for the prompt response to the disaster. Every Panchayat may be provided with ten lakh rupees and Panchayat Samiti with fifty lakh rupees.

Panchayat Disaster Management Plan

All disaster-prone Panchayats should prepare a disaster management plan and update the same regularly.

Conclusion

The IPCC assessment report six has warned that global warming will exceed 1.5 degrees Celsius much before 2050. This would increase the incidence of natural disasters in several forms. The Sendai Framework on Disaster Risk Reduction

appeals to the member nations to strengthen their institutional capacities, including national-level government to local level government, community members, market, and non-government organizations. The Disaster Management Act of India and similar legislation at state levels provide the active involvement of PRIs and ULBs in disaster management. The Government of Odisha has recently amended the Panchayati Raj Act to transfer the disaster management responsibility to the Panchayat Samitis and Panchayats. Based on the case study in two cyclone-affected blocks of Odisha, India, we have suggested three crucial suggestions to strengthen the PRIs for the effective management of the disaster: (1) a dedicated disaster management department should be created; (2) in line with the National and State Disaster Response Funds, a disaster response fund should be created at the Panchayat Samiti and Panchayat level; (3) disaster-prone villages should form a Village Disaster Management Committee and at Panchayat level a Panchayat Disaster Management Committee; (4) all disaster-prone Panchayats should prepare and regularly update the disaster management plan; (5) in Chapter VI of the Disaster Management Act, 2005, independent roles of PRIs and ULBs during the disaster management should be added; (6) the 11th and 12th Schedules of the Constitution should be amended to add the disaster management power. All states should take prompt measures to transfer all functions, functionaries, and funds to the PRIs and ULBs for transforming them into local self-government. The empowerment of PRIs and ULBs would help to mitigate the disasters effectively.

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Training Programs for Police in Disaster Risk Reduction

65

Balu I and Nazia Shaik

Contents

Introduction	1036
Objectives	1036
Importance of Involvement of Police in Disaster Risk Management	1037
Training Need Analysis	1037
Role of National Institute of Disaster Management in Training of Police	1038
Role of Police Academy in Training of Police	1039
Role of Administrative Training Institutes (ATIs) in Training Police in DRR	1041
Case Study	1041
The Module of National Disaster Management Authority	1042
Conclusion	1043
Recommendations	1043
References	1044

Abstract

Local police along with civil defense and home guard form critical local capacity against disaster risk and emergencies as first responders. These forces have an advantage over other forces such as NDRF, paramilitary, and even armed forces due to their proximity to the affected areas which considerably reduces the response time and familiarity with the local conditions vulnerability, risk, capacities, and sociocultural realities. Regular, comprehensive, and quality DRR capacity development programs for local police and auxiliary forces are essential; hence, the chapter would examine the existing DRR induction, orientation, and training programs for police by institutions such as NDMA, SDMAs, NIDM, NDRF, etc. It attempts to analyze different technical aspects and components of training – communication systems, information dissemination, risk communication, community engagement, search and rescue, response, and relief. The current

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paper also studies the adequacy of these training programs and analyzes gaps therein through review and comparative analysis of the global best practices of DRR training to the police. The chapter would also evaluate the current level of effectiveness of local police during disasters through a case study approach.

Apart from technical expertise, qualities and skills like empathy, sensitivity, and compassion are indispensable for the police and other local forces to deal with trauma stricken people in disasters and emergencies especially the most vulnerable groups like children, people with disability, women, minorities, senior citizens, etc. Hence, the chapter also examines the existing training modules for their adequacy to inculcate emotional intelligence in the police.

Keywords

DRR · Police · Civil defense · Home guard · Training · Capacity building · First responders

Introduction

Disaster risk reduction is a very important aspect of the police administration. It may be law and order and response to natural calamities or disaster, but also the police has greater role in disaster preparedness phase before the disasters. The roles and responsibilities of police come to the forefront when there is a disaster which requires immediate attention and action of police in the event. Police played a crucial role in massive evacuation carried out before cyclone Vayu of 2019 and in Cyclone Fani. The role of police is not limited to the phase of disaster response alone. The voluntary work of police is needed for successful management of post-disaster scenario. The police can perform role in pre-, during, and post-disaster management phase (GIDM, 2020).

No matter what type of disaster it is, the police team can be the first responders at the incident site and establish bondage with the affected local community. The police force is much familiar to the area under their jurisdiction so they can effectively perform their role in disaster risk management and development of strategies.

Sendai framework Target E talks about development of local level disaster risk reduction strategies which are in line with state level and district level. The police force can play an effective role in development of such local level strategies for disaster risk reduction. However the police force is mostly used during response phase only. Necessary training programs to police force would stimulate the involvement of police force in the entire process of disaster risk management (GIDM, 2020).

Objectives

The aim of this research paper is to analyze the adequacy and effectiveness of training programs provided to the police. The objectives of the research paper are as follows:

- Adequacy of these training programs and analyze gaps therein through review and comparative analysis of the global best practices of DRR training to the police.
 - Evaluate the current level of effectiveness of local police during disasters through a case study approach.
 - Examine the existing training modules for their adequacy to inculcate emotional intelligence in the police.
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Importance of Involvement of Police in Disaster Risk Management

On the occasion of any emergency or an event of disaster, the district and state level authorities cannot wait for the response of specialized force like National Disaster Response Force/Armed Forces. Many times, it is not advisable or feasible to obtain specialized force. Police force is the first and best responders to help and manage in disaster and emergency situation because of their proximity to the incident site, awareness about local terrain, wider reach and better knowledge of locality and culture, and established communication system (Julian Laufs, 2020).

On the occasion of an event of disaster, sometimes the state and district level authorities cannot afford to wait for response of specialized forces, like NDRF/ Armed forces. Moreover, on many occasions, it might not be advisable or feasible to obtain/deploy specialized armed forces and NDRF. At the same time, due to police's proximity to the incident sites, familiarity with the local terrain, wider reach and better knowledge of background of the locality and culture, and established communication system, they are one of the first and best responders to help manage any crisis situation (Julian Laufs, 2020).

Training Need Analysis

Police officers and other staff members are frequently getting involved in managing disasters and emergencies. The police officers adopt different styles of policing based on the responses and reactions of citizens during emergencies. The style of policing may vary based on the scale, nature, and stage of the disasters. Therefore, it is crucial for the police force to understand the behavior of citizens in order to ensure the compliance of the citizens (Bonkiewicz & Ruback, 2012).

In order to increase the effectiveness of police in disaster risk management, the police force and department should modify their style of policing and strategies for various types of disasters and emergencies to accommodate the behaviors, expectations, and priorities of disaster affected people. Therefore, police officers require training to be cognizant in people expectations and realizing social impact of disasters and emergencies (Bonkiewicz & Ruback, 2012).

It is not clear that up to what extent the police force may be able to modify their style of policing during the disasters and emergencies. Particularly in developing

countries, police force is under-resourced and insufficiently trained. Police responses to disasters and emergencies have focused on the importance of sensitizing police officers towards disaster affected people and towards their own roles and responsibilities during crises (Chirambwi, 2016).

During the disasters and emergencies, the police officers are at high risk of developing psychological problems, such as symptoms of substance abuse (Boscarino, 2015), trauma (Kowalski, 2019), acute stress disorder (Regehr et al., 2019), psychological distress (Kerswell et al., 2019), posttraumatic stress disorder (PTSD) (Haugen et al., 2012), fear, as well as anxiety and depression (Mao et al., 2018).

The police forces, often involved in response to disasters and emergencies, were given new responsibilities such as crowd management, maintaining public order, retrieval and removal of dead bodies and transport, and aid for disaster affected people. While fulfilling the responsibilities, the police may face situations where some people may be hostile towards police officers (McCanlies et al., 2014). The police also need a training on communication with community in disasters and emergency.

The research studies have mentioned the importance of training as an effective way of mitigating and managing of disasters. The training facilitates social support networks for police force (Bakker et al., 2016) and focusing on strengthening and enhancing resilience among police officers. This is further induced to reduce the risk of depression and substance abuse of disaster affected community (van der Velden et al., 2012). The higher level of police officers who are supervising the police on ground should be trained to better lead their frontline officers during disasters and emergencies (Kowalski, 2019).

The decision making and performance and retaining of existing police force can be enhanced by providing adequate training and well-established practices. Training and education can reduce new threat perceived by the police officers (Flavin, 1998). The knowledge of the risk can be a major tool for the police officers to create awareness among the community and also to protect themselves and their relatives (Gellert et al., 1996).

Role of National Institute of Disaster Management in Training of Police

National Institute of Disaster Management (NIDM) Ministry of Home Affairs, Government of India, is a premier institute and a Statutory Body (under Disaster Management Act 2005) for training, research, documentation, awareness, and human resources and capacity development in the field of disaster mitigation and management in India and in the region.

The National Institute of Disaster Management has conducted 323 training programs during 2015–2016 to 2019–2020. About 13,265 participants have attended the trainings in the past 5 years. About 5–13 percent of police only attested the disaster management training programs conducted by NIDM during the past 5 years.

Table 1 Year wise % police participation in DM training organized by NIDM

Year	No. of programs conducted	% of police participated
2015–2016	52	12
2016–2017	43	13
2017–2018	46	11
2018–2019	52	8
2019–2020	130	5
Total	323	8

Source: Trainee data base, National Institute of Disaster Management

The percentage of participation of police is much less. During 2015–2016 to 2017–2018, above 10 percent of police has participated, and during 2018–2019 to 2019–2020, less than 10 percent of police only attended the disaster management training programs. The data makes it evident that the police participation in disaster management training is not up to the mark. There is a need of organizing more programs for police personnel (Table 1).

Role of Police Academy in Training of Police

Police Academy is a certified institution that is dedicated to provide world-class police training and encouraging the highest standards of performance, adopting the latest training technologies, employing best practices in policing, and enhancing the quality of training to achieve excellence in both substance and methods of delivery. Each state government has its own Police Training Academy in different names. It plays crucial role in providing training to police force (Table 2).

Among 36 states and union territories, only 14 States and UT Police Training Academy only conducted disaster risk management training programs during 2015–2016 to 2020–2021. During this period, about 41 disaster risk management training programs were conducted by State/UT Police Training Academy and only 1518 police personnel participated in the training programs. Assam has incorporated relief and disaster management subject for newly recruited police personnel.

Tamil Nadu has given priority in organizing disaster management trainings. During 2015–2016, Tamil Nadu is the only state which conducted disaster management training for police force. During 2015–2016 to 2017–2018, Tamil Nadu has organized three training programs and covered large (1057) number of polices. Tamil Nadu is top in conducting disaster management training programs to police; but during 2018–2019 to 2020–2021, no program was conducted.

During 2017–2018, about five states/Police Training Academy, i.e., Tamil Nadu, Meghalaya, Himachal Pradesh, Karnataka, and Odisha, have conducted the disaster management trainings. During 2019–2020, about seven states/UT Police Training Academy have conducted disaster management training, viz., Andaman and Nicobar, Daman and Diu, Goa, Mizoram, Sikkim, Rajasthan, and Telangana. During 2020–2021, only four states/UT Police Training Academy have conducted disaster

Table 2 Year wise no. of disaster management trainings conducted by State Police Training Academy and number of police participated

Name of the state	2015–2016		2016–2017		2017–2018		2018–2019		2019–2020		2020–2021	
	a	b	a	b	a	b	a	b	a	b	a	b
Tamil Nadu	1	14	1	1035	1	8						
Meghalaya			1	50	2	50						
Himachal Pradesh				3	75							
Karnataka				1	17							
Odisha				1	50							
Andaman and Nicobar						1	11		3	125		
Daman and Diu									1	20		
Goa									5	NA		
Mizoram									2	25		
Rajasthan									4	NA	3	NA
Sikkim									2	NA		
Telangana									1	13	1	25
Jammu and Kashmir											4	NA
Punjab											3	
Total	1	14	2	1085	8	200	1	11	18	183	11	25

Source: Training Calendars, Police Training Academy

NA: Data not available

a No. of disaster management training conducted

b No. of police attended

management training, namely, Jammu and Kashmir, Rajasthan, Telangana, and Punjab. Table is reveal that the Police Training Academy is not shown much interest on organizing disaster risk management training programs for police personnel.

Role of Administrative Training Institutes (ATIs) in Training Police in DRR

The State Governments in India were required to set up state level training institutions as per the recommendations of the Administrative Reforms Commission (ARC). In connection with this, the Administrative Training Institutes were promoted in all the states with different names and different objectives. The mission is to “promote good governance by transforming the functionaries involved in the process of Governance through enhancing their competence and administrative capability by providing quality training in a transparent framework.”

It is revealed that among 36 states and union territories, only three administrative institutes conducted disaster risk management training programs during 2015–2016 to 2020–2021. With reference to training database available from the respective ATI website, it is observed that except following ATIs other ATIs have not conducted DRR training programs for the police. During 2015–2016 Chhattisgarh Academy of Administration, Raipur has conducted disaster management training program for police, but the data about number of participants and content of the program is not available. During 2016–2017 State Institute of Public Administration and Rural Development (SIPARD), Agartala has conducted a training program on role of police in disaster management, and about 25 police officers attended the training program. The duration of the program was 3 days only. During 2018–2019, Andhra Pradesh Human Resource Development Institute (APHRDI) has conducted training program on disaster management for 30 police officers. It is also observed that no ATIs are having DRR training module for police.

Case Study

District Disaster Management Authority (DDMA) Ri Bhoi District of Meghalaya organized training program for police officials on the role of police personnel on emergency management, search, and rescue/first aid in disaster during 2019–2020 November 2018. The training program has covered Understanding Disaster Management, Group Exercise on the Impacts of Disasters and Presentation, the Role of Police in Emergency Management, Fire Safety, and Search and Rescue/First Aid in Disaster. About 31 police officers participated in this training program.

The first session of the training has covered basic concept and definition of disaster, hazards, and disaster management cycle including response, rehabilitation, and reconstruction. It also covered prevention, mitigation, and preparedness in pre-disaster activities. The second session was on disaster impact. In this session,

the participants were divided into four groups, and they have discussed on social, economic, psychological, and physical impact of disaster.

Participants also learned the role of police in emergency management. In this session, they have discussed the role of police in search and rescue, deployment of manpower, prevention of crime, security during distribution of relief materials, and relief management, management of relief camps, transportation, coordination for casualty information, disposal of dead bodies, family liaison officers, media management, and crowd management.

On the second day, the first session was about fire safety, in which they have discussed about types of fire, safety measures for fire and safety tips for survival, gas fire, health hazards, explosion hazards, first aid golden rules of first aid, and rescue method during fire rescue. The last session was about search and rescue and first aid in disaster. This session has covered using ropes and knots for rescue operation, emergency bandaging, different methods of rescue and transport of victims, various first aid techniques, and step by step of conducting mock drill.

This is to appreciate that District Disaster Management Authority (DDMA), Ri Bhoi District of Meghalaya, has organized a special training program exclusively for the police. The course was well designed. Two days training is merely not enough for the police to learn about disasters and their roles. The number of days to be increased. We can consider that this is a basic training to police, but of course the duration of the course should be increased. There is no evidence of providing training materials to participants. The training material helps participants to read and understand and recollect the information learned from training, so training material should be provided to participants for ensuring the quality of training.

The Module of National Disaster Management Authority

The Training Regime for Disaster Response, Volume – I (2008), prepared by the National Disaster Management Authority has proposed training of trainer course in disaster response for faculty members of training institutions of state governments/ central police forces (CPFs). The training was proposed for disaster response training in the training institutions of state governments as also of the central police forces. The suggested course module is for 6 weeks with the objective of understanding, from a trainer's perspective, the concepts and definitions of search, rope rescue, water and flood rescue, and also management of different types of disasters and emergency including nuclear, biological, and chemical emergencies and medical emergencies and teaching the same to the trainees, including effectively handling their questions and doubts during the training.

The training module includes Collapsed Structure Search and Rescue, Rope Rescue, Water and Flood Rescue, Essentials of Fire Fighting and Control, Medical First Response, Radiological Emergencies, Biological Emergencies, Chemical Emergencies, Communication during Disasters, Dignified Management of Dead Bodies, Case Studies of Major Disaster Events, Disaster Management Act 2005, National Disaster Management Authority (NDMA), and National Disaster Response

Force (NDRF). The module has covered 179 theoretical sessions, 74 demo sessions, and 78 practical sessions. Mental health aspects also need to be included in the module.

It is observed that the above suggested module is well designed and it should be implemented. The faculty members of the training institutes should impart this training to the police force for enhancing the performance of police in disaster risk reduction.

Conclusion

It is evident from the present study that the role of police in disaster and emergency is crucial and they play a vital role, but they have not received the adequate training programs on disaster risk management. The National Institute of Disaster Management is a nodal agency in organizing disaster management training programs for government officials, but enough trainings were not organized for police officers. State Police Training Academy is a nodal agency for conducting training program for police officers, but majority of the State Police Training Academy has not organized disaster management-related training programs for police officers. There is a major gap in organizing training programs for police in disasters and emergencies.

Recommendations

- Being a nodal agency to organize disaster risk management training programs, the National Institute of Disaster Management should organize special training programs for police in disasters and emergencies.
- The women police also plays a crucial role in disaster management protecting safe guarding women and children in disaster and emergency. Therefore, the Mahila Police should be given adequate training programs on disasters.
- The State Police Training Academy/schools play a major role in training police officers; therefore, the State Police Training Academy should focus on conducting training programs on disaster management for police.
- Subhash Chandra Bose Aapda Prabandhan Puraskar may be awarded to motivate the Police Training Academy and Administrative Training Institutes which conduct more number of training program on disaster management.
- Administrative Training Institutes play crucial role in enhancing the competence and administrative capability by providing quality training in a transparent framework to the functionaries, but inadequate training program on DRR for police has been observed. The ATIs should focus on conducting more training program on DRR for police.
- National Institute of Disaster Management, Police Training Academy, and Administrative Training Institutes should focus on developing training modules

on DRR for police to build the capacity and enhance the performance police in DRR.

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Kerala Floods 2018: Impacts and Lessons Drawn

66

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Contents

Introduction	1046
Hazard and Vulnerability Profile of Kerala	1047
Overview of Kerala Floods 2018	1048
Causes of Floods	1048
Damage and Loss Assessment	1051
Post-Disaster Needs Assessments (PDNA)	1052
Response and Relief	1053
Rehabilitation and Recovery	1054
Lessons Learned	1055
Relook into the Land Use Policy and Plan	1056
Convergence of Damage and Loss Assessment Techniques	1056
Women as Disaster Responders	1056
Build Back Better	1056
Role of Technology	1057
Effective Dam Management	1057
Protection of Ecosystem and Natural Resources	1058
Empowerment of the Community	1058
Conclusion	1058
References	1059

Abstract

Kerala, the southwest coastal state of India which ranks high on the Human Development Index, became vulnerable to severe flooding during the southwest monsoons of 2018. The state faced the worst floods in the century due to above-normal rainfall from June to August 2018. The above-normal rainfall was supplemented by a lack of integration of sustainable development practices and

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disaster risk management strategies. The floods affected all the districts of the state and led to the loss of over 400 precious lives along with extensive damage to infrastructure and property. It also triggered about 341 landslides in the area. The community including fishermen and women-centric organizations like Kudumbashree participated actively in responding to the disaster. Technology including WhatsApp, GIS, and crowdsourcing was used actively by the community during the search, rescue, and relief phase. The floods highlighted many constraints like lack of proper management and monitoring of critical natural resources such as water and land which left the state unprepared for major disasters caused by natural hazards. The disaster also highlighted crucial lessons to be adopted by other coastal states of the country which are expected to face increased flooding in the coming times due to climatic changes.

Keywords

Kerala floods 2018 · Flooding · Sustainable development practices · Landslides · Community · Search and rescue · Relief

Introduction

Kerala, the southernmost state of India, is generally referred to as “Gods own country” due to its beauty and rich ecosystem. There are two rainfall seasons in Kerala. A southwest monsoon or Edavapathi arrives in late May or early June, and a northeast monsoon or Thulam arrives in mid-October. Every year, the monsoon rains constitute an essential component of the state’s season. However, the southwest monsoon of 2018 brought devastating floods with it. The floods experienced by the state were some of the worst ever recorded. More than 400 individuals died as a result of the disaster. The Idukki dam’s five overflow gates were all opened at the same moment, while the Malampuzha dam’s five gates in Palakkad were opened for the first time in 26 years (Government of Kerala, 2018). In the districts of Wayanad and Idukki, torrential rainfall resulted in major landslides. As a result, the hilly districts became isolated.

Kerala floods 2018 bring to notice various structural constraints, and the state was unable to prepare for this natural disaster or climate change shock. The policies and institutional frameworks were inadequate for managing and monitoring the critical natural resources like land and water; there was an absence of risk-informed spatial and sectoral planning policies and frameworks that led to extensive urban sprawl, unmanaged construction in hazard-prone areas, exclusion of disaster risk preparedness in key socio-economic sectors, weak capacity of institutions to anticipate and respond to extreme events, and limited financial resources as well as the absence of ex-ante financing modalities for risk pooling and sharing (Duncombe, 2018, 54). Extensive deforestation in the catchment areas, unrestricted rock mining in sensitive areas, and political over-confidence were the other possible reasons.

Despite the fact that Kerala ranks highly on the Human Development Index (HDI) (SBI, 2019), the floods demonstrated that a high HDI ranking does not necessarily imply development or catastrophe resilience. Disaster resilience must be developed in tandem with development if long-term growth goals are to be realized. For the 2019–2020 fiscal year, the state was placed among the top 10 states in terms of per capita state domestic production. Other indicators and criteria of the human development index place the state on par with many other industrialized countries throughout the world. When compared to other states, the state has scored exceptionally well on a variety of indicators. For example, the state's literacy rate is 94%, compared to the national average of 73%. The country's average life expectancy at birth was 68.8 years in 2013–2017, whereas Kerala at the same time had 75.2 year life expectancy (RBI, 2020, 15–16). Among all the states, it has the highest life expectancy at birth. The state has the lowest infant mortality rate in India, with a rate of only 10 per thousand live births. Kerala has a poverty rate of 7.05%, compared to 21.92% nationally (RBI, 2020, 237–239). According to 2015–2016 data, 99% of households had access to electricity, 98% of households had access to better sanitation facilities, and 94% of households had improved drinking water facilities (Ministry of Health and Family Welfare, 2017, 2–3). The state's sex ratio is the highest in the country at 1084 women per thousand men. Kerala's high literacy rate makes its local government and villagers highly communicative, participative, responsible, and aware. Its economy is the country's thirteenth largest with gross domestic product (GDP) of \$ 104 billion, with a GDP per capita of USD 11,153 (IMF, 2021).

Kerala's high development indicators demonstrate its robust standing in non-disaster situations. A state with such high standards is expected to be able to survive any disaster or crises with resilience and determination. The floods of 2018 in Kerala, the worst since 1924, were unanticipated and unexpected. It revealed several significant flaws in a state that scored high on all human development indicators.

Hazard and Vulnerability Profile of Kerala

Kerala is located on the southwestern part of the Malabar Coast in India. It covers a territory of 38,863 km² (15,005 square miles) and borders Tamil Nadu, Karnataka, Lakshadweep Sea, and Lakshadweep group of Islands (UT) (Azzali et al., 2021, 120). The state, due to its geographical location along the coast and slopes of the Western Ghats, is highly vulnerable to the effects of natural disasters and climate change. According to the Kerala Disaster Management Plan, the state is vulnerable to 39 natural hazards and human-induced hazards. The phenomenon of floods and landslides is reoccurring along the Western Ghats, whereas during summers the drought-like situation is very common in the state. In the summer months due to dry rivers and low water tables, the issue of water scarcity aggravates.

The state also lies in seismic zone III which is an indicator of earthquake vulnerability (Kerala State Disaster Management Authority, 2016, 16). The climate of Kerala state is humid and tropical, and as far as rainfall is concerned, Kerala receives 3000 mm average rainfall. Southwest monsoon is responsible for 80% of the total annual rainfall. Similarly, the high-intensity monsoon storms cause heavy discharges in rivers leading to floods in the state (ENVIS Hub: Kerala state of environment and related issues, 2021). The incidences of biological disasters such as epidemics and pest attack are also on the rise. Fatalities in road and rail accidents, human-induced accidents, lightning, and boat capsizing are high in the state. Soil piping and coastal erosion make the area more vulnerable to hazards and disasters.

Overview of Kerala Floods 2018

Generally, the Monsoon in India arrives when it hits Kerala and moves on further to other states giving relief from the scorching heat. However, the southwest monsoon of 2018 brought disaster in the form of severe floods and rains which resulted in over 433 deaths and affected all the districts of the state (Government of Kerala, 2018). According to the state government, the floods have directly affected one-sixth of the state's population. Consequently, the floods were declared as "calamity of a severe nature" by the Government of India (Special Correspondent, 2018). Out of 1664 villages in 14 districts of Kerala, the calamity destroyed the 1259 villages. About 5.4 million people were affected and 1.4 million people were displaced by this disaster (Government of Kerala, 2018).

As far as rainfall is concerned, Indian Meteorological Data (IMD) showed that Kerala experienced 2346.6 mm of rainfall between starting of June 2018 to 19th of August 2018, which was considerably more than the expected 1649.5 mm (Kerala State Government, 2018).

Table 1 describes the district-wise rainfall in Kerala from 1st June 2018 to 22nd August 2018. The actual rainfall received by the whole state was around 2394.1 mm. On the hilly slopes of the state, due to heavy rainfall, the torrent of water loosened the soil resulting in landslides. Out of 14 districts, about 341 landslides were experienced in 10 districts (Hydrological Studies Organization Hydrology (S) Directorate, 2018).

Causes of Floods

There were various causative factors that prompted the heavy rainfall in Kerala to become a disaster. Several human factors exacerbated the natural causes of torrential rains resulting in the loss of lives, livelihoods, and infrastructure. From June to August 2018, heavy rainfall was the natural causative factor of flooding. The rainfall received by Kerala was about 42% above the normal range (IMD, 2018). Further, the devastating effects of the Kerala floods were compounded by the dams. In Kerala, there are a total of 33 dams, out of which major dams are Idukki Reservoir,

Table 1 District-wise rainfall released from 1st June 2018 to 22nd August 2018

Districts	Normal rainfall (mm)	Actual rainfall (mm)	Departure from normal (%)	
			Percentage (%)	Type of rainfall
Kerala State	1701.4	2394.1	41	Excess
Alappuzha	1380.6	1784	29	Excess
Kannur	2333.2	2573.3	10	Normal
Ernakulum	1680.4	2477.8	47	Excess
Idukki	1851.7	3555.5	92	Large excess
Kasaragode	2609.8	2287.1	-12	Normal
Kollam	1038.9	1579.3	52	Excess
Kottayam	1531.1	2307	51	Excess
Kozhikode	2250.4	2898	29	Excess
Malappuram	1761.9	2637.2	50	Excess
Palakkad	1321.7	2285.6	73	Large excess
Pathanamthitta	1357.5	1968	45	Excess
Thiruvananthapuram	672.1	966.7	44	Excess
Thrissur	1824.2	2077.6	14	Normal
Wayanad	2281.3	2884.5	26	Excess

Source: Hydrological Studies Organization Hydrology (S) Directorate (2018)

Malampuzha Dam, Mullappriyar Dam, Vazhanni Dam, Banasura Sagar Dam, Idamalayar Dam, Meenkara Dam, Chulliyar Dam, Kanjurapuzha Dam, and Pothundi Dam (NDRF, 2018). The state's majority of dams (around 57%) under hydroelectric projects were operated by Kerala State Electricity Board, and the rest were under the irrigation department. Both bodies were concentrated on electricity generation and irrigation rather than flood control measures. The dams were not capable of moderating floods due to a lack of capacity to store water and delay in the rainwater flow from the catchment to the river. The lack of capacity of the state played a crucial role in compounding the devastating effect of disaster and combined with continuous devastation of local water bodies, wetlands, and natural forests. Almost all the dams in Kerala were full by the end of July with no capacity left to store more water. Consequently, the authorities released all the inflows to the downstream river which ended up increasing the proportions of downstream flood disasters (Hydrological Studies Organization Hydrology (S) Directorate, 2018, 3).

Another major cause of floods was the overflow of rivers and blockage of water bodies. During flood time, rivers, namely, Periyar, Bharathapuzha, Pamba, Manimala, Meenachil, Achenkovil, Chalakudy, and Kabini, overflowed and played an important role in causing the Kerala floods. Periyar, the longest river of state with about 50% of the state's cumulative live storage, affected many cities like Kochi, Aluva, Ernakulum, Idukki, Neriamangalam, Kalady, Malayattor, and Thrissur (NDRF, 2018). Rather, poor resource management also added to the fury. An expert panel on Western Ghats Ecology known as "Gadgil Committee" categorized most of the areas hit by monsoons as Ecologically Sensitive Zones (ESZs) (Welankar, 2018).

Madhav Gadgil, a renowned ecologist, was the head of this team. The first report, namely, "Report of the Western Ghats Ecology Expert Panel (WGEEP) Part I," was submitted by the committee to the government in 2011, recommended classifying the stretch of the Western Ghats into three zones (Gadgil Committee, 2011). The committee suggested strict restrictions on activities like mining and quarrying in ESZs. The usage of land for non-forest purposes and allowing high rises in sensitive areas was also suggested to be restricted in the report. Nevertheless, the recommendations were not adopted by Kerala government. According to Gadgil's report, quarrying was one of the major causes of landslides and mudslides (Narayanan, 2018). Additionally, it mentioned the Kerala floods as human-induced calamity where human interventions and intense rainfall made it a serious disaster.

Unplanned and unchecked urbanization, particularly densely populated cities of developing nations, is increasing the devastating effects of disasters. The development of human society leads to inevitable conflicts with nature, the effects of which depend on the use of land and water resources. The rugged eastern highlands that transform as the midlands and as coastal regions make Kerala's landscape spectacular, but it is also vulnerable to natural processes that can lead to disasters. In big cities like Chennai and Mumbai, urbanization with ill-planned drainage systems, improper filling up of ponds, lakes, channels, and floodplains, inadequate waste recycling, and other infrastructure malfunctions are the major causes of floods (Government of Kerala, 2018). As far as the 2018 Kerala floods are concerned, not just urbanization but unscientific use of land and water resources supplemented the severity of damages. Other triggering factors were illegal constructions (constructions without following building bye-laws), unchecked tourism, construction of non-flood resilient dams, and poor river management. Unlike other big rivers (like Narmada, Godavari), Kerala state is having small and narrow rivers. Over time, with the construction of various dams on these rivers, the flow of water into the rivers has been reduced. Due to the shrinking of floodplains, people occupied these areas for constructing infrastructure (like houses, resorts, and other commercial usages) and cultivation. The reckless urban expansion on floodplains destroyed the natural water bodies and flood-buffering forests. Further, constant removal of natural infrastructure and ecological defenses such as forests and wetlands reduced the percolation capacity of soil. The infrastructure was built over floodplains which destroyed the water bodies.

Poor discharge capacities of water bodies were another cause of floods in the state. Kerala is having rivers with steep embankments which are stable to a degree. It seems that the rivers are stable within their bed; however, higher river discharges cause flooding in the region. Although people were ready for limited flooding, they remain unprepared for the extreme floods which occurred in 2018 after the 1924 floods in Kerala. Initially, flooding started with the flood discharge inflow from rivers which was worsened by poor discharge capacities of canals and blockage of discharge at the sea outlets (azhis and pozhis) (SDMA Kerala, 2021). The frequency and magnitude of river floods have been augmented due to the rising frequency of precipitation and heavy rainfall during the monsoon. According to the fifth assessment of the Intergovernmental Panel on Climate Change (IPCC), it is predicted the

average sea-level rise (SLR) will be somewhere around 24–30 cm by 2065 (IPCC, 2021) which will bring drastic uncomfortable changes in the coastal zone. Hence in Kerala, backwater banks, filtration ponds, paddy fields, and other sensitive sections of the coastal region are vulnerable to SLR. Although it is of not much significance for the next planning cycle, it is particularly vital for the long-term scenario spanning over 50 years (UNDP, 2018).

Similarly, the closure of Cochin International Airport for 2 weeks was an example of a lack of awareness regarding disaster risks especially when urban development meets the weather-related vulnerabilities. The airport is constructed on a low plateau, which is merely 420 meters away from the Periyar River (WRI India, 2018). The runways expanded over floodplains, and the river channels of the airport are not ideally located. The total damage to this world's first solar-powered airport was around USD 35 million with the destruction of about 20% of solar panels (WRI India, 2018). Kochi's airport wasn't unique in this aspect. Other airports such as Chennai and Mumbai airports are also situated close to flood plains and river channels and witnessed devastating flooding in the year 2005 and 2015 (WRI India, 2018).

Therefore, the extreme floodings faced by Kerala in the year 2018 were an outcome of various natural and human-induced causative factors. These include high rainfall, overflow of rivers, high spring tides, poor drainage capacity of canals and sea outlets, issues in flood storage capacity in the reservoirs, unplanned urbanization, and poor resource management. Moreover, an effective policy on the management of dams during floods needs to be specified.

Damage and Loss Assessment

The floods of 2018 lead to loss of lives, widespread damage to infrastructure, injuries, and disabilities. People lost their lives in both villages and densely populated cities. The state faced both direct and indirect losses. The quantified losses like the number of deaths, damage to infrastructure, buildings, and natural resources were included under direct losses, whereas indirect losses due to floods included impact on individual's wellbeing like psychological stress and trauma, a decline in revenue, disruptions in the supply chain of goods and services, and impact on the environment including contamination of drinking water, destruction of aquifers, and saltwater intrusion. Substantial loss by way of damage to cultural and religious structures, ecology, and environment including flora and fauna were also reported. For instance, the hamlets where aranmula kannadi (metallic mirror) is manufactured were under flood water for weeks leading to the destruction of equipment and inventory putting into jeopardy the continued manufacturing of this world-renowned GIS-tagged product.

In Kerala, State Government conducted the damage and loss assessment in the form of a memorandum which was submitted to the Central Government. The memorandum apprehended the damage to government assets only with a focus on productive sectors (Walia & Nusrat, 2020). Later, comprehensive damage and loss

assessments focused on the inclusion of social sectors were also carried out by international agencies such as UNDP and the World Bank along with the State Government under the domain of Post-Disaster Needs Assessment (PDNA).

The state submitted an interim memorandum for damages caused by floods and landslides in Kerala from 29 May to 31 July 2018 of USD 117.20 million. Moreover, on the second phase of floods in the state from 1 August to 30 August 2018, an additional memorandum was submitted by the State Government on fresh damages of USD 685.19 million. Therefore, the total amount of damage claimed by the state from the Central Government was USD 820.39 million (State Government of Kerala, 2019). The cumulative damage and loss from both preliminary memorandum and additional memorandum in terms of human fatalities and impact on agriculture, fisheries, and animal husbandry are described as:

- (a) **Human Fatalities:** The landslides and floods of Kerala from 22 May to 29 August 2018 resulted in 433 fatalities including 268 men, 98 women, and 67 children (Government of Kerala, 2018). About 687 square km of land covering 14 districts and 1260 villages out of 1664 villages were affected by the floods.
- (b) **Agriculture:** Around 1,62,660 hectare of spice crops is cultivated by Kerala with a production of 140,000 tons per annum. Nearly 62% of the total spice cultivated area lies in the districts of Idukki and Wayanad only. Incidentally, a high quantum of southwest monsoon was witnessed by these districts in 2018 which destroyed almost all crops (ICAR, 2018).
- (c) **Fisheries and Animal Husbandry:** The floods resulted in the cumulative loss in aquaculture inland capture and fisheries of USD 14.77 million. Simultaneously, important fishing assets such as boats and fishing nets were destroyed. Around 235 boats were fully damaged, whereas 1002 boats were partially damaged (State Relief Commissioner, 2018). The flash floods took the life of 7146 cattle, including 3502 calves, 2994 sheep, and 650 cows and buffalos. Additionally, around 500,792 poultry died in these floods (State Relief Commissioner, 2018, p28).

Post-Disaster Needs Assessments (PDNA)

A post-disaster needs assessment was done by a committee that was commissioned by the Government of Kerala. The PDNA, initiated on 18 September 2018, was jointly approached by International development partners – World Bank, UN, and European Union – for damage and loss assessment and estimation of recovery needs (Government of Kerala, 2018). The PDNA of Kerala Floods was undertaken by the line ministries and 78 experts from international, national, and state-level. Similarly, a Joint Rapid Damage and Needs Assessment (JRDNA) was undertaken by the World Bank and the Asian Development Bank. The JRDNA focused on the damage and recovery needs of infrastructure sectors like transport, power, water resources, and irrigation (Walia & Nusrat, 2020). The PDNA, on the other hand, covered a total

of 15 sectors and cross-cutting issues, an analysis of macroeconomic and human development impact, and recovery strategy. The sectors were housing, land and settlements, health and nutrition, education and child protection, cultural heritage, agriculture, fisheries and livestock, water, sanitation and hygiene, transportation, power, irrigation, other infrastructure, environment, employment and livelihoods, disaster risk reduction, gender and social inclusion, local governance, and integrated water resources management.

The PDNA estimated the total damages of around USD 1.5 billion and total losses of around USD 2.3 billion totalling disaster effects of around USD 3.8 billion (Government of Kerala, 2018). This did not include the damage estimates as per the Joint Rapid Damage and Needs Assessment (JRDNA) carried out by the World Bank and the Asian Development Bank (ADB). The total estimated damage did not cover the damages to private buildings and properties, losses experienced by the private traders and business units, damage and loss suffered by road transport, Kochi airport, and waterways. The damage and loss calculated as 3.8 billion in PDNA report would be much higher if it is reviewed (Government of Kerala, 2018).

An assessment across social, infrastructure, productive, and cross-cutting sectors (public and private sectors) describes that complete recovery requires a total of USD 4.4 billion. The share of estimated total disaster effects among the sectors of social and economic activity shows that the most affected sectors were the infrastructure sector which accounted for 38% of the total disaster effects. This was followed by cross-cutting sectors (27%) followed by social sectors (18%), and finally the productivity sector (17%) (Walia & Nusrat, 2020).

The share of estimated recovery needs among the sectors of social and economic activity showed that the infrastructure sector had the highest recovery needs which accounted for 51% of the total recovery need. This was followed by the social sectors (20%), productive sectors (15%), and finally cross-cutting sectors (14%) (UNDP, 2018).

The memorandum submitted to the Central Government by the State Government estimated the damages to be USD 0.82 billion, whereas the Joint Rapid Disaster Needs Assessment carried out by the World Bank's team of 28 experts estimated damages and losses of around USD 3.65 billion. The UN-led team of 76 experts in their PDNA study estimated the damages and losses to be about USD 3.93 billion. Though, after counting the recovery needs the cost put forward was USD 4.52 billion (Government of Kerala, 2018). Therefore, a need was felt for convergence in the process of damage and loss assessment to facilitate a holistic framework from responding to recovering from any disaster.

Response and Relief

The response includes actions envisioned for limiting injuries, loss of life, and damage to property and the environment that gets impacted during the disaster. In the wake of the Kerala floods, various stakeholders like NDRF, Indian Army, state-led community volunteers, fishermen, women volunteers, non-state actors, and

technological interventions responded to the massive deluge in a very effective manner.

In total, National Disaster Response Force (NDRF) sent 58 teams along with 435 boats for search and rescue, 5 companies of paramilitary forces, armed forces, and coast guards, 40 helicopters, 20 aircraft, 2 ships, and 10 columns of Engineering Task Force (PR Cell, 2018). Similarly, the Indian Army was deeply involved in the rescue and relief operations in Kerala. Under “Operation Madad,” over 23,000 people were rescued by the Indian Army (Indian Navy, 2018). Indian Air Force also provided immediate assistance by carrying out the “Operation Karuna” and Humanitarian Assistance Disaster Relief (HADR) mission (Anand, 2018).

The Kerala State Disaster Management Authority (KSDMA) provided relief assistance in the form of cereals, pulses, drinking water, kerosene, and other life-essential items in the relief camps. The central government under the Pradhan Mantri Awas Yojana (PMAY) sanctioned financial assistance package of USD 84.0 million for providing houses in villages (Walia & Nusrat, 2020). In addition, the package of USD 252 million under Mahatma Gandhi National Rural and Employment Guarantee Scheme (MGNREGA) was also declared by the Ministry of Rural Development for the financial year 2018–2019 (Walia & Nusrat, 2020).

Kerala fought with one of the worst floods in its recent history. Many NGOs lent their support to the worst affected areas by supplying packaged meals and other relief items. Contributing to the rescue, the fishermen came together across the state to rescue those who were in need. A total of 4537 fishermen with 669 boats went out and managed to save at least 65,000 lives. Every element of cost for this rescue activity was born by the Government (State Relief Commissioner, 2018). Women played a crucial role in responding to the disaster, where the workers of *Kudumbashree* which is a state-driven poverty eradication and women empowerment program made efforts to restore normal life in the regions damaged by the disaster (Anandan, 2018).

Information Technology played a vital role in Kerala floods to carry out rescue and relief operations. Keralarescue.in, a web-based application and social media like WhatsApp, was used by government officials and voluntary groups. These helped the rescue personnel to identify the location of victims, camps, and materials desired in the relief camps. The Rebuild Kerala Application (app) was used by the authorities to assess damages caused to houses and buildings (Ajay, 2019, 913). USD 96.29 million was released to 6,87,843 families as immediate relief at the rate of USD 142 per family. A total of 10,50,838 kits having food supplies and 7,24,352 kits containing 22 essential commodities were supplied to people who returned home from relief camps. A total of US\$ 7.215 million was spent on this relief measure (Chief Executive Officer, 2019).

Rehabilitation and Recovery

The Government of Kerala launched an immediate recovery program, utilizing public finances at its disposal. To build a green and resilient Kerala, a comprehensive

and inclusive roadmap was formulated. The Government under the Local Self Government Department established the “Rebuild Kerala Initiative” (RKI). The objective of RKI was to “bring about a perceptible change in the lives and livelihoods of its citizens by adopting higher standards of infrastructure for recovery and reconstruction and to build ecological and technical safeguards so that the restructured assets could better withstand floods in the future” (Department of Local Self Government, Government of Kerala, n.d.). Several major steps for rehabilitation and recovery were taken by different departments of the state. To withstand future disasters, the principle of building a new Kerala as “Nava Keralam” was adopted by the state. The framework of building a green Kerala under the vision Nava Keralam was emphasized on the concept of “Build Back Better and Fast.”

During Kerala floods 2018, the total loss in the agriculture sector was USD 2.66 billion. An amount of USD 2.52 million compensation under the State Crop Insurance Scheme was allotted to 11,718 farmers. An amount of USD 27.68 million was distributed for bond/block renovation and dewatering and repairing water pumping services. Central Government provided USD 13.08 million through the “Mission for Integrated Development of Horticulture (MIDH) Scheme” (Chief Executive Officer, 2019). A total amount of USD 12.88 million compensation was given to vegetable farmers. The Public Works Department (PWD) allocated administrative sanctions worth USD 3.86 billion for works by re-arranging its budgetary resources for that year. In addition to this, for repairing the roads and bridges, the department issued a new Administrative Sanction worth USD 51.94 million. The Urban department accorded USD 16.8 million in 2018–2019 and USD 2.52 million in 2019–2020 for roads to be repaired or reconstructed. Another USD 2.81 million was also allocated for house construction activities (State Relief Commissioner, 2018).

Moreover, wage employment to 14.72 lakh families was provided under Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS). A total of 16.96 lakh individuals were beneficiaries under the scheme. After the floods, new job cards were issued to 82,605 families (Walia & Nusrat, 2020). Despite being severely affected by the disaster, Kerala Water Authority provided water through tankers in all affected areas. USD 135.32 million allotted by the State Plan Fund and State Disaster Management Fund was used to complete 1661 projects. The Disaster Management Department vide GO (MS)No.27/2018/DMD dated 17/12/2018 formulated a new Scheme “Ujjeevani.” This scheme was aimed to provide bank loans for rejuvenating the flood-affected MSME Units and Shops. This scheme envisaged providing margin money up to USD 0.0028 million for a loan taken (State Level Bankers’ Committee Kerala, 2019).

Lessons Learned

Disasters in all forms such as floods, fires, earthquakes, cyclones, or other events, besides the devastation of lives, teach hard lessons. At present, it is imperative to implement these valuable lessons to reduce risk and make resilient communities. It is the weakest point of the management that gets exposed to the occurrence of every

disaster. The vulnerability and weaknesses of Kerala to hazards and disasters was clearly shown in the floods of 2018. The lessons which flew unabated from the disaster were as follows:

Relook into the Land Use Policy and Plan

Land use planning plays a critical role to control floods. In Kerala, the river flows were constrained by uncontrolled sand mining; however, the soil has been weakened due to the rapid spread of high-rise buildings on unstable hill slopes. Land use planning, a nonstructural approach, promotes sensible use of the land along with natural resources by guiding investment to secure community benefits from development. In the 2018 Kerala floods, it was made clear that the land use policy of the state was short-sighted and improper. Therefore, Kerala must improve the land use policy of the state to avoid or mitigate such disasters in future (Mohanti & Sheikh, 2019).

Convergence of Damage and Loss Assessment Techniques

After the deluge in 2018, various damage assessments were carried out. Firstly, the World Bank carried out the Joint Rapid Disaster Needs Assessment (JRDNA) for re-building Kerala, which calculated an amount of USD 3.65 billion. Secondly, an UN-led team carried the Post-Disaster Needs Assessment (PDNA) for USD 3.93 billion. Thirdly, Central Government also submitted a memorandum for immediate relief for 0.82 billion. Hence to facilitate a holistic framework from responding to recovering from any disaster, there is a need for convergence in the process of Damage and Loss Assessment.

Women as Disaster Responders

The potential contributions that women can offer to disaster risk reduction around the world are often overlooked, and their leadership in building community resilience to disasters is hardly highlighted. Women are generally viewed as a more vulnerable group in disasters, but Kerala floods showed that they are effective responders to disastrous events. The example of “Kudumbashree” which is a poverty eradication and women empowerment program of the Government of Kerala can be used as a case study where women have responded to a disaster of such high magnitude in an effective manner.

Build Back Better

Building Back Better (BBB) is an approach to post-disaster recovery that reduces vulnerability to future disasters and builds community resilience to address physical,

social, environmental, and economic vulnerabilities and shocks. The state adopted the principle of rebuilding as “Nava Keralam” to build a new Kerala to withstand future disasters. The advocacy of a new and better Kerala with an emphasis on BBB was accepted and brought into focus after the Kerala floods. The framework for building a Green Kerala was also dedicated to the vision Nava Keralam (New Kerala). There is need to emphasize on Build Back Better but also Safer. Post-2018 floods it cannot be business as usual: to allow continued granite mining in sensitive areas, destruction of trees in the higher reaches, allowing water bodies to be filled up willy-nilly with no corrective action, and illegal construction in violation of the Building Bye-Laws (BBL).

Role of Technology

Technological innovation is bringing digital solutions to sectors that have previously lacked access to technology, including communities. The rapid pace of this change suggests that one of technology’s most meaningful benefits for society may lie in the humanitarian sector, which must reach a large number of people, in remote and dangerous locations, to provide critical resources fast and efficiently. The boom in technology can be used not only in hazard assessments and modelling but also in responding to disasters. The disaster in Kerala highlighted how technology can be used effectively in saving lives as well as garnering support for the disaster survivors. Social media platforms, Facebook posts, Twitter updates, and WhatsApp groups were used to get information quickly. There were various Tweets from disaster survivors stuck in homes and other places which were used by NDRF responders to reach the distressed people. All the team’s commanders working on the ground were in touch through social media with other officials. A 24×7 helpline was also functional at NDRF headquarter to receive the calls of relatives of the stranded persons. Their location and coordinates were shared with the responding agencies. An example is the Online portal KeralaRescue.in which was started to collect donations (to be sent to the CM Disaster Relief Fund), help enlist volunteers, record requests for help, etc. The web-based applications, especially The Rebuild Kerala app, were used by the authorities to assess damages caused to houses and buildings. In many places, locations facilitated by WhatsApp were used as virtual “control rooms.” Many volunteers were mobilized through social media for one-time cleaning operations. It worked as a device to connect to people in need. The Thanal Palliative and Paraplegic Care Society was one of the organizations which were at the front line of the rescue efforts in the district of Ernakulam. With volunteers trained in paramedical care, this organization rescued 160 people with disabilities (PWDs) along with the elderly population.

Effective Dam Management

Various concerns about the function of dams in floods were widely discussed in media. According to reports, floodgates of 22 dams were opened, and warnings were

issued in numerous districts. These dams should have functioned as a defense wall during periods of excessive rainfall and river overflow. Even though rains were light (below normal levels) during that time, the Idukki dam was nearly full by the end of July. When the torrential rains began in August, the nearly full-capacity Idukki had little choice but to release water into the inundated districts. Experts say dam reservoirs required to be substantially empty before the rainy season for dams to successfully manage floods. The lesson learned, however, is that any structure that is built and has the potential to cause harm to people should be assessed, and Emergency Action Plans should be prepared to prevent such problems in the future.

Protection of Ecosystem and Natural Resources

The usefulness of wetlands for flood abatement can result in storing floodwaters and lowering the speed of floodwaters. This action combined with water storage can lower flood heights and reduce the water's destructive potential. The wetlands have become shallower which enhanced the flooding in Kerala (Kumar, 2018). The disaster highlighted the need to stop the encroachment of wetlands and conserve them to battle the fury of floods.

Empowerment of the Community

The community is the first responder to any disaster. Various communities in Kerala had put immense effort during and post-flood restoration. Empowerments of such communities are always a tool to fight against deadly disasters. The fisher folks of Kerala did the biggest rescue across the state. They arrived in boats and spent tireless hours moving people to safety. Though they were offered payment for rescuing people by the administration, they refused to take it. Additionally, the workers of the Kudumbashree poverty eradication and women empowerment program did efforts to restore normal life. Aapda Mitra, a scheme to train community volunteers with skills needed in disaster response, is developed by National Disaster Management Authority in the selected 30 most flood-prone districts of India. This scheme can be used to empower communities like women and fishermen in Kerala to strengthen their hands in facing any eventuality.

Conclusion

Disasters are a constant challenge faced by human civilizations since ancient times. They lead to the loss of lives of humans and cattle; damage many cities, villages, houses, agricultural fields, roads, and various buildings in many countries. There occur huge monetary and humanitarian losses due to these disasters.

The learning from the Kerala floods of 2018 paves the way for a long-term and stable future for the coastal states. To prevent future casualties and to develop a well-

protected and sustainable society, it is vital to implement what we have learned from the Kerala floods 2018. There are some suggestions drawn so that future calamities can be handled in a more prepared manner. It is recommended to make a strict land use policy of the state. There is a need to stop illegal construction and mining in the restricted areas along with the protection of existing flood vulnerable lands of the state. Secondly, considering the vulnerabilities and capacity building in mind, an inclusive approach for all phases of disaster management must be adopted. With the effective role played by women associated with Kudumbashree in disaster response, measures must be taken to mainstreaming all capacities of women into all the disaster-related programs. The fishermen community also rescued people effectively during the floods. By providing proper training and equipment to this community, a professional task force can be organized. Thirdly, during the post-disaster phase of the Kerala floods 2018, technology played an important role. Technology made it much easier to alert people in risk-prone areas and remote areas. Additionally, capacity building of community, awareness generation to safeguard environment, effective dam management, and protection of wetlands are the concern areas where the state has to work extensively and intensively. Fourthly, both human activities and climate change have worsened the nature of hydro-meteorological disasters. It is required to take care of the environment while doing construction activities. Unsustainable developments and lack of preparedness can lead to massive destruction during floods. Finally, for a dam, proper planning and immediate alerts can mitigate the flood induce damages. In the case of wetlands, if they are damaged or converted into cultivated land, the state has to take care of sustainability. There is a need to take forward schemes like “Aapda Mitra” introduced by National Disaster Management Authority. To save people’s lives in a crisis, it is important to provide rescue training, equipment, and proper setup to the volunteers. The loss of 400 lives is a tragedy that could have been prevented with better management.

The lessons learned from the floods in Kerala should be learned and incorporated by all coastal states of India, to ensure that they build a robust disaster management mechanism to face future disasters.

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Resilience of MSMEs During the Pandemic 67

Deepmala Baghel

Contents

Introduction	1064
MSMEs' Risk and Resiliency: Conceptual Background	1066
Methodology	1067
Sampling	1068
Case Study Results and Discussion	1068
Conclusion	1074
References	1075

Abstract

Scholars, policymakers, and industries are focusing on disaster resilience as a goal for the country's socioeconomic development. Disaster resilience is defined as the ability to handle and respond effectively in turbulent times. Establishing resiliency is crucial for Micro, Small, and Medium-sized Enterprises' (MSMEs') survival due to their resource-constrained operating style. Indian MSMEs confront a plethora of challenges in the Coronavirus Disease 2019 (COVID-19) scenario, which the government is working to solve through a number of policy initiatives.

In this context, this study aims to look at the repercussions of COVID-19 and its management by MSMEs. The study draws on data from MSME entrepreneurs operating in the Nagpur District of Maharashtra State, India. The study uses qualitative methodology. This study is based on the case study of five MSME units with its in-depth information and the quantitative data that is gathered through an online questionnaire circulated and analyzed to get a detailed picture of the selected MSMEs.

The findings reflected that the MSMEs faced myriad issues following COVID-19 due to their inherent characteristics of small-scale operations, a limited monetary

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base, and a confined area of operation. As a result, an appropriate policy framework emphasizing both monetary and governance aspects is required to support MSMEs' organizational resiliency. The study proposes a number of valuable elements in terms of both theoretical and practical implications for disaster resilience building in industries.

Keywords

MSMEs · COVID-19 · Policy · Resilience theory · Entrepreneurial self-efficacy

Introduction

Resilience (an attribute to respond, recover, and adapt to disruptions) has become a buzzword in today's crisis-ridden climate of Coronavirus Disease 2019 (COVID-19). The pandemic outbreaks are not uncommon in human history, and hence, the coronavirus outbreak was not entirely unexpected, yet it took all of us by surprise when it surfaced, resulting in unprecedented global limitations on human activity and the first major global socioeconomic downturn (Economist Intelligence Unit, 2020). The ILO has dubbed the crisis the worst global disaster since the Second World War (2020). The novel virus had a massive implication for human society and specifically demonstrated what occurs when an unprepared entity encounters an attack.

From its first official note in Wuhan on December 29, 2019, to its peak in mid-April 2020, it has been not just about the direct loss of lives (more than 150,000 people died globally), but also about the indirect collapse of major socio-economic systems, resulting in loss of living and destruction of human survival structures. Therefore, one must recognize that the risk posed by COVID-19 is much greater in terms of widespread impacts on various sectors and systems. There is a critical need for ground realizations, lessons, and rational knowledge to enable policymakers to develop verifiable solutions and for aggrieved groups to reassure and build morale in regard to future crises.

The pervasiveness of the COVID-19 pandemic has caused unforeseen distortions in every area of the global economy. Amidst the impact of the pandemic on diverse industries, Micro, Small, and Medium-sized Enterprises (MSMEs) have faced unique challenges that leave them to nothing but be resilient in order to survive. MSMEs have evolved into a growth engine for the national economy throughout the years. This sector creates livelihood opportunities for both skilled and unskilled labor, promotes market sustainability, and contributes to the country's GDP growth. According to estimates for 2019, the MSME sector contributed 29% to India's overall GDP (Agyeya Tripathi, 2020). As a result, during the last few decades, the government has implemented a slew of measures aimed at enhancing the sustainability of MSMEs. With the expansion of MSMEs, the government's emphasis on Make in India and the new objective of creating a \$5 trillion economy by 2025 can be meaningful.

However, COVID-19 has a profound impact on the growth prospects of the Indian MSME sector. Nationwide lockdown, social distancing, and travel restrictions have unprecedented repercussions on MSMEs in the form of business shutdown, worker migration and absenteeism, people losing jobs and livelihood opportunities, and a spiral effect in the sort of slow consumption and sluggish market dynamics. The pandemic rocked the deepest foundations and fundamentally transformed socioeconomic environment of the world having a deep impact on MSME sector.

MSMEs are vulnerable to any crisis since they are resource-constrained, cash economy-dependent, and operate on a small scale. MSMEs, in general, operate on a short-term basis, and as a result, they can only operate for 5–6 months with limited cash. MSMEs' dependence on the cash economy has been adversely affected by the pandemic (Williams & Schaefer, 2013). A survey conducted by the Endurance International Group of 500 Indian MSMEs in June 2020 states that around 60% of MSMEs are shutting their operations and would not return until normalcy is restored (<https://www.financialexpress.com/>). According to another report, the COVID-19 pandemic has reduced MSMEs' earnings by 20–50% (Times of India Report, 2020). The ILO (2020) even anticipated that MSMEs would be one of the sectors that would require severe intervention following the pandemic's devastation.

For MSMEs, any crisis (natural or human induced) often results in uncertainties leading to destruction. This calls for a robust policy response in an influential way so that resiliency among firms can be established and offset the adverse effects of any pandemic outbreak. However, the strategies to promote awareness among MSMEs, facilitate their planning, and increase their abilities for implementing effective actions to adapt to change have received relatively modest attention in the literature despite the significant role these strategies may play in a pandemic response. COVID-19 has introduced unprecedented situations, which have not been experienced by anyone, so everyone is trying to learn, even governments are learning by doing. Hence, it is interesting to examine the impacts of pandemics on MSME sector that makes it obvious that crisis response is a requirement that must be built into the system. However, resilience should evolve from holistic analyses of credible data sources, not from hasty decisions made on the spur of the moment.

Various lines of research have emerged on business disruption and resiliency in India's MSME sector (Sharma & Singhal, 2018). However, no research has examined the impact of the COVID-19 pandemic on the MSMEs in a state of Maharashtra's economy. Moreover, no research has been conducted on the context of business disruptions in combination with techniques for achieving MSME resilience in those conditions. To address these gaps in the literature, this study proposes the research objectives of investigating the MSMEs' business disruptions caused by COVID-19 and their strategies for developing disaster resilience.

This research makes three key contributions. Firstly, it presents empirical insight into the risk and resiliency in times of disaster. To date, there exist a plethora of research on disaster and their impacts on MSMEs (Miklian & Hoelscher, 2021). However, many studies have examined the correlation between risks from crisis and response of businesses. Those that exist usually focused on large firms, in general,

and multinational corporations (MNCs), in particular (Li & Tallman, 2011). Whereas it was proven in various past research and present scenario of COVID-19 that small businesses are far more vulnerable than large firms under different forms of crisis conditions (Adian et al., 2020; Chowdhury, 2011). Moreover, diversified business operations in the MSME sector lead to a wide range of crisis responses, which has become a good stock of knowledge for preparing to respond to the future disasters. By providing ground reality about the resiliency behavior of MSMEs, this study aims to assist policymakers and practitioners in identifying current responses as well as future strategies to respond to the crisis.

In different settings and countries, we get a different definition of MSMEs. For this study, MSMEs are those industries that are defined according to the MSME act, 2006.

The remainder of this chapter is organized as follows. The next section discusses in detail the conceptual background and significant elements affecting the trajectory of risks, resiliency, and MSMEs. Then, the methodology is described in detail, along with a case study of five MSMEs. The discussion and conclusions section highlight the study's major findings.

MSMEs' Risk and Resiliency: Conceptual Background

It is a historical fact that MSMEs are more likely to be hit by natural and human-induced disasters than larger businesses. This has been proven in the past. Small and medium-sized businesses all over the world have been affected by environmental disasters, like the great floods in 1953, Hurricane Katrina in 2005, Thailand floods in 2011, and the Great East Japan Earthquake in 2011. There is enough evidence from previous research to say that small businesses that do not make health-care products often lose more money when there are both man-made and natural disasters (Auzzir et al., 2018). Small businesses have been ruined by disasters like the 1918 influenza pandemic in the United States, SARS, MERS, the 2009 H1N1 swine flu pandemic, the 2014 Ebola outbreak, the avian influenza outbreak, Salmonella infantis, and ZIKA, all of which have been very bad for them.

Until recently, numerous investigations have consistently highlighted the unusual effects of COVID-19 on MSMEs (Bartik et al., 2020; Akpan et al., 2020). The small industrial sector accounts for a significant portion of the \$2.9 trillion indirect economic losses claimed by disaster-hit countries between 1998 and 2017 (UNDRR, 2018). Small businesses are more prone to disasters owing to their unique characteristics, like working with limited cash, having short-term goals, and limited storage capacity. This makes them more vulnerable to crises, especially when natural disasters weaken the country's infrastructure and socioeconomic base. According to the United Nations Development Program (UNDP) in 2020, those who rely on the informal economy lost a lot of money because of COVID-19. The research has extensively shown that when there is a shortage of raw materials and financial flow is restricted in the market, it primarily influences unorganized small enterprises (Auzzir et al., 2018; Chaudhary et al., 2020; Duchek, 2018). In India, a great majority of

unregistered MSMEs operate in an unstructured manner (Abhishek et al., 2020). The COVID-19 pandemic has disrupted supply chains, leading to interruptions in the flow of money, raw materials, and human capital (Akpan et al., 2020), evoking a range of response mechanisms from various types of MSMEs. This response is mostly constrained by their perception of risk and their ability to establish appropriate response mechanisms.

Therefore, risk as a concept has a distinct meaning in the context of MSMEs. In business and organizational research, risk is frequently defined on the basis of deviations from expected results (Miller, 1992) and such accidents that have a negative impact on business activities (Chen et al., 2019). Disruptions of business functions are one type of negative influence that results in unexpected outcomes (Chen et al., 2019; Scholten et al., 2014). In the instance of COVID-19, the risk is both natural and human-induced, resulting in the disruption of MSMEs' business operations. The nationwide lockdown (from March 25 to June 8, 2020) imposed to combat the spread of COVID-19 infections has entirely disrupted India's socioeconomic activity, with MSMEs suffering supply- and demand-side disruptions, resulting in negative growth rates (Abhishek et al., 2020).

According to research, managing disruptions entails overcoming a business's vulnerability to disruptions and developing and implementing solutions for resilience building (Park et al., 2016). In resilience theory, a notion known as "organizational resilience" asserts that an organization can develop its own resilience through the utilization of existing resources and networks (Bastamnia et al., 2017).

Resistant entrepreneurs are found to have features such as developing and exploiting networks of resources, creatively accepting the changes in the world around them and avoiding crises wherever possible (Duchek, 2018). Resilience is defined as the ability to cope with adversity while maintaining a positive outlook on the future (Asgary et al., 2020). The study applies components of resource generation and networking to understand the status of MSMEs in the current COVID-19 pandemic. This approach would allow for the assessment of the applicability of appropriate policies for fostering organizational resilience and ensuring the sustainability of MSME in the post-COVID-19 era.

Methodology

The study applies analytic and descriptive research approaches. By the application of a case study methodology, the study aims to decipher the subtle meanings and provide a comprehensive grasp of a situation of MSMEs in and after COVID-19. Given that the present COVID-19 epidemic is one of a kind and its impacts in the form of normal business flow disruption are peculiar to MSMEs, it seems necessary to apply the method that can facilitate understanding what is going on at the ground level. In this schema, case method seems to be the most appropriate strategy (Yin, 2013; Mohajan, 2018) to investigate the links between crises and resilience management by MSMEs. For organizational research, the case study is a well-accepted research approach. According to Eisenhardt (1989), "[a] analysing data is at the heart

of creating theory from case studies, but it is also the most difficult and least codified component of the process" (p. 539). Hence, to make data analysis in case study research clearer, content analysis is used as an interpretation approach for qualitative interviews and other data sources.

The chapter's analysis is based on the original data collected through personal and telephonic interviews with five MSMEs' entrepreneurs, owners, and managers, who were chosen from a list maintained by the MSME Development Institute (DI) in Nagpur. The interviews were conducted in-person or over the phone with the entrepreneurs that lasted an average of 50 min. The 14 respondents from five MSMEs were interviewed in-depth, resulting in a sufficient amount of information about the variable, namely, the challenges associated with operating in a COVID-19-related scenario and the strategies adopted to overcome the difficulties (Yin, 2013). Apart from that, concerned civil society organizations, NGOs, and government officials were also interviewed to get the real picture. Secondary sources such as scholarly studies, policy briefs, websites and newspapers, online media reportage, press notes, and advisories were analyzed to gain a better grasp of the topics at hand. The online survey was designed to assess the impact of COVID-19 on small enterprises using questionnaires that solicit thoughts and facts. The study used pre-structured closed-ended questions with ranking or score possibilities, as well as open-ended questionnaires. A questionnaire was distributed online or by email to MSMEs in the Indian state of Maharashtra. The questionnaire is divided into three sections. Part A inquires about responder profiles, whereas part B inquires about MSMEs' pre- and post-COVID experiences and disaster response strategies.

Sampling

Purposive sampling was used to establish a representative sample of MSME entrepreneurs who could consult actively and give a wealth of knowledge throughout the COVID-19 epidemic (Williamson, 2006). The enterprises were selected following consultations with officers from the MSME-DI government office to ascertain their current condition of business. Once the initial MSMEs were contacted, the snowball sampling technique was used to collect informative samples that could be valuable for collecting rich data. The research was continued from August 2020 to December 2021. Both online and offline interactions with entrepreneurs, suppliers, and specific clients aided the study in traversing the chain of trade for MSMEs.

Case Study Results and Discussion

Respondent Profile

As seen in Table 1, each of the five MSMEs has been in business for more than 10 years. Maharashtra, India's industrial hub, has the fourth highest concentration of small enterprises in the country, accounting for 8% of the country's 6.3 million MSME base (MSME-annual-report-English, 2020–21). MSMEs in Nagpur regions

Table 1 Profile of the representative MSMEs and respondents

MSME firm (To protect identity, firms are given fictitious names)	Category	Year of inception	Product profile	Respondents	Entrepreneur's education	Company size
					Pre-COVID	Post-COVID
Adobe Pvt. Ltd.	Micro	1991	Fabrication and engineering works	Entrepreneur and research person, client company person	Graduation	11
Blush Pvt. Ltd.	Small	2012	Incense sticks and other utility products	Entrepreneur and area sales manager	12th	15
Cadform	Micro	2010	Bakery products	Entrepreneur	Graduation	5
Dglass Pvt. Ltd.	Small	1994	Glass processing	Entrepreneur, area sales personnel	Graduation	16
ENaturelife	Micro	1992	Ayurveda cosmetics and toiletries	Entrepreneur, supplier, sales manager, regular client	Graduation	19
						11

Source: Interview and survey

are severely affected by the COVID-19 pandemic and required immediate help to regain their strengths to fight back pandemic-generated recession.

COVID-19: Hard Time Resulting in Risks and Disruptions

This section presents the primary finding received from the case study of five MSME firms that reflect upon the impacts of COVID-19 on the MSME sector.

MSMEs are subject to crises and associated hazards, all the more so because they are primarily dependent on short-term goals and locally available resources. As a result, MSMEs have experienced significant losses both during and after the unexpected shutdown imposed in March 2020 to stem the spread of the pandemic. Suddenly, the functioning of the country's social, economic, and political systems was interrupted, leading to the paralysis of the overall industrial sector. What followed was the closure of companies and workplaces, which resulted in worker migration, as well as the entire prohibition of money, people, and resources mobility. Then, beginning in May and early June, the lockdown was gradually lifted but maintained in high-risk zones or "containment" areas. Even after a full year, in May 2021, stagnancy was not fully vanished. Although a complete lockdown was not implemented, certain limits on the market's and commercial entities' normal operation were enforced.

COVID-19 and resultant lockdown have devastating impacts on MSMEs. For example, the entrepreneur of Blush mentioned that "restricted access to your market is a critical limitation that must be rectified promptly or we will perish." In a similar vein, ENaturelife reflects the thoughts: "We are unable to obtain raw materials, and our products are sitting dormant." What do we have left?" Adobe Pvt. Ltd.'s owner is concerned about declining demand in comparison to the firm's existing capacity. "I am quite concerned about my loans, as demand has dwindled. I was unable to earn the amount required to pay my EMIs. I'm considering selling my home in order to save my business." The lockdown and resulting restrictions have exacerbated the challenge of raising working capital for MSMEs' day-to-day operations. For MSMEs, the pandemic's overall scale is evident in disrupting routine company operations and the difficulties of continuing operations with a restricted supply of cash, raw materials, human capital, and physical resources.

According to the International Labour Organization's paper titled "COVID-19 and the world of work: Impact and policy solutions," the COVID-19 has resulted in an economic and labor market shock. It has a dual effect on the supply side (goods and services production) and the demand side (consumption of goods and services). Apart from capital issue, another major problem never ever experienced so severely is the problem of worker migration. Workers' migration from cities to their hometowns triggered a labor shortage. As illustrated through worker's number and statements of entrepreneurs in Table 2, the present number of employees at each firm is around half that of the pre-COVID period. Another critical aspect of the pandemic's impacts on MSMEs is the wise utilization of available staff to ensure continued production effectiveness. Resultantly, it is observed that whatever available workers are engaged in all types of labor without regard for their skill. Additionally, hiring employees to sanitize the premises is another management

Table 2 Employee absenteeism in MSMEs

Firm	Pre-COVID-19	Post-COVID-19	Statements by entrepreneurs/owners from MSMEs
Adobe Pvt. Ltd.	11	8	I have not reduced my employees much as after sometime we will need them. However, some had left the work
Blush	15	3	It is difficult to continue with the business, so there is no other option to cut your cost to get some profit
Cadform	5	3	I am suffering from severe loss of demand for the product. As it is perishable products, I cannot keep on making it. There is low demand, no support nor any kind of help
Dglass Pvt. Ltd.	16	13	My workers are from Bengal and all have returned to their hometown, and now I am not getting skilled worker
ENaturelife (To protect identity, firms are given fictitious names)	19	11	A production of quality products of Ayurveda depends on qualified technicians and now we are not getting that

Source: Interview and survey

concern that adds to the stress already felt by struggling MSMEs. The interesting revelation from the study is that apart from reduction in the number of laborers, certain businesses, such as Dglass Pvt. Ltd., and ENaturelife, are unable to recruit skilled staff. Here, the issue is not so much about labor absenteeism as it is about highly skilled workers. Certain vocations necessitate subject matter expertise and technological ability; for example, Ayurveda products necessitate Ayurvedacharya or expert knowledge of Ayurveda. Similarly, metalwork fabrication requires skilled personnel. Due to lockdowns and labor migration, MSMEs are experiencing a skills scarcity, which has a negative impact on product quality. Whereas for enterprises such as Cadform and Blush, it becomes difficult to operate the business at its previous capacity, and so cost cutting in order to earn a profit has necessitated the decision to lay off some employees.

Another consequence of the pandemic on MSMEs that came from discussions with suppliers and sales representatives is the expiration of products or a reduction in the shelf life of presently available products. In several industries, the product's shelf life is critical to its sale. Since the lockdown was implemented in March 2020, the products have been in retail stores and are nearing their expiration dates. As one of ENaturelife's sales representatives put it, "Ayurvedic products have a limited shelf life; hence, we predict a big expiry of products in the places of trade, such as retail stores, the distributor's warehouse, and even in the company's storage." Furthermore, Cadform's CEO remarked, "Immediately before lockdown, we prepared a big volume of our products as an extended supplier to the restaurants. However, restaurants shuttered without warning and did not reopen for months; as a result,

many of our items expired, and we suffered significant financial losses. We are still grieving over that loss today, as well. And the future is equally uncertain, so we're in a dilemma." This research also corroborates earlier findings, such as those in a report by *The Hindu*, which stated, "According to a recent survey of 5000 MSMEs done by the All India Manufacturers Organization, 71% of MSMEs were unable to pay salaries to their employees in March." Other reports from different parts of India show a similar picture. *Outlook* reported on a research conducted by the Confederation of All India Traders (CAIT), which represents 70 million traders in India, the majority of whom are small and medium-sized enterprises. According to the study, the pandemic has caused traders hardship of around Rs 380 lakh. Scholars studying the economic impact of COVID-19, such as Ray et al., (2021), have also highlighted how the COVID-19 pandemic has disproportionately affected India's already suffering informal labor economy.

The current pandemic period has reduced formal revenue sources to a greater level, resulting in transforming business methods of these firms. Shrinking consumers and dwindling demand are negatively affecting these MSMEs' trading relationships. A significant effect of COVID-19 is the restriction of distributors' and trade partners' functionality. Due to the closure of the majority of outlets, distributors are having difficulty earning enough profit to operate profitably. Due to the limited amount of sales, distributors must spend more than they get in order to distribute products to the market. This has resulted in a decline in MSMEs' networking, which has had an effect on commercial transactions. For example, Dglass Pvt. Ltd. said, "Many of the distributors are not willing to work during Covid-19, as their operation cost is very low and they are not in position to earn for living, forget about the profit." Reduction in return on investment is one of the reasons that has forced many MSMEs to either completely shut their business operations or reduced them to the level that can be managed within the network.

Response Mechanism of MSMEs: Crisis Analysis and Resilience

The COVID-19 has ushered in unprecedented circumstances that are truly putting an entrepreneur's resilience to test. Resilience is the capacity to adjust to change, which needs a fundamental grasp of risk recognition and its consequences to overcome obstacles created by natural or human-caused disasters (Salisu et al., 2020). Extant research shows that a firm's ability to thrive or overcome risky situations depends critically on the ability to demonstrate a high level of resilience in the face of the interactions with the environment (Duchek, 2018). A system is resilient when it can absorb and adapt to substantial external shocks without altering itself and successfully building new structures to survive (Bastamini et al., 2017). The examined MSMEs are quite vocal about their prospects and capacities for overcoming the risks linked with COVID-19 and reviving their businesses in the future. To find solutions, these MSMEs have been restructured to adapt to change. For example, their fundamental goal is to handle the problem in whatever form it takes and establish long-term viability. For example, products usually expire, so firms are concentrating their efforts on obtaining raw materials and making plans for the future, when demand is likely to increase. This applies similarly to other business operations. The

entrepreneur from Dglass noted, “As social distancing norms exist many distributors are having trouble operating their businesses profitably or even earning revenues. Many of them are not going to survive, so we must find other ways to proceed. On the other hand, we hope that the situation will improve in the future. As a result, we must be prepared. Hence, our objective is to discover alternatives, reallocate our resources, and wait for normalcy.” In this moment of distress, many responders have referred to networks as saviors. “We have problems interacting with distributors,” Adobe responded, “but our close business networks have stepped up and assisted us in selling our products.” “Our relatives who are in this industry,” Blush explained, “become my distributors.” Assist me in selling the things that were laying around. I couldn’t find a buyer for my items, and there’s no one in the market who can deliver them to clients. “My local customers spread the word in their neighbourhoods, and I was able to reach out to potential customers and outlets by building a local chain of networks.”

Apart from being aware of the ground reality, resourcefulness is recognized as another critical attribute driving decision-making during times of the COVID-19 crisis. Sustaining a difficult moment requires resourcefulness in terms of social and human capital. Moreover, business integration usually establishes critical ties at the local level in socioeconomic spheres (Doern, 2016). In case of studied cases, it is recognized that the firms who are well connected to their local networks found needed support system to strive over the disaster-ridden time. The findings reveal that firms with strong ties to their local networks received support for working capital, human capital, and networks to manage their business. As the entrepreneur from Dglass Pvt. Ltd. explains, “Because to Covid, our resources dwindled; initially, we were all distraught, but over time, we learned to exist on our own. Like I used a new strategy, such as mobilising local residents to produce capital. I collect a modest amount of money from all my local clients on a monthly basis; I have a factory outlets for garments, so at six-month intervals, I either return the money with specified interest or offer them discounted products from my factory outlet shop. As majority wants to purchase discounted products, I do not require returning money. Moreover, this enables me to raise working capital for my firm. As a result, networks are my saviours during difficult times.”

During lockdown, the breakdown of supply chain relationships and structures has yet to establish a balance, resultantly entrepreneurs are innovating their business operations. Due to financial constraints, they have little choice but to minimize promotional costs in order to remain competitive in the market. As Blush states, “During Covid-19, we have no choice but to survive with the bare necessities. As a result, giving away free things to sustain the relationship is not an option for us.” Manufacturers, for example, used to provide distributors and merchants one or two units for free. They are not in that capacity today, nor do they intend to do that. It is worth noting that long-term relationships have also had downturns during these times. Old business practices have given way to fresh options and techniques that can aid in survival. Moreover, technology has opened up new avenues for marketing and promotion for MSMEs operating on a limited budget. For instance, Blush noted, “in the past, we placed a premium on appeasing wholesalers and identifying new

retailers for our promotional activities; however, in the current environment, we cannot do so due to the uncertainty, therefore we strive to engage with online-available merchants.” Previously, the emphasis was on developing close relationships with retailers; however, COVID-19 has altered much of this practice. Online channels are the most frequently used medium by these small businesses in these alternatives. They have all agreed that they will use Internet platforms to promote their businesses and build relationships with potential buyers and sellers. Earlier research also suggests that entrepreneurs who adapt to change fast are better at accessing the benefits generated due to opportunities the crisis situation encourages (Kurmann et al., 2020).

This study found that entrepreneurs that demonstrate a quality of adapting to their crisis-stricken workplace are more successful in terms of overcoming the crisis. Contrarily, those lacking in these had long-lasting setbacks in their businesses. For instance, a firm such as Abode is experiencing difficulties because of its inability to adapt to changing circumstances. The firm has installed a transformer, which has resulted in an increase in energy use. When product sales grow sluggish, investment in nonessential entities puts additional strain on the firm’s already frail financial state. To preserve a cost-profit ratio, the firm was forced to restrict production to an unsustainable level. Hence, entrepreneurs’ hasty judgments, made without regard for future prospects, have resulted in a massive loss for the firm. In contrast, some entrepreneurs are seen as anticipatory and paying close attention to ground realities. Entrepreneurs from Blush Pvt. Ltd., for example, concurred, “It is critical to make judgments with a stable mind-set. We have not expanded our business in any way.” During the study, a significant difference in decision-making was seen, allowing us to assess the importance of adaptability on the side of the entrepreneur. The most critical aspect of entrepreneurship development is crisis management. As crises frequently result in infrastructure impediments that frequently result in systemic failure, it is crucial for entrepreneurs to be aware of the possible consequences of the methods used to address critical situations. According to risk and resilience research, it is always desirable to learn lessons from the past and adapt them in order to mitigate negative consequences in the future.

Conclusion

This study examines the impact of the COVID-19 pandemic on MSMEs situated in the state of Maharashtra, India. MSMEs are an integral part of the country’s socioeconomic fabric. Thus, it becomes critical to decipher the socioeconomic and livelihood security components of MSMEs in order to give effective policy solutions for resolving such calamitous scenarios. The findings of the study show indisputably that MSMEs that have adapted after a setback have a number of essential attributes that are together referred to as resiliency. Adaptive behavior, self-awareness of organizational capacity, resourcefulness, a desire to build strong social networks, and a positive attitude toward the future were all identified as important attributes. As a result, given the appropriate conditions and supportive settings created by

legislative frameworks, they will excel and overcome the crisis. MSMEs face significant challenges that impede their ability to respond to change during times of crisis. The barriers include the following: (1) insufficient knowledge to address the challenges; (2) inability to analyze and determine cost-effective adaptation measures; (3) inability to gather financial resources; (4) inability to develop technical capacity to implement options; (5) ignorance of available policies and measures; and (6) skepticism regarding social acceptance of adaptation options. In this circumstance, a government policy regime can operate as a catalyst for adaption practices by rewarding investment, providing technical training, supporting resource development, and establishing a platform for the dissemination of information and expertise to MSMEs.

By conducting empirical research on various dimensions of crisis and MSME's resilience, the study enables the identification of critical elements for enhancing resilience among MSMEs, such as entrepreneurial development programs, financial sustainability, resourcefulness, and networking. Thus, it emphasized critical practical indicators that must be considered when developing a policy to assist MSMEs during the COVID-19 crisis.

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Studying Disasters Through Complexity Theory

68

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Contents

Introduction	1078
Theoretical Background	1079
Complexity Theory	1079
Power Law Distribution	1080
Korean Case of Power Law Distribution	1081
Korea Disaster Data	1081
Method to Derive the Coefficients of Power Law Distribution	1081
Program Implementation	1083
Results	1084
Conclusion	1087
References	1087

Abstract

Interest in disaster management is arising as damage caused by disasters increases worldwide. Many countries are severely affected by emerging risks such as COVID-19 and the enlargement of complex disasters. Complexity theory has been applied to explain how events occur through numerous interactions among elements that often occur in a straightforward but complex manner. The power law distribution is considered one of the significant components of the complexity theory. In this study, the power law distribution has been applied to identify the

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relationship between the frequency and magnitude of disasters using the official government data between 1957 and 2020 in Korea. Through the estimation of power law coefficients, the level of disaster preparedness of Korea was judged by comparing them with other continents. Moreover, we provide a detailed explanation of the algorithm used for deriving the coefficients of power law distribution. Since extreme catastrophic events are in the long tail of the power law distribution, efforts should be made to have a response system for an event with a very low probability of occurrence but a huge impact.

Keywords

Complexity theory · Power law distribution · Catastrophic event · Disaster risk management system

Introduction

Interest in disasters is rising worldwide as the frequency of major disasters such as disasters caused by natural and industrial hazards, terrorism, and the resulting socio-economic consumption costs increases (Keen & Pakkot, 2011; Roberts, 2009). In addition, disasters in modern society are very different from those in the past, such as the emergence of new disasters (e.g., COVID-19), the increase in complex disasters caused by the interaction of natural and social phenomena, and the higher possibility of large-scale disasters due to climate change. Accordingly, a paradigm shift in disaster management different from the past is essential to cope with recent trends.

Complexity theory was first applied to investigate complex natural phenomena such as meteorology and has been used for explaining various phenomena in complex systems. It has been revealed that multiple phenomena in the complex system follow power law distribution instead of normal distribution (Blank & Solomon, 2000; Gabaix et al., 2003; Faloutsos et al., 1999). As the causes of disasters become more diverse and complex, studies have been conducted to explain disasters using complex systems (Barton et al., 1994; Becerra et al., 2006; Mandelbrot, 1983). Janczura and Weron (2012) and Jo and Ko (2014) revealed that the magnitude and frequency of certain disasters follow the power law measures. However, since these studies are limited to specific disasters, it is unknown whether the frequency and scale of natural and social disasters occurring in a country follow the power law or not.

Complexity theory is helpful in understanding the features of catastrophic disasters having low probability and high impact. Recent studies have revealed that the relation between frequency and damage of disasters caused by natural hazards, such as earthquakes and hurricanes, does not show the normal distribution. Instead, the relation follows the power law distribution, a core characteristic of the complexity theory, which means catastrophic disasters can happen unexpectedly at any time.

The power law distributed disasters have policy implications for improving the national disaster risk management system since most catastrophic events are in the long tail of the power law distribution. Therefore, this study aims to identify the relationship between casualties, property damage, and frequencies of disasters in

the Republic of Korea. After placing the relationship, this study will provide policy recommendations for improving the national disaster risk management system. In this study, disaster damage data from 1957 to 2020 acquired from national statistics in Korea were applied to understand the distribution of disasters caused by natural and social hazards in Korea. If similar data are available, the method provided in this study can be readily applied to other countries as well. For this purpose, a full description of the algorithm used in this study was provided.

Theoretical Background

Complexity Theory

Complexity theory has been applied to explain complex natural phenomena such as meteorology and financial phenomena such as the stock market. For example, biologists have used complexity theory to mathematically describe ecosystems that are nonlinear dynamic systems (Farber, 2003). The theory is also useful in explaining the characteristics of disasters triggered by various and complex causes. As described in the butterfly effect suggested by Lorenz (1963), modern society is connected by complex networks, and thus even a tiny hazard can cause significant damage. In addition, mega-disasters can happen anytime, and secondary emergencies may result in a more severe impact than the primary disaster. Epidemic crises such as COVID-19 and Ebola virus, the 2011 Fukushima nuclear accident in Japan, and the 2011 great flood in Thailand are typical examples of the complex system of disasters in modern society.

The earthquake that occurred in the Tohoku region of Japan on March 11, 2011, was the fourth strongest earthquake in Japan. The massive tsunami and aftershock that occurred at the same time as the earthquake caused more than 20,000 casualties. In addition, the earthquake caused damage to the nearby Fukushima nuclear power plant, resulting in a complex disaster with radioactive leakage. As a result of this accident, the air, soil, sea, and groundwater were exposed to radioactive materials, causing damage to Japanese society.

The 2011 Thailand floods caused great damage within Thailand and damaged the economy of several countries, including neighboring countries. A major flood occurred due to heavy rains for 3 months from the end of July 2011, and it caused the inundation of the central region of Thailand, which forms the industrial backbone of Thailand. Due to this flood, the production line of automobiles and electrical and electronic products was stopped. Since Thailand was the 12th largest automobile producer globally, the damage caused by the flood caused disruptions in supply to major automobile markets such as Japan, Europe, and the United States. In addition, the supply of hard disks became insufficient due to the flooding of hard disk manufacturing plants, which led to a shortage of semiconductor production by Intel. This insufficient production led to a shortage of supply in the global semiconductor market, which caused a rise in computer prices worldwide. This case shows that a disaster in one country can have a global impact.

Pelling (2003) argued that the complexity theory has significant implications for disaster response. For example, emergence, one of the characteristics of complex systems, shows the characteristics of disasters that may occur from unexpected causes (Pelling, 2003). In line with this, Drabek and McEntire (2003) insisted that emergent phenomena also occur during or after a disaster, when people create and change organizations to respond to disaster situations. Furthermore, Beck's (2004) risk society theory and Perrow's (2000) normal accident theory have in common in that they claim that the increase in risk in modern society is related to complex systems. Nonlinearity, self-similarity, fractal, self-organization, and emergent phenomena, which are the core of the complex system, are necessary elements to analyze disaster occurrence patterns and develop an effective response system.

In addition to these features, the power law distribution of disasters is also a feature in contemporary society that disaster study needs to pay attention to. The recent research about power law distributed disasters, such as Kim and Sohn (2018), Janczura and Weron (2012), and Becerra et al. (2006), revealed that the relationship between the frequency and intensity of disasters such as earthquakes and floods can be explained by the power law distribution, which is one of the typical characteristics of complex system. This feature will be explained in more detail in the next chapter.

Power Law Distribution

Recently, several studies have been published that various phenomena in complex systems follow the power law distribution rather than the normal distribution. Complex systems and the distribution of power laws draw much attention in recent research on disasters because disaster is characterized by complexity in which various factors act simultaneously. These characteristics can be expressed using a power law distribution in which the long tail appears (Etkin, 2015). Figure 1 shows the difference between the normal distribution and power law distribution. In the normal distribution, the highest frequency events occur around the mean. In contrast, high magnitude events happen when the frequency is close to the minimum value in the power law distribution. For example, there are several small earthquakes before one big earthquake, and the frequency pattern follows the power law distribution.

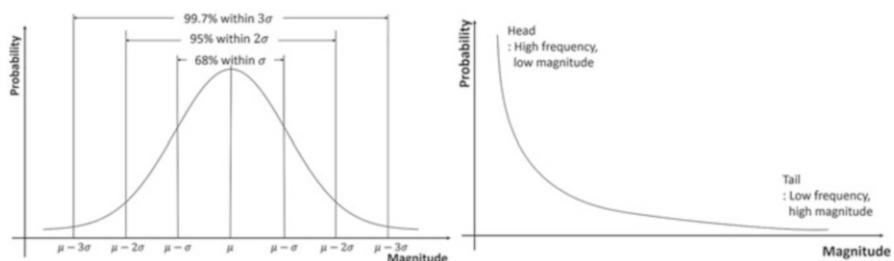


Fig. 1 Normal distribution (left) and power law distribution (right)

Similarly, the city's population, earthquake intensity, and power outage scale follow the power law distribution (Farber, 2003). In this way, it can be said that phenomena following the power law are not characterized by general or mean values (Clauset et al., 2009). Therefore, to prepare for large-scale disasters that do not occur frequently, the analysis should focus on the risks explained by the power law distribution rather than by the normal distribution.

Korean Case of Power Law Distribution

Korea Disaster Data

Disasters targeted in this study are disasters caused by natural and social hazards stipulated in Article 3 of the Framework Act on the Management of Disaster and Safety. In this study, the relationship between the frequency of disasters, personnel damage, and property damage is studied. Personnel damage represents the number of deaths and missing persons, and property damage indicates the amount of economic loss caused by disasters. To conduct the experiment, the number of fatalities and missing people, and the amount of economic loss due to natural and social disasters, was used. In the case of natural disasters, the data provided by the Yearbook of Natural Disaster were used, and in the case of social disasters, the data provided by the Yearbook of Social Disaster (Table 1) were utilized (MOIS, 2021). Data from the 60 Year History of Disaster Management published in 2010 by the former National Emergency Management Agency (NEMA) were used additionally. Finally, the amount of economic loss caused by disasters was converted to the 2020 price index announced by the Bank of Korea to standardize the value at a specific point in time. The conversion equation is shown in Eq. (1).

$$\text{Conversion Index} = \frac{\text{Base year price index}}{\text{2020 price index}} \quad (1)$$

Conversion amount = Conversion index × Won amount

Method to Derive the Coefficients of Power Law Distribution

In this study, the method of Becerra et al. (2006) was used as a model for estimating the relationship between the probability of occurrence of a disaster and the magnitude of a disaster. The probability of occurrence of a disaster can be expressed as Eq. (2).

$$p(x) = 1 - \frac{n(X \leq x)}{N} = \frac{n(X > x)}{N} \quad (2)$$

Table 1 Example of the Yearbook of Social Disaster data

Operation period	Disaster name	Occurring area	Headquarters' installation agency				City, County
			Central Disaster Countermeasures Headquarters	Central Disaster Management Headquarters	Province		
20.1.25. ~ 2.3	Toba pension explosion	161, Ilchul-ro, Donghae city	–	–	Gangwon-do	Donghae city	
20.4.24. ~ 3.10	Andong fire	Mountain 109 Ingeum-ri, Pungcheon, Andong city	–	Korea forest service	Gyeongsangbuk-do	Andong city	
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
20.12.1.	Baekdu Hanyang apartment fire	1119 Baekdu Hanyang apartment, Gumpo city	–	–	–	–	Gumpo city
Casualties							
Sum	Death	Injured	Missing	Amount of damage	Economic loss (Unit: 100 million KRW)	Disaster type	Current disaster management agency Note
7	7	–	–	Partial building loss	0.2	Gas explosion	Ministry of Interior and Safety
8	–	2	6	Fishing boat sinking	3.7	Marine ship accident	Ministry of Oceans and Fisheries
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
11	4	7	–	–	4.3	Multi-dense facility fire	National Fire Agency
							–

Here, X is a random variable of a disaster, x is the amount of damage of the corresponding disaster, $n(X > x)$ is the number of disasters with a scale exceeding x , and N is the total number of disasters. The disaster occurrence probability used in Eq. (2) is not a probability of occurrence for a specific scale disaster but a cumulative sum of the probability of a disaster to occur with a specific scale or larger. In this study, the relationship between the probability of disaster calculated through Eq. (2) and the magnitude was assumed to follow a power law distribution. Accordingly, the probability density function of Eq. (2) can be estimated using a power law given as Eq. (3).

$$p(x) = Cx^{-\alpha} \quad (3)$$

Here, $p(x)$ decreases as x increases, and α is a coefficient indicating the degree of decrease. In addition, C is a constant to make the maximum value of the cumulative probability function to 1. C is calculated in two different ways as shown in Eq. (4), depending on the case where the data used is continuous or discrete.

$$\begin{aligned} C &= (\alpha - 1)x_{\min}^{\alpha-1} = \frac{1}{\zeta(\alpha, x_{\min})} \text{ (Continuous)} \\ &= \frac{1}{\sum_{n=0}^{\infty} (n + x_{\min})^{-\alpha}} \text{ (Discrete)} \end{aligned} \quad (4)$$

The value to be estimated in the model of Eq. (3) is x_{\min} and α , which indicates the minimum value of the interval starting to follow the power law and the degree to which it decreases, respectively. In order to simultaneously estimate x_{\min} and α , the value of x_{\min} is sequentially increased during the estimation of α , and the suitability of the estimated x_{\min} and α value was tested using Kolmogorov-Smirnov statistics. When representing the graphic results, logarithm scale is taken because the number of deaths and the minimum and maximum values of the damage have a very wide range. By taking logarithm of the probability of occurrence according to the magnitude of the disaster, Eq. (3) can be converted into a linear equation as shown in Eq. (5), and the two variables following the power law show a linear relationship on the log-log graph.

$$\log p(x) = C - \alpha \log x \quad (5)$$

Program Implementation

To implement the program utilized in this study, it is required to organize the disaster data first. The natural disaster data and the social disaster data provided from the Yearbook of Natural Disaster and Yearbook of Social Disaster, respectively, must be sorted in a single Excel file along with the data from 60 Year History of Disaster

Table 2 The input file format used in the calculation of power law coefficients

Year	Start point	End point	Disaster type	Disaster detail	Cause	Personnel damage	Property damage (unit: 1000 KRW)	Property damage (converted)	Source
1957	1957 0806	1957 0806	Natural	Heavy rain	Heavy rain in Nakdong River	–	54,200,000	2,477,265,200	60 year history of disaster management
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
1998	1998 1029	1998 1029	Human-induced	Fire	Fire at Beomchang cold plaza	27	330,520	374,810	Yearbook of social disaster
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
2020	2020 0319	2020 0320	Natural	Forest fire	Ulju-gun Forest fire	2	2,800,000	2,800,000	Yearbook of natural disaster

Management. The types of information included in the input Excel file are year, starting date, ending date, type of disaster, whether it is a natural disaster or social disaster, disaster type in detail (e.g., flood, fire), cause of the disaster, number of personnel damage, amount of property damage, property damage converted to a specific point of time, and the source of the data (Table 2). In the case of natural disasters, the frequency of disasters was analyzed with respect to death toll and the amount of economic loss, while for social disasters, occurrence frequency was examined only with the number of casualties.

Figure 2 shows the pseudocode for calculating the coefficients explained in Eqs. (1) to (5). By reading the input data in a similar format as shown in Table 2, the user then selects the type of analysis. The corresponding data is extracted from the input file and sorted in ascending order for power law estimation according to the selection. The parameters of estimation x_{min} , α , C are performed by iteration of gradually increasing the value of x_{min} . At each iteration, the corresponding α value is calculated and the suitability of x_{min} and α are verified by Kolmogorov-Smirnov test. After the iteration process, the correction coefficient value C is computed according to the corresponding case from Eq. (4), depending on whether the damage data is continuous or discrete. The algorithm can be readily applied to countries with similar data to derive the relationship between the scale of disaster damage and disaster frequency.

Results

To analyze the relationship between the damage and the frequency of natural and social disasters in Korea using power law distribution, disaster damage data between 1957 and 2020 were utilized. The data was classified into natural and social disasters, and each disaster's property damage was converted into economic value

Power Law Analysis Program

Input : Disaster data input excel file(Table 2)

Output: Power law estimation parameters(x_{min}, α, C), plot of power law estimation

- 1) **Read input file**
input_file.xlsx
- 2) **Select analysis type**
 - case 1 = "natural disaster" & "property damage"
 - case 2 = "natural disaster" & "personnel damage"
 - case 3 = "social disaster" & "personnel damage"
- 3) **Get data for corresponding case**
 - if case 1:
indexes = find("natural disaster" from 4th column of input file)
take corresponding values from 9th column of input file
for i ∈ indexes:
 data = input_file(i, 9)
 - if case 2:
indexes = find("natural disaster" from 4th column of input file)
take corresponding values from 7th column of input file
for i ∈ indexes:
 data = input_file(i, 7)
 - else case 3:
indexes = find("social disaster" from 4th column of input file)
take corresponding values from 7th column of input file
for i ∈ indexes:
 data = input_file(i, 7)
- 4) **Estimate power law analysis parameters(x_{min}, α, C)**
 - Sort data by ascending order
 - if case 1(continuous case):
 - for idx in range 1:length(data):
 gradually increase x_{min}
 estimate α using direct MLE(maximum likelihood estimation)
 check suitability of x_{min} and α by Kolmogorov-Smirnov test
 - get correction coefficient $C = \frac{1}{\zeta(\alpha, x_{min})}$
 - else case 2 | case 3(discrete case):
 - for idx in range 1:length(data):
 gradually increase x_{min}
 estimate α using direct MLE(maximum likelihood estimation)
 check suitability of x_{min} and α by Kolmogorov-Smirnov test
 - get correction coefficient $C = \frac{1}{\sum_{n=0}^{\infty} (n+x_{min})^{-\alpha}}$
- 5) **Plot power law analysis**
Plot with estimated parameters(x_{min}, α, C)

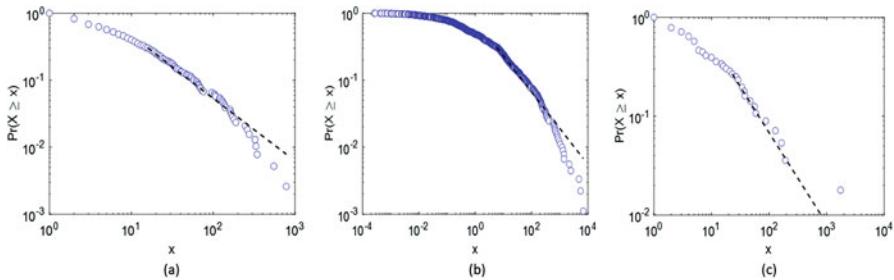
Fig. 2 Pseudocode of power law analysis program

in 2020. Assuming the relationship between the magnitude of the disaster and the probability of occurrence follows the power law as shown in Eq. (3), x_{min} and α values were estimated. In the case of the number of personnel damage, it has a discrete characteristic in which values are an integer, while the amount of property damage is continuous data with decimal points. Equation (4) was applied to obtain the correction constant C .

Table 3 and Fig. 3 show the results of estimating the relationship between the disaster damage magnitude and the frequency of the corresponding disaster using the power law distribution. Table 3 shows the values of x_{min} , α , and C obtained through the estimation procedure. Figure 3 shows the difference between the actual

Table 3 Estimated parameters of power law analysis

	Natural disaster			Social disaster		
	x_{\min}	α	C	α	x_{\min}	C
Personnel damage	16	1.93	-565.9087	23	1.92	-79.3563
Property damage	5,803,300	1.5408	-1451.7677			

**Fig. 3** (a): Relationship between frequency of natural disasters and casualties, (b): relationship between frequency of natural disasters and economic loss, (c): relationship between frequency of social disasters and casualties

probability of the disasters and the estimated probability of occurrence. In Fig. 3, the circles represent the value using the actual frequencies of disasters and the dashed lines represent the estimated frequencies. Figures 3(a) and (b) show the probability of occurrence according to the size of economic loss and the number of personnel damage caused by natural disasters, respectively. Figure 3(c) shows the probability of occurrence according to the number of personnel damage due to social disasters. In most cases, the estimates and the actual frequencies of disaster match well, confirming our basic assumption that the frequency and magnitude of disaster follow the power law distribution. In the case of economic loss caused by natural disasters, the estimated probability tended to be overestimated compared to the actual probability of occurrence.

The α value of the estimated from power law distribution indicates the degree to which the probability of occurrence decreases according to the magnitude of the disaster. If the value of α is large, the probability of occurrence decreases rapidly compared to the magnitude of the disaster. If the value of α is small, the probability of occurrence decreases gradually compared to the magnitude of the disaster, indicating a relatively vulnerable state. In Korea, the α value between the number of the death toll and the probability of occurrence of natural disasters was 1.93. Becerra et al. (2006) analyzed the α value for each continent using the same analysis method (world average, 1.73; North America, 2.13; South America, 1.68; Asia-Oceania, 1.69; Africa, 1.66; EU, 1.73). Since the α value in Korea is relatively high compared to other continents, it can be argued that the level of preparation for natural disasters in Korea is relatively high concerning the death toll, even with high population density. The high α value in North America can be explained due to the high-income level, high level of disaster preparedness, and low population

density. On the other hand, EU countries with high-income levels similar to North America showed a low α value of 1.73, similar to that of low-income countries. This result may be due to the very high population density of European countries.

Conclusion

This study analyzed the relationship between the frequency of natural and social disasters and the degree of damage using official damage data published by the Korean government. The statistical distribution of natural and social disasters that occurred in Korea from 1957 to 2020 follows the power law distribution. The result indicates that a paradigm in the national disaster response system must be re-established to efficiently respond to these large-magnitude disasters. Specifically, our results were compared with those of Becerra et al. (2006), which applied the same model to analyze the relationship between the number of casualties from natural disasters around the world. The resulting α value in Korea was high at 1.93, indicating the degree to which the probability of occurrence decreases according to the scale of disasters. Our study identified that the level of preparation for natural disasters in Korea is relatively high concerning the death toll, even with high population density.

Policy makers dealing with social issues, such as welfare and education, tend to focus on the issues located in the average zone because most demands are concentrated on average events. However, in the case of disasters, extreme events, sometimes considered anomalies, have a more significant impact than average events. That is, the extreme catastrophic events are in the long tail of the power law distribution. Therefore, it is necessary to have a response system for an event that has a very low probability of occurrence but has a huge impact. To this end, efforts should be made to establish an inclusive risk governance system in which all stakeholders, including the central government, local government, and civic groups, participate and to allocate sufficient budget and manpower. Creating a safe and resilient country is possible only when the efforts and aspirations of every citizen are combined and continuous efforts are made.

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Systemic Disaster Risk and Response Management

69

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Contents

Introduction	1090
Evolution of Systemic Approach for Disaster Risk Management	1091
Understanding Risk in Line with Sendai Framework for Disaster Risk Reduction	1091
Black Swan and Cascading Disasters	1092
Normal Accident and Systemic Approach in Safety Science	1092
Understanding the Features of Systemic Disaster Risk for Response Management	1095
Concept of Systemic Disaster Risk	1095
Notions of Risk Types for Systemic Response Management	1096
Multi-dimensional Systemic Response Framework	1098
Identify Risk Management Flow	1098
Develop Strategic Response Map Using Risk Management Flow	1099
Develop a Multi-dimensional Emergency Plan Using RMF and SRM	1101
Conclusion	1102
References	1102

Abstract

Disaster response planning has progressed substantially; however, it remains frustratingly bogged down as some major impacts were not anticipated. The traditional disaster response method of predicting risks in advance and executing it in an emergency has progressed substantially. However, recent catastrophic events, such as the 2011 East Japan earthquake and the ongoing COVID-19

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pandemic implied that modern society is getting vulnerable to disaster due to the increasing features of complexity, interconnectedness, and uncertainty, which often results in unexpected or emerging risk. To respond well to these unexpected events, this study explored the emergence of systemic disaster risk resulting from risk environment and its change by the intersection with response measures. As a result, the authors proposed a multi-dimensional systemic response framework, consisting in risk management flow, strategic response map, and multi-dimensional emergency planning, which can help countries respond effectively to the systemic disaster risk that threatens the safety of modern society. The response framework adopts the notions of risk types from a response perspective, anticipated risk, emerging risk, amplified risk, lingering risk, and mitigated risk, and applies the risk management flow to address various risks in an emergency.

Keywords

Systemic disaster risk · Response management · Risk management flow · Multi-dimensional systemic response framework

Introduction

The enormous damage caused by large-scale disasters, such as the 2011 Thai flood, the 2011 East Japan earthquake, and COVID-19, reminded us that understanding the nature of disaster risk is critical for establishing an effective response system since this type of event is often not anticipated in the classical risk analysis. The World Health Organization (WHO) announced that the number of confirmed cases of COVID-19 reached 659,108,952 as of January 10, 2023, among which the number of deaths was 6,684,756. On top of that, COVID-19 has had a systemic impact on all sectors worldwide. For example, the economic indicators recorded the deepest global recession since the end of World War II, and it was expected for a 100 million additional children to fall below the minimum proficiency level.

The traditional way to respond to disasters is to probabilistically predict risks in advance through the identification of hazards, vulnerabilities, and exposures and to respond by establishing a response plan (IRGC, 2018). Implementation of well-planned countermeasures by trained and responsible authorities can effectively reduce most conventional risks. However, unexpected risks often appear and cause huge damage due to increasing tendencies in modern society, such as complexity, interconnectedness, and uncertainty. Clearly, there are ripple effects on the rest of society and its response mechanism which are related to the interconnectedness permanently increasing interdependence of modern society. Therefore, the effective response system for disaster risk in modern society should be established based on the analysis of the dynamic process of risk change.

This chapter aims to investigate the nature of systemic risk and the evolutionary process of risk and identify key lessons that political leaders and emergency managers can apply during crises. Finally, the authors propose a multi-dimensional

response framework to systemic disaster risk. Section “[Evolution of Systemic Approach for Disaster Risk Management](#)” explores academic and practical achievements in understanding the features of systemic disaster risk. The authors explore the concept of systemic risk in line with the Sendai Framework for Disaster Risk Reduction (SFDRR), the concept of the black swan and cascading disasters, and the systemic approach in safety science. Section “[Understanding the Features of Systemic Disaster Risk for Response Management](#)” investigates the features of systemic risk and its cases and identifies notions of risk types. Section “[Multi-dimensional Systemic Response Framework](#)” proposes a multi-dimensional response management framework, which consist in risk management flow, strategic response map, and a multi-dimensional emergency plan.

Evolution of Systemic Approach for Disaster Risk Management

Understanding Risk in Line with Sendai Framework for Disaster Risk Reduction

The Sendai Framework for Disaster Risk Reduction 2015–2030 (Sendai Framework) was adopted at the 2015 Third UN World Conference on Disaster Risk Reduction (WCDRR) to replace the Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters (HFA). Based on the evaluation and review of the implementation of the HFA, the Sendai Framework suggested new strategies and action-oriented elements in order to cope with all types of disasters regardless of the size, frequency, and progression of damage (UNISDR, 2015). While the HFA emphasized the effect of disaster risk reduction (DRR) on the development and poverty eradication, each nation’s responsibility for DRR, the need for support for developing countries vulnerable to natural disasters, and the importance of international cooperation (UNISDR, 2007), the Sendai Framework aims to comprehensively understand and manage disaster risk in all dimensions of hazard, vulnerability, and exposure as well as to strengthen the disaster risk governance (UNISDR, 2015). To this end, the Sendai Framework adopted the four priorities: understanding disaster risk, strengthening disaster risk governance, investing in DRR for resilience, and improving disaster preparedness and building back better (UNISDR, 2015).

As emphasized in the Sendai Framework, an effective disaster risk management should be based on understanding the risk at all levels of vulnerability, capacity, exposure to people and assets, hazard characteristics, and the environment. In this sense, the 2019 Global Assessment Report on DRR investigated the endeavor and progress in understanding and managing systemic risks. The report found that great progress has been achieved in previous decades in identifying risks related to specific hazards. However, it also insisted that assessing systemic risk should be done through a comprehensive and multidisciplinary approach. This has an important policy implication for designing effective response system. Assessing disaster risk focusing on specific hazard is not enough for coping with the systemic risk in

modern society since large-scale disasters often occur by the intersection of various system elements. It requires an engagement of a multitude of expertise from all fields of knowledge and all sectors of society.

Black Swan and Cascading Disasters

To prepare a response plan for catastrophic events having low frequency and high impact became an emerging issue in crisis and emergency management. Recent research found that the magnitude of damage and the frequency of disasters follow the power-law distribution and that the catastrophic events are in the long tail of the power-law distribution. Nassim Taleb called these catastrophic events “Black Swan,” which, judging by our limited experience, are unlikely to occur (Taleb, 2007). These extreme events were also referred to as “Dragon King” by French physicist Didier Sornette. He argued that these events are so extreme and different from small events that accompany them (Sornette, 2009). Since Dragon Kings do not occur frequently, it is very hard to standardize the response method, resulting in the difficulty in allocating required resources in advance.

Pescaroli and Alexander improved the conceptualization of catastrophic events having low frequency and high impact by focusing on the systemic environment in which these catastrophic events occur. They emphasized the need to respond to cascading disasters where the cascading effect is increasing and the secondary emergencies have a much stronger impact. Based on the investigation of various catastrophic events along with their cascading effects and vulnerability paths, they defined cascading disasters as “extreme events, in which cascading effects increase in progression over time and generate unexpected secondary events of strong impact” (Pescaroli & Alexander, 2015). Some cascading disasters can be more easily anticipated even in a complicated situation. For example, a major earthquake on a known fault may generate a tsunami that will displace populations, create a health crisis (overwhelming hospitals and causing epidemic), and cause socioeconomic problems (unemployment and intrafamilial violence). Many cascading disasters are more challenging to foresee, especially in a complex system. The difficulties of responding to those cascading disasters in complex systems may arise from the nonlinearity (e.g., the fear of a few persons can generate the entire group to completely irrational behaviors), the emergence (e.g., the sudden need of a very specific equipment such as a respiration may trigger a new response), and the interdependence (e.g., one ship in the Suez Canal blocked 13.5% of global goods for weeks with ripple effects for months).

Normal Accident and Systemic Approach in Safety Science

Perrow (1984) investigated the Three Mile Island accident that happened in 1979 at the nuclear power plant located in Pennsylvania and found that complex systems, such as nuclear power plants, hold a high probability of unavoidable accidents, called normal accidents, regardless of safety measures and devices. He insisted that a

system accident or normal accident may involves the unanticipated interaction of multiple failures, reflecting the characteristics of high-risk systems (Perrow, 1984). According to Perrow, accidents in modern society are closely related to complex technical and mechanical structures with embedded risks in our lives. In a highly complex system, individual technologies interact closely and inseparably through an endless loop. This complex system is prone to catastrophe whenever one of the interwoven elements becomes dysfunctional. Also, in tightly coupled systems, a disaster can be caused by complex interactions in which a ripple effect spreads due to a series of errors when a single element fails. The normal accident theory has an important policy implication for response management since it understands the systemic risk as a matter of organizational characteristics embedded in a societal system. The normal accident theory contributed to understanding the occurrence of accidents and human behavior patterns in the context of complex social-technical systems and influenced AcciMap, System-Theoretic Accident Model and Processes (STAMP), and Functional Resonance Analysis Method (FRAM) that tried to interpret accident analysis as a systemic model. The remarkable feature of the systemic approach is that it does not generate a specialized “accident model” consisting of defects and failures to find the cause of the accident. Neither system operates to cause an accident, nor does it interact to cause an accident at the moment when an accident happens. The system may deviate from the norm while functions interact to maintain the system, rather than failures are caused by the interaction of faults. Understanding system as a whole is another feature of the systemic approach.

Jens Rasmussen was a pioneering scholar who took a systematic approach for accident analysis. The research by Rasmussen and his colleagues is at the forefront of a new perspective on understanding “error” in that it “emphasizes the role of a wide range of environmental and political factors as well as organizational problems in the process of elucidating the cause of an accident” (Waterson et al., 2017). He advocates a shift of focus from the error to the dynamic interactions and mechanisms leading up to the error. Rasmussen illustrates this with his dynamic safety model of three boundaries forming a safety envelope that constitutes the workspace within which the system can work safely. The three boundaries are the boundary to economic failure, the boundary to unacceptable workload, and the boundary of functionally acceptable performance or the boundary to performance failure.

The main concepts of the “dynamic safety model” and the “risk management framework” proposed by Rasmussen are reflected in the AcciMap. The AcciMap shows the causes of accidents hierarchically according to the hierarchy of causality. The most direct cause (e.g., the subject of an accident or the condition of its occurrence) is indicated at the bottom, and the most fundamental but indirect reason (e.g., government regulation or political/social environment, etc.) is displayed at the top. It analyzes the cause of an accident according to the hierarchy, including government (e.g., political science, law, economics, sociology), regulators and associations, company, management, staff, and work (Rasmussen, 1997; Rasmussen & Svedung, 2000). The advantage of AcciMap is to find problems of the overall system and come up with solutions for improvement by linking the various factors that influence the occurrence of the accident into a single logical diagram.

In 2004, Leveson presented the System-Theoretic Accident Model and Processes (STAMP). The model describes systems as a “hierarchy of control based on adaptive feedback mechanisms” and explains how a failure to control system safety produces accidents in design and operation. Leveson’s STAMP adopted AcciMap’s hierarchy and regarded the system as the framework of the control system. The basic principle is that all systems have a built-in control relationship. STAMP assumes that if the control is done correctly, an accident does not occur, and if an accident occurs, a problem can be found in the control relationship. Leveson understands the system as a multilayered control structure based on an adaptive feedback mechanism. STAMP regards an accident as a matter of “control” rather than a matter of “failure.” It views an accident as a process in which several events are continuously and dynamically combined. In other words, in complex and intensive modern systems, accidents can occur even by the interaction between safe elements, and thus Leveson emphasizes that the focus of accident analysis should be on “securing the dynamic stability of the system” rather than “preventing failure” (Leveson, 2004, 2011). Since STAMP emphasizes hierarchical control to ensure the safety of system operation, it underlines that field workers and all actors, including related safety managers, executives, and politicians, participate in safety management. Therefore, it can identify complex accident causes that the existing linear causal model cannot explain.

In 2004, Hollnagel introduced the Functional Resonance Analysis Method (FRAM), which graphically illustrates systems as a collection of interrelated sub-systems and functions that perform at variant degrees. And when those variants’ resonance merge, they produce an emergent variation that is uncontrollable. Hollnagel’s FRAM takes functionality as its core concept, arguing that the system’s functions interact. FRAM focuses on finding out what is necessary for a system to operate well and which functions had not been implemented when an accident occurred (Hollnagel, 2012).

The four basic principles of FRAM are failure and success equivalence, approximate adjustment, emergence, and functional resonance. First, the equivalence principle of failure and success means that failure and success do not have different origins but that things can go well or go wrong for the same reason. Second, the principle of approximate adjustment is that the performance of social and technological systems, including individual humans or groups, is adjusted to external environmental conditions. Third, many consequences that appear suddenly or whose causes are unknown can be explained as emergencies. Finally, the relationship and interdependence between functions within a system should be understood as arising from functional resonance in a specific situation (Hollnagel, 2004). To explain the relationship between complex system functions, Hollnagel identifies the relationship and connectivity between functions through the following six elements: Input (I), Output (O), Preconditions (P), Resources (R), and Time (T), Control (C). FRAM tries to figure out which functions are essential through these six elements, how those functions should be performed, and if the functions were not performed in a specific situation, why they were not performed. The results of the analysis indicate what must be done to remain safe in the future. Analysis by FRAM does not start with finding the direct cause of the accident but with finding which function must be

performed. If such a function was not performed well, it tries to explain why it was not performed (Hollnagel, 2004).

The advantages of the systemic model gave the following implications to the multi-dimensional systemic response framework. First, the hierarchical structure in the AcciMap and STAMP implies that the systemic response measures should have hierarchical structures. Response policy should be set up in the central level where the roles of primary agency and support agencies are clearly delineated, and in the local level, the response measures should be implemented in a timely way through one united agency. Second, the interconnection between functions in the FRAM has the implications that the response strategy should consider the intersection between risk environment, risk type, and response measure. Third, it is crucial to find hidden risks by focusing on securing system functionality, rather than continuously chase failures.

Understanding the Features of Systemic Disaster Risk for Response Management

Concept of Systemic Disaster Risk

Studies on systemic risk and cascading disasters have been actively conducted in the DRR academia and the UN system. The investigation related them with complex networks and their association with an increasingly interconnected world (Pescaroli et al., 2018). COVID-19, which has hit the world from 2019 to the present, is characterized by a lack of knowledge about the virus, complex socioeconomic impacts, and high uncertainty due to a second emergency with high impact. COVID-19 has also affected several sectors, such as economic downturn, reduced educational opportunities, food security issues, and protection of human rights (United Nations, 2020). The recent accomplishment about the conceptualization of systemic risk was achieved by the Global Assessment Report on Disaster Risk Reduction 2019 (GAR 2019), which explored the nature of systemic risk in combination with the complex networks and increasingly interconnected world (McGlade et al., 2019). The GAR 2019 defined the systemic risk as “risk that is endogenous to, or embedded in, a system that is not itself considered to be a risk and is therefore not generally tracked or managed, but which is understood through systems analysis to have a latent or cumulative risk potential to negatively impact overall system performance when some characteristics of the system change” (UNDRR, 2019).

Schweizer and Renn (2019) explored the nature of systemic risk and suggested its five core elements: complex characteristics, having a transboundary effect, a stochastic relation between the triggers and their effects, a nonlinear relation including tipping points, and often being underestimated by policy makers and the citizen. This concept considers that when a problem occurs in one element or cluster of a system, it causes a chain failure in other elements or clusters in the system. A risk becomes systemic when a society’s essential systems, such as critical infrastructures and healthcare system, are potentially threatened (OECD, 2003). This cascading effect

can cause a severe error of the system or lead to a situation in which the entire system fails.

The COVID-19 pandemic made clear that viruses can be potential risk drivers for health systems and at the same time can threaten multiple other systems. The pandemic has systemic features. It generated a health crisis, but also triggered an economic crisis, an environmental crisis, and a humanitarian crisis (UNDRR, 2021). In addition to healthcare, COVID-19 affected all those systems upon which society depends on, including transport, energy, telecommunications, information management, trade, health, finance, education, chain supply, etc. In addition, the pandemic risk can be intersected with natural events, such as climate change and natural disasters. Nuclear accidents, which can release radioactivity along with damage to the plant systems and potentially impact the broader economy and public health, have been recognized as a typical “systemic risk” and have been discussed as the leading topic in disaster risk reduction and response management (Robin & Anne, 2012). The nuclear industry has always considered many dimensions of safety-related risk to prevent nuclear accidents, and the integrated risk management approach has been factored into the design and operation of nuclear power plants under these high safety standards. And the approach to risk management in the nuclear industry has evolved to become more reliable based on probabilistic risk modeling and lessons learned from the previous few accidents (IAEA, 2001). The nuclear sector has adopted a systematic approach to identifying the potential risks and finding strategies to manage the risk, and these strategies include a design with a conservative safety margin and backup system, high-tech, and safety culture, etc. along with an independent regulatory framework.

Based on the review of previous research and concept in various sectors including UNDRR, the authors found out that the systemic disaster risk is highly likely to cause the failure of the system as a whole due to a series of complex cascading interaction and that the likelihood of the catastrophic events can be described as a function among systemic disaster risk, response management and the threshold of the society. Therefore, this study conceptualizes the systemic disaster risk as the likelihood of a large-scale loss of life, injury, or destroyed or damaged assets in a system, society or a community as a result of the variability in the functioning of system elements and/or the interaction between elements in the society.

Notions of Risk Types for Systemic Response Management

From the response management perspective, disaster risk can be categorized into five types: anticipated risk (AtR), emerging risk (ER), amplified risk (ApR), lingering risk (LR), and mitigated risk (MR). Since this category was developed based on the study of systemic risk by UNDRR and academia, it can be applied to systemic disaster risk irrespective of hazard type. First, the AtR can be assessed qualitatively or probabilistically as a function of hazard, vulnerability, exposure, and capacities of the society. In general, the responsible authorities prepare response plans based on the anticipated scenario and implement standard operating procedure through

precise situational awareness. Next, ER is seldomly described in the disaster response plan, and thus the responsible authorities have difficulties in coping with the ER. At the very early stage, the ER is mainly caused by insufficient information and complexity, which often causes situational awareness error. It can be caused by societal endogenous factors, originating in ecology and socioeconomic or cultural behavior. Additionally, ER may occur when appropriate response measures reduce the target risk but create new types of risk in a highly connected society. Strengthened social distancing, for example, reduces the risk of infection, but leads to economic stagnation and weakened education. The third risk type is ApR that emerges because of inappropriate response measures. The inappropriateness may come from mal preparedness, such as an insufficient resource by lack of skilled responders, delayed execution due to a situational awareness error, and complex socioeconomic impacts by the original risk. The responsible authorities should pay very special attention to ER and ApR since such risk is highly likely to bring about cascading disasters, which may result in a national crisis. Fourth, LR is sustained when the pre-planned response measure does not mitigate all the target risk. LR needs to be monitored closely by the responsible authorities because it may cause a huge impact when coupled with certain conditions. The last one is MR, which is the objective of multi-dimensional systemic response. The best scenario for response management is to mitigate the original risk by taking all available response measures at the very earliest stage. However, there are increasing trends that original risk does not dissipate and becomes worsened or new types of risk emerge in a tightly interacting and interconnected society. To mitigate these types of risk, the responsible authorities must not stick to the existing plan but take an adaptive response by adjusting the response plan and mobilizing all available resources under a higher political leadership (Table 1).

Table 1 Risk types and their features from a response management point of view

Risk type	Features
Anticipated risk (AtR)	Assessed qualitatively or probabilistically before the event Used to define the scope of a disaster response plan Necessitate the implementation of pre-planned response measure in case of emergency
Emerging risk (ER)	Not described in the response plan and, due to the high uncertainty and novelty, hardly anticipated at the initial stage Occurs due to endogenous factor and/or when appropriate response measure mitigates the target risk, but creates new risk while coupled with high uncertainty, interconnectivity, and complexity of the society Necessitate the early assessment, rapid re-planning, and adaptive response
Amplified risk (ApR)	Results from the implementation of inappropriate countermeasures Necessitate early assessment, rapid re-planning, and adaptive response
Lingering risk (LR)	Remains even after the countermeasures were taken Necessitate close monitoring and adaptive response as needed
Mitigated risk (MR)	Goal of the multi-dimensional systemic response

Multi-dimensional Systemic Response Framework

This chapter proposes a multi-dimensional systemic risk response framework that political leaders and emergency planners can use to prepare well and respond effectively to catastrophic events and cascading disasters caused by systemic risk. The framework consists of five core elements: (a) identifying risk management flows and its components of risk environment, risk types, and appropriate response measures, (b) developing a strategic response map, (c) developing a multi-dimensional emergency plan using RMF and SRM, (d) applying the multi-dimensional systemic response to cascading disasters, and (e) taking the pre-planned and/or adoptive response measure at a very early stage and according to situational change and risk flow.

Identify Risk Management Flow

This effective response system requires a clear understanding of what types of risk appear due to the risk environment comprising hazard, vulnerability, exposure, and other features of the society and how those risks have been changed by the interventions with the responsible authorities and citizens. Kim et al. (2021) developed the concept of the risk management flow to help political leaders and emergency planners identify the risk environment, risk types, and the appropriate response measures systematically. In the study of Korea's response to COVID-19, Kim et al. (2021) stated that the risk environment should include not only traditional elements of hazard, vulnerability, and exposure but also high uncertainty, interconnectivity, and complexity of the society. The study also found that various types of risks, such as emerging risk and amplified risk, had appeared and been affected, for better or worse, by the response measures taken by the affected society (Kim et al., 2021). The risk management flow (Fig. 1) shows that the risk environment, risk

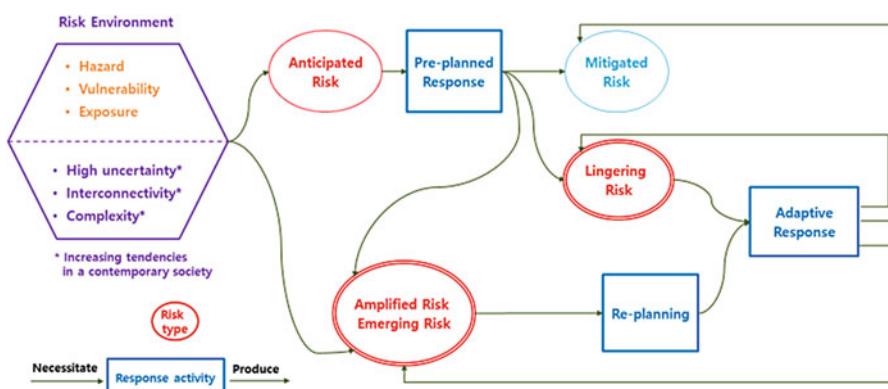


Fig. 1 Risk management flow revised from Kim et al. (2021)

types, and response measures are related nonlinearly and illustrates which risks emerge from the risk environment and how those risks are affected, better or worse, by the response measures.

The conventional risk management is to assess risk probabilistically by estimating hazard, vulnerability, and exposure. Such well-defined risk works as a strong basis for disaster response plan. However, the increasing features of modern society, such as high uncertainty, interconnectivity, and complexity, tend to generate unanticipated risk that cannot be dealt with by the pre-planned response measures. Therefore, the risk environment for systemic disaster risk should consider both the increasing features and conventional risk factors, such as hazard, vulnerability, and exposure.

Develop Strategic Response Map Using Risk Management Flow

The first step is to predict and draw anticipated risk (AtR) from the risk environment composed of risk factors, hazard, vulnerability, exposure, etc. AtR is a risk that can be determined in advance by analyzing past similar events and scientific knowledge and often work for a basic guideline for developing a disaster response plan. The second step is to estimate the emerging risk (ER) of which the probability is unknown. In general, ER has not been seen in the past. ER refers to a risk that is impossible or unnecessary to allocate resources in advance because the occurrence is unpredictable or extremely unlikely. However, its secondary emergency is severe unless it is tackled by appropriate measures.

The next step is to derive the response measures necessary to deal with ER and AtR that may appear early and then connect them with the corresponding risk. Response measure means the actions to be performed to reduce the risk in the organizational unit. In general, response measures need to be described in the form of a verb. For example, when there is a risk of the influx of a new coronavirus from overseas countries, the appropriate response measures are to strengthen the monitoring of inbound travelers at the airport and to operate an emergency response center. The response measures for ER and AtR occurring at the early stage are often different. ER requires either modifying the existing plan to match reality or finding and implementing an entirely new response plan since there is no pre-prepared response plan. For AtR, the responsible authorities should promptly implement pre-planned response measures that were described in the disaster response plan and mastered through training.

The response measures implemented to cope with ER and AtR produce the four results. First, if an appropriate response measure is implemented in a timely manner by mobilizing sufficient human and financial resources and equipment, the situation is terminated by reducing the risk according to the best-case scenario set in the disaster response plan. However, the responsible authorities should be prepared for the possibility that the best-case scenario will not work out. The initial response may be delayed or a response measure that is not suitable for risk resolution may be implemented. This often occurs in situations where situational awareness errors are

likely to occur due to insufficient information in the initial phase. For example, in the early stages of COVID-19, the infected continued to engage in social activities without being informed by the responsible authorities, which resulted in a wider spread of the new virus. This was caused by a lack of information and high uncertainty of the hazard. If such an inappropriate response is implemented, the risk will likely be amplified. This second result type may cause a severe secondary emergency, and thus an adaptive response should be made by quickly modifying the existing plan. Third, response measures reduce the target risk but may create new risk when it is closely coupled with complexity, interconnectivity, and high uncertainty of the society. For example, strengthening social distancing may lead to an economic downturn while reducing the infection risk. The responsible authorities should monitor these unanticipated risks when implementing the countermeasures and take rapid action when the new risk emerges. Finally, responsible authorities should prepare for the situation that the implemented response measure has been effective to some extent and the risk is partially mitigated. Lingering risk by itself does not cause much damage, but it can cause significant damage if conditions are met at some point. The responsible authorities should not estimate the situation optimistically but should find lingering risks and implement adaptive measures to mitigate them. Figures 2 and 3 exemplify the application of the strategic response map to two systemic disaster risk: pandemic crisis and nuclear power plant accident.

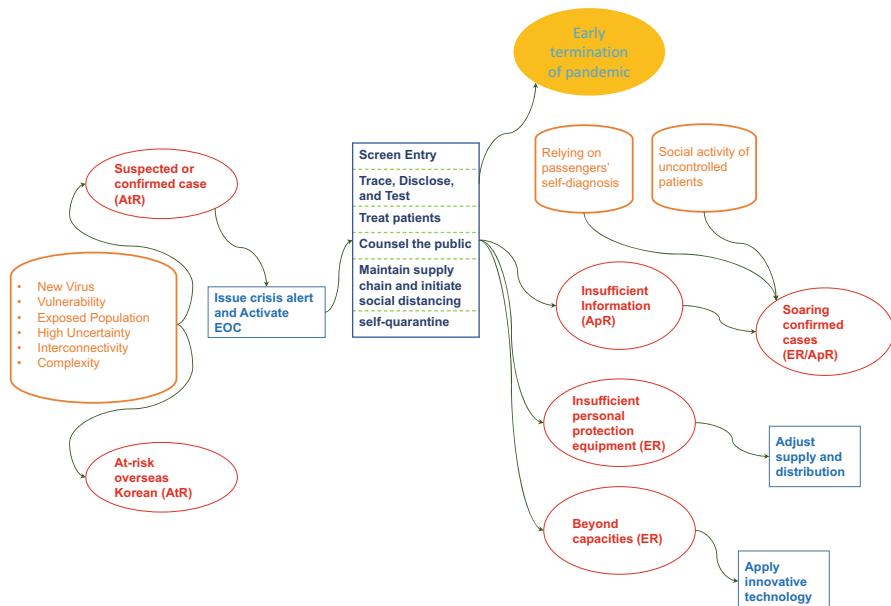


Fig. 2 Strategic response map for pandemic crisis retrieved from Kim et al. (2022)

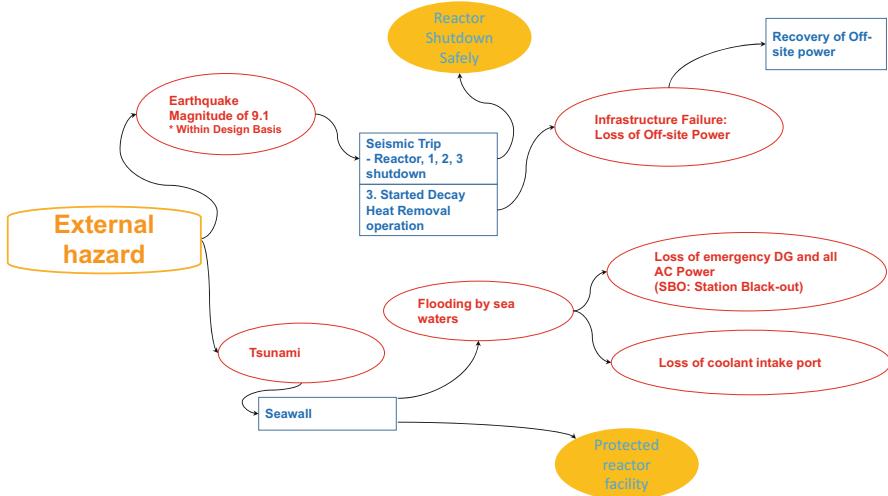


Fig. 3 Strategic response map for nuclear power plant accident

Develop a Multi-dimensional Emergency Plan Using RMF and SRM

To properly apply the SRM to the actual situation requires clear roles and responsibilities, necessary resource allocation, repeated training and mastery, and a legal and institutional environment to be equipped before the event. On top of this, the capability to flexibly modify the response plan needs to be cultivated in the training process when the real-world case does not go as planned due to the increasing features of contemporary society, such as complexity, interconnectedness, and uncertainty. The extent of damage or disaster pattern is often determined by how to respond in the early stage. The responsible authorities, including the primary agency and all support agencies, should develop emergency operation plans that include the requirements presented above and train themselves assuming real situations. In this multi-dimensional emergency plan using SRM, response measures should include the following four dimensions: actions, responsible authorities, resources, and enabling environment. These four elements included in the RM must be completed by the primary agency and all support agencies, such as the Ministry of National Defense and the National Police Agency, respectively. The countermeasure means pre-planned policies to mitigate the predicted risk. The countermeasure in general needs to be taken by the primary responsible agency. Next, the responsible authorities should be described, including the primary agency to take the countermeasure and all support agencies. The resource include equipment, financial resource, and an expert list, which needs to be allocated to implement the countermeasure. Finally, the emergency plan should include the legal base for implementing countermeasures and allocating resources.

Conclusion

Disaster response planning has progressed substantially; however, it remains frustratingly bogged down as some major impacts were not anticipated, resulting in millions affected by the 2011 Thai flood, the 2011 East Japan earthquake, the 2010 Haiti earthquake, and the ongoing COVID-19 pandemic. The traditional disaster response method is to analyze risk factors and vulnerabilities, predict risks in advance, establish a response plan, and execute it in case of an emergency. The prompt implementation of the planned countermeasures by the responding agency is effective in reducing most risks and can be realized by response manuals and trained responders. However, the modern society see the increasing features of complexity, interconnectedness, and uncertainty, which often results in unexpected or emerging risk.

This study aimed to improve the response management by better anticipating unexpected impacts which will increase as modern society becomes even more interconnected and interdependent. To this end, the authors proposed a multi-dimensional systemic response framework, consisting in risk management flow, strategic response map, and multi-dimensional emergency planning, which can help countries respond effectively to the systemic disaster risk that threatens the safety of modern society. The response framework adopts the notions of risk types from a response perspective, anticipated risk, emerging risk, amplified risk, lingering risk, and mitigated risk, and applies the risk management flow to address various risks in an emergency.

Developing strategic response map and multi-dimensional emergency plan and applying the response framework in a national crisis will help countries prepare for and respond to systemic disaster risk, which will result in reducing the uncertainty of disaster response. The authors hope that political leaders and emergency managers will use the multi-dimensional systemic response framework to identify emerging issues, make evidence-based decisions, and integrate administrative efforts through democratic processes.

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Policy Change in the Wake of Major Disasters

70

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Contents

Introduction	1106
A Conceptual Framework for Policy Change in the Wake of Major Disasters	1107
Policy Change, Window of Policy, and Focusing Events	1107
KL's Policy Change After Disaster (PCAD) Model	1109
Public Need	1111
Problem Identification	1111
Political Leadership	1111
Administrative Effort	1112
Major Policy Change	1112
Public Need	1112
Problem Identification	1113
Political Leadership	1113
Administrative Effort	1114
Major Policy Change	1114
Public Need	1115
Problem Identification	1116
Political Leadership	1116
Administrative Effort	1117
Major Policy Change	1117
Policy Implications	1118
Conclusion	1120
References	1120

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Abstract

Disasters have been regarded as a source of lesson-drawing and major driver of policy change. This study aims to propose a policy change model related to catastrophic events and test its usefulness. The PCAD model suggested in this study can handle dynamic interactions among various actors. The authors applied the PCAD model to the five cases of policy change in Korea and the United States and identified four policy lessons. First, policy change after disasters is likely to happen by the interaction of the following four streams: citizens' interest and demand for institutional reform, problem identification, political leadership, and administrative effort. Second, large-scale disasters do not necessarily entail changes in disaster response organizations and laws. Disaster response organizations and laws can be improved only when the citizens, governments, politicians, and the media pursue change with a strong will. Third, in general, policy changes cannot solve all the problems embedded in the society, implying that vulnerability remains and thus a catastrophic event can occur when certain conditions are met. Finally, the government should prioritize enhancing the national disaster response system so that it can appropriately respond to all types of risks.

Keywords

Policy change · Major disaster · PCAD · Institutional form

Introduction

Catastrophic events causing tremendous casualties and property loss are likely to bring about a national crisis. In other perspectives, they can provide an opportunity to lead policy changes for resilience building by enhancing disaster-related laws and strengthening organizations for disaster risk management. Policy change takes various forms, ranging from an intense form, including the constitutional amendment or the enactment of laws, to a slightly weak form, such as the behavioral change of public officials and the change of administrative order.

A large-scale disaster tends to bring about media attention and citizen's request to improve the disaster risk management system. The typical examples include the establishment of the Department of Homeland Security after the September 11 terrorist attacks in 2001, the strengthening of FEMA's roles and responsibilities after Hurricane Katrina in 2005, and the establishment of the Ministry of Public Safety and Security after the Sewol sinking accident in 2014 in the Republic of Korea. However, all the attention and requests do not lead to policy change. When the attention and requests are supported by enabling environments, such as administrative efforts and political will, policy change tends to happen.

Some academic achievements are Birkland's Event-Related Policy Learning model, Kingdon's Multiple Streams Framework model, and Kim's Disaster-Triggered Policy Change model. Based on these achievements, this chapter aims

to investigate the policy change process in the wake of major disasters, and to draw policy implications that each government can apply to establish a sound disaster risk management system based on the lessons from major disasters.

A Conceptual Framework for Policy Change in the Wake of Major Disasters

Policy Change, Window of Policy, and Focusing Events

Policy change refers to recognizing the problems of existing policies and environmental changes, preparing policy alternatives, going through the policy agenda formation process, and then modifying and confirming a policy alternative. Factors that promote policy change include changes in the policy environment, changes in public demand, and unexpected events. On the other hand, factors that hinder policy change include psychological resistance, political coalition against change, political burden, and high cost.

Policy change has diverse types. The most apparent form of policy change is the revision of a constitution, the drafting of significant laws, or the complete revision of existing acts. Weak forms of policy change include changes in the behavior of “street-level bureaucrats” or amendments to regulations. The representative models to explain policy change include Hofferbert’s Policy Output Change Framework (POCF), Sabatier’s Advocacy Coalition Framework (ACF), Hall’s Paradigm Change Framework, Kingdon’s Policy Stream Framework (PSF), Birkland’s Event-Related Policy Learning (ERPL) model, and Kim’s Disaster-Triggered Policy Change (DPC) model. Among the various policy change models, this study focuses on the research of Kingdon, Birkland, and Kim since these models are suitable for analyzing the policy change process that occurs because of the interaction between several factors that occur after a major disaster. Etkin (2014) argued that when a major disaster happens, the interest and criticism of the public, the media, and the National Assembly explode, and policy changes occur through the appearance and interaction of numerous policy alternatives and many players. He also insisted that the Garbage Can Model (GCM) suggested by Cohen et al. (1972) could explain this process precisely.

Kingdon proposed the PSF model to better explain the roles according to the interests of various participants by further enhancing the GCM. Since Kingdon proposed the PSF, also known as the “policy window” theory, as a model for policy agenda-setting, the model has been applied to various areas, such as policy change, policy formation, policy execution, and policy evaluation. Policy change occurs when the three flows of policy problems, politics, and policy alternatives are combined while flowing independently according to their own rules. Kingdon argued that a policy window would open during the flow of three streams when a dramatic event and a political event occur in the process of the three streams and act as a triggering device. When each stream develops independently and combines at critical junctures, this combination creates an agenda change (Kingdon, 2010). The

problem stream refers to the interest of government officials on various issues (Kingdon, 2010). The flow of politics consists of the national mood, public opinion, election results, change of administration, partial or ideological distribution within the parliament, and pressure from interest groups (Kingdon, 2010). Politics has a strong influence on setting new agendas (Kingdon, 2010). Policy alternative flow refers to the process in which various policy alternatives are established through the policy community, including researchers, parliamentary staff, planning, evaluation and budget office staff, and interest group analysts (Kingdon, 2010). The policy window opens for a short time when the conditions for putting a given topic on the policy agenda are met (Kingdon, 2010). A significant change in public policy can happen when such a policy window opens (Kingdon, 2010).

To explain the triggering impact of policy change, Kingdon (1995) introduced the concept of a focusing event on the study of the agenda-setting phase of public policy. He insisted that social shock events including crises and disasters should be an essential factor inducing policy change. Kingdon's study on policy change including the concept of policy window, multiple streams, and focusing event laid the foundation on the research of institutional reform and legal enhancement in the wake of major disasters by Birkland and Kim. Birkland (1997, 2006) applied the concept of focusing events on disasters and accidents and found that the focusing event could affect the setting of the agenda. Birkland (1997, 2006) insisted that a focusing event, such as a major disaster, could function as a triggering device, influencing policy flow by attracting attention to ideas that were not formed before the event. He also argued that a new opportunity could occur to review policies considered politically unappetizing or unnecessary. Birkland analyzed whether disasters could cause policy change beyond agenda change and how much their impact would be. He found that policy change might be triggered by focusing events, such as major accidents, natural disasters, and catastrophes due to terrorist attacks. He also proposed the concept of "potential focusing event," noting that a disaster does not necessarily lead to policy changes that the possibility relies on various conditions.

The ERPL model proposed by Birkland (2006) assumes a linear relationship that goes through the following stages: the occurrence of an event, increased agenda attention, group mobilization, discussion of ideas, and adoption of a new policy while considering the possibility of learning outcomes being forgotten (Sapat et al., 2011; Birkland, 2009). He analyzed the process of the establishment of the Department of Homeland Security after 9/11 through the ERPL model. After the 9/11 terrorist attack, the focusing event and interest in an agenda based on safety, such as homeland, aviation, and cyber safety, increased. The report of the Hart-Rudman Committee was adopted, which included the concept of homeland security by collecting opinions from various sectors of society. Afterward, the Department of Homeland Security was established by integrating the core functions of improving aviation security and improving confidentiality and information sharing, border patrol, and the Immigration and Naturalization Service.

Kim (2018) found that the magnitude of disasters, such as death tolls and property loss, and their frequency followed the power-law distribution by analyzing a total of 1019 disasters that occurred in Korea from 1948 to 2015. Among 1019 disasters, the

number of potential focusing events was 38 and focusing events were recorded to 22. He also found that all the catastrophic events causing huge human loss were in the long tail of the power-law distribution. In addition, Kim (2018) scrutinized how large-scale disasters affected the change of disaster-related laws and organizations coordinating disaster risk management in Korea. To this end, he referred to Birkland's argument that the learning process takes place in the executive and legislative branches after a focusing event like a large-scale disaster. The possibility of policy change increases because of this learning. He also referred to Kingdon's multi-stream concept, considering policy change because of the interaction of various flows that occur after a large-scale disaster.

By using these concepts, he analyzed the process of improving disaster-related laws and emergency response institutions after the collapse of the Seongsu Bridge in 1994 and the collapse of the Sampoong Department Store in 1995. On October 21, 1994, the Seongsu Bridge in Seoul collapsed, resulting in 49 casualties. The day after the accident, President Kim ordered the revision of the construction-related laws and the expulsion of the insolvent construction company. Three days after the accident, President Kim issued a special discourse apologizing to the public. The National Assembly enacted the Special Act on Safety Management of Facilities (Act No. 4922) on January 5, 1995, as a result of various debates about the measures to prevent a recurrence. The government implemented safety inspections on public facilities, including all the bridges across the Han River, and conducted reinforcement work for aging facilities (Kim and Sohn, 2018).

On June 29, 1995, the Sampoong Department Store located in Seoul collapsed, resulting in 1439 casualties (502 dead and 937 injured) (NEMA, 2009). After the collapse of the Sampoong Department Store, President Kim declared the site and the surrounding area as a special disaster zone and promised to establish a safety culture and expel poor construction. The National Assembly held a special committee to investigate the accident 2 weeks after the accident, adopted the state investigation plan for the Sampoong Department Store collapse, and conducted a state investigation (July 12, 1995–August 11, 1995).

The frequent occurrence of large-scale accidents in the 1990s increased public interest in technological disasters. Reflecting this, on July 18, 1995, the Disaster Management Act was enacted to manage human-caused disasters comprehensively. On October 19, 1995, an organization dedicated to human-caused disasters was established in the Ministry of Home Affairs and the rescue organization was strengthened.

KL's Policy Change After Disaster (PCAD) Model

This study proposes a Policy Change After Disaster (PCAD) model to explain the dynamic interactions of various elements in the wake of a catastrophic event, leading to a policy change, such as institutional reform and legal enhancement. The model was developed based on the achievements by Kingdon, Birkland, and Kim, which includes a window of policy, focusing event, and risk environment. Using the PCAD

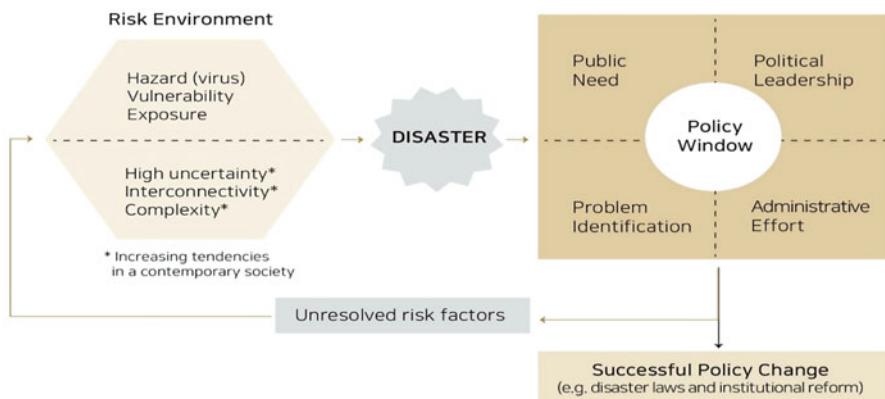


Fig. 1 Policy change after disaster model

model, the authors investigated the improvement of disaster risk management institutions and disaster-related laws after Typhoon Rusa (2002), Typhoon Maemi (2003), Daegu subway fire (2003), and Sewol Ferry sinking accident (2014). Based on the study, the authors insist that after a catastrophic event, the public need, political leadership, administrative effort, and problem identification arise. The policy window opens, resulting in the change of organizations and laws for enhancing disaster risk management. More specifically, a catastrophic event is highly likely to happen when natural, technological, or social hazards are coupled with vulnerable environments, such as a population concentrated in a low-lying river basin, a mal-constructed building(s), and settlements in areas at risk of landslides. Such a large-scale disaster draws the public's attention and increases the interest of the media, which would be followed by the flow of politics such as the President's special statements and firm instructions, the urging of the National Assembly for improvement measures, the flow of policy alternatives including the activities of the Prime Minister or related ministers, the preparation of the government's improvement measures, and the flow of problem including audit reports and investigations on the cause of accidents. Policy changes occur as a window of policy opens and improvement measures are adopted and implemented. Since such a policy change cannot solve all problems, the vulnerable factors remain and trigger a focusing event when certain conditions are met. Therefore, continuous monitoring of weak factors and activities to increase society's resilience is needed. Figure 1 shows the Policy Change After Disaster (PCAD) model developed by Kim and Lee.

In August 2002, Typhoon Rusa caused property damage of KRW 6.1 trillion and 270 casualties, the largest damage to Korea since Typhoon Sarah in 1959 (NEMA, 2009). The very next year, in September 2003, Typhoon Maemi, which recorded the lowest central atmospheric pressure of 950 hPa since Korea's meteorological observations, caused property damage of KRW 4.4 trillion and 148 deaths and missing persons (NEMA, 2009). On February 18, 2003, a large-scale fire caused by arson occurred in the Daegu subway, causing 192 death, 21 missing, and 151 injured. The

authors investigated how the changes in disaster risk management policy had been affected by public needs, problem identification, political leadership, and administrative effort that the PCAD model identified as critical elements for policy change in the wake of catastrophic events.

Public Need

As Typhoon Rusa was expected to make landfall, 7 cases were reported before the disaster, 26 cases during the disaster stage, and a total of 299 cases after the disaster. In the case of Typhoon Maemi, 56 cases were reported during the typhoon period and 129 cases during the week after the typhoon occurred. This increase in media reports shows that Typhoon Rusa and Typhoon Maemi were the subjects of social attention.

When the Daegu subway fire accident occurred on February 18, 2003, all broadcasting stations delivered breaking news and broadcasted the situation. On the day of the accident, 60% of the news reported the accident as a distinctive feature. From February 18, 2003, to March 4, 2003, significant broadcasters reported the accident a total of 457 times. Among them, 140 cases (20.4%) of accident investigation, 97 cases (20.4%) of safety measures, 85 cases (17.9%) of human casualties, and 40 cases (8.4%) of other subjects were recorded. This showed the high demand of the public for the improvement of managing human-caused disasters (Song & Lee, 2003).

Problem Identification

Several organizations, including the Board of Audit and Inspection, analyzed the reasons for the large-scale damage caused by Typhoon Rusa and Typhoon Maemi. The investigation reports included organizational problems such as insufficient coordination of disaster management along with technical problems such as the insufficient implementation of measures to secure dam safety in preparation for extreme weather events, the poor flood control policies, and regulations related to river zones (Board of Audit and Inspection of Korea, 2003a). The report of the Board of Audit and Inspection on the Daegu subway fire analyzed that several complex factors, such as insufficient disaster management system, insufficient morality of train manufacturers and supervisors, lack of training of train crew, and inferior flame retardancy performance of interior materials of trains, interacted and brought about the catastrophic impact (Board of Audit and Inspection of Korea, 2003b).

Political Leadership

When Typhoon Rusa started a path of destruction, President Kim held an emergency ministerial meeting to designate the area damaged by the typhoon as a special

disaster area and restore the damage as soon as possible. When massive damage occurred due to the Daegu subway fire (February 2003) and Typhoon Maemi (September 2003), the President ordered a rapid restoration of the damage and improvement of the disaster management system.

In the National Assembly, after the Typhoon Rusa, Typhoon Maemi, and Daegu subway fire, a special committee was formed and operated to find out the cause of the damage and requested the government to take measures to prevent the recurrence of the damage as soon as possible.

Administrative Effort

After Typhoon Rusa, the Daegu subway fire, and Typhoon Maemi, the government closely cooperated with the affected local governments to provide central support for damage management and prepared a plan for improving the disaster risk management system to prevent the recurrence of accidents. To prepare measures to prevent repeated floods every year, the Flood Damage Prevention Countermeasures Planning Group was established in 2002 and established comprehensive flood prevention measures. In 2003, the National Disaster Management System Planning Group was launched, and the relevant ministries and experts from academia and business sectors participated in developing a comprehensive plan for effective disaster risk management.

Major Policy Change

The major policy changes made after Typhoon Rusa and Typhoon Maemi and the Daegu subway fire were the enactment and revision of the Disaster Management Act and the strengthening of the emergency response organization. After Typhoon Rusa, in September 2002, the Natural Disaster Countermeasures Act was amended to create a “special disaster area.” In 2004, the Framework Act on the Management of Disasters and Safety was enacted to integrate the Natural Disaster Countermeasures Act dealing with natural disasters and the Disaster Management Act dealing with human-caused disasters. In 2005, the Natural Disaster Countermeasures Act was completely revised by introducing new systems to improve the prevention and recovery of natural disasters dramatically. Significant institutional reform was the establishment of the National Emergency Management Agency (NEMA) in 2004. The NEMA was the first independent organization in charge of natural disasters, human-caused disasters, fire prevention, and civil defense (Fig. 2).

Public Need

The sinking of MV Sewol occurred on April 16, 2014, and 304 out of 476 passengers and crew died in the disaster. Among the 304, around 250 were students from Danwon High School in Ansan City. After the incident, 132,186 articles (as of

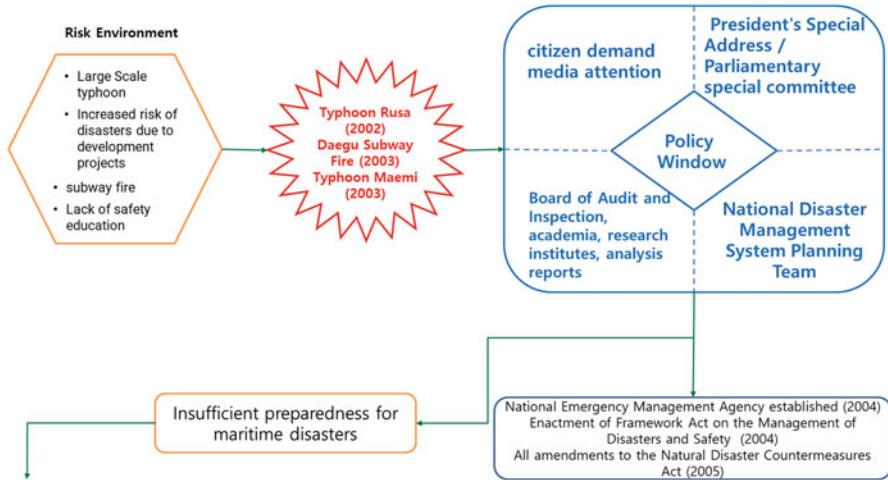


Fig. 2 Policy changer after Typhoon Rusa, Typhoon Maemi, and Daegu subway fire accident

2014) containing the keyword “Sewol” were reported, with more than 300,000 SNS records. After the media reported the sinking, the media reported in detail the cause of the accident, the rescue situation, and the current state of damage, and the public’s attention was focused.

Problem Identification

Several organizations, including the Board of Audit and Inspection, investigated and analyzed the cause of the Sewol ferry sinking. The ship’s resilience was weakened at the time of operation due to an unreasonable expansion and remodeling. Also, on the day of the accident, there was a problem in restoring the balance of the ship because it was loaded with about twice the maximum cargo capacity and did not comply with ballast regulations. The crew renounced their duty to save the lives of passengers without a proper initial response. In addition, systemic problems were also identified. As regulations on vessel operations were eased several times, vessel safety inspection standards were weakened, and the Enforcement Decree of the Seafarers Act allowed the captain to act on behalf of others so that an inexperienced navigator at the time of the accident was in charge of the operation. In addition, the Coast Guard’s poor initial response and shortage of diving rescue personnel were also revealed.

Political Leadership

On May 19, 2014, President Park announced a public discourse related to the Sewol ferry disaster. At this time, the President made an official apology, announcing the dissolution of the Coast Guard, and announcing that the maritime rescue and

maritime security sectors would be transferred to a newly established ministry. The National Assembly formed a special committee to investigate the sinking of the Sewol and worked hard to find out the truth of the tragedy, to support divers and to boost morale, to prepare measures to support victims' families, and to enact a special law for the Sewol ferry.

Administrative Effort

At around 9:10 a.m. on the day of the accident, the Korea Coast Guard activated the rescue headquarters, and the Ministry of Oceans and Fisheries formed the Central Disaster Management Headquarters to deal with the accident. And around 9:45 a.m., the Central Disaster and Safety Countermeasures Headquarters was in operation. On April 20, 2014, the Prime Minister held a meeting of relevant ministers and decided to declare Ansan City, where Danwon High School is located, and Jindo County, where the accident occurred, as special disaster zones, and the agenda was immediately approved by the President. At the meeting of the Central Disaster and Safety Countermeasures Headquarters held on April 23, the government first provided financial and state support for physical and mental treatment expenses for the injured, Danwon High School students, faculty, and rescue workers who did not board the Sewol ferry. For the cost, it was decided to exercise the right to indemnity against the Chonghaejin Shipping Company and others. And recognizing the problem that private diving rescuers who went to search for victims were not being paid wages and were working for a long time in a dangerous environment, on June 17, 2014, the government prepared a payment plan to pay them immediately.

Major Policy Change

As the amended Government Organization Act came into force on November 19, 2014, the Ministry of Public Safety and Security, a ministerial-level ministry directly under the Prime Minister, was newly established to take charge of the national disaster and safety management. The Korea Coast Guard and National Emergency Management Agency was renamed to the Maritime Police Safety Headquarters and the Central Fire Department, respectively, and belonged to the Ministry of Public Safety and Security. The Ministry of Safety and Public Administration, which had been in charge of the overall disaster and safety functions, was reorganized into the Ministry of Government Administration and Home Affairs in order to take charge of local autonomy, government organization management, and other administrative affairs. In addition, the Special Act for Investigation of the Facts of the April 16 Sewol Ferry Disaster and Construction of a Safe Society, etc. (Law No. 12843) containing information on the formation and operation of a fact-finding committee for the investigation into the truth of the Sewol ferry disaster was enacted on November 19, 2014. On January 28, 2015, the Special Act for Relief and Support for Damages from the 4·16 Sewol Ferry Disaster (Act No. 13115) was enacted. And

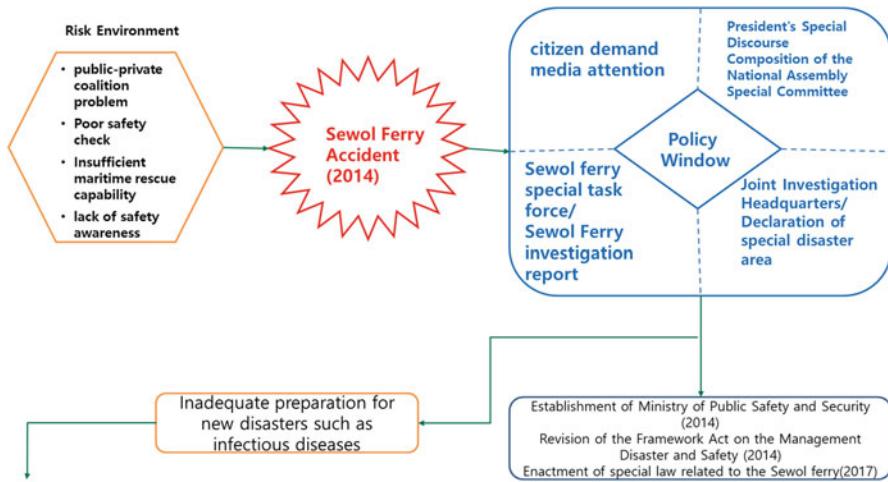


Fig. 3 Policy changer after Sewol ferry accident

on March 21, 2017, the Special Act on the Establishment and Operation of the Sewol Ferry Hull Investigation Committee (Act No. 14734) was enacted, which stipulates matters related to the hull investigation after the Sewol ferry salvage (Fig. 3).

Public Need

On August 29, 2005, Hurricane Katrina struck the southeastern United States. Louisiana's governor declared a state of emergency for the state before the hurricane landed, and asked President Bush to declare a federal state of emergency. This has enabled FEMA to organize and mobilize resources to help New Orleans residents. The Mayor of New Orleans issued a voluntary evacuation order on August 28, and the Superdome was opened for residents who could not leave. After the direct hit of the hurricane, FEMA mobilized 1000 Homeland Security officials to provide assistance to the city. Despite these efforts, devastating damage including a total of 1836 fatalities and \$125 billion damage occurred. According to Birkland (2006), on November 10, 2005, a search for legislation containing the word "Katrina" in the Thomas database of the Library of Congress found that 48% of 293 items billed with Hurricane Katrina in the title. Also, 24% had the word "relief" in the title, and 9% and 5% mentioned "recovery" and "reconstruction" in the title, respectively. The word "preparedness" appeared in three bills (1%). However, the word "mitigation" did not appear in any legislation. Birkland (2006) pointed out that the absence of any mention of mitigation or preparedness meant that 2 months after the disaster, it was not a major concern of Parliament. It was one of the largest hurricanes in US history and attracted worldwide attention. At that time, the US media focused on official announcements, such as reporting the scale of the victims and the criticism of politicians in the affected area for the delayed relief activities.

Problem Identification

After the 9/11 terrorist attacks in 2001, policy attention and budgets were concentrated in the area of homeland security, and preparations for natural disasters were neglected. FEMA focused on relief after the damage occurred, and its expertise and role in risk reduction and disaster response were weakened. Based on this awareness of the problem, the US Senate Committee on Homeland Security and Governmental Affairs prepared the Hurricane Katrina Investigation Report. In this report, what the government did well and what it did wrong was identified, and it was recommended to reorganize the national disaster management system to respond quickly and effectively in the event of a similar disaster. Specifically, it was to create an organization with full authority to take charge of disaster preparedness and response and to empower local and state governments to respond. The problems pointed out in the US Senate's 2006 report (*Hurricane Katrina: A Nation Still Unprepared*) are as follows. First, all government-level roles that had to plan and prepare for the ripple effect caused by Katrina failed. Second, it failed to draw attention to the growing large-scale disasters before the hurricane strikes, and it also failed to predict the landing date. Third, the government leadership failed to comprehensively consider the various response factors before the hurricane attack and did not recognize the problems of the existing response plan when faced with the worst-case scenario. Fourth, government agencies at all levels failed to formulate a plan to evacuate the elderly, sick, and disabled people in New Orleans in a timely and effective manner and failed to secure the means for evacuation. In addition, it failed to evacuate many citizens who did not have personal means of transportation. Fifth, the government has not acted on the lessons from the large-scale disasters of the past. It did not recognize that large-scale, well-equipped, and coordinated efforts to maintain order and repair damage were essential after catastrophic human-caused or natural disasters have occurred. Finally, the government failed to provide adequate medical assistance and temporary shelter in a timely manner for the numerous victims of large-scale hurricanes.

Political Leadership

At the time, while on vacation in Texas, President Bush looked around the scene through the window of his presidential airplane, receiving public criticism for doing so. President Bush was late to the scene and publicly praised Michael Brown, the director of FEMA, for being very proactive to respond to emergency. However, Brown failed to accurately grasp the situation and failed to respond appropriately, so he was fired 10 days after the incident. President Bush's approval rating plummeted to 30%, and his image changed from "strong leadership" to "incompetence."

President Bush recognized that the government's initial response to the disaster had failed. Therefore, he went on TV to apologize for the government's failure to

respond to the disaster and his actions. In 2006, the US Senate submitted a report on Hurricane Katrina: a nation still unprepared: special report of the Committee on Homeland Security and Governmental Affairs, which presented problems in the response process to Katrina and recommendations based on it.

Administrative Effort

The United States prepared a report containing 17 lessons learned and 125 recommendations and started work to prevent a recurrence and put it into practice through the Post-Katrina Emergency Management Reform Act of 2006. The Act authorizes FEMA to coordinate and support the federal government's disaster prevention, preparedness, response, and recovery activities. In addition, FEMA was given the authority to perform disaster management tasks, such as supporting transportation facilities in the event of a major disaster and identifying the unmet needs of victims. As such, FEMA has been given new authority for disaster management and has been able to bridge the gap for effective disaster response. The National Response Framework (NRF) has replaced the National Response Plan. The NRF aimed to improve consultation between state and local governments and to provide flexibility in disaster response. A "whole community" approach was taken in which all participants in the community can work together. The framework included new partners such as public health institutions, logistics, and supply chain management.

Major Policy Change

The Post-Katrina Emergency Management Reform Act defined the Federal Disaster Management Agency as a disaster response-focused agency that leads national efforts to prepare for or protect against natural, terrorist, and manufactured disasters. As a result, the status of the Federal Disaster Management Agency, which had been weakened under the Department of Homeland Security, was elevated, and the agency's independence was recognized to a substantial extent. In addition, the National Disaster Management Center was installed to unify disaster countermeasures, and a separate search and rescue team, the Urban Disaster Search and Rescue (US&R) Task Force, was also established and operated. In addition, the procedure was simplified so that direct federal intervention could be carried out quickly without intermediate processes, and disaster preparedness functions were strengthened to minimize damage in the event of an accident. In particular, the extent of private participation in the National Response Plan (NRP) has increased. From the planning stage, the scope of private participation was set in detail, and it was made so that it could be used at any time. For example, a large discount store near the disaster site is set in advance, and drinking water and food are automatically supplied immediately (Fig. 4).

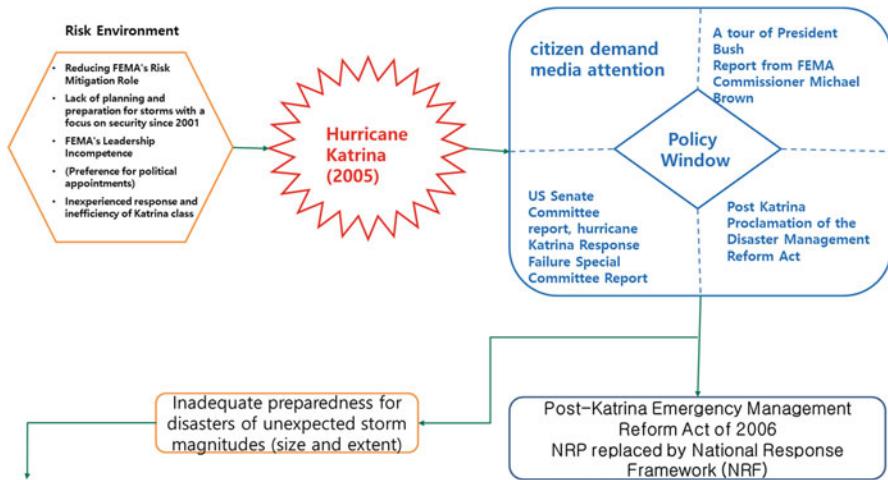


Fig. 4 Policy changer after Hurricane Katrina

Policy Implications

Understanding the process of policy change for disaster response after a major disaster that caused many deaths and massive property damage is essential to achieving a resilient society. By applying the PCAD model to cases in the United States and Korea, the authors were able to understand that disaster-related laws and emergency management organizations change along the path of various factors after a large-scale disaster, which can be considered a focusing event, occurs. In general, a catastrophic event will be followed by four main streams: citizens' interest and demand for institutional reform, problem identification, political leadership, and administrative effort. As these streams flow and interact with each other, policy changes occur as the policy window opens. Catastrophic events do not necessarily entail changes in disaster response organizations and laws. When citizens, governments, politicians, and the media, who have been greatly impacted by large-scale damage, pursue change with a strong will, the disaster response organization and laws can be improved. In Korea, after Typhoon Rusa in 2002, Typhoon Maemi in 2003, and the Daegu subway fire in 2003, the National Emergency Management Agency, the first independent disaster management agency, was established as a deputy minister-level organization, and the Basic Act on Disaster and Safety Management was enacted to integrate the management of natural disaster and human-caused disaster. And the Sewol ferry sinking incident in 2014 corresponded to the establishment of the Ministry of Public Safety and Security, the first ministerial-level disaster management organization. In the United States, significant functional reinforcement of the FEMA was achieved after the enormous impact caused by Hurricane Katrina in 2005, and the Post-Katrina Emergency Management Reform Act was enacted in 2006. These policy changes are typical examples of the PCAD model.

It is crucial to understand the content and direction of policy changes that occur after a large-scale disaster. Policy changes after a large-scale disaster should aim to establish a national disaster response system that can sufficiently respond to risks that can cause huge damage. Recent studies show that large-scale disasters that are considered extreme because of their low frequency are no longer extreme. In modern society, large-scale catastrophes with great social impact can occur at any time. Therefore, policy changes made after a disaster should aim to establish a disaster response system that thoroughly prepares for unpredictable large-scale disasters, on the premise that they can occur at any time. First, safety inspections and diagnosis of high-risk facilities such as old industrial complexes should be thoroughly conducted to reduce the probability of large-scale accidents. It is also important to increase the government's initial response capacity so that an accident does not develop into a national crisis. Regular training should be strengthened so that an exact situational awareness, prompt reporting, and appropriate measures by first responders can be made. Lastly, it is necessary to develop a response scenario for a national crisis that may occur and establish a system in which all relevant organizations can form a cooperative network to respond effectively.

Policy changes should be made in the direction of integrated management of all types of disasters according to the principle of comprehensiveness. An effective response to a national crisis requires strong leadership and authority to coordinate and control all ministries and local governments. The role of an overall coordination institution is essential in facilitating all actors, such as the central government, local governments, and civic groups, to participate in the entire process of the disaster management cycle and uniting the disaster management capabilities of all actors as a unity of effort. FEMA and DHS in the United States and NEMA and MPSS in Korea are representative examples of the overall coordination institution for disaster risk management. The important tasks of these coordination institutions include minimizing damage by efficiently mobilizing all resources according to the principles of standardization and flexibility by on-site response agencies, local governments, and line ministries to support the victims, restore damaged facilities, and provide disaster relief when a disaster occurs. To perform these tasks, the coordination agency must have the authority to comprehensively coordinate disaster responses among line ministries, local governments, and public institutions for all types of disasters, and trained officials to make prompt decisions under crisis.

Establishing risk governance in which all members of society participate which is essential to realizing a resilient society. Risk governance should be established to strengthen accountability in all sectors and strengthen cooperation among stakeholders. Reinforcing disaster response agencies and laws alone is not sufficient to cope with disasters in modern society, which are becoming increasingly complex and intensifying. Establishing risk governance that ensures the participation of all stakeholders is an essential element for establishing resilience at all levels of society. Such a system should be established based on the basic principles of governance such as responsibility, participation, norms, efficiency, and sustainability and should be established through disaster risk management systems and policies.

Conclusion

In this study, the Policy Change After Disaster (PCAD) model was proposed to explain the factors that induce policy change, such as institutional reform and legal reinforcement, after a disaster. The PCAD model was designed by adopting key elements of previous models, such as Kingdon's PSF (Policy Stream Framework) model, Birkland's ERPL (Event-Related Policy Learning) model, and Kim's DTPC (Disaster-Triggered Policy Change) model. The authors applied the PCAD model to investigate the five cases of policy change: the establishment of the NEMA in 2004 in Korea, the enactment of the Basic Act on Disaster and Safety Management in 2004 in Korea, the establishment of the MPSS in 2014 in Korea, the strengthening of the FEMA in the United States in 2006, and the enactment of the Post-Katrina Emergency Management Reform Act in 2006 in the United States.

The policy implications of the analysis are as follows. First, policy change after disasters is likely to happen by the interaction of the following four streams: citizens' interest and demand for institutional reform, problem identification, political leadership, and administrative effort. Second, large-scale disasters do not necessarily entail changes in disaster response organizations and laws. The authors found that disaster response organizations and laws can be improved only when the citizens, governments, politicians, and the media pursue change with a strong will. Third, in general, policy changes cannot solve all the problems embedded in the society, implying that vulnerability remains and that a catastrophic event can occur when certain conditions are met. Therefore, all actors, such as the central government, local governments, and civic groups, should monitor vulnerable factors continuously and strengthen activities to increase the resilience of society. Finally, the government should prioritize enhancing the national disaster response system so that it can appropriately respond to all types of risks. Responding effectively to national crises requires a central coordination institution having strong leadership and authority to coordinate and control all ministries and local governments. In addition, it is crucial for the coordination agency to have political leadership that makes it possible for all actors such as the central government, local governments, and civic groups to participate in the entire disaster management cycle. Policy changes after a large-scale disaster should be conducted in the direction of integrated management of all types of disasters.

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Part VI

Smart Cities and Technological Innovations for Disaster Management



Smart Cities and Technological Innovations 71 Towards Disaster Resilience

Amita Singh

Contents

Introduction: Understanding “Smart,” “Unsmart,” or “Smart Enough” Cities (The Connect with Disaster Management)	1126
Is There Greater Resilience Against Disasters in Smart Cities?	1128
Which Cities Would Be “Smart Enough” for Disaster Prevention?	1130
Conclusion	1131
References	1132

Abstract

The idea of smart cities emerged from a global concern for capacity enhancement of existing cities and their quest for sustainability of resource use for the rising urban population. The demand for essential services has been going beyond the carrying capacity of city’s available infrastructural ability to deliver. Urban areas bear disproportionate load of providing electricity, water, banking, housing, health, food, transport, and other support systems. Any scarcity or nonavailability of these resources increases vulnerability of citizens to varieties of disasters. While resilience building against disruptions of basic supplies remains the central objective of smart cities, there is no denying the fact that smart cities create technology determined spaces, which overlook inclusivity, justice, and equity. The management of enormous flow of data is expected to enable city managers to plan, provide, and adapt to contingencies of modern urban lives but it does not at any point indicate that the critical infrastructure would prioritize these democratic principles over which sustainability is built. This culminates into unreliable and uncommitted disaster preparedness with high possibility of divisive and

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exclusionary tendencies such as racism, speciesism, casteism, and prejudiced sexual orientations within which takes place an exclusion of poor, disabled, women, and weaker species who have no resources to control technology. Three questions become pertinent for any researcher on disaster management: first, what is the connect of smart city concept with disaster management? Second, is there greater resilience against disasters in a smart city? Third, which cities would be “smart enough” for disaster prevention?

Keywords

Critical infrastructure · Resilience · Contingencies · Speciesism

Introduction: Understanding “Smart,” “Unsmart,” or “Smart Enough” Cities (The Connect with Disaster Management)

To understand “Smart,” ‘Unsmart,’ or “Smart Enough” Cities is not a difficult exercise under traditional archetype of urban habitats. To begin with an oft-quoted description of an “Unsmart” city, one visualizes a city full of traffic congestion, garbage, water shortage, illegal constructions, shrinking green areas, corruption with impunity and crime. In sharp contrast, a “Smart” city is presumed to have overcome all these problems of an unsmart city, is clean, responsive, safe, and has respect for the rule of law. One can see that the contrasting factor between the two is that of “institutional functioning” alone due to which the city’s preparedness turns into its smartness. It is due to some smart institutions that much of good disaster management is expected to come naturally in a smart city not through technology alone.

The much publicized contemporary concept of a smart city can be understood through its differentiation from the traditional concept. How the three main drivers of change are located within the two may reveal their real nature. These three drivers are, i.e.; government, citizens, and corporates. Modern smart cities differ from the traditional ones in that the push for reform in the former comes from corporates and in the latter from citizens’ organized campaigns and protests against government inaction, apathy, and negligence. Ironically, standards and indicators for smart city ranking are picked up not by governance experts who would have rated “institutional functioning” as the key indicator but ranking has become a sole prerogative of the “Corporates” or “business investors.” Some of the key corporates that have been creating ranking systems for “Smart” cities are the IMD-SUTD Smart City Index, AT Kearney Global Cities Index, Mori-Foundation Global Power City Index (GPCI), and SECI Index by Smart Eco City Ltd., and top Corporates designing “Smart” cities are CISCO, PWC, Siemens, IBM, KPMG, and their few peers controlling this exercise from the top. So, a smart city today is what tech corporates want it to look like. Nowhere does one find any mention of a trajectory of a growing smartness of an “Unsmart” city as cities picked up to clothe in smartness are the cities which are already “Smart enough.”

If there is a smart city then there definitely would exist an “Unsmart” city too. Have the corporates reached out to “Unsmart” cities, which reflect inertia to any change and has any effort been made to transform them to “Smart” cities? One would gradually come to an understanding that cities are “Smart” or “Unsmart” due to their “institutions” and their “citizens” and not due to corporates, and therefore high HDI ranking cities were “Smart enough” for providing resilience and human security. So, is “Smart” a tech-implantation in a complete absence of any discourse on “institutional reforms”? Should the locus standi of the Ministry of Urban Affairs where “Smart City Mission” is located be questioned and shouldn’t DARPG (Department of Administrative Reforms & Public Grievances), which works on administrative and institutional reforms, stand up to reclaim its authority over this corporate mission?

As mentioned earlier, traditionally, cities were considered smart for their institutional outreach, simplicity of laws, and participatory governance. They were rarely “absolutely smart” but mostly “smart enough” to be inclusive and equitable as they collectively moved to reform institutional gaps. On the other hand, the new found “smart city” is smart because it applies many newfound smart technologies from the tech world of nanotechnology, Artificial Intelligence (AI), Cloud Computing, Machine Learning(ML), Internet of Things (IoT), Robotics, and Big Data analytics. This system is rooted into a virtual World Wide Web that stores information, conversations, decisions, and notifications on websites presuming that people are smart enough to access and afford them all whenever needed but ignorance of e-information is not pardonable for citizens in automated smart technology. A natural concomitant to this situation is that governments are no more duty bound to reach out to everyone as long as they are uploading all information in time on public websites. It is presumed that internet-based public information is reaching everyone. The premise of governance changes in a smart city. Therefore, while governments achieve greater capacity for focused and targeted action during accidents, calamities, and disasters as forecasting capacity of early warning systems increase and speedier solutions are obtainable, it nevertheless, brings benefits to only those with internet connectivity. So far smart cities demonstrate no innovative wisdom in taking everyone together as is traditionally understood for generating city’s social capital for inclusive governance. The much-hyped technological innovation of “smart cities” remains a corporate fiction or a “glib phrase” (The Advertiser (1996) ‘A Grand but Last Hurrah’, Adelaide, Oct. 29) as remarked by a newspaper in Adelaide calling it a “spin doctor’s latest wheeze” or a politically motivated sweetened phrase to please people.

In the September 2010, the New York Summit meeting between Bill Clinton and the service spirited Chairman of Cisco Board, John Chambers initiated the idea of Smart Cities. The global technology leaders agreed to bring a technology for change and development. The concern to make cities sustainable through digitization and to utilize digital networks for making cities more resilient to turbulence, accidents, and disasters in highly populated densities of urbanizing world technology of IoT and AI came as practical solutions. Following this meeting, a \$25 million project was launched in 2010. One could witness the returns to IT companies in selling

technology for Smart City projects. Cisco alone grew from \$70 million in the mid-nineties to \$1.2 billion and then an astounding jump to \$47 billion within 5 years. The global market for smart cities (Global Smart Cities Market Report (2022)) stood at USD 1226.9 billion in 2022 and with a compound annual growth rate (CAGR) of 25.8% from 2023 to 2030 (Market Analysis Report 2023–2030) the market is likely to reach USD 2.8 Trillion by 2027 (Smart cities: Global Strategic Business Report (2023)).

Francis Pisani in his book *A Journey through Smart Cities: Between Datapolis and Participopolis* (2015) calls it a gold rush for information technology market as data managers and tech experts outshine the participatory trends of city democracy. In India where the Smart City Mission started in June 2015 with around 100 smart cities to be built by 2020 now seems to extend much further. In the neighborhood Sri Lanka and Bangladesh, digital transformation is leading to Smart City initiatives such as connecting 2500 schools for smart education as in the former and for developing ultramodern power grids, green economy, and skills in a merit-based economy of the latter. European Smart Cities aim to improve quality of life for their citizens and achieve energy and climate targets. There is a world of difference between models of Smart Cities in South Asian region and that in the developed countries of North America and Europe. Whereas, smartness is to be achieved in South Asia from an “Un-Smart” urban area, North America and Europe are starting from an inherently smart environment of high HDI, advanced infrastructure, and a skilled digital economy. Nonetheless, there is greater fear of losing indigenous skills and social capital as governance is deflected from citizens to corporates in developing countries due to fast-track implantation of Smart Cities. The big question mark remains whether these nebulous technology models could bring smart-disaster management as well. In a recent disaster (ABP Live, 30th March 2023) at Indore in India, which is India’s no.1 ranked Smart City, the much delayed and deficient response of government’s rapid action force, emergency equipment, and medical support demonstrated unsmart disaster management. This suggests that even if Smart Cities have phenomenal databases and digitization, delivery to the last mile requires human effort or as Yeafesh Osman, the Science and Technology Minister of Bangladesh, appropriately sums up as possible “only if hardware, software and human-ware simultaneously integrate each other” (Prothom Alo English Desk (2022)).

Is There Greater Resilience Against Disasters in Smart Cities?

Smart Cities are considered smart due to their smart technology. For example, a fast response to disasters as a bare minimum is what ought to be expected of expensive smart technology installed in a Smart City. When IBM was working on the Smart City of Rio de Janeiro (Halegoua, 2020, p. 253) in 2012, three adjacent buildings collapsed in the city’s downtown area but the speed and manner in which ambulances, rescue teams, evacuators, shut down of gas stations and power and subway stations was achieved and then social media platform used to secure vicinity for movement of rescue operations came down as one of the best spectacle of “Smart-

ness” expected of a city. A model of staying prepared irrespective of human frailties is a design being promoted by top tech ICT companies for “smart-ness.” However, for technology too there are limitations to its autonomy. One can identify four conditions being primordial to its optimum performance and resilience building:

1. City’s decision-making system should be smart (or SMART which is a mnemonic acronym suggesting five traits of good project management), i.e., specific (simple and sensible), measurable, achievable, relevant, and time-bound. It requires educated, trained, responsible, and sensitive administrative system, which is accountable and performance oriented. There should be a separate and independent supervisory team to be watchful of performance evaluation and rating. The base of Smart City is embedded within institutional governance and not technology alone. An administrative system that governs the city such as the District Magistrate, Town and Country Planner, Municipal Commissioner, and Police Chief is the key to “Smart” cities.
2. Availability of City “Sensors” (ICT and human) to be able to provide real-time data, which could be swiftly understood, interpreted, and applied to take decisions during adverse conditions. This may not be a simple task as here arises an obvious need for “Metadata,” which is an outcome of a huge amount of data obtained from heterogenous sources of critical infrastructures of smart cities. Metadata synchronizes, authenticates, and integrates large volumes of data (Big Data and AI) to provide a holistic visual of a disaster (Sun et al., 2020). This could be connected to the Cloud or IoT to be freely available whenever needed.
3. Autonomy of information dissemination without human trespass need to be assured. The ICT System should be able to provide real-time data independently and autonomously so that even a freak incident is responded to without waiting for humans to understand, plan, and execute. Social media sites like Twitter, Facebook, and IoT can be great transmitting platforms for real-time data. Global Forest Watch (GFW) is an initiative of the World Resources Institute with an open source web application to monitor global forests and provide free real-time data for managing forest fires and other concerns.
4. Data visualization is a stupendous achievement of AI and 3-D Google Earth visuals. When Geo Spatial data (Sud, 2020) and Remote Sensing is combined with the experience and history made available in the databases, disaster management authorities may become better placed to visualize many disasters such as floods, landslides, fire, etc., in early event detection. High Resolution Satellite Imagery like the Cartosat One and Ikonos for a multisectoral and panchromatic imagery used to detect minor forest fires through its high detection capacity could also be used in high density, vulnerable city areas to enhance capacities of fire personnel. This capacity to visualize brings cost-effectiveness, better quantification besides saving lives by generating ability for prediction and reducing cascading damages.

Many authors (Ford & Wolf Charles, 2020) reflect upon the technology–community relationship in smart cities as brought out in the above points. He describes Smart cities as “ICT using communities which autonomously sense, store,

and make current information on community conditions that is easily available to community leaders and citizen's." However, to ensure availability and accessibility of information to community leaders and citizens, Smart Technology can only work in a society where citizens are laced with appropriate training, education, and also softwares for a sophisticated control over technology.

Which Cities Would Be "Smart Enough" for Disaster Prevention?

It is presumed that "Smart" cities provide faster response to disasters nonetheless being by-products of neoliberal economy (Greenfield, 2013; Grossi & Pianezzi, 2017). They may discount equity and inclusive approach in their response. Raised upon cost-effectiveness and efficiency as beacon lights, exclusion may come inadvertently. Picking up from the legendary literature of Adam Greenfield these "Smart" cities are different from their forebears, which were sprawling areas extending toward hinterlands and gradually achieving smartness through administrative reforms embedded in Rule of law. Notwithstanding the fact that Smart cities were built through convergence of innumerable segregated projects, dedicated apps and interdependent infrastructure networks (Sun et al., 2021), capacity for disaster prevention ultimately relied heavily on available databases. How smart could these cities be in handling disasters depends on sophisticated integration of databases and human decision makers (Elvas et al., 2021).

Another requirement of smartness was availability of Early Warning Systems as part of technology network in a city. A quick survey of Early Warning Systems in some important world cities aspiring to become smart reveals many challenges and limitations of applied technology;

Dubai as everyone knows is smart enough to manage a very high footfall of foreigners. The Dubai Municipality with its emergency management system connected to Public Health and Safety Department ensures resilience building for making cities disaster proof. There are Special Task Forces for attending to Emergency Planning to prevent flooding of roads in rains, fire, and zoonotic and communicable diseases. Dubai Police coordinates many segregated departments such as Civil Defense health, transport, Electric and Water Authority, and Dubai Municipality for early response. Yet, this depends upon a committed and consistently supervised coordinated planning, mapping, regular public preparedness drills, and technology monitoring to bring out best results.

Israel's Jerusalem and Tel Aviv have advanced EWS systems. Nanometrics, a Canadian company which has installed EWS on earthquakes gives 10–30 s alert between the epicenter's first wave and the terminal wave that causes destructiveness. Another, Ottawa-based company, along with its partner Motorola Israel, has set up monitoring stations in the Dead Sea valley, the Jordan Valley, and the Haifa area, which are the earthquake zones. The command and control centers relay emergency alerts for people automatically. Interestingly, many smart enough cities in Israel used a simple gas balloon (Grossman, 2023) for a perfect evacuation plan rather than expensive technology-based EWS.

Technology in **Indian** cities is transforming organizations responsible for forecasting and issuing weather alerts such as the Indian Meteorological Department (IMD). It initially started with a two-stage alert system but is now issuing alerts in many stages from the “Pre- Cyclone watch” to the “post-landfall situation.” Addition of more stages in sending alerts and warnings has enabled crisis managers and district administration to make an early detection with enough time in hand to evacuate people to safer places. With the coming of smart technology, advancement has been fast toward Aircraft Meteorological Data Relay system, the Cloud Motion Vectors (CMVs), and the Very High Resolution Radiometer (VHRR) payload onboard INSAT –2E. This has been able to provide water vapor channel data, which is an important factor in monitoring climate change and weather systems. The remote sensing data obtained from earth observatory satellites alongside VIS and IR (visible and infrared imagery) strengthens early warning capacities of organizations, which in current discussion is the IMD. However, states with functionally responsible governance have utilized advanced technology for disaster management such as Odisha but states where negligence, apathy, corruption, and political influences disturb decision making such as Kerala (2018 floods in Singh et al., 2018) and Uttarakhand (Kedarnath glacial lake outburst 2013, Chamoli 2021 Glacial landslide disaster in Upadhyay, 2022) “Unsmart” cities sometimes continue to survive behind a tourist friendly welcome look of smart shopping and heritage conservation but when disaster strikes the real picture surfaces. Indore (Choukse, 2023), the no. 1 ranked smart city in India has recently been exposed for a temple disaster but more than that is the exposure of inactive administration, which repeatedly failed to act against illegal constructions in defiance of city’s building bylaws.

The case studies discussed in earlier paragraphs are picked up from “smart enough” cities and have highlighted certain requirements for achieving sustainability in a tech-centric “Smart” city discourse. Cities which are “smart enough” for disaster prevention could inculcate and engender the following indispensable requirements brought together from case studies across many “smart enough” cities”:

1. Respect for the “Rule of Law” and accountable administration.
2. Advocacy and Civic engagement as part of participatory governance.
3. Functional economy with appropriate logistics, market measurement, consistent job growth, and opportunities in the job market.
4. Absolute functionality, maintenance, and supervision of Smart city critical infrastructure especially toward its “early warning” capacity.
5. Feedback loops on accessibility to technology-based solutions and to decision making.

Conclusion

Cities are “Smart,” “Smart enough,” or “Unsmart” to begin with a discourse on what provides better disaster management. Smart cities are technology-driven and byproducts of neoliberal economy with cost-effectiveness and efficiency as their

beacon lights to being smart. This makes exclusion unavoidable in a perfectly modeled smart city. Three questions become pertinent for any researcher on disaster management, first, what is the connect of smart city concept with disaster management? Second, is there greater resilience against disasters in a smart city? Third, which cities would be “smart enough” for disaster prevention?

However, many cities are smart from the beginning and organically develop their critical infrastructure as needs arise. These, which the chapter refers to as “smart enough” cities also advance with administrative reforms, participatory governance, and rule of law that gradually makes them robustly smart. However, in contrast “unsmart” cities exist in large numbers but the controlling top Corporates have no indulgence in their development. Disaster management in some key cities has been discussed especially in the context of technology that provides sophisticated Early Warning Systems and it is concluded here that a “Smart city” is one which could balance technology with community needs, skills, training, and interests. Expensive technology implantation without responsible, trained, and accountable governance may not be capable enough to respond to disasters as smartly as suggested in smart city concept.

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Mitigating the Impact of COVID-19 in Tehran via Technologies in Smart Cities

72

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Contents

Introduction	1136
Smart City Dimensions and Its Technological Applications	1137
Applications of Smart City Technologies Throughout the COVID-19 Pandemic	1138
Smart City Technologies' Application in the World to Mitigate COVID-19	1140
Adoption of Smart City Technologies in Tehran Prior to the Advent of COVID-19	1142
Application of Smart City Technologies in Tehran Throughout the	
COVID-19 Pandemic	1143
Challenges of Adopting Smart City Technologies in Tehran	1145
Conclusion	1148
References	1149

Abstract

Economic and social complications in addition to loss of many invaluable lives came with the COVID-19 pandemic. Amid the COVID-19 disaster, digital technologies and their applications became a powerful mitigating tool. Experience of several cities around the world indicates that smart city technologies enabled local and central governments as well as firms to provide various public and business services in a fast and effective way while complying with the social distancing, quarantines, and COVID-19 curfews. This chapter elaborates how the city-level adoption of digital technologies in Tehran, the most populous city in the West Asia, mitigated the pandemic impacts. Smartening initiative in Tehran commenced in 2015 and was accelerated by the COVID-19 spread. Contact trace, surveillance, telemedicine, and telework are among the key applications of smart city technological solutions in Tehran during the pandemic. This chapter categorizes these applications in different dimensions including mobility, environment, health, etc. In particular, MyTehran, a mobile application, which offers

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public services and Corona+ program, supporting digital startups and firms working on relevant solutions to alleviate COVID-19 consequences, are notable instances of how smartening Tehran enhanced its resilience against the pandemic. Chapter's conclusion explains varied challenges that Tehran faces in the path of transition to a smart city prior to, throughout, and post-COVID-19 pandemic.

Keywords

COVID-19 · Smart city · Urban disaster · Smartening Tehran

Introduction

The rapid and prevalent spread of COVID-19 since late 2019 has impacted the world, and millions of people have been infected with the virus. In this situation, offering reliable data for citizens, disseminating health guidance, and preventing the occurrence and aggravation of economic problems are the main challenges of cities. The high rate of COVID-19 transmission has had broad social impacts, including restriction of crowd, social distancing, and quarantine, that the smart city having a significant impact on complying with such considerations (Jaiswal et al., 2020). The utilization of smart solutions and technologies, focusing on healthcare, quarantine management, and citizen relations, is a common activity in smart cities (World Economic Forum, 2020). The growth of cities and the increase of urban population have created problems including heavy traffic, waste management, pollution, car park space, etc. Smart city is an effort to make cities a better place to live, and its initial concept was to improve the performance of cities through ICT. The concept of smart city, of course, is not bound to ICT and includes various interactive and human aspects (Camero & Alba, 2019). The integration of systems and services to improve the efficiency and optimization of urban management is facilitated through the smart city technologies. Providing and receiving services in a smart city need less physical communication, which played an effective role in disease control and prevention during the COVID-19 pandemic (Yang & Chong, 2021).

Technology has transitioned a lot in day-to-day life. Until a few years ago, smart city managers and executives saw advanced technologies as a behind-the-scenes tool, not directly in the lives of citizens. With the expansion of smartphones, technology has now been directly penetrated into people's daily lives. Only through a smartphone, a citizen can access to up-to-date information on various topics from traffic transportation to health and safety services (McKinsey, 2018).

In addition to being the capital city, Tehran hosts government institutions, industrial centers, and economic markets, which made the response to these challenges more complicated. Additionally, issues such as air pollution, traffic, and declining urban revenues are other challenges for urban management. Smart city technologies contribute to city-wide sustainability transitions and the quality of life. Smartening Tehran seeks to transform the city into a dynamic environment in which interaction among entrepreneurs, citizens, and government institutions leads to

economic and social development (Farjood, 2019). While the Smart Tehran program was at its early phases, the COVID-19 outbreak challenged citizens and business owners. Providing online services, innovative Tehran program, and digital transformation in Tehran Municipality by offering online services led to the reduction of crowd and helped to mitigate COVID-19. Tehran residents widely adjusted to teleworking and e-learning as well as online good purchases and services. MyTehran integrated platform and applications such as Bike app made social distancing possible (Parastesh, 2021).

This chapter firstly describes the smart city and its dimensions. Then it explains the impact of smart technologies and their pertinent initiatives throughout the COVID-19 pandemic. The subsequent sections go into Tehran smart city efforts to manage and reduce the effects of COVID-19. Finally, the challenges and suggestions for smart-resilient Tehran, in the case of future disasters, are discussed.

Smart City Dimensions and Its Technological Applications

Technology, people, and government are key constituents of a smart city. Besides, smart city does not limit to installing ICT infrastructure, but its functions and features can be categorized into six dimensions (economy, transportation, governance, environment, citizens, and life) (Ismagilova et al., 2019) as explained in Table 1. These dimensions complement each other, and their alignment is quite necessary.

Smart technological solutions improve life quality and transition to sustainability. The smartening process includes various software and hardware dimensions. In addition, infrastructures such as social innovation, education, culture, knowledge-

Table 1 Dimensions of smart city. (Adapted from Ismagilova et al. (2019), Kirimtak et al. (2020), and Jiang et al. (2021))

Smart life: Life quality increases with the management of smart buildings, healthcare, and public safety. Interactive voice response to report citizens' safety problems and smart and low-cost healthcare is placed in this dimension

Smart citizens: Citizens interact with the smart city through crowdsourcing. It means they can share their innovative ideas. It is essential to educate citizens regarding the benefits and utilization of smart city services along with addressing their concerns

Smart economy: In the smart economy, ICT is widely used in various industries. The potential for economic growth in smart cities increases through e-commerce

Smart transportation: Managing traffic congestion is rather difficult in big cities. Smart transportation improves urban transportation by providing solutions such as Internet of vehicles, new routing algorithms and using data to control traffic

Smart governance: The open governance paradigm widely shapes ICT-based partnerships in cities. Elements like citizen-centered and crowdsourced deliberation consulting allow citizens to be providing the desired model of public services

Smart environment: In a smart environment, issues including air pollution, waste management, and green urban spaces are evaluated by ICT. Increasing urban population highlights the need to pay attention to resource infrastructure and pollution control for better urban management and increased quality of life

based economy, etc. are important in city smartening (Sharifi et al., 2021a). The combination of smart city systems, services, and technologies must be flexible to be providing a platform for creating innovation, economic development, and creating collaborative and interactive spaces (Albino et al., 2015).

Technology plays a pivotal role in preventing and controlling pandemics, including COVID-19. Smart cities collect and integrate data from different sources; this is very effective in controlling the spread of the virus, especially in large cities. Smart city projects, including smart community, smart government, smart healthcare, etc., have more influence in real-time data sharing, reducing face-to-face and close interactions, and optimal allocation of resources during the pandemic. Thus, improving infrastructure, raising awareness, and attracting citizens to participate in smart city projects are very important. Smart information includes information sharing on floating population and geographical location increasing disease control efficiency. In other words, dimensions of the smart city complement each other and form a whole which is called the smart city. As a matter of fact, smart city technologies help governments, communities, and hospitals to provide an effective response to COVID-19 in their specialized responsibilities (Yang & Chong, 2021).

The elements of smart cities can be classified into three levels. The first level is based on technology and consists of open data portals and sensors connected by high-speed social networks constantly monitoring variables of energy consumption, traffic flow, etc. and providing information to applicants. The second level is specific applications. At this level, application developers and technology providers turn raw data into alerts and insights. Smart city applications cover various fields, including security, mobility, healthcare, energy, waste, and community participation. The third level is general use. Most programs succeed and lead to behavior change if they are accepted (McKinsey, 2018). Another key technological application of the smart city is enhancing access to education on the Internet by digital technologies. Digital technologies have revolutionized the way of education. Today, almost all top universities offer easy to access online courses in a variety of fields (Deloitte, 2015).

Applications of Smart City Technologies Throughout the COVID-19 Pandemic

An occurrence of unpredictable crises increases the uncertainty and vulnerability of cities. To improve resilience of cities, technology and digital tools play a key role. The three main components of a smart city are technology, people, and institutions. In the COVID-19 crisis, cities are known as the focus of disease, because of their high population density and mobility frequency. The prevalence of COVID-19 accelerated the digital transformation of cities, changed the behavior of citizens, and also redefined lifestyle. By utilizing the capacity of social media, smart cities are involved in informing citizens, and by providing big data, they help urban managers to make better decisions. The ability to trace and monitor people based on artificial intelligence and big data and digitalization of services to reduce unnecessary movement are among the measures that are taken by smart city. Generally, COVID-19

affects various aspects of life, and technology-enabled smart city solutions play a facilitating and effective role in areas, including healthcare, business, and education (Hassankhani et al., 2021; BCG, 2020).

During the COVID-19 pandemic, the role of ICT in our lives became more prominent than ever before. Thanks to information and communications technology, it is possible to support and maintain the supply chain and distribution network of essential items such as food, medicine, health equipment, etc. Information and communications technology is a public health information dissemination channel as well as a platform for the development of integrated policy guidelines. Moreover, ICT is the basis for developing platforms and programs for tracking, testing, and treating COVID-19 in various cities around the world (ITU, 2020a).

Improving citizens' knowledge and awareness regarding the COVID-19 is achieved by accessing valid and official information. Governments are responsible for providing updated information for citizens and the international community by medical organizations as well as control and informatics centers (Gultom et al., 2020).

The need for the Internet as an important tool for connecting and accessing infrastructure and resources has been challenging for governments across the world during this time. For example, high-speed Internet is an essential tool for hospitals and medical institutions so they could be accessing the global information network and resources needed to combat the disease. Access to broadband connection is also crucial for continuing educational institutional activities and business services. In fact, the COVID-19 pandemic has created the need for new action to achieve meaningful connectivity and key digital services (including education, health, financial services, etc.) in the community.

Over the pandemic, many governments, including China, Russia, the Republic of Korea, and the United Kingdom, used artificial intelligence to monitor the quarantine and track the virus. Smart governance technologies proved effective in rapidly identifying infected citizens, controlling and surveillance, keeping social distance and quarantine, as well as strengthening urban resilience in disasters (Sharifi & Khavarian-Garmsir, 2020). In India, 50 cities have ICCC (Integrated Command and Control Center) or COVID-19 war room (World Economic Forum, 2020).

Smart city technologies including telemedicine provide access to medical services and experts through telecommunications systems in all stages of the disease from hospitalization to treatment (ITU, 2020b). Besides, smart city technologies are considered as a preventive measure by regulating public transportation. Many efforts have been made to reduce the spread of the disease in various cities, including disinfection of public transport with large numbers of passengers such as trains, subway wagons, buses, as well as public transportation stations (McKinsey, 2020). Smart city technologies turned out effective throughout the COVID-19 pandemic in regard to abiding social distancing. Compulsory use of masks (in some countries from the time of leaving home; in others in shops and on public transport or in closed and crowded places) and avoiding crowds are some instances in this regard (McKinsey, 2020).

Smart City Technologies' Application in the World to Mitigate COVID-19

Amid the outbreak of COVID-19, almost all big cities faced new challenges and problems. The recent pandemic has affected all aspects of human life. Therefore, dealing with it needs special facilities and arrangements. Finding timely and efficient response in addition to capacity building and reinforcement of the infrastructure were of high importance for city authorities due to two key purpose – i.e., mitigating the disease through tracking and monitoring individuals and providing online services to citizens. Furthermore, the necessity of coordination between different institutions; integration of policies and decisions; human resources issues regarding new training, privacy, and data security; and, finally, citizen participation in the implementation of new guidelines and requirements are other challenges that officials are faced with. The applications of smart city technologies in the management and control of COVID-19 are explained in the following section.

Smart healthcare: Telemedicine (TM), the exchange of medical information through innovative technologies, received more attention during the COVID-19 pandemic than ever before. Patient-physician interactive visual sessions and healthcare-related instruction are realized in TM with a high-speed network and dedicated digital software. Utilizing TM, apart from saving time and reducing unnecessary movement, makes it possible to provide services to quarantined people with less access to medical facilities. Other benefits of TM include reducing the cost of healthcare and the risk of medical staff affliction while increasing patient satisfaction and efficiency of the healthcare system in the situation of offline doctor and patient interaction (Bahl et al., 2020). Telemedicine is developed based on IoMT technology and enables the transmission of patient information through wearable devices and chatbots and the possibility of monitoring and tracking them. Robots reduce the risk of the COVID-19 without the need to mobilize human resources (Chamola et al., 2020). Smart robots have been used in India, the United States, and Denmark to disinfect objects and public places. In China, autonomous vehicles were deployed to deliver food and medical equipment to hospitals. The Phone Pal program in the United Kingdom is a successful experience in maintaining social interaction and communication and avoiding isolation to improve community resilience (Sharifi et al., 2021b).

Contact tracing and monitoring: Tracking is one of the key actions of smart cities to control the pandemic. Tracking infected people by following their movement patterns leads to identifying people in contact with them and infected areas. Moreover, tracking facilitates effective monitoring of quarantine implementation (Sharifi et al., 2021b). Due to the high transfer rate of COVID-19, location-based technology solutions for crisis management have been considered. According to WHO, tracking includes three stages of contact identification, contact listing, and follow-up. Location-based technologies record and store citizen behavior from sensors and smartphone capabilities (Abbas & Michael, 2020). In Singapore, the TraceTogether program was developed to monitor and track people. The app detects infected people via cell phone Bluetooth and alerts those in contact with the infected

(Das & Zhang, 2021). South Korea, one of the successful countries in crisis management, undertook extensive diagnostic testing among citizens aged 20–30, who are often asymptomatic carriers of the COVID-19. Korea did the tracing by three mechanisms, i.e., credit and debit cards, CCTV cameras, and mobile phones. Time-space map data is then provided from the collected data and reported to individuals in contact with a person infected with COVID-19 (Sonn & Lee, 2020).

Before the pandemic, artificial intelligence and smart cameras equipped with facial recognition technology were used to identify criminals and prevent crime. The pandemic intensified the need to use such technologies (Costa & Peixoto, 2020). In Wuhan, through the QR code system, data such as body temperature have been integrated with the contact history of people, and people's health status is divided into three groups: green, yellow, and red. Therefore, the decision regarding the quarantine of the citizens would be made quickly. Infrared cameras and face recognition systems are used to online monitor people with symptoms (AlTakarli, 2020). The self-quarantine safety protection program enabled by GPS technologies was also used to quarantine patients more effectively (Inn, 2020).

E-learning and teleworking: The COVID-19 pandemic had a more severe impact on educational and job market than previous crises. From the early days of the pandemic, many companies around the world followed the teleworking implementation of their employees, following WHO guidelines for social distance. Companies help manage the crisis by teleworking their employees while taking care of their health. The International Labour Organization (ILO) defines teleworking as using ICT with tools, including smartphones, laptops, and desktops, and performing tasks outside the workplace (Belzunegui-Eraso & Erro-Garcés, 2020). More than 1.6 billion students have been affected since the outbreak of COVID-19. In order to continue the education process, e-learning and online classes were adopted in different cities. ICT-based distance learning in the context of social networks, mobile applications, and video conferencing for student-teacher communication are implemented (Hassankhani et al., 2021).

Smart mobility: COVID-19 strengthened data-driven urban management and helped plan and manage mobility (one of the major cities challenges) that is more critical throughout the pandemic. Online monitoring of urban transport status well demonstrates the temporal-spatial distribution of traffic and is used to manage traffic in various cities, including Lisbon and New York (Alpalhão et al., 2021). Expanding existing routes and creating new cycling paths are other measures of smart cities (such as Berlin, Madrid, and London) in the COVID-19 era. In Funchal, automatic traffic counters and environmental stations were used to collect city mobility patterns data, which was also served to monitor traffic during the quarantine period. Controlling and managing the occupancy level of public vehicles is another solution of smart cities. In Germany and Spain, a new feature has been added to the bus app letting users know the bus occupancy level for a specific trip at a particular time. Hence, when the bus is busy, users can select other vehicles (EIT Urban Mobility, 2021).

Smart environment: The smart environment became important during the COVID-19 pandemic in improving medical and household waste management and

socializing environmental protection programs. The smart environment utilizes the capacity of citizens and the government to help meet new environmental challenges through technological solutions and innovation. Although the COVID-19 pandemic improved the environmental quality of cities by temporarily reducing air and water pollution and greenhouse gases, the challenge of household and medical waste and water and electricity consumption at the household level soared as a result of the homestay. Jakarta Province, with its integrated smart city platform, has made it possible for citizens to contact call centers to collect household infectious waste. In addition to waste management in this province, the process of obtaining environmental license is online via sending videos or photos. Using social media to educate, raise awareness, and conduct various environmental campaigns is another effective measure of smart cities during the COVID-19 pandemic (Rachmawati et al., 2021).

Smart monitoring: Health data is collected through screening and monitoring by smart sensors from various locations, including airports and public transportation terminals and health centers. Analyzing such data helps to plan and make health decisions. Advanced technologies, including block-chain and quantum cryptography, not only increase the amount of collected data but also do not violate privacy and safety of individuals (Allam & Jones, 2020). IoT-enabled devices, including sensors, wearables, software, and cell phones, collect data from different places across the city. Big data obtained with AI is used to analyze trends and discover different algorithms. The use of big data before the pandemic was common in the preparation of traffic reports, and from the beginning of the pandemic, the importance of integrated use of data in the healthcare system has increased (Kummitha, 2020). For instance, the United States has integrated health data collection devices and systems into the National Healthcare Safety Network (Allam & Jones, 2020).

Adoption of Smart City Technologies in Tehran Prior to the Advent of COVID-19

Having an approximate population of nine million, Tehran is the capital and largest city of Iran, having a share of more than 25% of the Iran's economy. By 2025, Tehran is expected to be on the list of 30 most populous metropolises in the world. Challenges such as rising energy consumption, air pollution, and heavy traffic have reduced the quality of life in Tehran. Low citizen participation in paying tax, limited government financing programs, and unsustainable sources of income are major challenges of urban management in Tehran (Fartash et al., 2021). The focus of services development and smart management within the city includes smart and clean transportation and smart management of waste, energy, and environment. The focal point of municipality digital transformation is to create open and shared access to urban data and promote transparency and development of infrastructure and communication networks (Smart Tehran, 2020a).

Smart Tehran is a comprehensive program that addresses the challenges and problems of the city and its citizens. Urban smartening is a multidimensional and dynamic issue which aims to improve citizens' quality of life by using technology

and infrastructural development. Smart Tehran Strategic Council is the policy-making body, and Smart Tehran Center, which was established by the Tehran Municipality ICT Organization in 2017, acts as the executive body of Smart Tehran. The axis of smart city and digital services includes two projects of MyTehran platform and Baham citizen participation platform. Such platforms integrate citizen access to services and promote their participation as well as their interaction and engagement in urban management decisions.

Some important programs of smart city in Tehran are as follows. Tehran smart wastewater and waste management includes four modules, i.e., public supervision and control system, worker organization system, vehicle tracking system, and status reporting system (TMICTO, 2019). In Tehran's new traffic regulation which determines the share of cars entering (20 days in each season for each personal car) in the central part of the city, a smart traffic control system was launched. The smart system of car park in Tehran is being completed. In the traffic control system, users register their vehicle details and access facilities including the information at the nearest parking place and pay their parking fees online (TMICTO, 2018). The "Tehran Data View" system (data.tehran.ir) provides statistical data and updates urban information free of charge and without any restrictions. The open data policy has been implemented in Tehran with the aim of increasing the responsibility and accountability of city managers and promoting transparency (Smart Tehran, 2020b). The Smart Tehran API system (api.tehran.ir) was also launched with the aim of facilitating the access to innovative companies and startups to municipal data and services. This measure reduced costs while increasing the quality of public services and helped to strengthen businesses related to urban services (Smart Tehran, 2020c).

Application of Smart City Technologies in Tehran Throughout the COVID-19 Pandemic

Amid the outbreak of COVID-19 around the world, the normal lifestyle and the provision of public and business services to the citizens of Tehran were challenged. Such challenges, of course, provided an opportunity to play a more active role in the functions of the smart city and its development in Tehran. Although the implementation of the smart city in Tehran was in its rudimentary phases, the pandemic conditions and the need to provide online services accelerated the smartening process. The goals of these programs are to transform Tehran into a sustainable city for citizens along with continuously increasing life quality by attracting citizen participation, efficient urban management, and a dynamic urban economy. Success cases in Tehran have commonly adopted ICT, i.e., smart city, in the COVID-19 period which will be further discussed in this section.

From early 2020 and simultaneous with the outbreak of COVID-19 in Iran, the business environment and startup ecosystem were affected. Many startups suffered as a result of widespread shutdowns and restrictions. In this regard, and with the aim of reducing the consequences of the pandemic, innovative plans, services, and products in the form of Corona+ program were designed and implemented by the

Science and Technology Vice-Presidency. The key goals of this program are (1) identifying and evaluating digital and online startup capabilities in pandemics; (2) improving capacities to better serve the community during and post-COVID-19; (3) stabilizing the capacities of digital startups; and (4) development of startup network. Corona+ was launched in March 2020, and its priority support fields include online health, online sports, online education, online entertainment and tourism, online social innovation, and online stores.

Special advantages and facilities are given to selected ideas and technological solutions of this program, including speeding up the process of obtaining knowledge-based licenses and various incentives, financial and legal supports, as well as the provision of technical and physical infrastructure. About 700 projects applied for the Corona+. Eventually, 355 projects were approved and got support. Among the registered projects, 135 projects are pertinent to online retail, the highest area with 26% of the total projects. Online sports-themed projects were also ranked lowest in frequency with 16 items and 3% share. Corona+ facilities and financial support were provided to companies in two main categories: product development and market development. A total of 179 companies were approved, and \$2.7 million (1 US \$ = 42,000 Rial (Iran's official exchange rate accessible at www.cbi.ir/ExRates/rates_fa.aspx) have been funded so far, of which 37% is product development and the remaining 63% is market development. Online health companies with the 23% share have received the most support until now. The following are some highlights of COVID-19's influential businesses (Iran Vice-Presidency for Science and Technology, 2020).

Tritapp startup was formed in the field of health with the aim of providing an environment for interaction between doctors and other health workers. From the start of the COVID-19 outbreak, the platform was launched to connect Iranian and Chinese doctors with more experience in dealing with the pandemic (Iran Vice-Presidency for Science and Technology, 2020).

Mask is a free application to control and prevent the prevalence of COVID-19 in Iran. Using mobile apps to diagnosis and quarantine is a successful experience (in countries like China and South Korea) in controlling COVID-19. The developers of this application include a team of software and virology specialists. This application shows the possibility of viewing online and real-time COVID-19 outbreak status in cities, which is effective in awareness and distance from virus-infected areas. Patients' information, their place of residence, and their mobility are drawn based on the data of cellular phone operators. This application works well in terms of the possibility of contracting COVID-19 based on the location of the users and also informing the users about contacting the infected with COVID-19. User identity information in this application is considered confidential, and users' privacy has also been highly respected by its developers (IRIB News Agency, 2021).

Another example is Balad application. Balad is a smart map and router using online traffic data to provide the fastest route to destination. Simultaneous with the start of public vaccination in Tehran in June 2021, facilities and features in this regard were added to the application. Such features include showing health centers on the map, adding vaccination centers, showing the crowds and types of vaccines

available in each center, and the ability to ask and answer questions by users. These features were highly praised by citizens in Tehran, and about 15 million referrals were made to the information of vaccine centers through this application. In the Q&A section of this application, 70% of questions received at least one answer. More than 7000 users mentioned their suggestions and experiences from the vaccination centers (Balad, 2021).

Considering the importance of social distancing in the management of COVID-19, online municipal services were provided through the MyTehran website and application. Having three million users, the app operates in three main areas: participation, citizen service, and municipal digital transformation. This application is an integrated platform for online services of Tehran Municipality and communication with citizens. Diverse services provided in this application include citizen electronic wallets, car and traffic regulation services, technical inspection, sale of subway and intercity bus tickets in barcodes and on mobile phones, payment of service bills and mobile phones, the possibility of accessing more than 70 online stores and online businesses, public monitoring 1888, sending public reports and follow-up troubleshooting by submitting requests and sending photos, paying municipal tolls, accessing a map of Tehran for routing and providing data about important public places such as medical centers and hospitals (TMICTO, 2021b).

Bike app is another example that was presented in collaboration with the municipality and the private sector. The application was developed in the spring of 2020 to develop and facilitate cycling as well as observing social distance. The Bike application is the starting point for promoting cycling to citizens of Tehran. Citizens' behavior and lifestyle are expected to be gradually affected by the increasing share of bicycle in intercity travels. Bike features and capabilities include smart navigation and providing optimal routes; the possibility of sharing routes; sending images by users on the application social network; viewing the nearest bicycle parking, repair shops, and shared bicycle stations; etc. One of the important features of this application is holding a campaign to know the roads and make it enticing to users in order to send data. The Bike app won the Smart Mobility Award at the fourth edition of the WeGo 2020 global event (TMICTO, 2021a).

A summary of smart city technologies and initiatives in Tehran and the rest of the world to mitigate the COVID-19 pandemic is illustrated in Table 2.

Challenges of Adopting Smart City Technologies in Tehran

The general challenges of implementing smart cities are classified into four categories: financial, governance, technical, and social. In the category of financial challenges, the most common barriers are high investment costs, uncertainty of profitability, and lack of incentives. Lack of coordination and communication between stakeholders, restrictive regulations, and instability of laws or managerial changes are challenges of governance. Lack of specialized human resources, maintaining security, and data integration are deemed as the technical challenges of cities. In the social category, cities also are coping with issues such as low citizen

Table 2 Smart city technologies in Tehran and the rest of the world to mitigate the impact of COVID-19 pandemic (author's conclusion)

Smart city technologies	Application of smart city technologies and solutions	Instances in Tehran	International instances
1. Smart healthcare	Telemedicine support	4030 system, Snapp app	Varanasi; Jabalpur; New York
	• COVID-19 online counseling service for patients and doctors	Nursino Tritapp	Wuhan
	• Develop application for vaccine registration	Ministry of Health website	Jakarta
	• Develop a medical calling robot to deliver extra healthcare and treatment	–	South Korea; Italy
2. Contact tracing and tracking	• Track and trace of suspected and positive cases	Mask app	Singapore (TraceTogether app); Surat; Hangzhou (City Brain app); Canberra (COVID Safe app); Istanbul; Milan
	• Creating wearable device to empower contact tracing	–	China; India
3. Smart monitoring and restriction	• Night traffic restriction monitoring and measuring physical distancing	Done by traffic police	Stuttgart; New Castle
	• Using biosensor patches as wearable devices to gather health information	–	Megacities in China and the United States
	• Real-time monitoring of citizens through QR	–	Megacities in China; Cannes
	• Using facial recognition platform and street infrared camera system	–	Wuhan
4. Quarantine management	• Daily contact with quarantined people and patients by smart applications	–	Jabalpur; Pune
	• Using mobile application to monitor people who should be quarantined via GPS	–	Big cities in South Korea
5. Teleworking and online education as a new normal	• Facilitating teleworking for civil servants as well as private sector employees	*	Many big cities worldwide
	• Rapid development of infrastructure for online teaching in schools and universities	Skyroom platform Findo	Singapore; Tokyo

(continued)

Table 2 (continued)

Smart city technologies	Application of smart city technologies and solutions	Instances in Tehran	International instances
6. Online services	<ul style="list-style-type: none"> ● Digitalization of services ● Integrated municipal services through mobile applications for paying utility bills, mobile phones, and city tolls 	Tehran electronic book fair; MyTehran app	Many big cities worldwide Lisbon (Lisbon 24 app); Bengaluru (INDEX app; BBMP app)
7. Smart mobility	<ul style="list-style-type: none"> ● Designing dashboards as a framework for monitoring data 	–	Lisbon; New York
	<ul style="list-style-type: none"> ● Enforcing wearing mask obligations by artificial intelligence in public transportation system 	–	France
8. Smart environment	<ul style="list-style-type: none"> ● Waste pick-up service through mobile apps/call centers to minimize the mobility of people 	Smart waste management apps, e.g., ZarPlus Jaroob	Jakarta

participation and lack of motivational factors (TMICTO, 2021c). Challenges of implementing smart city in Tehran can be discussed in two time periods pre- and post-COVID-19. The subsequent section, “Conclusion,” addresses the challenges of smart city implementation in Tehran prior to the COVID-19 and particularly throughout the COVID-19.

In the dimension of smart governance, key challenges that Tehran faces include the lack of integration in the urban management decision-making system, the lack of an integrated monitoring system, the mismatch of authority and responsibility, and the lack of transparency in the results of different institutions. The multiplicity of executive bodies who make decisions leads to the lack of coordination and parallelism. Another challenge is the lack of an integrated monitoring system (Khansari et al., 2015).

Challenges related to smart city infrastructure in Tehran include lack of ICT and urban infrastructure and integration of data platforms across sectors including transportation, waste, and energy. Regarding the need of integrating infrastructure, maintaining the security of citizens’ data (including debit cards, terminals, and data centers) should be considered in Tehran. Low Internet speed and bandwidth in some parts of Tehran is another challenge in implementing a smart city (Fartash et al., 2021).

Citizens are the most important component of a smart city. Participation of interested citizens in the promotion and implementation of smart city technologies in Tehran deserves more attention. Education and culture-building through educational and promotional programs in social media and urban advertising increase the speed of acceptance and adaptation to smart city changes (Haghghi et al., 2018).

Additionally, so far, there has been no suitable system for encouraging the participation and suggestions of the citizens of Tehran.

Economic problems in Iran have challenged the implementation of Smart Tehran project that required high investment. Also, the services and products of the smart city in Tehran should be more appropriate with the needs of citizens (Fartash et al., 2021). Environmentally speaking, Smart Tehran lacks an efficient monitoring system and accurate criteria in line with the goals of the projects to measure performance. Identifying environmental parameters and measuring them also must be taken into consideration (Haghghi et al., 2018).

During the COVID-19 pandemic, the challenges of implementing smart cities and the smart urban ecosystem in general focused more on data collection, analysis, and integration infrastructure. The lack of coherent regulatory policies and procedures in emerging technologies, including standards for the collection and privacy of user data, became more important during the pandemic (Gupta et al., 2021). Tehran in particular lacks effective policy framework and regulations for digital technologies. Deploying smart devices and sensors in Tehran have high operating costs. In addition, fault tolerance, resilience, and high energy consumption of mobile communications are other challenges in implementing Smart Tehran in the COVID-19 era. Lack of inclusiveness and access to digital technologies increase social inequality which deserves further attention in Tehran (Hassankhani et al., 2021). Data integration and lack of financial and skilled human resources pertinent to smart city technologies are other notable challenges in this regard.

Conclusion

The COVID-19 outbreak has turned into a serious and pervasive crisis for cities across the world. Due to the high speed of transmission, limiting crowd, and social distancing, many services and jobs and even education in schools and universities became online. Smart city technologies played a pivotal role in preventing the spread of pandemic in Tehran and also in the smart cities around the world. Smart cities equipped with a variety of technological and innovative facilities and tools provided faster and more efficient responses to the consequences of the pandemic. This chapter reviews international experiences in regard to adopting smart city technologies and also explains Tehran's experience in detail.

Smart Tehran, which is a new initiative in Iran, has taken important steps toward effectively confronting and preventing COVID-19 by offering various solutions. Based on this chapter's findings, some recommendations are provided to strengthen the capacity and applications of smart city technologies in Tehran to better overcome future health and natural crises.

- Empowering economic and business ecosystem and establishing smart monitoring and warning mechanisms to predict, identify, and deal with the probable future crises

- Establishing specialized working groups at governance and citizen level, to consult and provide creative solutions to solve the problems and challenges caused by crises
- Capturing citizens' trust by increasing the efficiency of urban services, creating mutual trust, and increasing urban resilience with smart city plans and actions
- Implementing structural reforms, integrating governance, collecting and applying the data, and reducing parallel work along with speeding up urban decision-making by improving smart city infrastructure

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Therapeutic Role of Arts and Crafts in Post-disaster Resilience Building in India

73

Mitali Gupta and Reena Kumari

Contents

Introduction: Healing and the Arts and Crafts	1154
Post-disaster Recovery Through Visual Arts	1155
Case Studies of Visual Arts from India	1157
Madhubani Paintings of Bihar	1157
Pattachitra Paintings, Odisha	1162
A Brief Account and Role of Other Traditional Indian Paintings in Disaster Mitigation	1165
Concluding Remarks: Building Resilience and Policy Advocacy	1169
Appendix 1	1171
References	1172

Abstract

India has been frequently fraught with a substantial degree of severity of both natural and man-made disasters, which have taken a heavy toll on the lives and property of millions of people rendering them homeless and jobless and leaving them with deeply ingrained reflections and memories of pain and trauma which may even take generations to be healed completely. For thousands of years, the arts and crafts have been widely recognized as a medium of interaction, self-expression, empowerment, and resolving conflict by binding together various elements of the society, culture, heritage, environment, and ecology of a region. Thus, there is a dire need to understand the existence of arts and crafts not only within their cultural context but also in terms of their therapeutic usefulness and empowerment aspects in strengthening the voices, sustaining identities, and building capabilities of the disaster-affected victims by exploring various aspects of artistry and creativity associated with a particular craft.

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In this context, the present study attempts to (i) present a historical narrative of the role of visual arts in mitigating the after-effects of some of the prominent disasters in India by promoting a speedy process of recovery and normalcy of the affected victims over a period of time and (ii) eventually propose resilience-building policy recommendations by the inclusion and promotion of Indian arts and crafts as an important tool in the post-disaster recovery and redevelopment process in mitigating disaster-related aftermaths in India. The study is conducted by holding a series of discussions with some of the well-known NGOs and individuals working in the field of visual arts through telephonic and virtual conversations. Data is analyzed by applying the thematic analysis method.

Keywords

Arts and crafts · Healing · Disaster · India · Visual arts · Trauma · Covid-19

Introduction: Healing and the Arts and Crafts

According to a UN research, India endured the fourth highest economic loss in the world, or \$79.5 billion, as a result of natural catastrophes that happened between 1998 and 2017. The National Disaster Management Authority (NDMA) revealed that about 5700 kilometers of India's 7516 kilometers of coastline are still vulnerable to cyclones and tsunamis of varied intensities and more than 40 million hectares are at risk of flooding and soil erosion. Not only this, but India has also been fraught with a substantial severity of man-made disasters as well, such as communal riots, wars, and terrorism, and most recently the devastation and havoc caused due to the global pandemic Covid-19. This has taken a heavy toll on the lives and property of millions of people rendering them homeless and jobless and leaving them deeply ingrained with the reflections and memories of pain and trauma which may even take generations to be healed completely. Arts and crafts not only serve as an excellent medium of provision of inexpensive employment opportunities to the victims of the disasters but also have a great potential toward rapid healing of the affected people and resilience building of the affected communities.

According to the famous Chinese philosopher Confucius, one's experience of pain and grief has the potential to serve as the most potent source of creation and change, and that is where exactly the crucial role of healing through arts and crafts comes into play. Arts and crafts constitute an indispensable intangible component of the cultural heritage of a place which is known to play an important role (though hardly acknowledged) in resettlement processes, ability to restore the social fabric, effectively maintaining and managing cultural variations, encourage intercultural discussion dialogue, and enabling the effective monitoring of cultural change in post-disaster situations. The United Nations Educational, Scientific and Cultural Organisation (UNESCO) proposed in its recently released position paper (2018) on "Culture in City Reconstruction and Recovery" a CURE framework which highlights the importance of mainstreaming "culture" into all the fields and areas

of invasion and in all the phases of the reconstruction and healing period, including needs assessments, scope definition, making plans, funding, and execution. This was developed with the belief that while existing place-based solutions emphasize the restoration of physical assets, integrating “culture” increases a sense of belonging to community, as well as its viability and sustained life in the physical environment (UNESCO, 2018). However, there exists a dearth of systematically theorized or evaluated studies at both the national and international levels in this regard.

According to some of the most well-known literary works in this area, arts and crafts are a significant means of facilitating the retrieval and reprocessing of traumatic memories, which are frequently encoded in the imagery of a disaster’s experience rather than in words, while on a larger scale, they can aid in rewriting a collective account of a catastrophe and inspire people to take charge of their lives again (Jones et al., 2018). Thus, the arts and crafts of any place bind the society, culture, heritage, environment, and ecology of a region and thus play a pivotal role in mitigating the challenges of a disaster or a crisis situation by enhancing our understanding of the entire ecosystem and implementing a wider recovery mechanism to promote sustainable livelihoods of the most vulnerable and neglected communities of the society. They are transcultural expressions of iconic symbols that have persisted over history and across cultures. They are representations of human consciousness that are typically visual, kinesthetic (dancing), verbal (poetry), or musical (song, music).

Post-disaster Recovery Through Visual Arts

For thousands of years, various civilizations and religions have used carved idols, charms, holy artworks, and symbols to aid in healing. But it wasn’t until the middle of the twentieth century that art therapy became recognized as a distinct and popular therapeutic strategy (The emergence of art therapy as a profession arose independently and simultaneously in the United States and Europe. The term “art therapy” was coined in 1942 by a British artist Adrian Hill, who discovered the healthful benefits of painting and drawing while recovering from tuberculosis. Margaret Naumburg, Hanna Kwiatkowska, Florence Cane, Edith Kramer, and Elinor Ulman were five influential writers of the 1940s who made significant contributions toward the development of art therapy as a recognized field. They have used a variety of methods which include creating community murals (Argue et al., 2009), open studio approaches (Block et al., 2005), art-based large group dialogues (Lark, 2005), mask making (Allen, 2007), installations (O’Rourke, 2007), and ritual (Warner, 2001). Maya Angelou, Frida Kahlo, Marcel Proust, and Edvard Munch, all recognized as masters in their respective disciplines, are just a handful of the many talented artists throughout time who turned unfathomable human suffering into riveting works of art.). The artists have served as commentators on and chroniclers of disaster, war, famine, disease, and other forms of crisis who have portrayed the disasters simultaneously: beautiful and utterly destructive; terrifying and awe-inspiring; devastating and healing. Disasters may represent an “end” and a “new beginning”

simultaneously. An artist probably acts as a first responder to a natural/man-made disaster and can help people develop emergency plans after hurricanes, floods, tsunamis, and other such types of natural disasters. Their work does not provide us with the answers to the questions that disasters raise; rather, it encourages us to investigate the forces that may simultaneously serve to remind us of our capacity and fragility in the face of natural disasters, technological mishaps, and terror. In doing so, it helps the disaster rescuers take charge of their thoughts, emotions, and stories, starting the protracted process of recovery. As a result, art therapy, which uses art as a means of symbolic communication, is a field that is expanding and gaining tremendous momentum in the domain of mental health care. The framework is based on the idea that brainstorming, which serves as a vehicle for instinctual expression, can aid in resolving internal conflicts, fostering self-worth and self-awareness, lowering stress levels, and restoring a sense of general physical, emotional, and social well-being. Using creativity as a framework, they support posttraumatic healing (Tedeschi & Calhoun, 1996; Serlin & Cannon, 2004), progress through adversity (Joseph & Linley, 2008), hardness (Maddi & Hightower, 1999), optimism and resiliency (Antonovsky, 1979; Epel et al., 1998), and self-efficacy. Art therapy has three main benefits for a disaster-affected individual: it (i) gets involved the human body in stress relief through the use of art supplies; (ii) allows the patient to engage in a customized introspective activity where the process and final product serve as "symbolic containers of traumatic memories"; and (iii) fosters cognitive perspective through discussion of the artwork (Sarid & Huss, 2010). Art therapists have shown that they can enhance empowerment, community engagement, problem-solving abilities, and self-esteem in the citizens as well as create a safe environment, decrease stress, and foster a sense of community (Hocoy, 2007; Allen, 2007; Argue et al., 2009; Feldman et al., 2014; O'Rourke, 2007; Warner, 2001). They combine the components of the body, communication, mind, and spirit and allow for the growth of a holistic person. With its many benefits, art therapy today has become a staple of many rehabilitation centers, mental health facilities, crisis centers, private practices, and schools, as well as many other communities and social institutions that have the mission of promoting health, wellness, and growth. While art therapy is immensely helpful in treating adults suffering from any kind of trauma due to various reasons, it is also helpful for treating youngsters, who frequently lack the social and verbal skills to convey their feelings, especially when they have gone through any form of trauma (Hussain, 2010).

In the light of the above discussion, the present study attempts to (i) present a historical narrative of the role of visual arts in mitigating some of the prominent natural and man-made disasters in India and examine which of the Indian traditional paintings/sculptures have played a prominent role in this regard and (ii) eventually propose resilience-building policy recommendations by the inclusion and promotion of Indian arts and crafts as an important tool in the post-disaster recovery and redevelopment process in mitigating disaster-related aftermaths in India. In the literature, the visual arts have primarily been associated with healing because they are utilized by victims to express their feelings and express their emotions (mainly psychological issues, traumatic experiences, depression, and emotional dis-balance).

It is called diversional therapy (i.e., taking your mind off the pain and away from the negative thoughts). There are two ways to pursue it, individual narratives and group narratives, and the present study attempts to present the case of both. Using a qualitative descriptive approach, the study was conducted by undertaking interviews with the well-known NGOs and individuals working in the field of visual arts in India. Thematic analysis is applied to the data to identify themes by utilizing different semi-structured questionnaires for the different category of respondents.

Case Studies of Visual Arts from India

India, endowed with its rich and glorious legacy of visual arts throughout the ages, has one of the most apt and suitable traditional as well as modern art therapies which can prove to be immensely beneficial in advocating and devising post-disaster recovery mechanisms for the disaster-affected victims not only in India but across the world owing to the fact that the Indian paintings have been not only the canvas for the individual artists but also the repositories of community narratives as well. *The following are narratives from some of the respondents:*

When I colour during therapy, it creates a safe space for me to express painful feelings from my past. Colouring engages a different part of my brain that allows me to process my trauma in a different way. I can even talk about the most difficult memories of my sexual abuse without panicking. - *One of the communal riot-affected victims in Gujarat*

For me, during those tough times, painting served as a distraction and a way to numb myself from anything negative. Because it was always stressful for me to see the aftermath of the Covid-19, it has given me many positive thoughts and escaped me from many negative thoughts. - *One of the artists from Madhubani District, Bihar*

The following sections reveal the healing potentialities of the rich Indian traditional paintings in case of different disasters faced by the different communities across India.

Madhubani Paintings of Bihar

In North Bihar, about 76% of the population lives under the threat of floods, making it one of the most flood-prone states of India. Madhubani paintings or more commonly known as the *Mithila Art* is the most popular visual art form of India that originated in the Madhubani district of Mithila region, Bihar, and has ~~majorly~~ strongly come to the rescue of the flood-affected communities in Bihar in terms of both therapeutic healing and creating sustainable livelihoods for them. It is one of the oldest forms of art in the world dating back to 2500 years old. When the biggest earthquake recorded in history – a magnitude of 8.0 – occurred in Bihar and other parts of Nepal in 1934, it was then that this art form was found and first brought to the attention of the public. William G. Archer, a British colonial officer in the Madhubani district of Bihar, discovered these paintings while assessing the damage

brought on by the natural calamity. The British officer published multiple essays and black-and-white images of these paintings, which caught the attention of the outside world. Eventually, Madhubani paintings received national recognition in the year 1975 when Sita Devi received the National Award and Jagdamba Devi, the Padma Shri Award by the President of India. These paintings have been a symbol of love, devotion, tradition, fertility, and prosperity depicting various local and global issues alike.

Some of the disaster-prone situations and social problems where Madhubani paintings played a key role in mitigating post-disaster-related issues and challenges are as follows (Table 1):

- (i) It played a crucial role in the conservation efforts in India in 2012, a year marked by frequent deforestation in Bihar. This campaign was initiated by Gram Vikas Parishad, an NGO headed by Shashthi Nath Jha, in an effort to save local trees that were being cut down for new roads and construction. The trees were originally decorated with depictions of gods and other religious and spiritual figures, including Radha-Krishna, Rama-Sita, scenes from the Ramayana and Mahabharata, and other figures from myths of the same kind. The Indian civilization attained philosophical heights for the power of love, longing, and serenity through these representations. The utilization of abundantly available raw materials and the examination of the relationship between environment, culture, and the human mind are what make Madhubani paintings so beautiful.
- (ii) Mithila folk ladies convey their innermost emotions, hopes, aspirations, expectations, and imaginations through these paintings. At a time when child marriage was rampant in society and that too in the backward regions of the state, a lot of child widows were prohibited to wear colorful clothes. These child widows expressed themselves through Madhubani paintings and painted their lives as they wished to live. Not only this, but the art form has also enabled many women in these regions to empower themselves and live a life of dignity. After struggling to combat the orthodox ideas and traditions that surrounded them for a long time, these women were finally able to take a stand for themselves by becoming financially independent with the help of Madhubani paintings. Finally, they had something which they could call their own which led to the psychological and material well-being among these women.
- (iii) There is a ritualistic context in the Madhubani paintings for particular occasions, such as birth, marriage (such as the one depicted in Fig. 1), and festivals such as Holi, Kali Puja, and Durga Puja, which greatly enables the disaster-affected victims to experience the feelings of joy, happiness, and prosperity.
- (iv) Covid-19 has been widely depicted by various artists of Bihar. Pushpa Kumari, a Madhubani artist, produced a series of brand new pieces last year that was inspired by the pandemic-related events. The Covid Bride is one of the most remarkable of these; it is a complex piece that is richly observed. A classic Mithila bride in the one-eyed Madhubani profile stands in the foreground. She is portrayed clutching the Earth in her hands while donning a mask in an effort to protect it from Covid-19. At the bottom of the piece, a line of trains transports

Table 1 Therapeutic impact of Madhubani paintings, Bihar

S. no.	Indicators	Details of the art form
(1)	Purpose (personal/social/religious/ritual)	To transmit deep social and religious messages among the societies To depict rituals during birth, marriage, and festivals such as Holi, Surya Shashti, Kali Puja, Upanayana, and Durga Puja
(2)	Use of major/prominent colors (which are naturally made and give a sense of soothed-ness)	Black – lampsoot White – powdered rice Green – leaves of the apple tree and tailcoat Blue – from the seeds of <i>sikkot</i> and indigo Yellow – singar and jasmine flower Saffron – bark of peepal tree Red – kusum flower and red sandalwood
(3)	Most commonly used geometrical shapes/patterns/designs/figures	Figures of Ram and Sita, Radha and Krishna, and Shiva and Parvati Figures of peacock, lotus, tulsi (sacred plant), sun, and moon are the most common Flowers, animals, birds, and all types of geometric patterns Scenes from the royal court Two-dimensional geometry pattern which majorly symbolize love, devotion, tradition, fertility, and prosperity The illustrations drawn in these paintings are majorly a reflection of myriad thoughts, hopes, and dreams of the villagers especially the womenfolk
(4)	Building and strengthening “connectedness” (individual/collective works)	The canvas of painting today has shifted from mud walls to paper, fabric, wood, handmade paper, and ceramics indicating that through years of generational connectedness, the paintings today also have shifted toward individualism and depicting individual issues
(5)	Targeted groups	Majorly women-centric craft of India
(6)	Mitigation in disaster (natural/man-made)	
	Man-made	Major products/expressions which marked the event/disaster
	Covid-19 (2019 onward) ^a	Paintings on masks (carrying motifs of birds, fish, and floral designs) Paintings depicting vaccine advocacy Paintings depicting role of doctors and lives amidst Covid-19
	Champaran Satyagraha	Paintings depicting Kharau of Mahatma Gandhi and his leadership role in Bihar and India Contribution of women in Champaran movement
	Ghadar Mutiny	Valiant uprising against the British Rule

(continued)

Table 1 (continued)

S. no.	Indicators	Details of the art form
	Natural	Major products/expressions which marked the event/disaster
	Earthquake of Bihar (1934)	These wall and floor paintings were first identified by the British colonial officer William G. Archer who sold these paintings (by canvassing it on paper in black and white) to the outer world
	Earthquake of Bihar (1950s)	The villagers under the craftsmanship of Bihar Ratna Sita Devi started making paintings and their livelihoods from them

^aAccessed at <https://indianexpress.com/article/lifestyle/art-and-culture/motifs-of-birds-fish-flowers-madhubani-artists-bring-traditional-art-to-masks-6367140/>; 20 February 2022

Source of information: Award winning artists ((i) Ambika Devi and Asha Jha (founder and owner of Kalakriti) and (ii) Remant Kumar Mishra (popularly known as “mask man” of Bihar)); non-award winning artists who have taken up Madhubani paintings as their passion to revive it ((i) Alka Das (commercial artist from Patna), Ankit Jha (Darbhanga), Ruchi Jha and Renuka Kumari (Darbhanga), Itashri Shandilya (founder of MITHILAsmita), and Kundan Roy (Bihar))



Fig. 1 Kohbar painting by National Awardee Sita Devi depicting the ritual of “Marriage”

migrant workers home. An airplane flying across the page represents people traveling and spreading the illness. Multi-award-winning folk artist Ambika Devi’s tribute to the doctors connects the birth of Lord Krishna (a god Vishnu’s incarnation) to the present situation by drawing on the classifications of superheroism, sacrality, and Hindu religious legends.



Fig. 2 “Tribute to Doctors,” by renowned Madhubani artist Ambika Devi

Ambika Devi’s work alludes to the story of Krishna as told in *Krishna Charitas*. Vasudeva (father of Lord Krishna) carries baby Krishna in a basket held above his head as he crosses river Yamuna to save baby Krishna from Kamsa, a tyrant ruler of the Vrishni kingdom, who is determined to kill all the children of Vasudeva and his wife Devaki. In this painting (Fig. 2), it is a physician who carries a group of people in a basket to save them from coronavirus (see virus icons around the physician’s coat). This painting pays homage to doctors and bestows divinity and sacredness to them. Hindu stories are re-circulated, refashioned, and secularized here to convey the superheroic interventions and exemplary work done by the physicians who save not an individual (as in the story) but humanity at large from infection and death. This mapping and re-coding of a religious story to the current moment helps the artist to celebrate the extraordinariness and persistence of the doctors amidst challenging times. The painting is also global (There are several such instances of repurposing religious myths and legends across the globe – Jonathan Muroya, an illustrator based in Providence, for instance, deftly uses Greek gods and the associated myths to capture several aspects of life during the pandemic in his “Greek Quarantology” series.) in that it not only joins other visual arts in paying tribute to the frontline workers but also remains local and quintessentially embedded in the Hindu tradition through the way it utilizes the rhetorical context and traditions of the religion.

Pattachitra Paintings, Odisha

Prints on woven fabrics or scroll paintings are referred to as pattachitra, which is a combination of the words *pata* (fabric/scroll) and *chitra* (drawing or painting). Pattachitras, which are created by chitrakars (artists), are primarily used in Bengal and Odisha in India to express both religious and socio-culturally significant topics. These paintings also date back to 1000 years of age and are one of the oldest among all the traditional paintings that evolved and spread in India. The best works of Pattachitra are found in and around Raghurajpur near Puri in Odisha and Birbhum, West Midnapore, Kalighat, and Bardhaman regions of West Bengal. These paintings are divided into three parts as far as the medium or canvas of these paintings is concerned: (i) paintings on cloth or “Patta Chitra,” (ii) paintings on walls or “Bhitti Chitra,” and (iii) palm leaf engravings or “Tala Patra Chitra” or “Pothi, Chitra.”

Some of the disaster-prone situations and social problems where Pattachitra paintings played a key role in mitigating post-disaster-related issues and challenges are as follows (Table 2):

- (i) *Corona Rakshasa* by Bengal chitrakars Rupsona and Bahadur Chitrakar portray coronavirus as a *rakshasa*. *Rakshasas* (as opposed to gods) in Dharmic religions are malignant demons who are capable of consuming human beings and shifting shapes. Like vampires and medieval monsters in Western mythology, *rakshasas* are wicked beings with a terrifying appearance who constantly come into conflict with human beings and saints. Rupsona and Bahadur Chitrakar’s painting offers a close-up view of corona *rakshasa* with long fingernails, horns, and corona-stricken body and eyes. The painting is presented predominantly in red color and is invested in the Hindu mythology of *asuras* (ungodly beings) not only to suggest the monstrosity and the horror that the virus triggers in contemporary real life but also to imply how the virus, like a typical *rakshasa*, feasts on the blood of helpless victims. While corona icons and sun-looking motifs fill the border of the panel with geometrical regularity, a flying dragon and a multi-colored earth in the foreground suggest the Chinese origins of the virus and the planetary nature of the pandemics. In short, the painting concretizes corona as a *rakshasa* to convey the lethal and the atavistic force of the virus. In so doing, *Corona Rakshasa*, described in the visual language of Hindu religion, provincializes and thus offers a cultural/folk narrative to the widely circulated clinical image of the virus.

The accompanying songs were written by the artists, and they provide the narrative for the pandemic while the scrolls provide the visual narrative. They have largely discussed Covid-19, its consequences, and how to defend oneself from the disease in the most recent scrolls created by renowned painters. They have also voiced their regret and grief at the deaths of loved ones brought on by the dreadful illness. The multi-panel scrolls are unfolded by the performers as they sing. Normally, they would travel to various parts of India and even to other nations to share their stories, but the virus has stranded them in their communities, severely

Table 2 Therapeutic impact of Pattachitra paintings, Odisha and West Bengal

S. no.	Indicators	Details of the art form								
(1)	Purpose (personal/social/religious/ritual)	To depict Hindu mythology based on Vaishnava Sect These paintings were primarily used for worship of the deities when the ritual of “bath” took place for them								
(2)	Use of major/prominent colors (which are naturally made and give a sense of soothed-ness)	Rich colorful application Usage of vegetable, earth, and stone colors Majorly vibrant colors are used such as red, orange, yellow, pink, etc.								
(3)	Most commonly used geometrical shapes/patterns/designs/figures	Creative motifs and designs Portrayal of simple themes A mix of classical and folk culture Decorative borders with the use of flowers and foliages								
(4)	Building and strengthening “connectedness” (individual/collective works)	Three different mediums of painting, cloth, walls, and palm leaves, provide for a spectacular narrative of collective narratives on various socioeconomic issues apart from the Hindu mythological stories								
(5)	Targeted groups	Majorly women-centric craft of India								
(6)	Mitigation in disaster (natural/man-made)	<table border="1"> <thead> <tr> <th>Man-made</th><th>Major products/expressions which marked the event/disaster</th></tr> </thead> <tbody> <tr> <td>Covid-19</td><td>Depiction of deities and common women wearing masks</td></tr> <tr> <td></td><td>Depiction of “Rakshas” resembling “Covid-19”</td></tr> <tr> <td></td><td>Depiction of common life badly impacted due to Covid-19</td></tr> </tbody> </table>	Man-made	Major products/expressions which marked the event/disaster	Covid-19	Depiction of deities and common women wearing masks		Depiction of “Rakshas” resembling “Covid-19”		Depiction of common life badly impacted due to Covid-19
Man-made	Major products/expressions which marked the event/disaster									
Covid-19	Depiction of deities and common women wearing masks									
	Depiction of “Rakshas” resembling “Covid-19”									
	Depiction of common life badly impacted due to Covid-19									

Source of information: Renowned artists of Pattachitra paintings ((i) Apindra Swain and (ii) Swarna and Mamoni Chitrakar).

restricting and curtailing their artistic and creative powers. Sonali is among the artists. Apindra Swain, an Odia Pattachitra artist from Raghurajpur, has produced a number of absurd pieces that are based on Covid-19 safety regulations. One of the artworks has customary elaborate borders and vivid colors. It is composed of cloth and has layers of natural gum, lime, and polish applied with glass bottles. But instead of displaying gods and goddesses as is customary, it shows a woman dressed elegantly, donning a mask, and cleaning her hands in a basin (Fig. 3).

“My heart is breaking,
How will I express my feelings?
The whole world is filled with sorrow everywhere.”.....

We as a community have been making scrolls on current events for a long time now,...So, we thought that when such a virus has hit not only our country but the world, why not make a



Fig. 3 “A Woman beside the Wash Basin,” Apindra Swain Pattachitra painting depicting the case of Covid-19 (a work imbued with a sense of whimsy).

painting or song on it? Because patachitra is a medium of social communication, through our art and song, we reach out to many people. – *Swarna Chitrakar, song sung to Patachitra scroll on coronavirus*

A modest publisher named Tara Books was drawn to Swarna’s artistic talent. She claimed that during Covid-19, they evaluated her work in an online form and asked her to create about 100 little illustrations on the various facets of the pandemic, such as labor migration, individuals living apart from family, etc., for a book that they would probably publish. She added that in addition to addressing how the pandemic is hitting the entire world, not just their hamlet, her work for the book would also contribute to the history of our current era. Swarna expresses optimism in her song for the day when everyone would be present and able to enjoy each other’s company.

Mamoni, another Pattachitra artist, while imagining the post-pandemic world has expressed:

If the scrolls can go somewhere and an exhibition can be held, they could spread not only the message of dealing with the pandemic but foster an appreciation for their traditional art.

- *Mamoni Chitrakar, Pattachitra artist.*

- (ii) Apart from depicting the recent phenomenon of Covid-19, the Pattachitra artists have also painted and sang about current events and issues as well as mythological and natural subjects such as commemorating tragedies like 9/11 and natural disasters such as tsunamis and floods. Others promoted social and health education, such as those that explained preventive measures to take against HIV/AIDS or the deadly coronavirus affecting the world today.

A Brief Account and Role of Other Traditional Indian Paintings in Disaster Mitigation

Warli Paintings

One of the earliest known artistic styles is the Warli painting (Source of information: Non-award winning artists who have revived this art form driven by their passion: (i) Mugdha (Mumbai) and (ii) Balu Mashe (son of renowned Padma Shri artist Jivya Soma Mashe), Warli Paintings). It is a type of tribal art that has Maharashtra as its birthplace. Although this art is particularly well-liked in the tribal community, it has not yet attracted much attention outside of India. A kind of tribal art known as “Warli painting” was primarily developed by Indian tribes from the North Sahyadri Range. Cities like Dahanu, Talasari, Jawhar, Palghar, Mokhada, and Vikramgadh in the Palghar district are included in this range. Despite the fact that the tribal form of art is considered to have originated as early as the tenth century AD, the Warli painting style was not recognized until the 1970s. The idea of “Mother Nature” and natural forces are central to Warli culture. Their primary means of subsistence and a major contributor of sustenance for the tribe is agriculture. Similar to how prehistoric people utilized cave walls as their canvases, Warli painters use the framework of their clay houses as the subject for their paintings. The Warli (Varli) tribes from the mountainous and coastal areas around the borders of Maharashtra and Gujarat practice it as a way of life as well as a form of art. This kind of art, which dates back to roughly 3000 BC, has a mysterious appeal. It now stands out among other styles because of Maharashtrian artists like Jivya Mashe and his sons Balu and Sadashiv who work tirelessly to preserve the art. In reality, Mashe received the Padma Shri in 2011 for promoting the style over the world (Fig. 4).

Warli art inspires us to consider environmental awareness and find delight in the small things in life. The Warli people have a straightforward way of life. They used to worship nature, rely on it for sustenance and daily needs, and had a belief in the balance of man and nature. In order to promote “sustainable” living, many urban



Fig. 4 Warli paintings depicting 'Nature at its Bounty'

residents are now embracing a modest lifestyle that includes avoiding technology whenever feasible, eating healthy, loving handloom, and learning more about the science underlying old customs and traditions.

Phad Paintings of Rajasthan

Phad, a Rajasthani art with a history dating back more than 700 years, is popular due to the oral tradition that surrounds it (Source of information: Renowned artists who have taken up Phad paintings as their passion to revive it: (i) Kalyan Joshi (Rajasthan) and Pragati Agarwal (founder of Art Tree)). Phad paintings are a component of a complex song-and-dance show put on by a couple of balladeers, typically a priest and his wife known as Bhupa and Bhopi from the Rabari tribe of nomadic cattle and camel herders. They play dramatic interpretations of narratives from the Ramayana, the Hanuman Chalisa, and other legendary tales while travelling from village to village with their two-string instrument, the ravanhatta, and using the Phad paintings as visual aids. Mostly practiced in Rajasthan, Phad is a religiously styled scroll and folk painting. The painting depicts the folk deities, Pabuji and Devnarayan, on a long piece of cloth or canvas. Phad is a 700-year-old tradition that has been handed down through one family's generations and has its roots in Shahpura, close to Bhilwara, Rajasthan. After sunset, the Phad artwork would be unwrapped or unfolded, and the performance would then take place in front of the villagers that would run well into

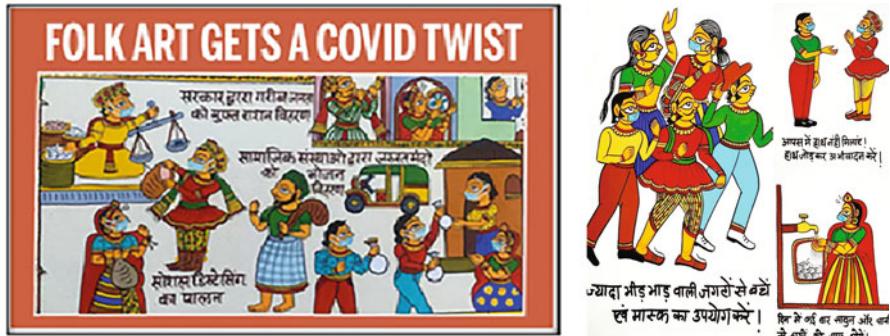


Fig. 5 Phad painting by Kalyan Joshi on wearing masks and social distancing

the night. This may be the origin of the painting's name, "Phad," which in the local language indicates "fold." At the onset of Covid-19, Phad painters Kalyan Joshi and others have taken to depict the troubled lives of the people amidst lockdown, safety restrictions, and widespread migration which can be witnessed from their paintings alongside (Fig. 5).

Kalyan Joshi also worked on a water conservation project in Jhunjhunu in Rajasthan with IDC Mumbai earlier to address the challenges of water scarcity in the state. The greater scarcity of water gripping all the villages nearby was primarily due to lack of knowledge of water harvesting, wastage of water, illegal borings, and evolution of new crop harvesting not suited to the climate and geography of this village, which consumed 100–500 times more water than what was originally produced there. As a result, the water levels were down by 300 feet, and most villages have reached the water threshold. As a result, people started to abandon the villages adding the population elsewhere. The Phad "Narrative Craft" helped in the local way of narration and storytelling of how to save water and recycle and preserve it. This grassroots communication is being done across 10–15 villages near Jhunjhunu, and the artwork has not only been done on the wall of homes in the villages but has been made also on Phad scroll which would be carried and narrated by Bhopa and Bhopi in all these villages about the importance of saving and preserving water. And in a few months, there has been a great water conservation in the entire region.

The Case of Buddha Paintings from Leh-Ladakh Region

There is no denial to the fact that art has no religion attached to it. But when art is discussed in Indian context, it starts taking beautiful religious turns. In the Indian context, it can be said that art is not restricted to a mere mode of expression, but it takes on a higher level where artists and common people choose it as a medium to connect with the "divine." In this world of contemporary art, there are people who let these paintings be the focal point of the energies in their room and, thus, provide them with an energized personal zone to meditate. The best suited paintings for this



Fig. 6 Buddha paintings depicting Peace and Tranquility

purpose are landscape paintings and “Buddha,” Ajanta, and Ellora paintings which give a deep sense of peace and tranquility.

At over 10,000 feet altitude, the barren desert plateau of Ladakh is a fascinating crucible of culture. It is bound on the south by the Great Himalayas and on the north by the majestic Karakoram Range. However, in days gone by, this was not an isolated place; it was an active crossroads of trade in the ancient world. Leh in Ladakh was on an artery of the Silk Route, which flowed from the distant lands of China to those of Mediterranean Europe. This artery connected the Silk Route through Leh and Srinagar to Amritsar and from there down to Nalasopara in present-day Maharashtra and to Kerala. Along with trade, philosophic ideas and optimistic impulses flew to this crucible in the mountains up from Ajanta and Kerala on the one hand and from the cities of China and Central Asia and those of the Mediterranean on the other hand.

A great Buddhist culture was created in this trans-Himalayan plateau. Since very early times, religious teachers from the Pal Kingdom in eastern India and from Kashmir were bringing the ideas of Buddhism to this land. The first great coming of Buddhism which swept across Ladakh onto Tibet, Nepal, Sikkim, Bhutan, and Arunachal Pradesh was in the eighth century. The second great coming of Buddhism was when 108 monasteries were made in Ladakh, Western Tibet, and Lahaul-Spiti in the early eleventh century. Craftsmen and artists from Kashmir were invited to construct and paint these monasteries which were to become the backbone of trans-Himalayan Buddhism. These monasteries are a significant part of the heritage of the world, and they reflect one of the most glorious periods of painting in India (Fig. 6).

Resorting to religion and art is a standing reserve and a natural human response to fear, uncertainty, and existential angst caused by the pandemics. They have time and again reinforced the power of good over evil and thus the cathartic, coping, and reassuring functions of the same. The paintings discussed here repurpose and weave the Hindu religious imageries, stories of the Hindu celestial gods, and extraordinary acts of ordinary people with the Covid-19 pandemics not only to map the cultural anxieties occasioned by pandemics but also to offer the much-needed hope and confidence during the coronavirus pandemic. Also, these folk paintings are textured bio-cultural sites which demonstrate how Covid-19 is not a mere medical/epidemiological event but is also constituted and constantly negotiated within socio-artistic and religious matrices. These paintings, in short, are a testimony of such functions and meaning-making practices and, thus, contribute to the collective grand narrative on contagion.

Concluding Remarks: Building Resilience and Policy Advocacy

While disasters are incidents, trauma is a more accurate way to characterize their impacts. These traumatic incidences frequently irreparably destroy the social and emotional structure, which has a major impact on the entire survival of the people. Resilience is the capacity to bounce back after stress and trauma, to rebuild one's life even after experiencing a devastating tragedy as grief, sadness, and pain which tend to be the natural outcomes of suffering from any kind of adversity and loss (Herman, 1992). The path to resilience involves dealing with the feelings and effects of pressure and traumatic events, learning from them, and reflecting on adversity to increase one's sense of understanding, goal, and compassion in life. It also involves approaching challenges creatively to broaden one's horizons and possibilities for even accomplishing "the impossible" in life. A new theory termed posttraumatic growth (PTG) and the idea of resilience go hand in hand (Calhoun & Tedeschi, 2006). The theory of posttraumatic growth contends that from the breakdown of trauma can come transcendence and that additional growth is conceivable, as opposed to the traditional trauma recovery paradigm, which focuses on returning personal and societal performance to pre-morbid levels of operation (Lev-Wiesel & Amir, 2006; Rosner & Powell, 2006). Stephen Joseph and Alex Linley put up a notion dubbed "Growth Following Adversity" in response to the possibility that posttraumatic growth can come across as being overly optimistic (2008). This idea places significance on the lessons that can be learned through adversity and incorporate them into therapy. Both posttraumatic growth and growth after adversity advocate a method that involves going through stages of loss and repair in order to develop resilience. The visual arts, in particular, has an important role to play here as it helps people re-imagine and re-energize their lives as it promotes intercultural dialogue and respect for cultural diversity which are considered to be the powerful tools for reconciliation and the creation of peaceful societies. Further, it is commonly

understood that the role of the arts and crafts in disaster recovery is simply about cheering people up and providing a short-term distraction through entertainment; however, implementation of various projects worldwide has shown that the arts engender so much more than that and can contribute to long-term outcomes of recovery and rebuilding of the affected communities. (Appendix 1 gives a snapshot of healing effects of arts and crafts at the international level.)

The narratives presented through the case studies of Indian traditional paintings have successfully been able to capture, express, and record life stories met with utter grief, trauma, and the loss of identity and livelihoods and have the ardent potential to develop resilience among the disaster-affected victims at four levels:

- (i) **Physical:** to regain senses of the body in cases of deep pain ingrained personalities which probably lead the victims to the stage of the coma and unconsciousness from short- to long-term spells.
- (ii) **Psychological:** to achieve balance of mind and body and to enable both verbal and non-verbal expressions of the traumatic and depressed victims.
- (iii) **Social/Economical:** to search for lost identity and livelihoods (empowerment impact) and to establish a sense of communication among the individuals within a community or among different affected communities.
- (iv) **Spiritual:** to establish the oneness of mind, body, and soul and search the true purpose and meaning of one's life (existential impact).

The series of “civil conversations” that the visual arts create in the aftermath of disasters not only focus on strengthening of the community values and but also, to a great extent, serve to bring communities together and to engage with the various types of issues the disaster might have brought to light. In this context, it can be clearly advocated that the post-disaster recovery mechanisms/processes in India essentially need to adopt a *culture-centric-based approach* (as envisaged by UNESCO, 2018) to address the different needs, value systems, and mental well-being of the disaster-affected communities made a compulsory part of the National Disaster Management Act (2005) for its effective implementation in the affected areas. It is also to be understood that culture can no longer be considered only as a dividend of development, but rather serves as a prerequisite to its achievement (UNESCO, 2018). A culture-centric approach would also lay the foundations of addressing post-disaster roadmap of economic growth and development which encompasses complex social, culture, and economic transformations within its trajectory. Thus, the culture (in particular arts and crafts of a region/place) should be holistically integrated as an indispensable endowment which can be used as one of the most effective “tools” at all the levels of post-disaster recovery and management mechanisms to achieve resilience and stimulate other development sectors in the disaster-prone as well as disaster-affected areas across India.

Appendix 1

Lessons Drawn from International Experiences

Country	Disaster	Post-disaster recovery model/mechanism	Impact
Australia	Natural: Like Black Saturday bushfires in Victoria in 2009, Cyclone Yasi and floods in Queensland in early 2011	Rebuilding of disaster-affected communities by using arts-led and creative activities conducted by Arts Victoria initiative and the Arts Queensland/Australia Council for the Arts initiative	These projects engaged the affected people and the communities in the process of collaboration, interpretation, reflection, and commemoration
UK	Man-made: Racial conflicts	Research conducted by psychologists at Goldsmiths, University of London	Traditional toys and dolls could work best in helping UK and immigrant kids' friendships to reduce racial conflict
USA and the other adjoining countries	Natural: Hurricanes Katrina and Rita	Hyogo-NOMA Art Therapy Initiative has provided weekly art therapy for over 250 New Orleans public school children (Orr, 2007)	Deeply impacted and uplifted the mental well-being of the affected children who did not have even the access to the mental hospitals
Sri Lanka	Natural: Tsunami	Art therapy was applied to 113 girl survivors between the ages of 5 and 13 who exhibited the most acute symptoms of grief and trauma (Chilcote, 2007)	Art is an effective, psychologically beneficial intervention for children who have undergone significant psychological trauma and one that can be administered cross-culturally
USA	Man-made: 9/11 tragedy	The International Child Art Foundation (ICAF), in collaboration with psychiatrists and psychologists, asked children to use their creativity to reduce trans-generational transmission of trauma and hatred by producing a vision of peaceful coexistence	The effect was positive and helped in healing many children

Source: Compiled by the author from various sources

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Enhancing the Smartness of the “Smart City” Concept: A Critical Review for a Better Conceptualization

74

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Contents

Introduction	1176
Literature Review	1177
Review of the Concept	1177
Discussion: Enhancing the Meaning of the Concept of “Smart City”	1179
The Importance of Incorporating the “Disaster Resilience” Aspect When Defining the Term	1183
The Importance of Incorporating the “Ethical Aspect” When Defining the Term	1184
Conclusion	1186
References	1186

Abstract

A smart city is one that uses technology, data, and intelligent design to improve the livability, workability, sustainability, and resilience of cities. The concepts of “smart city” and “disaster resilience” are interrelated because, without a disaster resilience plan, it is harder to maintain a sustainable smart city. The term “disaster resilience” allows better anticipation of disasters and proper planning to reduce disaster losses. However, low attention has been given to the “resilience” aspect when defining the term smart cities in contemporary academic dialogues. On the other hand, when discussing various aspects of smart cities, no previous studies

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have focused on the ethical aspect of the people who live in those cities. Scholars have discussed the term differently based on their preferences. There is a lack of consensus about the exact meaning of the term “smart city.” Therefore, the purposes of this chapter are to explore the conceptual deficiencies of the term smart city and to highlight the importance of incorporating the “disaster resilience” and “ethical” aspects when defining the term. This is a conceptual paper based on published secondary data. This chapter provides insights for scholars and practitioners to specify the exact meaning of the term for future research.

Keywords

Smartness · Smart city · Disaster resilience · Ethical aspect · Critical review

Introduction

The “smart city” concept has been quite a fashionable and emerging concept throughout the past few decades. Cambridge Dictionary (2019) defines “smart” as having a clean, tidy, and stylish appearance for something. Various scholars use the term to mean multiple things such as smart cities, smart governance, smart education, smart agriculture, smart transportation, smart disaster resilience, IT-led smart infrastructure, smart inclusiveness, and, ultimately, smart well-being of people. Thus, it appears as an umbrella term that contains many broader views.

Despite several discussions about this concept, there is a lack of consensus on precisely what a “smart city” is about. It lacks a clear and sound definition in both empirical studies and empirical applications (Dameri, 2013). Even though there is no clear-cut definition that discusses the criteria that cities ought to meet to be considered “smart,” more cities are nowadays labeled as “smart,” making it controversial about its real meaning (Sikora-Fernandez & Stawasz, 2016). Supported by various literatures, the term smart city is still a fuzzy concept. “Smart city” continues to be a fuzzy concept, frequently used improperly, and weakened with diverse meanings (Caragliu et al., 2011). Though it takes many aspects into account, when defining smart cities, some important aspects like disaster resilience nature and people’s ethics are rarely considered. In this chapter, the authors move forward by generating a comprehensive definition for a smart city by specifying its meaning and including some important yet lacking aspects in existing definitions. There is a lack of discussion on what improves the smartness of the smart city concept. This study tries to specify the “smart city” concept by filling this literature gap. Accordingly, the objectives of this chapter are (1) to highlight the contradictions of the “smart city” concept to specify its meaning and (2) to highlight the importance of incorporating “disaster resilience” and ethical aspects when defining the term. Both aspects will enhance the smartness of the concept.

This conceptual paper is based on secondary data. A comprehensive literature survey permits the comparison of smart city definitions and explores various meanings and definitions to highlight the confusion of the concept. Finally, this study tries to develop a comprehensive definition by specifying essential components of the

smart city and incorporating the ethical aspect in outlining the concept for improving the “smartness” of the smart city concept.

Literature Review

This section begins with a review of the concept’s meaning and flows to its evolution. The latter part of the section analyzes various definitions and discusses the components of a “smart city” to specify the concept’s meaning.

Review of the Concept

Meaning

The term “smart” denotes the standards of good practices (Herrschel, 2013, cited in Rosati & Conti, 2016). The adjective “smart” applies to the concepts of urban technological innovation and the changes that can be made through ICT (Daniel et al., 2016). The smart city idea arises from the application of technology to urban problems. Smart urban development is a strategy used to improve the quality of life in cities by delivering better services to the people using information and communications technology. Though traditional knowledge-based cities focus primarily on education, from the nineteenth century onward, the development of intellectual capital, permanent learning, creativity, and maintaining a high level of innovation, communication, and information technologies started playing major roles in the development of cities (Dewalska–Opittek, 2014). According to Winters (2011), smart cities act as magnets for creative people and workers and allow creating a virtuous circle, making them smarter and smarter (cited in Albino et al. 2015). Also, a smart city is a solution for several existing problems. Prior research done by Gontar, Gontar, and Pamula (2013) suggests the smart city concept to answer the problems of urbanization, aging of social infrastructure in developed countries, and cutting CO₂ emissions. It is also noted that smart cities using high technologies address certain issues like city crowding, pollution, traffic, and poverty (Dameri, 2013). Consequently, a smart city leaves multiple opportunities to exploit its human potential and promote a creative life. The proceeding section examines the existing scholarly definitions for developing a comprehensive definition by incorporating success factors to enhance the meaning of the smart city concept.

Definitions

Many scholars and organizations have defined the term smart city from various perspectives based on their views and experiences. These definitions vary from very simple to comprehend. In simple terms, scholars have identified a smart city as a well-defined geographical area that uses high technologies to create benefits for citizens. A thorough examination of definitions shows that both common and varied ideas are explicit by these definitions. Some selected definitions are discussed below:

Smart cities as environmentally friendly and livable cities, encompassing sustainability and quality of life, also, of course, the composition of technological factors. (Marsal-Llacuna et al., 2015)

The above authors have emphasized the necessity of technological factors to improve the well-being of the people which have been supported by many other authors too. Many previous studies (Sikora-Fernandez & Stawasz, 2016; Gontar et al., 2013; Capdevila & Zarlenga, 2015; Glebova et al., 2014) have discussed the inclusion of information and communications technology (ICT) in defining smart cities. Hence, the use of ICTs is a core in smart cities (Daniel et al., 2016); in addition, many other technological strategies are also applied. According to Daniel et al. (2016), the smart city concept understands ICTs in a very broad sense.

Perhaps, the definition given by Caragliu et al. (2011) provides more insights about how these high-tech applications facilitate the emergence of smart cities:

“Smart city” can be defined as “a city that is sustained based on highly intelligent ICTs and social networking; communication between people and things and things and things, which goes beyond time and space; convergence between ICT and real-time; and convergence with other industries by which new value-added contents and services are constantly re-created accompanied by innovation of society, including work styles, lifestyles, culture, politics, and the economy.

Citing the works of Caragliu et al. (2011) and Capdevila and Zarlenga (2015) have highlighted the importance of using ICT to improve the well-being of the people through participatory governance:

A city is smart when doing investments in human and social capital, traditional (transport) and modern (ICT) communication infrastructure, fuel, sustainable economic growth, and a high quality of life, with a wise management of natural resources, through participatory governance.

Nam and Pardo (2014) argue that a city can hardly become smart with technology alone. Hence, among hundreds of definitions of smart cities, previous authors have highlighted the aspects like technological factors, energy efficiency aspect, governance aspect, quality of life, the well-being of people, and many more. All the aspects are significant to represent the smartness of the cities; however, the consistency among the definitions is lacking.

Moreover, as noted by Madakam (2014), the European city project has identified a six-axis approach to characterize a smart city, namely, (1) smart economy, (2) smart people, (3) smart governance, (4) smart mobility, (5) smart environment, and, finally, (6) smart living. In this study, the smart economy focuses on attractive corporate fiscal incentives, great infrastructure including high-quality domestic and international connections, excellent public services, a high-quality education system, and publicly funded scientific research. A smart environment is defined as a region of the real world that is extensively equipped with sensors, actuators, and computing components. Smart people concept comprises various factors like affinity to lifelong learning, social and ethnic plurality, flexibility, creativity, open-mindedness, and participation in public life. The smart mobility framework emphasizes the travel

choices, reliable travel times for people, travel safety, traffic management in real time, management of passenger transport means, management of car parks, fleet management, management of the use of bicycles, payment of tolls, support in the use of electric vehicles and tracking applications and logistics, etc. Smart governance is basically about using technology to facilitate and support better planning and decision-making in smart cities, and it is about improving democratic processes and transforming the ways that public services are delivered effectively and efficiently. Smart living or simply smart homes are the houses with the sole ability to monitor and adjust environmental systems like heating and lighting automatically.

The literature review revealed that the ultimate promising aspect of the smart city concept is “well-being” and “quality of life” of people on a city. A considerable body of literature discusses the well-being or the quality of life of people because of creating smart cities (Marsal-Llacuna et al., 2015; Myeong et al., 2018; Dameri, 2013; Japan Smart city Portal, 2013, cited in Gontar et al., 2013).

Dewalska–Opitek (2014) also identifies smart cities as a combination of elements: smart economy, smart people, smart mobility, smart environment, and smart living. Hence, smart city is a multifaceted concept (Albino et al., 2015), and it requires a holistic approach to understand it fully. Thus, this study examines whether any additional components need to be included to enhance the meaning of this concept.

Discussion: Enhancing the Meaning of the Concept of “Smart City”

This section summarizes the current state of definitions on smart city concepts and reviews the status of discord among them. The literature review characteristically includes various aspects of a city ecosystem such as smart infrastructure, smart operation, smart services, smart industry, smart education systems, or smart security systems in general. But the common and main component of a smart city seems to be the application of information and communications technology (ICT) for improving the well-being of the people in that city (Table 1).

There is a lack of consensus and fuzziness of the smart city concept. Thus, the current discussion also appears to be consistent with the literature highlighting the issue of consensus in the concept. This definitional confusion in the literature inspired the researchers to examine the concept’s meaning. Hence, the factors essential to making a city smarter and measures contributing to a smarter city are discussed. Many elements and dimensions characterizing a smart city emerged from the analysis of the existing literature, which is depicted in Table 2.

More cities are labeled as smart with the application of ICT. Along with the ICT, a wide range of factors can be identified backstage in accelerating the process of creating the cities smarter. Out of which, it is important to identify the most important features to be focused on in smart cities. But just a few facets alone cannot create a smart city without any regulating and monitoring body. Hence, governments also need to be smart. Meijer and Bolivar (2015) mentioned smart governance as making the right policy choices and implementing those policies in an effective and

Table 1 Imprecise definitions

Description	Scholar(s)	Main critique
“A clear and sound definition of a smart city still lacks, not only in the academic studies but also in empirical applications of smart concepts and projects”	Dameri (2013)	Lack of clear and sound definition
“Even though there is no clear-cut definition which would specify the criteria that cities ought to meet to be considered as such, more cities are nowadays labeled as ‘smart’”	Sikora-Fernandez and Stawasz (2016)	No clear-cut definition
“We still do not have a shared definition of the term; smart city continues to be a fuzzy concept, often used improperly and declined with many different meanings”	Caragliu et al. (2011)	Fuzzy, improperly used, and concept with many different meanings
The definitions posed by cities calling themselves “smart cities” lack universality	Albino et al. (2015)	Lack of universality
There is huge conceptual confusion regarding the smart city concept	Schaffers et al. (2011)	Conceptual confusion
Although ICT and cities have developed, the concept is still under development. Obviously, all those concepts that have been used to denote smart cities are not in total contradiction with each other but are partially overlapping. However, too many definitions mean a lack of focus on the really important factors	Trindade et al. (2017) and Dameri (2013)	Partially overlapping
Although the term smart city has become a buzzword in the last decade, its definition is still unclear. The concept is difficult to define (Odendaal, 2021), and the term is used inconsistently in the relevant literature	Tranos and Gertner (2012) cited in Daniel, K. et al., (2016)	Unclear definition
A significant number of research and literature are imbued with a general idea of what “smart” is in defining smart cities. Hollands (2008) is far more critical of the concept. He has stressed that the main criticism toward the concept is the inability to define what “smart” means in defining smart cities	Daniel et al. (2016)	Inability to define what “smart” means
We still do not have a shared definition of the term or rather the concept of smart city. However, over the last decade, we have multiplied the semantic and operational attempts to	Greco and Cresta (2015)	Do not have a shared vision of a definition

(continued)

Table 1 (continued)

Description	Scholar(s)	Main critique
“bring order” among disparate definitions of the concept and achieve at least a shared vision of a “smart city”		
There is a wide variety of definitions of what a smart city could be; however, a common definition of the term has not yet been stated	Monzón (2015)	No common definition

Source: Literature

efficient manner. Further, a study by Osborne (2006) concludes smart city governance in the mode of four ideal-typical conceptualizations named as the government of a smart city, smart decision-making, smart administration, and smart urban collaboration (cited in Meijer & Bolívar, 2015). Dameri (2013) identifies the presence of governance in special consideration as, in smart cities, the technologies, both ICT and others, to realize high-quality infrastructures, services, and governance processes, to give better results to people. These conceptualizations reflect different theoretical perspectives on the role of government in modern society. Beyond governance, ICT and infrastructures are prerequisites for a smart city, and both together represent the second layer that will serve as a base link to implement the smart city services. Here, information and communications technology acts as a facilitating service. Smart city infrastructure can take advantage of a large amount of data generated from the application of ICT in the domains of environmental monitoring, healthcare monitoring, and transport monitoring (Gaur et al., 2015). There is multiple “e” applications in smart city urban developments, as e-government, e-participation, e-mobility, e-learning, e-health, and e-inclusion (Wolfram, 2012). Today, the most considered component of smart cities is the technology: several types of technology, not only ICT. As an example, the EU SETIS smart city initiative classified technologies concerning four application fields: buildings efficiency, transport, electricity production, heating and cooling. It involves both ICT (e.g., to monitor smart urban mobility) and other technologies, such as smart grids, alternative fuel vehicles, and so on. Further, “smart city” is defined as a city using a set of advanced technologies, such as wireless sensors, smart meters, intelligent vehicles, smartphones, mobile networks, or data storage technologies (Peng et al., 2017, cited in Justina et al., 2019). With all the above, the use of high-tech strategy is also mentioned by some researchers. According to Kehoe et al. (2015), smart grids are also used as a high-tech strategy to alleviate problems such as reducing faults, improving the responsiveness of utility companies to handle demand variations, increasing efficiencies by reducing transmission and distribution losses, and managing cost better. They let customers participate in the energy value chain, by enabling more intelligence throughout the grid. Smart building controls, wind turbines, intelligent lighting, facial recognition, solar panels, low-power semiconductors, wireless charging for automobiles, LED lighting, crowdsourcing techniques, traffic control, and medical alerts are a different kind of technologies associated with urbanization (Deepti et al., 2014). According to Harrison and

Table 2 Elements/components of the smart city as per the existing literature

Facet	Citations in previous literature
IT	Myeong et al. (2018), Albino et al. (2015), Gontar et al. (2013), Capdevila and Zarlenga (2015), Gaur et al. (2015), Komninos et al. (2011, cited in Mosannenzadeh & Vettorato, 2014), Fusco et al. (2012, cited in Daniel et al., 2016), and Selvakamani (2015)
Infrastructure	Capdevila & Zarlenga (2015), Nam and Pardo (2011, cited in Monzón, 2015), Dameri (2013), and Chourabi et al. (2012, cited in Albino et al., 2015)
ICT infrastructure	Gaur et al. (2015)
Public safety	Novotný et al. (2014)
Healthcare	Novotný et al. (2014)
Education	Novotný et al. (2014)
Environment	Chourabi et al. (2012, cited in Albino et al., 2015), Giffinger et al. (2007, cited in Albino et al., 2015), Dameri (2013), and Gaur et al. (2015)
Resilience	Munier (2007) and Selvakamani (2015)
Technology	Myeong et al. (2018), Dameri (2013), Capdevila and Zarlenga (2015), Daniel et al. (2016), and Monzón (2015)
Citizen participation with multi-communication channels	Myeong et al. (2018)
Research and development	Myeong et al. (2018)
Sustainable resource management	Kogan (2014)
Entrepreneurship	Kogan (2014) and Capdevila and Zarlenga (2015)
Participation in public life	Kogan (2014) and Rosati and Conti (2016)
Flexibility of labor market	Kogan (2014)
Sustainable development and green growth	Gontar et al. (2013), Munier (2007), and Yigitcanlar and Kamruzzaman (2018)
Transport	Caragliu et al. (2011), Gaur et al. (2015), and Deepti et al. (2014)
Waste management	Dameri (2013)
Economic growth	Meijer and Bolivar (2015)
Information access	Gaur et al. (2015)
Improve the well-being of people	Rosati and Conti (2016) and Smith (2012, cited in Daniel et al., 2016)
Improve the quality of life	Deepti et al. (2014), Daniel et al. (2016), Munier (2007), and Trindade et al. (2017)
Governance and administration	Daniel et al. (2016)

Source: Literature review

Donnelly (2011), there are few approaches to smart cities, which have become feasible because of recent progress in technology, such as the use of digital sensors and digital control systems, growing penetration of fixed and wireless networks, development of information management techniques, and development of both computing power and new algorithms.

The creation of ICT-led infrastructure is important to link the smart government with smart cities through the enrichment of success pillars like public safety,

education, environment, healthcare, infrastructure, research and development, sustainable resource management, entrepreneurship, participation in public life, and flexibility of labor market and economic growth. The ultimate result of smart cities is identified as the well-being of people or the enhancement of the quality of life. When the well-being of the people is achieved, that city would be considered a smart city where people can prepare to expose to any disaster and recover from the efforts of a hazard in a timely manner. Thus, it needs to incorporate disaster resilience aspect when defining the term “smart city.”

The Importance of Incorporating the “Disaster Resilience” Aspect When Defining the Term

The above discussion shows how the previous scholars have highlighted various aspects when defining the term. Most of them have given priority to the aspects like IT, infrastructure, environment, etc. Yet, no adequate attention has been given to the disaster-resilient aspect. Some authors have mentioned that urban safety and resilience aspect has been neglected or gained less attention in designing strategies in the fields of smart development (Haan & Butot, 2021; Ristvej et al., 2020). At the same time, some authors have previously claimed that “smartness” and “safety” need to be truly interconnected (Ristvej et al., 2020).

In the context of cities, the term “resilient” refers to the ability of a city to absorb shocks like terrorist attacks and natural disasters and to maintain their usual activities as it is. Modern-day cities are heavily congested in terms of population and physical elements. Though strong development measures took place in the cities, disasters are probable to vanish all the developments (Mohammad et al., 2019). The frequency and the intensity of the disasters that happened in the past few decades are alarming and emphasizing the importance of disaster resilience. According to a study done by the United Nations, almost 890 million people (60%) across the globe live in cities that are at risk from at least one major natural disaster, including floods, droughts, cyclones, or earthquakes (Bansal et al., 2017). The rapid urbanization and growing number of megacities created serious ecological issues like climate change, disasters, and environmental degradation. This greater concentration of people and assets can increase the number of disasters and their impact. As has been explored in the literature, there are cities termed “smart cities” that failed to plan for future threats and had an outstanding lack of planning and preparedness which ultimately cause exceptional damages and losses in an event of a catastrophe (Desouza & Flanery, 2013). Thus, when designing smart cities, considering the disaster-resilient aspect is vital.

Some authors have already identified the significant of this point, and their definitions on smart cities have some insights about this aspect. Patel and Leah (2016) have defined the city resilience as establishing proactive qualities and processes at all levels to mitigate the risks of disasters. For Drobniaik (2012), resilient city can manage disruptions before reorganizing around a new set of structures and have the means of anticipating, preparing for, responding to, and recovering from a

disturbance. For Campanella (2006), city resilience means the capability to survive from the natural or man-made hazards. Hence, urban resiliency to disasters can be achieved more efficiently through the means of improving the “smartness” of the cities.

Smart cities are not about making huge investments in infrastructure building, but about making infrastructure do more and last longer while aiming to reduce negative environmental impact (Bansal et al., 2017). Therefore, the smart city is one that uses technology, data, and intelligent design to enhance the livability, workability, sustainability, and resilience of cities (Stasinopoulos & Chalaris, 2020). Smart cities should be resilient in all stages of a disaster cycle, pre-disaster stage, disaster stage, and post-disaster stage, so they have various kinds of strategies and techniques. As per DesRoches and Taylor (2018), smart technologies and systems can strengthen disaster monitoring and risk assessment, so better predictions and preparations can be done. They can quickly respond to citizen concerns by monitoring infrastructure and environments in crisis and addressing associated safety issues. Finally, rapid restoration of critical city services can be ensured.

Authors have discussed the same phenomenon using the word “urban safety.” Urban safety expects to enhance the resilience of cities, such as improving the ability to recover from shocks, disruptions, disasters, and crises (Helbing et al., 2021). The term disaster resilience is strongly affected by the smartness and safety of city systems; hence, to originate high resilience within the city, all systems must work with high efficiency, and there needs to be a connection between each system (Bansal et al., 2017). Also, researchers have highlighted the importance of information and communications technology in enhancing disaster resilience. As literature mentions, ICT can be used as a means of getting the involvement of people, improving the services rendered by the city, and enhancing the urban systems are making definite improvements in disaster resilience (Bansal et al., 2017). In addition to that, previous literature explores the ability to stimulate the learning process and strengthen urban resilience against disaster risk by exploiting the transformative power of information and communications technology (Vermiglio et al., 2020).

Therefore, the current study highlights the importance of giving more priority to the “disaster resilience aspect” when defining the term smart city. If the cities are resilient, they should be necessarily livable, workable, sustainable, and resilient. Therefore, the authors suggest that these aspects should reflect through the definitions of “smart cities” along with other elements (see Fig. 1).

The Importance of Incorporating the “Ethical Aspect” When Defining the Term

Any standard of the advanced city could be destroyable due to unethical human actions that are being experienced by contemporary society. Yet, many studies are silent about the ethical aspect or smart values that are essential to maintaining a smart city. Only a few authors and practitioners have discussed this ethical aspect of smart city literature. Cobbe and Morison (2019) have stated that the ethical aspect has been

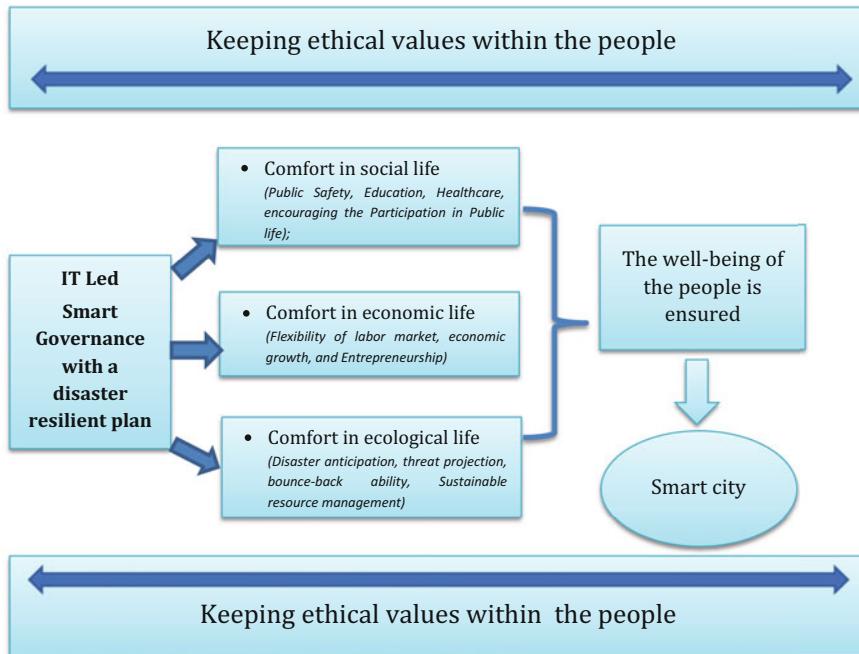


Fig. 1 A framework for specifying the meaning of the “smart city” concept

missed in this hungry journey of city leaders to achieve “smart” status for their cities. According to them, especially, smart values like fairness, transparency, agency, and accountability should be associated with smart city technologies. As noted by Albert (2020), smart city solutions are working, when they address the ethical dilemmas inherent in these services. Singh (2019) noted that technology is the mere scaffolding that lifts the structures of society and cities cannot be built from technology up; they should be built around the needs and values of the human. Some authors have discussed the ethical issues which could emerge due to smart cities and the necessity of having smart values to overcome those issues. For instance, unequal citizen inclusion and the privacy threat due to mass surveillance are identified as issues of smart cities (Cobbe & Morison, 2019). Since the smart city technologies trace every move, habit, medical problem, and other private details of its people, it jeopardizes their liberty. Therefore, data transparency and privacy should be the top priority of the smart value system of its leaders. Accordingly, there is now an emerging debate between smart cities and ethical cities among scholars.

Indeed, when there is absence of ethical values among the people, all that physical, technological, and intellectual designs would not work properly. All those sophisticated city developments can be suddenly destroyed by a single action of an unethical person in the city. Therefore, the current study identifies the “smart values/ethics” of the people as a novel dimension of smart cities. It has been

considered the outer layer of the successful smart city, which ensures the smooth functioning of the entire system (see Fig. 1). As a concluding point to the discussion, the following figure specifies the meaning of the smart city concept.

Accordingly, the concept of a smart city could be broadly considered as a city with IT-led smart governance that ensures the comfort of the social aspect (public safety, education, healthcare, encouraging the participation in public life), economic aspect (flexibility of labor market, economic growth, and entrepreneurship), and environmental aspect (environment, sustainable resource management) of people's lives, through IT-led infrastructure, and ultimately improves the quality of life and well-being of the people in that city. More importantly, this entire system functions properly in an environment where people have ethical values.

When congesting the above idea more narrowly and preciously, "a city is said to be smart when it economically, socially, and environmentally enhances the well-being of its citizens through the smart governance which is blended with intellect, creative, and hi-tech solutions, a disaster resilience plan, and ethical values of the people."

Conclusion

The fuzziness of the existing literature made the researchers enhance the meaning of the smart city concept. Smart governance is an effective and efficient government which is a prerequisite of a smart city. The presence of smart governance is important as the regulating body making the right policy choices and executing them in a productive manner. ICT plays a facilitating role in every aspect of smart cities. The creation of ICT-led infrastructure is important for governments to act smartly, through the enrichment of services like public safety, public utility services, environment safety, sustainable resource management, entrepreneurship, flexibility of labor market, and economic growth. When those elements are properly functioning, the city becomes more resilient to man-made or natural disasters. Specifically, the city will be more capable of predicting and minimizing threats, absorbing damage, and bouncing back soon. Hence, finally, the "well-being of people" and "the quality of life" would be enhanced. However, all those sophisticated city developments could be suddenly destroyed by a single action of an unethical person in that city. Thus, the current study highlights the importance of identifying the "ethical values of people" as a vital dimension in defining smart cities. Therefore, it can be concluded that the inclusion of disaster-resilient aspects and ethical aspects into the characterizations of a "smart city" will enhance the smartness of the concept.

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Disaster-Resilient Smart Cities Inclusive and Pro-poor

75

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Contents

Introduction	1192
Development of Smart City	1193
Disaster Resilience: An Overview	1194
Smart City Mission: A New Developmental Context	1195
Need for Disaster Resilience in Smart Cities	1195
Disaster Preparedness and Challenges in Indian Smart City Context	1196
Smart City: An Inclusive Ideology	1197
Underprivileged Urban: Plan Smart with Sustainability for All	1198
Smart City: A Representation for the Underprivileged	1199
Social Inclusion for Underprivileged	1199
Access and Affordability for All	1200
Disaster Preparedness for Underprivileged: Universal Model	1201
Disaster Preparedness for Underprivileged: Indian Model	1201
Conclusion	1202
References	1202

Abstract

Mankind is currently encountering increased urbanization. The world is moving much faster with ease of access to anything and everything toward a status called *smart*. India, a diverse nation, is one of the fast developing countries in the world. The continuous achievement through computer literacy in popular fields especially in Information and Communications Technology (ICT) has motivated the country to plan for smart city development. However, the concept of smart city aims for a luxurious development which is going to be more computer competency and expensive. The concept of smart cities tends to provide technological advantage to its population, but it is imperative to look its effect on certain segments of the society, especially the underprivileged in terms of their

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accessibility and affordability. Moreover, the understanding of the concept of smart city development has made the researchers to think aloud the possible factors of providing resilience and sustainable development for the underprivileged eradicating discrimination, inequality, and injustice. Therefore, the main objective of this conceptual chapter is to glean ideas and suggestions regarding resilient, inclusive, and sustainable smart city development. This chapter will explore, through statistical information, models and best practices for disaster-resilient smart cities for the underprivileged.

Keywords

Smart city · Urbanization · Underprivileged · Computer competency · Sustainable development

Introduction

“Smart cities” is a popular terminology used in the worldwide developmental process. The perception of the term *smart* toward the people is an application of the technologies for the ease of access to luxurious deluxe lifestyle. The world’s future key element for growth and luxury lies in the construction and existence of city customs (UNFPA, 2012) that have published a report stating that more than 50% of the people which constitutes 3.3 billion of the world’s population lives in the urban areas and are expected to increase by 70% in 2050. The enlargement and implementation of Information and Communications Technology (ICT) has a plan for worldly modification with sustainable development (Albino et al., 2015). According to the Human Development Index (HDI) report for 188 countries, India ranks 131st with an evidence of world’s leading number of population in which 642 million are living in poverty and over 800 million people are still living in rural areas (69%) (UNDP, 2016). The mission for smart cities in India has an inception from the month of June 2015 which aims to create 100 smart cities on tenure of 5 years by 2020. By considering the current conditions, the period has now been extended to 2023 (HLRN, 2017).

In the mid-twentieth century, plentiful environmental, social, economical, and political crisis has affected our society on a larger scale (Trindade et al., 2017a). Many countries have strategically tackled and have moved its society toward sustainable (Toh, 2022) development. Later the development methods of the twenty-first century had focused particularly on Information and Communications Technology (ICT) (Gere, 2019) establishing a trend of moving toward global smartness which is believed to make the human life more comfortable in all aspects (Corcuera et al., 2019). Smart city is not a new concept for many developed and developing nations, but globally, there are still many countries that face challenges in understanding the concept clearly (Gade, 2021). Even today, many international countries misunderstand the exact ideology of smart cities limiting itself only to technological advancement (Samih, 2019). However, the concept of smart city

includes a planned infrastructure, renewable energy sources, Information and Communications Technology, Internet of things, sustainability (Mohanty et al., 2017), and most importantly disaster resilience (Parker, 2020).

Disaster is a growing menace for sustainable development (Keating et al., 2019). With increased universal risk, it should be dealt with development objectives. Resilience is an important terminology used in the area of disaster risk management (DRM) (MacAskill & Guthrie, 2014), but nowadays, resilience has been threatened by poor sustainability; therefore, it is moving toward implementing and establishing ideas for sustainable development (Toh, 2022). At the present time, this concept is playing a key role in the international, national, and local policy and development (Parker, 2020). Therefore, resilience against man-made and natural hazards is paramount for the well-being of many modern societies (Marasco et al., 2022). Hence, disaster resilience on a whole covers various aspects relating to vulnerability, governance, risk, sustainability, and adaptation (Parsons et al., 2016) which arrest the underlying drives for global risk. There exist critical research gaps for the underprivileged population regarding disaster preparedness (Shih et al., 2018) as the population need to be harnessed to strengthen the resilience building activities' inclusiveness which helps to manage and inculcate ideas regarding active disaster preparedness within the underprivileged population groups (Acosta et al., 2018). Therefore, by reviewing extensive possible literatures and government reports, this chapter seeks ideologies to include the underprivileged sections of the society and have possible amenities provided to ensure the best livable conditions among the urban population with the aid from technological innovation (Annual Report 2017–2018). The specific objective of this study is to analyze social inclusiveness for the underprivileged. Before analyzing, there are some significant concepts which suit for the study area to understand these concepts in a clear-cut manner and inculcate the readers with clarity in a broader sense.

Development of Smart City

The term smart cities had been introduced in the late 1990s by the European and the American countries as their focus was on innovation and invention, which made them far advance among nations worldwide (Simpson, 2015). The invention of computers, the Internet, and electronic devices which can store and retrieve data has made the world to think ahead towards being smart. At the same time, the concept of smart cities is still a dream for many underdeveloped and developing nations as it demands for huge economic and technological investment in terms of luxury and development (National League of Cities, 2016). Smart cities aims toward a “systems of people interacting with and using flows of energy, materials, services and financing to catalyze sustainable economic development, resilience, and high quality of life; these flows and interactions become smart through making strategic use of information and communication infrastructure and services in a process of transparent urban planning and management that is responsive to the social and economic needs of society” (Sherpa Group and the Stakeholder Platform, 2013).

The concept of smart cities was introduced in-between the years from 2014 to 2015 by the government of India. Globally, India being a developing nation, the industrialization and the technological innovation during post-independence has made India to flourish in developing the rural areas into urban areas which has completely changed the lifestyle of the country (HLRN, 2017). As a result, the Indian population has been classified into many segments from the rural, urban, and metropolitan and now into smart. India has planned to implement the necessary steps for realizing smart cities covering 100 selected cities nationwide in 2015, and the vision statement of the government of India's smart city program to "improve the quality of life of people and attract investors to invest to establish a virtuous cycle of growth and development" using the strategy plan of retrofitting, redevelopment, greenfields, and pan city, thereby quickly moving toward achieving the vision. The Indian government has also defined the concept of smart cities as "Developing the entire urban ecosystem which is represented by four pillars of comprehensive development – institutional, physical, social and economic infrastructure" and "Smart Cities are those cities which have smart (intelligent) physical, social, institutional and economic infrastructure while ensuring centrality of citizens in a sustainable environment" (Wadhwa, 2017).

Disaster Resilience: An Overview

Over the past decades, research studies on resilience have become a hot topic in many areas of scientific and applied research and also in multi- and transdisciplinary research context (Fan & Lyu, 2021). The term resilience has its own long and diverse history and has evolved from the concepts of "build back better" to "bounce forward" (Graveline & Germain, 2022). Disaster resilience can be justified as the ability to recover, emerge stronger, and overall withstand future unpleasant events (Acosta et al., 2018) that seriously threaten people's lives (Nurhidayati et al., 2020) irrespective of any geographical location worldwide. Globally, natural and human-made disasters are threatening factors of the rural and urban development (Xu et al., 2021). Urbanization has become an irreversible procedure and an indicator of national economic development and poverty diminution.

India may be said to be in the midst of evaluation from rural to quasi-urban society (Bhattacharya & Rathi, 2015). According to a census report, 52 Indian cities had more than a million population, and over the years, the urban population has increased and still keeps on increasing (Census 2011). Thus, smart city project mission aims to boost the economic growth and enable a standardized decent quality of life for the people and address problems through smart solutions ultimately ensuring human growth and development (Annual Report 2017–2018). In addition, the mission proposes the concept of resilience, with the main objective of reducing risk and enhancing resilience in all stages of a disaster by promoting smart connections toward vulnerability and sustainability development (Xu et al., 2021).

Smart City Mission: A New Developmental Context

India has an urban population of 410 million, making it the second largest urban nation in the world. The cities contribute 31% of India's population which constitutes 63% of gross domestic product (GDP) (Census 2011). In the past, the government of India and its union states and territories have faced many challenges in the urban improvement. New initiatives like "Make in India" project and "Clean India Campaign" have moved the country for a sustainable and inclusive development. The development has initiated the government to create new and improved cities for the nation. Private firms have also extended their roles in establishing new urban development projects like Lavasa and Palava which are located in the state of Maharashtra (Ministry of Housing and Urban Affairs, Government of India, 2019). Subsequently, the country has also planned for collaborative development through assistance from the world nations. One such program includes turning Varanasi into a smart city with the collaboration support from Japan, and even the United States has also shown interest in tie-up development. Like all the governments of the world, India also focuses on the need to provide new modernized infrastructure and advancement in the public sector (HLRN, 2017). Even though all these works are being witnessed in the mission of smart cities, the underprivileged of the country still lives in extreme poverty, and citizens basic rights are still not fulfilled and their representation has not been accepted as the living standard and the business which they perform has a negative impact in the urban services (Handbook of Urban Statistics, 2019).

Need for Disaster Resilience in Smart Cities

Disaster is an intensified damage which can be natural or man-made. It is recorded that the 3751 natural disasters which include earthquake, flood, tsunami, etc. have occurred globally for the past 10 years and have affected 1658 billion people (International Federation of Red Cross and Red Crescent Society, 2018). Disaster management is a prearranged structured activity that a strategy plan of action is required to manage the disaster efficiently. Disaster management and resilience needs an effective environment that enhances the initiative performance in developing smart cities. The disaster-experienced citizens are forced to live in poverty as they are vulnerable and their needs cannot be addressed continuously. Some studies have found that people with lower income and who are poor are in greater risk when they are exposed to natural and technological disaster (Eggers & Skowron, 2018). The disaster impacts are also becoming more critical and the crisis after the disaster becomes comparatively high. The post-disaster problems are more pathetic as the population especially the underprivileged lack housing, security, and resources and have a tendency to develop physical- and mental health-related problems (SAMHSA, 2017). The concept of smart city also aims to predict disaster prior to its usage of the latest technology, i.e., Information and Communications Technology (ICT), in response, rescue, and preparedness phase of a disaster. The invention of

smart gadgets and technological advancement like social media, smart phones, location-based system, satellites, sensors, etc. will potentially function for creating a new era and will provide intimation toward disaster management system in prior (Shah et al., 2019). The tragedy of post-disaster sweeps the entire development of the country and pushes the country to start from the initial point once again, but a disaster-resilient system with the smart technological conditions helps toward re-accumulation of resources and makes the country overcome the crisis situation within a short span of time. Smart development and resilience are closely related to each other in terms of growth, urbanization, and development.

The concept of smart city planning must not be a disaster mission but a resilient mission; hence, this undertaking should be strategically planned toward self-recovery from the hazards, traumas, and crises which ensure better sustainability for the countries' growth. Resilience on the other hand is more important for the nation as it prepares a post- and pre-successful plan for the speedy development and avoids the risk approaching multidimensional (The High-Level Political Forum on Sustainable Development, 2017). Improvement of disaster risk management inculcates awareness and helps to plan a nation with more sustainability in development, inclusive of all the contributors of the national development. The understanding of disaster resilience balances the areas in need of development in addressing and improvising the needs of the vast section of the society (Korngold et al., 2017). A resilience development should take in sustainable policy and practices with professional risk management practices and develop a framework with potentiality and consistency.

Smart city should ensure the use of ICT to its fullest and heighten the level of consciousness through which the citizen's intelligence, well-being, community participation, hazard handling, crisis intervention, trauma recovery, etc. get saturated. The inculcation of the rights and responsibilities for transformation of sustainable development achieves quality of life for the underprivileged section of the society (Skouby et al., 2014). With such improvement in technology, the government of India has initiated a plan of smart city for the national improvement with a vision to compete with the developed nations.

Disaster Preparedness and Challenges in Indian Smart City Context

The Disaster Management Act, 2005, defines disaster as "The catastrophe, mishap, calamity or grave occurrence in any area arising from natural or manmade cause, or by accident or negligence which results in substantial loss of life of human suffering or damage to, and destruction of property, or damage to, or degradation of environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area" (Ministry of Corporate Affairs, 2017). In India, the National Disaster Management Authority (NDMA) is the government nodal agency that is working exclusively in laying down policies for disaster management. NDMA was created by enacting the Disaster Management Act on December 23, 2005.

NDMA is headed by the Prime Minister and the State Disaster Management Authorities (SDMAs) by the Chief Minister of the respective states and union territories. Other organizations which work for disaster management and preparedness are the National Institute of Disaster Management (NIDM) and National Disaster Response Force (NDRF) (Thattai et al., 2017). These organizations work toward disaster preparedness, rescue, relief, rehabilitation, capacity building, and mitigation (Sharma, 2021) which helps to create field awareness and strategic response plans toward disaster management. India, with increasing unplanned urbanization, has poorly planned and unmanageable urban development. Smart cities in India aim to create an urban space where green, hi-tech initiatives create much efficient utilization and management of resources like water and energy and better services to the community (Magotra et al., 2019). Therefore, obtaining a fully efficient protocol toward disaster management and smart cities is highly challenging, but it can be improvised through continuous monitoring and updating of the global ideas to help prevent massive exposure to disaster (Elvas et al., 2021).

Smart City: An Inclusive Ideology

The smart city mission as a national development program ensures full development of all sections of the society; above all it should not posit the underprivileged section of the society to stay behind in darker side which directly affects the nation's development (OECD, 2015)). The urban India comprises majority of the people living in the slum and in unhygienic condition. Their contribution to the national development is also to be respected and recognized as they too have equal rights to be exercised (Haughton & Khandker, 2009) and should be allowed to experience and enjoy the nation's development without any discrimination. Smart city, a planned project of the nation, is showing progress towards creating sustainable environment with representation from all sections of society. Irrespective of huge population parameters, the underprivileged and the weaker section of the society has no constructive representation within themselves (Phadke, 2018); thus, negotiation with them will be a struggle and ensuring full development is a question.

The awareness to differentiate the cause for development is only possible with education as the questioning tendency becomes reasonable when literacy is ensured. The government along with the bureaucracy should ensure enough transparency to educate the underprivileged on their rights and must ensure their sustainability in their developmental standards (Trindade et al., 2017a). The growth of the nation should promote developmental space for the underprivileged with equal and sustainable distribution to all; therefore, the citizens of India must make sure for a unified development witnessing “India, a nation unified with diversity.”

Underprivileged Urban: Plan Smart with Sustainability for All

India is a fast growing urban country. According to the 2011 census, the urban population has increased to 377.1 million compared to the 2001 census which was 286.1 million. In the recent years, India has developed a large number of newly emerged towns which shows there is a huge industrial investment and demand for urbanization. Expansion in urbanization created in encroachment of urban slum which remains as a hindrance in country's development. Access to basic amenities like employment, transportation, sanitation, housing, and livelihood has also improved in a good number which is recorded in the 2011 census (Ministry of Housing and Urban Affairs, Government of India, 2019). Literacy rate as one of the indicators of the society's development records that the urban overall literacy population was 84.1%, and Mizoram and Kerala states have high literacy rates of 97.6% and 97.1%, respectively. In low human development countries, the adult literacy is 47.5% in total and the population which has access to the Internet is 17.1% (Registrar General & Census Commissioner, India 2011). Even though the country has developed in various aspects, the swell in the urban population has created slum development leading to vast and congested people's settlements, and thus evaluating these aspects, the underprivileged society of India stands as a hindrance in the development of urban infrastructure.

The Planning Commission (2013) articulates vision for "faster, more inclusive, and sustainable growth." The plan emphasizes five agendas which include (1) inclusiveness as poverty reduction, (2) inclusiveness as group equality, (3) inclusiveness as regional balance, (4) inclusiveness and inequality, and (5) inclusiveness as empowerment. The five agendas were initiated to promote sustainability and inclusiveness which decides the countries' development (World Economic Forum, 2015). The Sustainable Development Goals by the United Nations especially the first, second, third, fifth, and ninth goals have been widely focusing on the development of underprivileged (The High-Level Political Forum on Sustainable Development, 2017).

There are four fundamental truth which serve as a foundation for the system of successful implementation and execution of smart cities for the underprivileged. They are the following: "(1) wellbeing, this includes safety, infrastructure, and functionality to enhance the overall performance from the citizens' perspective; (2) equity, this focuses on the accessibility and coverage for the poor and marginalized in which the well-being condition is available to all the section of the society without any discrimination; (3) efficiency, this focuses on the performance of the individual and the country with the utilization of the resources, finance, and human power; for a better and expected outcome, the quality is ensured and the resources on all aspects are highly utilized; and (4) foresight, the long-term achievement is analyzed and the aspiration and the strategy that needs to be attained are planned strategically" (Bhattacharya & Rathi, 2015).

Smart City: A Representation for the Underprivileged

Metropolitan areas have engaged in the development of urban infrastructure. Sustainable urban development inculcates people regarding the awareness to limit the uses of resources by reusing it to the fullest. This chapter proposes four attributes for achieving smart and sustainable city: (1) sustainability, (2) quality of life, (3) urban aspects, and (4) intelligence. These four attributes enhance innovation and problem-free practices for the underprivileged and weaker sections (Trindade et al., 2017a). Simultaneously, there exist many models and practices worldwide but their successful implementation is still a question. The factors of development in the country have created an imbalanced pattern in the living standards of people. Planning a smart city for all the sections of the society in the short span of time tends to develop bias and stereotype with weaker section of the society which leads to political unrest and problem in social development (Phadke, 2018). However, the population of the underprivileged is high and they are harassed, humiliated, and discriminated because they are powerless and lack social representation (Plotnikov et al., 2019). Planning smart cities with the inclusive representation equally benefits to address their needs and the representative's voices are recognized.

Lack of infrastructure and improper planning of cities result in population explosion. Thus, the underprivileged people in the long run will establish temporary shelters which in the long period of time will develop into slum settlements in the urban areas (Phadke, 2018). It is difficult for the government and the administrators to eradicate existing slums in a shorter span of time; rather, identification of emerging new slum can soon be addressed and can be stopped with establishing new settlements through slum clearance board. The underprivileged and the weaker section of the society are forced to stay in the urban areas as the opportunity for the employment is high compared to the rural areas (National Disaster Management Plan, 2016); thus, the new smart city mission should ensure equal distribution of employment even in the semiurban areas.

Through the urban development, the smart city mission should guarantee sustainability in development by creating more space for the migrants and the underprivileged. The people should be unified and there should be also representation from the underprivileged to ensure inclusion and equality in sharing resources and thereby to have unified development for sustainability growth (Plotnikov et al., 2019) which unites them for a better adaptation with others in the developmental context of smart cities.

Social Inclusion for Underprivileged

Social inclusion and exclusion are inseparable sides of the same coin, and every person has a mind-set to live in prosperity and enjoy a good standard of living. The sustainable development models aim to evacuate all the society from poverty and hunger and provide access to health education and information (Trindade et al., 2017a). Social inclusion is a process and a goal to be achieved in all aspects of

development promoting and helping in eradication of exclusions of the society. The socially excluded groups according to this study include poor, uncared elderly, urban slum people, and disabled. Social inclusion aims to have a full-fledged participation of all the excluded groups ensuring growth and development by providing opportunities for their involvement and respecting their rights through nonbiased distribution of the resources (National League of Cities, 2016). Discrimination is the major hindrance for inclusiveness as it motivates exclusion process leading to injustice and obstructs the even distribution of opportunities triggering discouragement and isolation. The underprivileged mentioned in this study due to their incompetence and exclusion from the dominant society finds some hardships to compete with them as their state of exclusion has made them to extend on dependency which leads to personification. The exclusion has prolonged through many ideologies in the human era which extends toward unequal access to resources, unequal participation, and denial of opportunities which suppressed their growth for development.

Old age is an increasing phenomenon and the elderly are considered to be the most underprivileged section. As the world's majority of population is growing old creating dependency, excluding them in terms of their age leads to discrimination; thus, the elderly should be taken cared of with proper infrastructure and ensuring their rights and privileges. The twenty-first-century social contract for urban life must be rooted in an age-friendly philosophy, making the elderly feel safe and secured (MHFI, 2016). Infrastructure development, housing, access to community health opportunities for education, recreation, etc. should be included in the provision of smart city mission. Age-friendly city should be constructed for a better user-friendliness for the older people to satisfy their changing needs (Skouby et al., 2014). With the application of universal models, smart city development may heighten the level of awareness for a successful planned city with inclusion of all the section of the society.

Access and Affordability for All

Any swift change is difficult to accept as this is an existing human psychological inclination. India's smart city concept has made some turbulence among the social scientists and thinkers as the sudden implementation on a shorter span of time may lead to subjective issues like gender inequality and discrimination toward women, minorities, schedule cast, schedule tribe, children, person with disabilities, and also to the poor and slum living people (World Economic Forum, 2015). To have a clear outfit on the above said issues, a question was put forth by the opposition party on the house of the people, i.e., Lok Sabha, "Question: Whether the Government has taken into consideration people with special needs, the aged citizens, and such special classes of citizens, to ensure accessibility in the smart cities and if so, the details thereof." To this question by the opposition, the response was given by the Minister of Housing and Urban Affairs "Answer: The Smart Cities Mission aims at accelerating economic growth and improving the quality of life of people, among others, the core infrastructures elements in Smart Cities also include affordable

housing especially for poor, and safety and security of citizens, particularly women, children and elderly provision of accessibility infrastructure has also been made in the Smart City Proposal prepared by Smart Cities” (Lok Sabha, Question No. 1075, 8 February 2017). Hence the concept proposes for an inclusion in every section of the population, thereby ensuring access and affordability leading towards consistency in growth and development (HLRN, 2017).

Disaster Preparedness for Underprivileged: Universal Model

Prevention is a safe game played by many external and internal contributors in which they establish a model of change for the future world. Some universal initiatives taken by the world nations have to be acknowledged especially for the underprivileged because as citizens, their lives also matter. The Californian government incorporates solutions like the individual-resilient solution and community-resilient solution to generate awareness and assistance among all sections of society (Cal OES, 2019). The Indonesian government in Jakarta (capital of Indonesia) has initiated an innovative early warning system via SMS at the urban slums alerting people on upcoming floods, and large-scale adaptation infrastructure projects have also been developed to accommodate the urban slum people during urgent floods. Sao Paulo, a municipality in Brazil, identifies risky areas for landslides via geo-referencing and alerting people of the slums in prior and efforts for landslide major slum upgradation are always ensured (Baker, 2012). Toyama city in Japan uses walking assistance cart (a four-wheel walking aid) for elderly safe transportation during normal and disaster situation (OECD, 2015). These models exist as some key eye-openers for the world nations acknowledged from the perspective of the underprivileged which are in similarity and can be incorporated as a universal model for the Indian government in terms of smart city development. Hence, by incorporating these ideologies and moving forward the disaster resilience smart cities will be a successful proposal benefiting all the section of the society ensuring social inclusiveness with special reference to the underprivileged.

Disaster Preparedness for Underprivileged: Indian Model

India’s geoclimatic condition and high degree of socioeconomic vulnerability have made the country disaster-prone among the world’s nations. During the last 30 years, the country has been experiencing nearly 431 major disasters which have led to loss of many lives and properties. Most of the disasters occurring in India are floods, cyclones, windstorms, heat waves, earthquakes, landslides, etc., and based on intensity, these disasters are classified into moderate, high, and severe risk (Magotra et al., 2019). The concept of disaster management has been chaptered in detail by the Tenth Five-Year Plan (Kaul et al., 2016). Disaster preparedness for the underprivileged in India begins from legislative and institutional framework under the Disaster Management Act of 2005, National Policy of Disaster Management, and state

legislative acts enacted prior to disaster management act, legal institutional framework for disaster management, and response setup across the country for disaster management. The legislative framework has been screened and planned by the national plan for disaster management, state plan for disaster management, national disaster management guidelines, and demarcation of roles and responsibilities. Therefore, based on the funding and resources arrangement, the plan will be executed by the National Disaster Management Authority by communication and response system (Union Government Civil, 2013). Hence, by assessing the vulnerability, the response team seeks for effective evacuation process through the application of community-based disaster management strategy (Bhagath, 2020; Singh, 2013). Thus, to address the underprivileged, the national disaster frameworks which include institutional mechanism, early warning system, disaster preparedness and mitigation, disaster prevention strategy, and human resource development (Subbaraju & Siva Krishna Raju, 2015) are continuously monitoring and working with the national broad guideline for the betterment of the underprivileged Indian population.

Conclusion

The smart city mission creates more opportunity for humanity to move toward holistic and inclusive development. The application of inclusive development ensures the underprivileged to participate in establishing smart city project. Inclusion as an instrument imbibes human rights and eliminates social exclusion. The government of India on execution of the project needs to be more specific in adapting the benefits for the underprivileged on a multidimensional approach for a sustainable developed nation. Technological development should not be a barrier or an obstacle as the upcoming generation and the mid-aged population shall be informed on technological utilization and a proper assistance shall be ensured for their comfortableness. Hence, the ideology of implementing smart city mission in various cities will be a success when all the populations are given inclusive equal opportunities, by which people of all segments get benefited which obviously benefits the development of the nation.

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Disaster Governance and Policy for Dhaka: 76 Building a Smarter City

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Contents

Introduction	1208
Disasters, Policies, Governance, and Analysis	1209
Actions for Improvement and Conclusion	1216
References	1220

Abstract

The chapter is an attempt to address the issues of disaster governance and public policy in Dhaka, the capital of Bangladesh, which is a designated smart city. A smart city is recognized as environmentally secured, safe from disaster risks, and has efficient governance for living and livelihoods. A smart city ensures integrated products and services, creation of jobs, wise use of resources to develop the living standards of city dwellers. Owing to national policy and economic resource strategy Dhaka has emerged as a center of livelihood for people from across the country. Having more than 20 million people, Dhaka city contributes to 36% of the country's GDP. The high density of people and property in Dhaka city compound the risk for natural and/or technological disasters. Flood, water logging, drainage congestion, un-planned use and abuse of wetland, earthquake, pollution, and fire are the potential disaster risks and challenges faced by Dhaka, which is constantly increasing its rapid expansion. However, in terms of policy, planning, and program formulation and implementation the Dhaka city governance authorities with institutional arrangements are facing the challenges of disaster mitigation with knowledge and capacity. Now it needs coordinated efforts of government organizations, nongovernmental organizations, Civil Society, Researchers, Scientists, Media, and city dwellers to provide an effective response to the mitigation approach to achieve good disaster governance in building Dhaka as acceptable among the smart cities of the developed world.

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Keywords

Smart City · Dhaka · Policy · Disaster · Governance · Bangladesh

Introduction

Dhaka city is no stranger to disasters, but is recognized as one of the most vulnerable cities to the impacts of natural as well as manmade disasters such as flood, water logging, drainage congestion, unplanned use and abuse of wetland, pollution, fire, and the potential risk for earthquake. Dhaka is situated on the southern fringes of an area that is seldom flooded. Dhaka city has experienced many major floods affecting up to 77% of the area, with about 66% of city dwellers being submerged. Wetlands are described as a natural security in maintaining the environment. Owing to rapid expansion of housing, industrialization, and infrastructural development, the wetland of Dhaka city and its adjacent area are being reduced, thus affecting the natural drainage system and causing frequent water congestion and water logging with adverse effects on the surrounding ecology and biodiversity. Hazards such as fires and technological disasters occur in Dhaka city almost every year, causing a huge loss of lives and assets, which has led to disruption of living conditions of city dwellers. Increased population, faulty electrical wires, higher power loads, loose connections, use of old equipment, unsafe use of chemicals, old and risky gas pipelines, and petrol and compressed natural gas (CNG)/liquefied petroleum gas (LPG) stations have been linked to the increasing frequency of fires in Dhaka city. Environmental problems created by the transport sector and pollution generated by defective fuel burning from motor vehicles constitute one of the major health hazards and cause road congestion in Dhaka city. Experts indicate the possibility of an impending earthquake striking Bangladesh any time in the future; if this happens, there will be a mega-catastrophe in Dhaka city with unbelievable damage to the infrastructure, property, and loss of life. Against this backdrop, the future development of Dhaka to build as a smarter city are being guided by the national policy makers and related public institutions taking account of disasters and their effect.

Dhaka, the capital city of Bangladesh, has existed for many hundreds of years as physical urban. Dhaka is situated on the banks of the river Buriganga and at a center point between the Bay of Bengal and the interior region of the country. In 1960, the Mughal Emperor centered their provincial capital of Bengal in Dhaka. Over the last 400 years the size and population of Dhaka city have increased remarkably. Once Dhaka was planned for 1 million people (Mitra & Ali, 2009). At present more than 20 million people live in Dhaka, which is about 10% of the country's total population. The population of Dhaka city is growing continuously either by birth or by migration. Dhaka alone contributes 36% of the country's GDP (World Bank, 2012). Owing to national policy and economic resource strategy Dhaka has emerged as a center of livelihood for migrants including job seekers and emerging elites from across the country and has now shaped the hope of alternative income opportunities, education, health care, and substantial improvement in livelihood. The average share

of employment in Dhaka is 51%, i.e., 14% in the public sector and 37% in the private sector, and 20% of the working population is engaged in industries (IGS-BRAC, 2012). From the inception, the focus of investment and construction prevails in Dhaka city; most industries, manufacturing units and readymade garment (RMG) factories are located and constructed in Dhaka city. The RMG industry accounts for half of the formal employment of the country and 30% of the RMG jobs are located in Dhaka city. The industry and wealth of Dhaka city has been based on flood plains, which have sometimes been a victim of disasters. When disasters happen the livability of city dwellers has to be compromised and governance is seen to be the influential factor in improving the livability and making them resilient.

The high density of people and property in Dhaka City compound the risk for natural and/or technological disasters. By disasters are meant here all those that cause hazards to the day-to-day affairs of Dhaka City, disrupting wellbeing and the livability of city dwellers and polluting and degrading the environment. Owing to the concentration of built structures, infrastructure, properties, and people, governing disasters in Dhaka is a very complex task. Governance is defined in terms of policy, planning, and program formulation and implementation with knowledge, capacity, transparency and accountability; and institutional arrangements for facing disaster hazards. Thus, in building Dhaka as a smart city the challenge of disaster governance and policing is equally as important, such as financial mobilization, infrastructure, and information and communications technology (ICT).

Disasters, Policies, Governance, and Analysis

Flood, water logging, drainage congestion, unplanned use and abuse of wetland, earthquake, pollution and fire are the potential disasters risks and challenges faced by Dhaka, in its path to developing into a smart city, which is constantly increasing with its rapid expansion. To ease the situation in 1989, a Flood Action Plan (FAP) was formulated to protect Dhaka City with the objective of providing flood mitigation, drainage improvement, and a safe living environment for city dwellers. In this respect, other major initiatives that have been taken so far are the Flood Hydrology Study, Flood Management Study, National Water Plan, National Water Policy, and the Flood Warning System Study. Wetlands in Dhaka are reducing because of the rapid infrastructural expansion of Dhaka. To address this hazard, the Wetland Conservation Act-2000 and the Detailed Area Plan were issued to protect the wetland of Dhaka; Water Supply and Sewage Authority Act 1996, Bangladesh Environment Protection act-1995 to deal with the pollution of water bodies and the Water Bodies Protection Act-2000 for the rational use of water bodies for housing and infrastructural development. As precautionary policy measures toward an impending earthquake to strike Bangladesh in the future, there are Bangladesh National Building Code, 1993 and Dhaka Metropolitan Building Construction Rules, 2006 to cover planning administration and enforcement, general building controls and regulations for earthquake safety and fire protection. In order to face the post-earthquake situation Bangladesh government has taken initiatives to form a

group of volunteers, procure equipment for search and rescue-related operations, and has a plan for disaster-related equipment. Fire events are far from being accidents and are preventable. Factory fires happen because of poor planning and a weak infrastructure. Factories Rules 1979, Fire Prevention and Extinguishing Rules 2003, Bangladesh National Building Code 1993, and Dhaka Metropolitan Building Construction Rules 2006 provide broad guidelines on fighting fires, evacuation systems, and directives for making buildings relatively safe from fire hazards. Every year in April Bangladesh Fire Service and Civil Defense observes fire prevention week for awareness building. The Government has enacted Transport Policy 2019 to tackle the situation. However, there are plans and programs for disaster governance for Dhaka to make a smart city but it is also a fact that the city has largely grown in an unplanned manner, thus making it vulnerable during disaster. The Bangladesh Water Development Board, Bangladesh Fire Service and Civil Defense, RAJUK (Capital Development Authority), Bangladesh Road Transport Authority, and Dhaka City Corporations are the vital agencies on disaster mitigation initiatives that led to the development of policies and proper monitoring to control and enforce policy/rules for Dhaka city being smart. In 2010 the Government issued a National Plan for Disaster Management involving the governance of risk and consequences of disasters and formed a separate Ministry of Disaster Management and Relief as a key point on disaster governance.

A smart city is not just about technology, but also about an urban center that is safe from disaster risks, environmentally secured, and has efficient governance for living and livelihoods. A smart city ensures integrated products and services, smart solutions to infrastructure, and promotes a variety of transport options; a smart city can create jobs, use resources wisely, and develop people's living standards. Almost 60% of people across the globe live in cities that are at risk from at least one major natural disaster such as flood, drought, cyclone, or earthquake. Owing to climate change the frequency and intensity of these disaster events are thought to have greater risk and vulnerability. Bangladesh is recognized as one of the most vulnerable countries to natural disasters owing to its geographical location and high density of population. In the context of Dhaka City, disasters and hazards are posed by floods, water logging, drainage congestion, unplanned use and abuse of wetland, earthquake, pollution, unauthorized infrastructure, and fire. In Dhaka City, so many buildings exist close together and millions of people live in close proximity, which brings some issues when natural disasters arise. Thus, adaptation of policies and governance is a justified concern for minimizing and reducing the vulnerability of the city dwellers.

Dhaka city has experienced many major floods, affecting an area of up to 77% with about 66% city dwellers being submerged. Floods in Dhaka affect the basic elements of a smart city such as water supply, transport, and housing by displacing city dwellers. Impacts and damage of extreme flooding that occurred in 1987 and 1988 (two times) hit Dhaka City, causing an enormous loss of life and livelihoods and damage to property, which brought into focus the urgent need for immediate governance. Subsequently, the Government of Bangladesh (GoB) prepared an urgent flood protection and drainage plan including flood embankments, reinforced

concrete walls, and drainage/flood regulation structures such as sluices and pumping stations and has banned the filling in of any wetland for urban development. In 1989, an FAP was specifically issued protecting Dhaka City from flooding, covering flood management such as flood mitigation and drainage improvement to provide a secure living environment for city dwellers, and the Structure Plan of Dhaka Metropolitan Development Plan (DMDP) 1995–2015 was formulated, focusing on the FAP. However, to protect Dhaka City from flooding, dredging work in the surrounding rivers such as Buriganga, Turag, and Balu has been regularly carried out. Massive construction work was also commenced in 1989 to provide flood protection facilities to the most highly urbanized areas, covering about 87% of Dhaka City. In addition to structural measures, nonstructural measures such as flood forecasting and warning and evacuation have been institutionalized to ensure the status of smart city by reducing flood damage. In this respect National Water Policy 1999 can be understood, which emphasizes water-related problems and risk zoning; it focuses on flood proofing, both structural and nonstructural for flood management, early warning, and preparedness. Other major initiatives are the Flood Hydrology Study, Flood Management Study, National Water Plan, and the Flood Warning System Study.

Wetlands are important features of nature and considered an ecological safety valve, which are described as natural security in maintaining the environment. Dhaka was built on the higher terrain and encompasses a river, network of canals, and wetlands. But with the increasing population, the low-lying areas of Dhaka city are being occupied over a period of years owing to the settlement of migrants, rapid expansion of housing, industrialization, and infrastructural development, which cause damage to the natural drainage system of Dhaka, and frequently occurring water congestion and water logging affecting the surrounding ecology and biodiversity. There are many sectoral laws in nature related to water bodies that exist in the country, such as the Bengal Canal act 1864, East Bengal Embankment and Drainage Act 1952, Ground Water Management Act Ordinance 1985, and Water Supply and Sewerage Authority Act 1996. Focusing the pollution of water bodies the Government has enacted the Bangladesh Environment Protection Act 1996. In 2000, the government enacted the Natural Water Bodies Protection Act for the rational use of wetlands in development and settlement works. This Act particularly prohibits any sort of development activities on the wetlands in the Dhaka Metropolitan Development Plan area; issued a detailed area plan (DAP), which has given precedence to eliminating water logging and drainage congestion in Dhaka city; and the Structure Plan of DMDP 1995–2015 for drainage capacity adjustment, a comprehensive drainage development plan and improvement of the drainage management system. The annual loss of wetlands in and around Dhaka city during 1989–1999 was 1.23%, which increased to 5.70% during 1999–2003. If this rate of loss continues then there will be no wetlands in and around Dhaka city in the near future. Thus, further loss of wetlands need to be prevented to mitigate the adverse impact of disaster for balancing the ecosystem and better living of city dwellers.

Experts indicate the possibility of an impending earthquake striking Bangladesh at any time in the future. Dhaka city is at a high risk for earthquake owing to its unplanned urban growth, inadequate infrastructure, and uncontrolled urbanization

resulting in incredibly high population density. A huge number of buildings have been built in Dhaka city flouting the Bangladesh National Building Code, which did not even exist prior to 1993, and more buildings exceeded the number of floors and space then allowed in the approved plan. The present Mayor of Dhaka South City claimed while speaking in a roundtable discussion in March 2019 that around 5500 buildings have been constructed in the capital illegally. Meanwhile, the Government (Bangladesh Inland Water Transport Authority) demolished about 2000 illegal structures along the Buriganga River in Dhaka city in its eviction drive and Dhaka City Corporations have been demolishing the unauthorized constructed/built/extended portions of the structures. However, the earthquake hazards can never be resisted, but the impact in Dhaka city can be reduced/limited by introducing proper policy and planning for disaster management, community awareness build-up and training, proper implementation of the national building code, and enrichment of a well-equipped rescue team. As precautionary policy measures there are the Bangladesh National Building Code, 1993, and the Dhaka Metropolitan Building Construction Rules, 2006, to cover planning administration and enforcement, and general building controls and regulations for earthquake safety and fire protection. In order to face the post-earthquake situation Bangladesh government has taken initiatives to recruit 70,260 urban volunteers and has procured 7496 pieces of equipment for search and rescue-related operations and has a plan to procure another 2154 pieces of disaster-related equipment with the support of the Japanese government (GoB, 2015).

Almost all cities of the globe are more or less affected by pollution, but Dhaka city has reached the highest level. Air and water pollution are the varieties of man-made/technological disasters to the environment that have taken place in Dhaka city creating obstacles to safe and healthy living and affecting with different kinds of fatal diseases. The environmental degradation situation in Dhaka City has arisen out of a lack proper sewage and sanitation for a huge number of residents, particularly the poor who live in the slums; polluting effluents from vehicles, industries, and the presence of brick fields and tanneries in and around Dhaka. The tannery at Hazaribag in Dhaka city and water vehicles plying trade in the Buriganga, Turag, and Balu rivers, are responsible for severe water pollution. However, recently the Government has endured the sifting of all tanneries from Dhaka city to Savar. The unauthorized and open space piling of generated solid waste in Dhaka profoundly impacts the quality of life city dwellers. Dhaka city dwellers are also exposed to noise and odor pollution. As a part of governance and policy, in 1977 The Environmental Pollution Control Ordinance promulgated ambient air quality standards, vehicular exhaust emission standards, river mechanized transport emission standards, and gaseous emission for industries or project standards; in 1989 The Department of Environment Pollution Control was renamed The Department of the Environment, which reflects the seriousness of the government in dealing with environmental pollution; in 1995 the Environmental Conservation Act was enacted, which also contains laws as regards the protection of environmental health and the control of environmental pollution; in 2018 the shifting of all tanneries from Hazaribagh to outside of Dhaka city was completed with strict initiatives and

monitoring by the government; the government banned wood as a primary fuel in the brake-making process in and around Dhaka city and the Dhaka City Corporations built many shades for temporary dumping of waste. Dhaka city has recently been identified as the city with the worst air pollution city in the world. In this situation, in a ruling on 26 November 2019 the High Court Division of The Supreme Court of Bangladesh banned the operation of all brick fields situated near Dhaka city in the districts of Narayanganj, Mushiganj, Manikganj, and Gazipur. Environmental problems in Dhaka city are also created by the transport sector and pollution generated by fuel-burning defective motor vehicles, which is one of the major health hazards and causes of road congestion in Dhaka city. The Government has enacted Transport Policy 2019 to tackle the situation.

Occurrence of fire incidents is a common phenomenon in Dhaka city, particularly in the dry season. Fire that break out in slums, garment factories, and small manufacturing industries are regular news items during that season. Fire hazards that occur in Dhaka city causing a huge loss of lives and assets almost every year are termed accidents, but most fire events are far from being accidental and are preventable (GoB, 2010); fire hazard is a technological disaster that has led to disrupted living conditions of city dwellers and hampered Dhaka from becoming a smart city. Increased population has been linked to the increasing frequency of fires in Dhaka city. Faulty electric wires, higher power loads, loose connections, use of old equipment, unsafe use of chemicals, old and risky gas pipelines, and petrol and CNG/LPG stations at improper places are responsible for most of the fire incidents in Dhaka city. In 2018 alone, at least 468 fire incidents were reported in Dhaka city and among which the horrific Nimtoli fire of 2010 killed 124 people, the Chawkbazar fire of 2019 killed 71 people, and the Tazreen Fashions Factory fire of 2012 killed 112 people. In all cases, fires were caused and had a devastating effect because of the unregulated chemical warehouses in Nimtoli and Chawkbazar. Factory fires occurred owing to poor planning and weak infrastructure. The Factories Rules 1979, Fire Prevention and Extinguishing Rules 2003, Bangladesh National Building Code 1993 and Dhaka Metropolitan Building Construction Rules 2006 provide broad guidelines on fighting fires, evacuation systems, and directives for making buildings relatively safe from fire hazards. Every year in April the Bangladesh Fire Service and Civil Defense observes fire prevention week for awareness building.

Dhaka is well known as a city of rickshaws, manually driven nonmechanized vehicle popular with lower- and middle-class city dwellers. Rickshaws are pollution free but are a cause of road congestion in the city. Dhaka city offers 65% of jobs in the informal sector, among which largest portion is in the rickshaw sector (Mukherjee, 2006). However, in addition to rickshaws, private cars, buses, minibuses, taxis, tempos (baby taxis), and three-wheelers (auto-rickshaws) are the essence of transport in Dhaka city; emissions from these mechanized vehicles are one of the major sources of environmental pollution in Dhaka city. Improperly maintained vehicles and the use of leaded gasoline vehicles are responsible for polluting Dhaka. A study revealed that in Dhaka city, 80% of buses, 90% of trucks and 80% of tempos have been polluting the city by discharging high levels of carbon monoxide emission. To ease the situation from the governance angle in 2006, the

Strategic Transport Plan was adopted for the creation of environmental pollution control standards with a special emphasis on emission from vehicles. In 2002, legislation was introduced for the use of relatively environmentally friendly CNG in vehicles and following the legislation, two-stroke auto-rickshaws, the largest contributors to the city's air pollution, were banned in Dhaka city. The Bangladesh Road Transport Authority, Road Transport Committee, Dhaka City Corporation, and have been playing regulatory functions and the Dhaka Metropolitan Police (DMP) is the implementing authority of traffic management in Dhaka City's transport system.

Dhaka City dwellers face the most serious problems such as traffic jams in their daily life, which consists of 3.2 million work hours per day. Increasing numbers of vehicles on the city's roads contributes to more air pollution emissions and hampers the living standards of city residents. In this situation, the Government has already revised the Strategic Transport Plan for 20 years (2015–2035) to enhance traffic speed. The government has massive plans for Dhaka city. To increase traffic speed and improve living standards of Dhaka city dwellers the Government has taken up plans/projects to build Metro-rail, an Elevated Express Way, and a Digital Traffic System. The projects are being implemented and yet to be completed soon. Metro-rail will certainly help to reduce the number of vehicles in Dhaka city; the Elevated Express Way and the Digital Traffic System will increase the average traffic speed and thus help to reduce emissions from vehicles in Dhaka city and to improve the living standards of city dwellers.

With the economic progress of the country poverty has been declining with improvement of the material wellbeing of the citizens. Dhaka city provides large share of goods, employment, housing, and amenities to enjoy comfortable living and thus, needs a stable electricity supply, water supply, and soil waste management system with assurance of improved service delivery in this regard. Bangladesh now has 23,548 MW installed capacity of electricity and 97% of households have access to electricity (GoB, 2020). Ensuring the distribution of electricity irrespective of slum and nonslum areas through a definite entity is very concerning for Dhaka being smart city. Power generation and transmission distribution to the end users lies entirely with Bangladesh Power Development. In 1977 the Government formed the Rural Electrification Board to ensure the rural distribution of electricity. In 1990 the Dhaka Electric Supply Authority (DESA) was established to provide improved service delivery within Dhaka city. In 2008, the Dhaka Power Distribution Company Limited (DPDC) was formed and took over DESA. The DPDC covers the southern part and the Dhaka Electric Supply Coorporation (DESCO) covers the northern part of Dhaka city. This two authorities are responsible for ensuring the distribution quality of electricity to the city consumers of their jurisdiction and related commercial functions. A few years back frequent power cuts for about 4–5 h a day were common in Dhaka city owing to constraints in the distribution of electricity (IGS-BRACK, 2012). This situation has changed with the expansion of the generating capacity of the country. Now, the city dwellers are getting uninterrupted electricity. However, there are still illegal connections, particularly in the slum dweller area of Dhaka city and corrupt practices in the case of providing service to faulty connection line repair. To ensure water supply delivery, the Dhaka Water

Supply and Sewerage Authority (DWASA) Dhaka Water Supply and Sewerage Authority (DWASA), established in 1963, further endorsed by the WASA Act, 1996, is responsible for providing water, sewerage, and drainage services to Dhaka city citizens. At present DWASA has 311,064 registered consumers, mostly in the nonslum area of Dhaka city. With its 2842-km distribution line DWASA has been meeting the consumers' daily demand of 3152 million liters of water; DWASA produce 3204 liters daily (Water Supply Master Plan, 2021). Almost 100% of Dhaka city dwellers of nonslum areas and only 34% of slum residents are covered by the DWASA water supply distribution line network (IGS BRAC, 2012). The rest of Dhaka city dwellers have to manage water by their own arrangement from various sources such as their own wells, water vendors, private companies, and non-governmental organizations. Dhaka is a rapidly growing city with a growing population and hence its water requirements need to be met through formal channels for the well-being of the dwellers.

The responsibility for solid waste management (SWM) lies with the City Corporations (Dhaka North and South City Corporations). There is definitely no law for SWM except that corporations have the Conservancy Department to collect waste from the source for dumping in a specific place. Open-place dumping of waste is one of the causes pollution-related problems in Dhaka city, with health hazards. Dhaka city generates about 4750 Mt of waste daily (Menon, 2002). Among the produced waste 78% are residential, 20% industrial, 1% institutional, and remaining 1% others; from the source city corporations are supposed collect all waste, but they provide only 85% of services; the rest is found here and there in the streets and drains (Rahman & Rahman, 2011). The slum/poor of Dhaka city can hardly be served by the City Corporations because of the inaccessibility of their garbage vehicles and thus, community members are encouraged to develop participatory type waste management/disposal (Islam & Shafi, 2004). In most smart cities waste is separated for recycle and reuse. Here in Dhaka city there is a small arrangement for the separation of waste for recycling, but there is a dismantling facility in the formal sector that is yet to be developed. In the informal sector separation of waste for recycling is done and many children and women are involved in the recycling process, but there are health hazards (Ahsan et al., 1991). About 120,000 urban poor are involved in the recycling trade chain of Dhaka city (ESDO, 2010). This recycling process is very injurious and hazardous and there is no specific management guideline or regulation. The waste activities in Dhaka including production, import/export, and recycling, etc., are carried out under the provision of (i) the Bangladesh Environment Conservation Act 2010, (ii) the Chemical Substance Depleting Ozone Layer (Control) Policy 2004, (iii) the Sound Pollution Policy 2006, (v) the Bangladesh Environment Conservation Policy 2010, (iv) the Hazardous Waste and Ship Breaking Waste Management Policy 2011, (vii) the Bangladesh Bio-safety Rules 2012, (viii) the Import Policy Order, (ix) the National Environment policy 1992, and the (x) The Environmental Conservation Rules 1997 and The Environmental Court Act 2000. So, to make Dhaka a clean and pollution-free smart city SWM has to be improved on a priority basis. However, under the arrangement of Dhaka North City Corporation an electricity generation plant, with

the technical assistance of a Chinese company, is going to be installed using city waste as a raw material. The plant is expected to come into operation within the next 2 years, and then the SWM scenario of Dhaka city will change.

Poverty and inequality are very common in the slums of Dhaka city, thanks to the main cause: crime (Hossain, 2011). A study revealed that 17% of the total crime of the country occurs in Dhaka city (Shafi, 2010). Crimes such as the abuse of narcotics and its illegal trade, repression of women and children, kidnapping, murder, theft, robbery, and possession of illegal arms and ammunition have been recorded as often witnessed in Dhaka city. In January to June 2005, a total of 2000 crimes, including 120 murders, were committed in Dhaka city (Shafi, 2005). In January to July 2015, a total of 544 persons were arrested in 251 cases for their involvement in illegal arms and ammunition from Dhaka city (Khan, 2015). In addition to these sorts of criminality, political violence, and intra-party clashes, religious fundamentalism, and even terrorist attacks have risen in Dhaka city, which hampers the lives of city dwellers. There are hardly any newspapers without the news of drug addiction, hijacking, illegal arms cases, torture/trafficking of women and children, and the presence of activities of thugs. All the regions are not equally crime prone; crime varies with socio-economic factors (Cohn, 1990). Poverty and inequality are the main reasons for the existence of crime in Dhaka city, particularly in the slum area. Therefore, the Government established the Dhaka Metropolitan Police in 1976 to maintain complex law enforcement procedures in the city area. With the speed of crime and violence the Government was forced to form an anticrime force such as the Rapid Action Battalion with trained forces from the Bangladesh Army, Navy Airforce, and Bangladesh Police (Nazrul Islam, 2005). However, the country has made many improvements in controlling religiously fundamentalist terrorist violence and Dhaka is now more free of violence for city dwellers.

Actions for Improvement and Conclusion

To make Dhaka a more livable and smarter city by 2035 the policy makers of the country have prepared and finalized the Detailed Area Plan- 2016–2035 (DAP). The DAP is a huge document with a massive amount of data regarding the future of Dhaka city. RAJUK initiated the DAP work back in 2016 and it covers almost every aspect of the city, from land use to a demarcation of canals and flood flow areas. Under the DAP, Dhaka city will be renamed Dhaka Metropolitan Region (DMR), which includes Gazipur and Narayanganj City Corporation, Banshi River in Savar, Kaliganj-Rupganj, and Keraniganj, covering an area of 1528 km². The DAP will help to make DMR an eco-friendly, livable, and smarter city with a rapid and efficient interconnecting transport system. With the implementation of DAP policy makers want to keep the population density of different areas of Dhaka proportionate to civic amenities and to develop planned infrastructures for accommodating more than 60 lakh (6 million) people. Presently, there are some certain areas of old Dhaka with a population density of 700–800 per acre. The DAP wants to maintain a population density per acre of 250 in old Dhaka; 200 in central Dhaka; 180 in the

Gazipur, Narayanganj, Savar, Kaliganj-Rupganj, and Keraniganj areas; and 150 in other urban areas. There exist 228 km of inter-regional connecting roads in Dhaka, which is planned to increase to 291 km. The DAP has also a plan to extend the collector road by 1200 km, create a 202-km cycle lane, and 574 km of waterways in its area. The DAP has identified 54 locations to build 650- to 700-ft² (60 to 65 m²) housing flats by RAJUK and Real Estate Companies for lower- and lower middle-class people, providing them with special incentives. To build Dhaka eco-friendly and smarter the DAP has planned to create and construct 5 large regional parks, 49 water parks, 8 large eco-parks, another 9 parks and playgrounds; and 627 schools and 287 hospitals to ensure the education and health of the city dwellers; and to create a cultural zone surrounding the Buriganga river preserving the historical sites and turning them into tourism and recreation centers.

With the increasing rapid development of Dhaka city the disasters and their impacts are increasing. Disasters cause loss of life, properties, and years of development. Like other smart cities, Dhaka city is an integration of transportation, water supply, sanitation, housing, other infrastructure, and service system; strengthening these systems may increase the resilience and help in disaster governance in Dhaka city. Smart cities use ICT. Bangladesh has launched its first satellite “Bangabandhu-1” on 12 May 2018, from which Dhaka city will also benefit with uninterrupted internet service, a faster broadcast service, and effective disaster preparedness, which will ultimately improve city services and disaster resilience. However, good governance, effectiveness and efficiency in policy planning are the ultimate ways in which to make Dhaka city disaster resilient and have a major impact on communities’ preparedness and capacities to recover. There are plans and programs for disaster governance make Dhaka a smart city, but it is also a fact that the city has largely grown in an unplanned manner, thus making it vulnerable during disaster. The Bangladesh Water Development Board, Bangladesh Fire Service and Civil Defense, RAJUK, Bangladesh Road Transport Authority, and Dhaka City Corporations are the vital agencies on disaster mitigation initiatives, which led to the development of policies and proper monitoring to control and enforce policy/rules for Dhaka city to be smart. The Government enacted/adopted/issued the Disaster Management Act, National Disaster Management Policy, National Plan for Disaster Management, and the Standing Order on Disasters for the governance of risk reduction and emergency response management, and formed a separate Ministry of Disaster Management and Relief as a key point on disaster governance. Policy implementation is a great challenge in such a huge population of Dhaka city that needs to be given due importance with preferences and options of different stakeholders. Now it needs the integrated efforts of government organizations, nongovernmental organizations, civil society, researchers, scientists, and media; an effective response across the city dwellers; implementation of major policies/plans/programs to ensure a proper monitoring and accountability system and that may help to achieve good disaster governance in building Dhaka as a smart city.

Smart cities require monitoring of pollution levels, water runoff, and even sewage system overflows, and getting these functions back following a disaster, keeping a city habitable; preventing loss of properties from disasters through preemptive repair

works of identified bad/weak infrastructure; developing systems in such a manner that response times to disasters can be reduced and assessing loss and needs of the victims in the event of a disaster; developing ICT and ensuring safe access to social media so that family and friends outside the disaster-affected area can know/get the real picture of the victims, even when traditional communication is a challenge; reducing the impact of a disaster, creating sustainable designs that consider the natural landscape and any changing climate concerns. These common actions, in terms of policy governance, are equally applicable for Dhaka city too. However, some specific actions are recommended to ensure and improve the smart nature of Dhaka city addressing the disaster risk reduction (DRR) and adaptation to climate change through initiatives with policy formulation and proper governance:

- a. The authorities concerned should take reasonable measures to protect related wetlands, water bodies, and rivers in and around Dhaka city for its survival.
- b. The Government has already issued a decree banning the filling in of any wetland for urban development. Thus, proper land development rules should be introduced without delay to minimize the loss from river flooding from the surrounding rivers of Dhaka city.
- c. Sewage facilities for every corner of Dhaka city, particularly in the slum area, to be ensured to improve the living standard of residents and remove the potential risk to their health, hygiene, and sanitation.
- d. Emissions from vehicles and industries in and around Dhaka city should be strictly regulated at the cost of the owner through proper legislation and its enforcement.
- e. Open and unauthorized dumping of solid wastes in Dhaka city are a source of disease-carrying insects and germs, which need to be properly managed and thus the existing infrastructure should be adequate to handle the huge amount of waste produced every day.
- f. The Department of Environment should monitor the air quality of Dhaka city and data on suspended particulates in the air and the regular publication of such data through news and social media to generate mass awareness of the threat of pollution.
- g. The authorities concerned should ensure regular and careful maintenance of the infrastructure of Dhaka city through proper monitoring.
- h. Natural disasters in Dhaka city would be unavoidable consequences of the impact of climate change and thus a comprehensive disaster management plan is required to be kept in mind for DRR.
- i. Manufacturing industries inside the DMP area attracts poor migrants from other parts of the country to be reallocated to improve traffic congestion and pollution levels and the standard of living of Dhaka city dwellers.
- j. It is observed that most of the fire occurrences in Dhaka city are caused by electrical problems; thus, electrical lines and connections in the infrastructure should be installed with proper sustainable design and regular maintenance has to be ensured in the case of any deviation. On the other hand, any unauthorized connection has to be removed immediately, ensuring proper monitoring.

- k. There are many fire stations in Dhaka city to handle fire occurrences; their capacity needs to improve in such an integrated framework, combined with information and communication systems to alleviate the damage and suffering of the people due to fire.
- l. The application of good and effective scientific management can help the authorities to find better outcomes in the case of criminality and violence in Dhaka city where millions of people live. The law-enforcing agencies of Dhaka city should have to maintain large databases so that they can use those data successfully to understand the problem, take necessary actions, deploying forces, and managing any situation successfully.
- m. The authority should apply existing policy regulations on disaster prevention and mitigation, building infrastructure without any exceptions, and take legal actions against the violators irrespective of their political and social identity.
- n. Appropriate customized software should be developed and to assess the level of fire hazard risk for buildings and industries, as well as measure the quality of fire protection facilities.
- o. A framework should be initiated to facilitate the development of an integrated information system for hazard management and effective handling of disasters in Dhaka city.
- p. Concerned authorities should be pro-active in preventing a building from being erected that violates the construction permit and the violator should brought under law.
- q. Communications technology helps city residents in emergency disaster response and disseminates information to warn people about the current conditions during and after disasters; thus, a holistic approach needs to be taken to extend ICT to all city dwellers at an affordable cost.

Water supply, an assured electricity supply, sanitation, including solid waste management, efficient urban mobility and public transport, affordable housing, smart law-enforcing agencies preventing crimes, programs for poverty elevation, ICT connectivity and digitalization, good governance, especially e-Governance, etc., all exist in Dhaka city; the question is whether they are adequate and can deliver efficiency. Dhaka, with its huge and increased population, has the potential be a smart city. To support its goal to become a smart city, the policy makers at a national level must address the planning needs for achieving sustainable development facing and mitigating disasters in and around Dhaka city. Being a capital city, Dhaka should ensure planned development in both living and livelihoods to be attractive to its residents and settlers. Professionals related to city planning and specialized institutions responsible for governance and policy implementation have a lot to do in respect of raising its standard as a smart city. Government strategies should be connecting city dwellers through information networks to address the challenge of regulations, relevance, and awareness. Thus, the incorporation of ICT into planning practices should occur, with purposeful actions of decision makers and those who regulate and support planning for building Dhaka as a smart city, helping to enhance community resilience to disasters.

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Disaster Management Plan for Libraries Located in Cyclone-Prone Areas in India

77

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Contents

Introduction	1222
Library and Its Structure	1226
Disaster Management Plan	1226
Preparation Before the Cyclone Struck	1228
Impact of the Cyclone on the Library	1228
Post-Cyclone Responses and Recovery Efforts	1229
Realization and Lessons Learned	1230
Conclusion	1230
References	1231

Abstract

Owing to its unique geoclimatic condition, India is highly susceptible to sundry natural catastrophes, such as earthquakes, landslides, and other hydro-meteorological disasters. The Indian shoreline is 7516 km, making the 13 coastal states and union territories subjected to 10% of the world's tropical cyclones. Since time immemorial, libraries have been imperiled by various disrupting calamities that severely alter their usual functionality. Libraries have endured numerous disasters, including cyclones, fires, floods, earthquakes, and hurricanes, in addition to the harm caused by war and terrorism. So, libraries need to consider disaster risk reduction for resilience building. This chapter explores the disaster preparedness of libraries in the coastline areas of India and demonstrates the disaster preparedness of libraries in gauging their current resilience levels to natural hazards, specifically cyclones. Thus, this study exhibits an outline of Indian libraries' disaster preparedness in coastal areas. The chapter discusses the research work's findings and extrapolates the significance of disaster management plans in libraries. The study's conclusion urges the enactment of the disaster management plan and the obligation of training for disaster preparedness

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to the staff. Consequently, this study will help the institutions in drafting a disaster management plan for their libraries.

Keywords

Disaster management · Disaster plan · Disaster risk reduction · Cyclone · Libraries · India

Introduction

Since time immemorial, libraries worldwide have encountered disasters in various forms caused by natural and manmade incidents. From fire to floods, earthquakes and hurricanes, libraries have gone through and through various disasters, together with the damage initiated by war and terrorism (Hussein Moustafa, 2015; Kaur, 2009; Najar & Wani, 2021; Superio et al., 2019; Thiem, 1979; Wani & Ganaie, 2017). Libraries, academic or public in nature, hold a collection of cultural significance along with the general collection, and we are liable to safeguard them against any disaster. However, many are unaware that protecting these unique collections has become an integral part of the international framework for disaster risk reduction (DRR) (Garnett, 2021). The history of library disasters communicates the abject account of the obliteration of libraries and the forfeiture of treasured collections of cultural importance. From the burning of the Great Library of Alexandria to the libraries destroyed in the war, many valuable collections have been lost due to natural or anthropogenic disasters (Heller-roazen, 2018; Moustafa, 2013). Libraries around the globe have also faced large-scale disasters initiated by cyclones. In 2004, the Asian tsunami damaged several libraries in Sri Lanka and Indonesia. Correspondingly, various libraries in the United States were destroyed by two hurricanes, namely, Katrina and Rita, in 2005. Additionally, much literature has also reported the catastrophe done by Typhoon Haiyan in the Philippines in 2013 (Amarasiri, 2005; Corrigan, 2008; Diamond, 2006; Mabe, 2015; Nevins & Nyberg, 2007; Shaw, 2015; Superio et al., 2017; Topper, 2011). In May 2019, Odisha was hit by the highly severe “Cyclone Fani,” which caused damage to library books, administrative buildings, and boundary walls in 18 Teacher Education Institutions (TEI), including Elementary Teacher Education Institutions (ETEI), District Institute of Education and Training (DIET), and Colleges of Teacher Education (CTE) across eight districts. Damage to cultural institutions, including museums and libraries (HKM State Library, District Library, Odisha State Museum, Odisha State Archaeology, Anand Bhawan, Madhu Smriti, BK College of Art & Craft, Swaraj Ashram, Sanskruti Bhawan, Utkal Sangeet Maha Vidyalaya, Odisha State Archives, GKCM Odissi Research Center, OIMSEAS, Utkal University of Culture, Netaji Museum, Netaji Memorial Museum), was reported in Cuttack, Khurda, and Puri as well (“Cyclone Fani: Damage, loss, and needs assessment,” 2019).

Correspondingly, the libraries, museums, and art galleries of the magnificent medieval city of Florence were irreparably damaged by the flood in Florence in

1966 (Clarke, 2002). During the great flood of 1997, many Polish libraries lost volumes of their collection. Piotrowicz (2010) reported that 40,000 volumes of periodicals from 1929 to 1945 were damaged by the water. Correspondingly, Colorado State University's Morgan Library experienced water damage in 1997, resulting in the loss of 500,000 books from its basement. It took 7 years, numerous millions of dollars, and countless staff hours to process approximately 100,000 gift volumes, repair 163,377 damaged volumes, and repurchase more than 63,000 highly used total loss volumes in the library's response and recovery operations. There were at least 192,000 volumes that were either categorized as "complete loss" or were not recovered but were nonetheless permanently lost to the collection (Lunde & Smith, 2009). A flood in Punjab, India, destroyed 44,535 articles. India experienced tremendous floods on the evening of July 11, 1993, which impacted the Thapar University Library and the Panjabi University Library. For 4–5 days, the Thapar Technology Campus was covered by 1.4–2.4 meters of water. Out of the 63,000 objects in the university library, 44,535 were destroyed. The library also lost computers, photocopiers, and CDs. Except for the damage to a voltage stabilizer, there were very few losses to the collection and equipment at Panjabi University Library. Only those books that users who resided in flood-affected areas had borrowed were damaged. Similar to this, about half of the library resources were lost, and numerous libraries' physical infrastructure was seriously damaged by the 2014 flood in Kashmir. For at least 2 months, library services were suspended (Kaur, 2009; Wani & Ganaie, 2017). In Iran, 39 public libraries were shuttered, 3 were evacuated, and 1 was destroyed during the recent flood, according to the official reports of the Iran Public Libraries Organization. According to the Public Libraries Institution's report on the incidents involving the public libraries under its supervision, 171 libraries have suffered damage. A total of 171 libraries have been damaged overall in 16 provinces, most of which have been dampened, and 1 library has been completely submerged in water. In addition, two libraries that were 80% complete were devastated. Due to the landslides and their proximity to the dam and the river, three libraries were also evacuated (Pazooki & Saboori, 2021). Besides the damage caused by natural disasters like floods, cyclones, or hurricanes, libraries have also lost their prized holding in anthropogenic disasters. Throughout history, numerous libraries have been destroyed by fire. A famous illustration of how a fire can destroy a collection is the burning of the magnificent Library of Alexandria. Even if there is disagreement over who set the fire, the fact remains that a sizable portion of the collection was destroyed. Like this, Khilji destroyed nine million manuscripts in the library of Nalanda University. Moreover, two-thirds of the 55,000 books in the Library of Congress were destroyed in the largest fire in the library's history on December 24, 1851. In another fire incident, the Norfolk and Norwich Central Library was also destroyed (Gupta, 2018; Hammond, 1996; Musharraf, 2016; Thorburn, 1994).

Cultural wars have also been the reason for the destruction of many great libraries. The best public library in China was thought to be the Oriental Library in Shanghai. According to the statistics from the 1932 Symposium, the library had a substantial number of rare book collections, more than 600,000 volumes in different

languages, and subscriptions to more than 700 magazines. Both a number of priceless first editions from the Sung Dynasty and one of China's most significant collections, the Yen Feng Lau classics collection, were destroyed in the Sino-Japanese War that began in 1937 (Zgonjanin, 2005). During the US incursion on Iraq, many universities and libraries were burned and looted, along with the media equipment. Many Iraqi libraries had a personnel and leadership crisis that exacerbated their material losses, and librarians fled the country (Moustafa, 2013). Consequently, all libraries must include disaster management as a vital part of library management because a thorough disaster management plan can eradicate the chaos by ensuring that logical and appropriate decisions are being made during the disaster (Morgan & Smith, 1997).

Library disaster management encompasses disaster control planning, risk assessment, and staff training. The first step in disaster management is to design a catastrophe preparedness strategy. It is the most significant policy and training document, and it necessitates ongoing managerial commitment and organizational support in the form of a catastrophe awareness and preventive culture. The primary objective of a disaster preparedness plan is to bring down the risks and enhance the efficiency of response during the disaster. For crafting an operational plan, the institution must have thoroughly analyzed the reasons for the disaster, be aware of accessible resources and practices for dealing with a disaster, and sustain a constant commitment to advocating and executing the plan's recommendations (Matthews & Eden, 1996; McIlwaine, 2006; Muir & Shenton, 2002). Despite being an essential part of any library management, many studies have found that libraries fail to implement disaster management plans in general (Ayoung et al., 2016; Kaur, 2009; Kostagiolas et al., 2011). Though the literature on the aftermath of cyclones is few, the investigators found few excellent studies that recognized the response and recovery of libraries that have experienced the wrath of cyclones. Amarasiri (2005) documented the damage caused by the tsunami in Sri Lankan libraries and emphasized the psychological trauma of librarians in affected libraries while accounting for the rebuilding efforts of libraries from scratch. He also expressed the dire need for libraries' effective disaster preparedness plans.

Corrigan (2008) described the experience of numerous academic libraries in New Orleans ruthlessly impacted by Hurricane Katrina. He accounted for the remarkable efforts of Tulane University to protect collections and stabilize flooded library buildings. Skinner (2007) gave a succinct analysis of the magnitude of loss at the academic libraries before recounting the devastation and recuperation of the library at Xavier University. He also provided a list of problems that librarians in flood-prone locations may ask over to plan for the potential of a large flood and its implication. However, Superio et al. (2017) documented the effect of Typhoon Haiyan on academic libraries in Northern Panay, the Philippines, and the disaster management methods that were put into effect. The outcomes disclosed that even though most libraries do not have a disaster management plan, but they all had standard disaster management practices that facilitated them to protect parts of their collections. Furthermore, the study showed that librarians were deficient in knowledge and skills in disaster management. In addition, Hurricane Katrina and

Hurricane Rita have been the most devastating disasters faced by the libraries, especially in New Orleans, Mississippi, Louisiana, and Illinois, the United States. The experience of these libraries in response and recovery to the damage done by the hurricane can be a lesson for other libraries as the studies found that despite having a disaster management plan libraries failed to safeguard themselves from the destruction as the measures were inadequate to tackle such large-scale disasters (Diamond, 2006; Ellis, 2007; Hamilton, 2011; Shaw, 2015; Topper, 2011). In the same way, Frank (2011) also concluded that Gulf Coast libraries in the United States have ineffectual disaster and preparedness plans to render the massive destruction caused by hurricanes. However, disaster management remains a neglected area in India after tsunami awareness has been raised regarding the importance of disaster planning (Kaur, 2016). Subsequently, it is evident from the literature that libraries being the vital institution of the community lack the management of disaster. Though libraries in foreign countries are aware of the importance of disaster plans in India, library professionals are still inconsiderate. As India stands vulnerable to various natural disasters, it is crucial to realize the importance of a well-documented disaster plan in general. Thus, this is the first study that strives to determine the status of disaster management plans in general while converging on libraries' prevalent disaster management practices, particularly for tropical cyclones.

This study centers on the disaster management practices of academic libraries located in the coastline areas of India. The investigators opted to implement the survey method by administering the questionnaire as a research tool to fulfill the study's purpose. A similar study was conducted by Superio et al. (2017) on the academic libraries of the Philippines. Therefore, the investigators adopted the scale developed by the mentioned author to root out the data. The questionnaire consists of 30 close-ended questions and 2 open-ended questions in the following subsections:

- A. Demographic information
- B. About the library
- C. Disaster management practices
- D. Preparation before the cyclone struck
- E. Impact of the cyclone on the library
- F. Post-cyclone responses and recovery efforts
- G. Realization and lessons learned

After identifying nine states (*Andhra Pradesh, Goa, Gujarat, Maharashtra, Kerala, Tamil Nadu, Karnataka, Odisha, and West Bengal*) susceptible to cyclones, the investigators retrieved the email IDs and contact numbers of approximately 80 librarians working in the academic libraries (central as well as state university) located in these states. As the country's academic institutions were closed for walk-ins, due to pandemic the investigators were bound to collect data via online mode. Employing Google Forms, an online questionnaire link was created and sent out to the librarians via email. Regrettably, a few email IDs were found invalid, and the investigators tried to reach them via WhatsApp. Notably, few respondents expressed their inability to provide data as the libraries have done nothing for the management

Table 1 List of the respondents

Name of the institution	Location
Central University of Tamil Nadu, Thiruvarur	Tamil Nadu
Yashwantrao Chavan Maharashtra Open University, Nashik	Maharashtra
Goa University, Taleigao Plateau	Goa
Indian Institute of Teacher Education, Gandhinagar	Gujarat
The Maharaja Sayajirao University of Baroda, Vadodara	Gujarat
The WB National University of Juridical Sciences, Kolkata	West Bengal
National Law University, Cuttack	Odisha
University of Calicut, Malappuram	Kerala
Cochin University of Science and Technology, Kochi	Kerala
Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar	Karnataka

of disaster; this scenario exhibits the obligation of instituting recognition of disaster management in academic libraries. The link to the online questionnaire was accessible from early January 2022 to mid-March 2022. Despite the several reminders and follow-ups, the investigators succeeded in getting only 12.5% (10 out of 80) responses from the target population. Then the accumulated data was imported to MS Excel Office 365 for analysis and interpretation. Table 1 displays the list of universities that take part in the survey.

Library and Its Structure

The physical structure of any building plays an essential role in protecting it from any disaster. When asked about the physical structure, 80% responded that the libraries were made of concrete while the rest were made with concrete and light materials like wood. Further, 90% of libraries responded that they are in only one building, while 10% had two or more buildings. Likewise, it is also essential to know that the library building is situated far from the shoreline. It was found that 50% of libraries are located within the range of 10 or fewer kilometers from the shoreline, whereas 20% lie within 21–30 km. For now, 10% of libraries are too far from the shoreline. The library's proximity to the shoreline helps determine the chances of risk posed to the library. Libraries in close vicinity of the shoreline are highly likely to be affected by the cyclones.

Disaster Management Plan

A disaster plan is the most important aspect of disaster management because it removes fear and allows for logical and proper decision-making to minimize potential damage (Morgan & Smith, 1997). Though a disaster plan is vital for every library, only one library (The Central Library of Goa University) has been found in

Table 2 Reasons for lacking a disaster management plan ($N = 10$)

Reasons	Frequency	Percentage
No significant holdings of rare books/materials	2	20
Lack of financial resources	1	10
Lack of human resources to implement	0	0
Lack of model to serve as a guide	3	30
No staff available to write a plan	0	0
There is no perceived risk	6	60
No instruction from the parent institution	1	10

Multiple answers were permitted

possession of a disaster management plan. In contrast, the remaining libraries do not have any disaster management plan to refer to for the duration of any emergency. Kaur (2009) has also found that disaster management remains a derelict standpoint in Indian libraries. However, 50% of libraries showed interest in writing disaster management plans, while the other 30% (3) responded that they are in the process of writing one for their library. The usual reason for the lack of disaster management in libraries was that 60% of libraries think there is no perceived risk of disaster like cyclones, followed by a lack of a model to serve as a guide. Also, 20% of libraries responded that they do not have any significant holding of rare books. One library responded that it has no instruction from the parent institution. Cuthbert and Doig (1994) have also accounted that most libraries assume that they do not need any disaster plan because they anticipate no chance of any statistical disaster. Though the unpredictable nature of disaster cannot be taken lightly, as disaster has the potential to strike at any time and any place. Furthermore, a disaster management plan does not deal with the response and recovery of the collection alone, but it also guides the management team on the safety of clients and staff when any disaster strikes. Thus, libraries must seriously consider writing a disaster management plan precisely drafted according to the nature of the library Table 2.

As mentioned above, the disaster management plan deals with the collection of the library and encompasses the security of the building and staff as well as clientele of the library. The library has a disaster management plan that covers the safety procedures of persons and the collection of the library and building. Correspondingly, one library out of two libraries that are in the writing process of a disaster management plan also responded that its disaster plan covers the disaster management practices of upkeeping its building and collection along with the staff and clientele. In contrast, the disaster management plan of the second library involves its building only. The justification for ensuring only the library's building is that the library recognizes no risk of disaster and has considered the safety of library buildings against disasters such as fire.

Disaster management practices such as an updated list of staff that can be contacted in a disaster situation, labeling of collection that mare in salvaging priorities list, technical endorsements/strategies/policies for rescuing damaged

materials, regular building maintenance, conducting drills and exercises in case of disaster, and updated telephone tree help the libraries in minimizing the risk of disaster and guide them in quickly reacting against the disaster (Superio et al., 2017). However, the study found a lack of any such practices among the libraries. However, 90% of libraries have emergency kits such as flashlights and fire extinguishers, which indicates that libraries are mainly concerned about the fire disaster, which is further proven by the availability of fire alarms in 80% of the libraries. Illo et al. (2018) also found that among most libraries disaster management practices are standard for fire disasters only, and libraries have trained their staff to oversee this disaster. In line with the previous statement, the study reveals that most libraries have provided training to their staff in managing the fire extinguishers and have detailed what to do in case of any disaster caused by fire. However, 20% of libraries responded that none of their staff had undergone such training. Besides, having insurance policy is also an essential part of securing library against any disaster. In response to the query about having insurance policy, five (50%) libraries have their building insured, whereas three (30%) have insurance for their collection.

Thus, considering the importance of a disaster management plan, each member of the library must get the necessary training, and libraries must consider enactment of a disaster control plan that summarizes the risks, responsibilities of staff, and strategies related to response and recovery to the disaster (Matthews & Eden, 1996).

Preparation Before the Cyclone Struck

The states the investigators have chosen for conducting research have faced cyclones recently. The Indian Meteorological Department (IMD) issued a warning before the cyclone struck to take adequate measures to reduce the damage done by the disaster. Libraries are no exceptions, and the authority must ensure that the library building is safe enough to face the disaster. As the library's under study has no well-documented plan, still some measures had to be taken to ensure the safety of the library. In response to the preparation of libraries before the cyclone struck, it was found that nine (90%) libraries checked the roof for any possible leaks, while six (60%) repaired the library building and three (30%) put up some items on chair or tables to safeguard them in case of a flood.

Further, two (20%) libraries have covered the collection and library equipment with plastic and waterproof materials. Only one library has relocated its collection to other buildings. These measures have aided the libraries in upholding the collection (Fig. 1).

Impact of the Cyclone on the Library

Figure 2 reveals that 70% of the libraries were untouched by the cyclone, whereas 20% of the libraries reported slight damage like detachment of roof or windows due to the strong wind and water inside the library; however, the collection remained safe

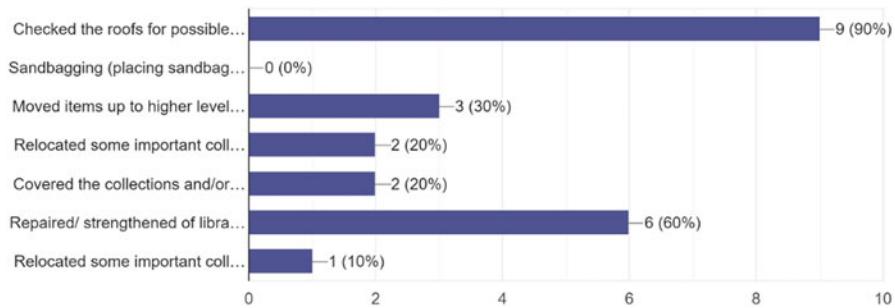


Fig. 1 Preparation before the cyclone

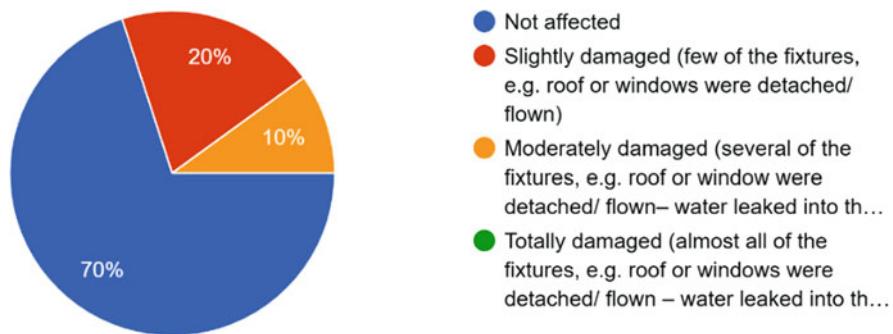


Fig. 2 Impact of cyclone on libraries

from water leakage. Only one library testified moderate damage due to storm surge, several fixtures like detachment of roof and windows and water leakage from the roof were also stated. Additionally, the library that received moderate damage is situated less than 10 km from the shoreline; thus, it can be comprehended that libraries within the range of 20–30 km need to consider implementing disaster management plans more seriously Fig. 2.

Post-Cyclone Responses and Recovery Efforts

It is imperative to check the library after the disaster pass to know the damage caused by the disaster. It was found that 60% of the libraries checked the library a day after the disaster; however, 80% of libraries reported that communication was made among the library staff. As most of the libraries reported being impervious to the cyclone, the libraries that received slight and moderate damage opened the door and windows and drained the water inside the library. Additionally, the libraries also sanitized the building to prevent mold growth. Further, the libraries also removed the wet carpet and affected furniture.

Realization and Lessons Learned

Whatever the extent of damage caused by the disaster, it is essential to take the opportunity to learn from it and utilize it to improve the current practices of tackling any disaster. As mentioned previously, libraries have believed that they are out of danger from any disaster and the good luck of not receiving significant damage from the disaster, and they have paid no heed to dwell on the thought that what if the cyclone has damaged the library to a great extent. Hence, they seem to be not bothered that the disaster could have proven chaotic for them.

Conclusion

This study uncovered that despite being in the high vulnerability zone of the cyclone, most of the libraries have assumed that there is no perceived risk of disaster, especially cyclones in their library. Libraries were unwary to face such type of risk in the future. The library professionals are undertrained for any disaster other than fire. The leading cause behind the unavailability of a disaster management plan was the assumption of library professionals that the library stands out from any disaster. Notably, the lack of cooperation to participate in the survey indicates the wretched status of awareness concerning disaster management in libraries, which further points out that disaster management continues to be an overlooked area in the academic libraries in the country (Kaur, 2009). Whether natural or anthropogenic, disasters are capricious and can bring about destruction to a great extent. Statistically, a disaster may be unlikely to happen in a few places, but that does not mean it cannot happen in the future (Cuthbert & Doig, 1994). A well-written plan that deals with the emergency must be a part of any library management strategy (Owens & Brown-Syed, 1998). Libraries retain valuable collections labeled as a special collection in their inventory that is important to global heritage, and a few libraries under study also have an important special collection of cultural importance. As global warming has skyrocketed the occurrence of natural disasters, libraries cannot ignore the importance of a well-written disaster management plan in the present time. It has become the *need of the hour* to safeguard the precious collection of libraries and staff, and clientele against any disaster. The government of India has undertaken many initiatives for DRR in the nation. Though no specific initiative has been found for the libraries, many government policies and guidelines can serve as a roadmap for libraries in creating their disaster management plan. The National Disaster Management Authority (NDMA) has created a Disaster Management Plan template that the libraries can adapt according to their prerequisite. Other than that, libraries can help in research studies and try to find out the best practices and lessons learned from already happened disasters to improve their disaster management plan. Further, libraries must provide training to their staff as disaster training is an indispensable condition of a disaster management plan and it ensures the efficiency of the plan. The National Institute of Disaster Management (NIDM) in collaboration with other institutes organizes workshops on various aspects of disaster covering every possible

disaster such as earthquake, cyclones, and tsunami. Libraries can register for the workshop and learn from the experts. Additionally, individual efforts can also be taken to train the library staff for any disaster.

With the change in climate and frequent occurrence of natural disasters in the present world, libraries need to shift their focus to draft a disaster management plan according to its need as the libraries serve as the custodian of cultural heritage and bridge the past and future generation through this collection of cultural importance. It is time to emphasize safeguarding its collection and staff as some of the collection can be irreplaceable, and the loss cannot be undone ever. Thus, this study recommends taking the disaster management plan seriously and urges the Indian libraries to draft a disaster management plan. The study also emphasizes the significance of training staff to handle any catastrophic situation and organize mock drills occasionally.

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Reflections of Disasters in Indigenous Arts: 78

The *Patuas* in India

Aparna Sengupta

Contents

Introduction	1236
Indigenous Art and Agency	1237
Indigenous Art, Epistemologies, Resistance in the Eurocentric Imposition of Anthropocene	1238
An Indigenous Understanding of Disasters	1240
Expressing Disaster in Indigenous Art: The <i>Patuas</i> of India	1241
Conclusion	1243
References	1243

Abstract

Disasters be it natural or humanmade has been perceived from diverse viewpoints in human history. Modern scientific knowledge places enormous emphasis on disaster management, mitigation, resilience, and control, while the field of history and anthropology has focused on various conceptions of disasters and tragedies as experienced and depicted by humans across time and space. The present paper will examine disaster through the lens of indigenous art of the Patuas in India especially their visual depiction of disaster, by combining the methodology of meaning making and indigenous and visual anthropology. The primary objective of the chapter will be to take forward our understanding of disasters not as the common geographical-environmental process but a nuanced, often invisibilized impact they have on human life and imagination of social realities of life, death, spirituality, and religion.

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Keywords

Disaster · Philosophy of art · Indigenous communities · Visual anthropology · India

Introduction

Disasters are events which are perceived and experienced differently across humans and communities. It impacts the mind and psychology of human beings, but those close to nature, such as indigenous communities, absorb its occurrence in its most unadulterated form. Some of these human beings who are perceptively sensitive and have an ability to illustrate their experience reflect this impact in their art forms. But this alternative perspective has often been silenced and ignored by modernism, irrespective of its diverse forms. Indigenous art has been subsumed as “primitive” and “tribal.” Art within such an Enlightenment epistemology, was understood as “self-evidently universal,” silencing the histories and achievements of the non-West (Harney and Philips 2018). Following the Enlightenment, modernity played a remarkable role in art with its emphasis on knowledge as what can be “scientifically” tested and verified and not based on religion and myth. Such a definition of “scientificity” rendered indigenous art as mythical and mystic not portraying the “real,” often termed as “primitive” (Price 1989).

It is important to bring to light that in the history of human evolution, art appeared much before writing, which establishes that prehistoric art by humans and indigenous communities is as significant a human contribution to knowledge as philosophical attributions of art and aesthetics in Greek philosophy of Plato and Aristotle.

A dominant tendency among scholars has been to define and measure disaster quantifiably, i.e., in terms of loss of property, life, economic destruction, possessions, etc. Recent development in the field of disaster resilience and studies have focused on the significance of emotional and psychological impact of disaster on humans. A prominent contribution in this newly evolving field of disaster studies is its emphasis on art as therapeutic, possessing healing mechanisms, and how art can bring in hope and recovery from loss (Knoff 2022). Apart from acting as a healing mechanism, it is equally an important tool for expressing stories of disaster, further helping in illustrating experiences of disaster. These experiences reflected through art then gets translated into knowledge that can have impact across boundaries (Alexander 2021: 3,4). Aristotle in his *Poetics* stated that art as mimesis is a natural and pleasant way of learning and contributes to knowledge (Pappas 2013: 18).

The proof of such Eurocentric domination is amply available to be witnessed as none of the so-called handbooks and companions of aesthetics and art carry work on indigenous art and aesthetics or any topic on indigenous knowledge and everyday living such as *The Routledge Companion to Aesthetics* edited by Berys Gaut and Dominic McIver Lopes (2000, 2013) and *The Oxford Handbook of Aesthetics* by Jerryold Levinson (2005).

With this as a background, the present paper elaborates, first art as agency for indigenous communities through a visual anthropological lens and its resistance in the Western epistemologies in Anthropocene and, second, how disasters are perceived by indigenous communities in India and expressed through their art form. The argument of the chapter is supported by the case study of the *Patuas* of West Bengal, also known as *Paitkars*, famous for their indigenous paintings known as *pattachitras* (*Pattachitra* is a Sanskrit term, *Patta* means cloth and *Chitra* means picture. It is a picture painted on a piece of cloth) depicting disasters.

Indigenous Art and Agency

There has been a tendency to hierarchize art into “high” and “low” and “primitive” or “tribal,” forms of art considered much below the high art. Breaking such a hierarchized view of art, Sally Price (1989) asserted that non-Western art must be recognized as it is produced by individual artists through their imagination (Price 1989, as referred in Gell 1998). Moving further, Alfred Gell argued that art of non-Western cultures must not simply be evaluated but identified as possessing a social relation with the community and culture it belongs to. Herein, Gell brings out an anthropological study of art as social relation much beyond its exhibitory-economic value. Gell in his ambitious scholarship to further an anthropological theory of art was one of the pioneering scholars who advocated “art as doing” beyond the usual function of providing meaning and communication (Gell 1998). Nicholas Thomas, in the foreword he wrote for Gell’s book published posthumously, illustrated:

Doing is theorized as agency, a process involving indexes and effects [wherein] indexes are understood as material entities which motivates inferences, responses, and interpretations. Indexes stand in a variety of relations to prototypes, artists, and recipients. Prototypes are the things that indexes represents, recipients are those whom the indexes are taken to effect and artists are responsible for the existence and characteristics of the indexes... [wherein] agency of the artist is rarely self-sufficient but a distributed extension of agent. (Thomas in Gell 1998: xi)

Not only did Gell propounded an anthropological theory of art as agency, but his work is also significant in decolonizing art, especially his challenge to the Western Eurocentric evaluation of any non-Western art with the universal yardsticks of aesthetics. Gell punctures the European project of “indigenous aesthetics” as essentially a project to expand and refine the sensitivities of Western art public, by comparing Western art to non-Western art (Gell 1998: 3).

Art has been understood as agency for individuals and communities; equally art is also a space which is colonized and marred with power dynamics of the market and neoliberal demands. Notwithstanding the approach to art as agency is the acceptance of art as marketable things for the European audience and auctioneers. In this respect, indigenous art or art of Global South had to suffer the onslaught of colonialization and the museumization of their way of life considered as primitive and non-modern, as exhibits in museums for anthropologists to study. Asserting that

colonial mindset not only impacted the art and life of the colonized, Guha Thakurta stated that the museum became a “complex site for production of new orders of religious values” around indigenous art by designating objects of art as “sacred” (Guha Thakurta 2007).

Another significant interpretation of Western epistemologies emanating from the Enlightenment has been the presentation of the indigenous population in various parts of the world as “under perpetual threat,” completely obfuscating their knowledge as premodern, mythic, and spiritual rather than acknowledging that indigenous art and knowledge presents alternative to the dominant white ecological paradigms of thinking about our earth (Horton 2017: 50). Though such thinking has undergone a shift, there still exists a gap among policy-makers and administrative bureaucrats, researchers as well, about indigenous knowledge as “soft” and “unscientific,” incapable of solving modern issues of environmental degradation which modernity itself is responsible for. Indigenous communities do not treat environment as problem but as a part of their life; it is intrinsic to living. From this perspective, indigenous art is not just a thing or piece for collector’s items or antique but as the Cherokee artist Jimmie Durham stated:

“the purpose of art is to help people interpret their world so that they may be better able to change it in positive ways.” In opposition to the kind of privatized vision of art that privileges the individual’s own relationship to his or her work and suggests no desire for any more interactive art process, Durham challenges us to consider how our understanding and engagement with art would change if art were recognized as part of a “social dialogue,” if we could accept art as existing for “the purpose of critical social interpretation.” (Durham as cited in Bell hooks 1994)

For the indigenous communities, their art is about the relationship they share with each other, the cosmos, and nature. It is connected and deeply entrenched in their idea and thought about life and living. It is a social dialogue (hooks 1994). Such renditions of indigenous art and life get either caricatured in their depiction by mainstream cinema and media or canonized as premodern, while what they present is “shared modernity” (Horton 2017: 53). Indigenous art is evolutionary and reactive to the changes in environment. It is neither primitive nor static like the Eurocentric vision shows it to be. Art for the indigenous has also become a political conversation between the humans and nonhumans as Horton also examines the violation of treaties by the American state and the indigenous nations which is often depicted through indigenous art of the First Nations (Horton 2017: 54).

Indigenous Art, Epistemologies, Resistance in the Eurocentric Imposition of Anthropocene

The last decade of the twentieth century saw a new movement in art world, i.e., of connecting art to the idea of the Anthropocene wherein “art is conceptualized as the vehicle of aesthetics, located at the center of thinking with and feeling about the

Anthropocene” (Davis and Turpin 2015: 3). Scholars, especially, anthropologists and art historians, ventured into this space of growing academic discourse focusing on the sensorial and visual in the Anthropocene (*ibid*). According to Davis and Turpin, Anthropocene has brought forth the issue of “living in a damaged world where art provides polyarchic site of experimentation, visualization and new alternates to the Anthropocentric where it is not just a concern, a problem to be managed or mitigated rather bringing in the complexities of power relations which have led to massive transformation of the Earth” (*ibid*: 7). Laura Hall asserted that in thinking about and in the Anthropocene, indigenous art provides a meeting ground for the Eurocentric dichotomies of art and craft, aesthetics and spiritual, as indigenous art is not a part of life but a way of life, rooted in community responsibility and accountability toward living well in the ecologies inherited from their ancestors; such art is capable of renewing fractured cultural-ecological connectivity (Hall 2015: 283).

Postcolonial nations following the path of Western modernity have carried the burden of thinking as “binary”: nature-human and human-artificial; in such ideas, nature seems to be treated as an unlimited credit bank from where humans can simply take more and more. It is such exploitative notions popularized under the tag of “development” that has caused the Anthropocene. In most countries of the African continent, Asia, and Amazonia, agricultural practices of the indigenous communities have been categorically suppressed or discontinued. Indigenous art, although flourished in certain pockets, was not a popular form for many decades in India becoming more lost with meager intergenerational practices, migration of indigenous people to urban centers, and new technologies of art.

Paradoxically, it was the twentieth-century globalization which led to the increasing demand of indigenous art patterns more as fashion and style, while the everyday lives of these communities are getting more marginalized. Parallelly, there are also indigenous creative resistance rooted in the art of healing wherein the aesthetic in indigenous is to “heal” the community from colonial and capitalist violence. But how far the damage of imposing Eurocentric categories and concepts in “making sense” of indigenous can be healed remains a question as the indigenous nations have been categorized by the adulteration of patriarchy, race, and ethnicity, and this has resulted in homogenization of knowledge within the indigenous communities. A case to cite is that of indigenous women. In many countries today, indigenous communities’ identity has been fixated by the state authorities. Critiquing such “misrecognition,” Monika Siebert (2015) argues that multiculturalism with its fetish on recognition is influenced by the Eurocentric liberal perception of what is it to be indigenous. Her work *Indians Playing Indians* (2015) criticizes the cultural misappropriation that multicultural misrecognition has leashed on indigenous nations in a twofold manner: first, by substituting cultural meanings with political meanings of indigeneity and, second, the replacement of “indigenous nations” by the term “indigenous cultures,” equated with the ethnic/immigrant minorities, while they were the original nations and owners of the land and appropriated by the white modern statist powers turning the owners into minorities seeking accommodation and recognition in their own land (Siebert 2015: 3). This in turn has led to the grouping of all indigenous nations under the rubric of “indigenous” without taking

full cognizance of the diversities within these First Nations, another European Enlightenment project of homogenization necessary for the larger interest of the national project of cohesion (*ibid*: 180–181).

Although a complete understanding of indigenous epistemologies may not be comprehensible for non-indigenous individuals and communities, nonetheless, a genuine attempt to shift the focus from a cult of calculative-interpretive result-oriented individuals that modernity has brought with itself to an unfeigned attempt toward accepting an epistemology which believes humans to be nature's extension and not master, acknowledging the earth's healing power, practiced by most indigenous communities may educate us toward acknowledging indigenous epistemologies (Todd 2015). Indigenous worldview is ingrained with the ecological, environmental, or natural world-based knowledge whose inclusion in the Western Eurocentric world continues to be debated till date (Hall 2015: 287). As Battiste and Henderson establish such connections by elaborating that:

Ecological teachings have defined for Indigenous Peoples the meaning of life, our responsibilities, our duties. They have also developed our consciousnesses, our languages, and what others have categorized as our cultures. (Battiste & Henderson, 2000: 9 as quoted in Hall 2015: 286)

Furthering her argument, Hall brings forth the practice of storytelling among the indigenous as a way of reviving, renewing the interconnections with earth as a living being (Hall 2015: 287). This brings us back to our main position of how art becomes a relationship beyond simply an impression or extension of individual emotions, as the pictorial depiction of stories woven in the psyche of younger people by the elder generation. In this respect there is an eerie similarity among almost all indigenous communities irrespective of their location. The Great Andamanese folktales claiming birds as their ancestors (Abbi 2021: 35) are seemingly closer to the “creation stories” of the indigenous people of Canada and North America claiming animals as ancestors (Sengupta 2022).

The indigenous epistemologies have no doubt been influenced by the “quest for political-governmental power forgetting the goal of reconnection and preservation of harmonious ways of life” which has been termed as “internalized colonization” imposed upon indigenous nations (Hall 2015: 288). Yet among the indigenous nations and communities, disasters are not problems to be managed but earth's mode of communication with other living creatures. Such a vision is not control-centric giving way to understanding disasters as “sharing-caring” for the earth and giving time for her renewal.

An Indigenous Understanding of Disasters

Disasters have a special place in traditional knowledge and religion, and indigenous communities offer chants and offerings and conduct ceremonies and thanksgiving in their unique manner (Kapur 2010: 92). To support Kapur's statement, herein quoting

a few examples from the Indian indigenous communities and their age-old practices for perceiving and understanding disasters will clarify the idea. In West Bengal, to avert a threat of flood, women perform a ritual named *Batiphota* (*Batiphota* is a combination of two bangla words – *bati* means a bowl and *phota* means small ball-shaped imprints) wherein the lady who only bears a daughter and not son can perform it. Her daughter is selected by the villagers to recite a few mantras into the bowl, and it is buried under the earth to stop the rain (Kapur 2010: 104,114). Lord Ganesh is termed as *Vighnaharta*, and it is people's belief that by worshipping Lord Ganesh one can not only bring success and prosperity to one's life but also help to deter any disaster to occur on earth. Goddess Kali who is 1 out of 108 avatars of Shakti, *Rakshakali* avatar, is associated with both the destroyer and protector of disaster. People in West Bengal, Orissa, Bihar, and Uttar Pradesh worship Goddess *Kali*. Especially in many villages of West Bengal, *Rakshakali* is worshipped when people are struck by a disaster or epidemic (Scrase 2001: 124).

People living in the Koraput district of Orissa has the presence of huge number of *sacred groves* which according to the villagers would protect them from famine and other epidemic diseases. Deity worship in context to disasters is common in India; the "Naga tribes of Manipur believe that a deity named *Kampinu* made the hills for the Nagas to live in and an earthquake happens when a piece of rock is cut away to mend the deity's house below." In the Himalayas, "the *Gaddi* tribe always carry a sickle which according to them symbolizes the *Kalubir* (the father of all serpent gods). It is their belief that when *Kalubir* is not duly propitiated, a landslide occurs" (Hudson 1911). The Indian Ocean tsunami which struck India on 26th December 2004 was regarded as the outcome of bad sins by many of the survivors. The fishermen who were affected in the coastal areas of India – Kerala, Tamil Nadu, Andhra Pradesh, and Pondicherry – held the belief that it was the "act of god" and the result of displeasure and anger of the sea god due to bad karma. Rituals were performed to satisfy and please Goddess Ganga who is considered to be the goddess of sea and water (Paul 2013).

Along with these religious practices and beliefs, art finds a distinctive flavor within indigenous communities who treat the earth as a living, growing creature. In this way, indigenous art is a repository of knowledge, expression, way of life, and understanding, presenting the events as well as predicting the future events of disasters.

Expressing Disaster in Indigenous Art: The *Patuas* of India

Disasters have found a unique place in popular culture, literature, art, myths, and religion (Giovanni et al. 2019: 12–13). Natural calamities, death, and disease are presented through art of all genres: from rock art in prehistoric period to indigenous art, modern, and postmodern art. The *Patuas*, a community inhabiting the eastern region of India, mainly living in the states of West Bengal, Jharkhand, and Odisha,

are also called as the *Paitkar* and are famous for their scroll paintings known as *pattachitra* (narrative scroll art) accompanied by the songs about the paintings. The *Patuas* are a semi-itinerant caste originally from the village of Naya in West Bengal, and their repertoire of paintings encompasses disasters such as the Medinipur floods, Tsunami, the 9/11 (Korom 2019: 187), and recently the Covid-19 pandemic. Some scholars point out that the *Patuas* belong to the ancient Indian tradition of performing artists, as even the gates of Sanchi stupa, the ceremonial gates of the famous Buddhist pilgrimage (first century BC), have scroll finials depicting life of Buddha, in Jain texts of sixth century BC, and find mention in the *Tarikh-e-Firoz Shahi* 1351–1388 (Sarkar 2016).

The “flood narratives,” as Roma Chatterji calls these paintings, argued that the “the idea of affliction as a form of grace. . . . are performed in the mode of picture storytelling. . . the *Chitrakars*, an itinerant caste of performers, paint and display narrative paintings on a variety of themes inspired by the *mangalkavyas*” (Religious-literary documents, several of the poems also contain references to geographical places and historical events) (Chatterji 2014: 76). The Medinipur floods of 1978 affected Medinipur, bringing havoc and rendering more than two million people homeless, and after the flood water receded, there was fear of epidemic that engulfed the region (Korom 2015).

An interesting feature of the *pattachitra* songs is that the singer mentions the date in accordance with the Saka calendar (The Saka calendar is based on luni-solar reckoning of time consisting of 365 days and 12 months. The calendar was believed to be created by Kushana king Kanishka.) and explains the characters as depicted in the vertical scroll while singing the narrative (Korom 2019: 189). These paintings by the *Patuas* who now call themselves *Chitrakar* (painters) weave in the songs, the narration of suffering, reliefs provided, political gimmicks surrounding disasters, and relief work, all infused through their paintings. This indigenous community of artists uses organic and vegetable colors from nature and does not use chemical colors to draw their *pattachitras*.

In recent times, the young *Patuas* have started small teams which move from place to place informing communities about disasters and how to deal with them. One such group is the *Jubo Shilpogushthi*, who is spreading awareness about the Amphan cyclone, floods, and now the Covid-19 pandemic and the need for hand sanitization, cleanliness, wearing of mask, etc. (Anwar and Akter 2021). The survival of the *Patua* paintings for centuries is the testimony of the community’s resilience and resistance to the surroundings through their art. They fuse the mythological narratives with the contemporary events affecting humans and non-humans equally breaking the binaries of the modernist-humanist, presenting their worldview that all living creatures share this earth in common and disaster affects one and all, rejecting the modern ontologies toward an episteme of respect for nature (Korom 2019: 197). Another scholar Ines Ponte (2015) calls the *Patuas* and their surviving art is a result of cosmopolitan tradition rather than of modernity (Ponte 2015).

Conclusion

Disasters are not what the scientific experts mean and define. It is a polysemous term and its definition, meaning, and understanding are differential. They are not just phenomena to be mitigated using techno-scientific methods, but their perception, mitigation, and response are also subjected to individual/community's understanding and environmental and indigenous knowledge. Disasters are narratives depicted by the artists and painters to describe about the event and educate their community for the future events. Indigenous art plays a critical role in meaning making and interpreting disasters among these communities who have been living in harmony with nature since a longtime. Art be it in a form of painting or performance doesn't always involve words but is rather a reflection of unsaid dialogues. For the indigenous communities, disasters are not problems but rather events to live with and adapt to. It provides an alternative epistemology of disaster events not the capitalistic way of managing and controlling disasters.

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An Integrated Approach Toward Smart and Resilient Cities

79

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Contents

Introduction	1246
Evolution of “Smart City” Concept	1247
Evolution of “Resilient City” Concept	1248
Integrated Approach Toward “Smart and Resilient City”	1249
Case of Guwahati, India	1250
Case of Kathmandu, Nepal	1251
Case of Beijing, China	1252
Case of Surabaya, Indonesia	1253
Case of Takamatsu, Japan	1254
Key Takeaway Lessons	1255
Toward Integrated “Smart and Resilient City” Concept	1255
Relevance of Soft Assets in Creating Smart and Resilient Cities	1256
References	1258

Abstract

The twenty-first century is deemed as the century of cities. The rapid and haphazard development of cities worldwide has, however, been faced with unprecedented challenges, ranging from typical concerns like population congestion and pollution to new and emerging risks like pandemics to cyberattacks. In the backdrop of these widespread contemporary challenges, the evolving notions of “smart city” and “resilient city” are now being widely recognized as policy-level pathways for enhancing the quality of life and sustaining urban livelihoods. Although both the visions have considerable overlaps between their meanings and relationships, their ground-level implementation continues to be done in a discrete manner. Recognizing the need for an integrated approach toward smart and resilient cities, this chapter discusses five good practices of smart city developments from around the world (Guwahati, India; Kathmandu, Nepal;

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Beijing, China; Surabaya, Indonesia; Takamatsu, Japan), wherein the notion of resilience has been effectively integrated. It is hoped that the lessons derived through these existing cases will provide a broader understanding to researchers worldwide, while also paving the way for policy-level deliberations to realize integrated smart and resilient city development.

Keywords

Smart city · Resilient city · Information and communication technology · Disaster risk reduction · Integrated approach

Introduction

Attributed to the growing concentration of population and economic activities in cities worldwide, the twenty-first century is widely being recognized as the century of cities. More than 55% of the world's population already resides in cities (confined in about 4% of the terrestrial surface), and this proportion is projected to reach 68% by 2050 (UN DESA, 2019). Serving as the engines of economic growth, cities have been providing ample opportunities for jobs, economic development, and better living standards. However, the continuous migration of people toward cities has, over the years, brought forward many challenges including population congestion, overstressed infrastructure, increased resource demands, increasing pollution levels and waste generation, etc. (Hayat, 2016). Superimposed on these typical challenges are the rising concerns of extreme weather to disease pandemics to cyberattacks. To thrive in face of such unprecedented shocks and stressors, it is increasingly important for the cities to get smarter in risk mitigation while creating livable and self-reliant features.

In that context, to revolutionize the traditional ways of managing urban systems, the fancy notion of "smart cities" has gradually drawn remarkable attention of not only the scientists and policy makers but also the hi-tech businesses. Leveraging the potentials of information and communication technology 'ICT', the idea of smart cities is intended to solve the contemporary urban problems and enhance the quality of life through improved service delivery (Baron, 2012). To date, more than 1000 smart city pilot projects have been executed (are either ready or under progress) worldwide, a few prominent examples of which include San Diego in the United States and Vancouver, Canada (Zhu et al., 2020). Nevertheless, due to the lack of a universally agreed definition (or set of indicators) and the multi-interpretations, the execution of "smart city" concept remains to be challenging. More so, the smart city terminology has developed concomitantly with many other similar terms such as virtual city, intelligent city, ubiquitous city, etc.

While the smart city discourse continues to be debated, the onset of new and emerging risks like the latest COVID-19 pandemic, terrorism, energy crises, and climate change have also mainstreamed the need for new models of governance to enhance the resilience of smart cities. Though the scientific research on smart city

development is increasingly covering wider prospects, Arafah and Winarso (2017) underline that very few of the existing studies have emphasized on the importance of resilience. Besides, the new and evolving concept of “resilient city” has simultaneously attracted global attention for enhancing the capabilities of cities to deal with such unexpected predicaments. Typically, a resilient city resonates with the ability of cities to absorb the impact of the disasters, shocks, and pressures, through adaptation to ensure long-term sustainability of a city’s basic functions. In recent years, numerous researchers (e.g., Shamsi, 2020; Zhu et al., 2020; Sharifi et al., 2021; Majewska et al., 2022) have further conducted in-depth studies on the application of resilient city concept in tandem with smart city solutions, while also uncovering the existing faults, failures, and solutions.

Aimed at realizing sustainable urban development through improved quality of life and the environment, Arafah et al. (2018) underscore that the visions of smart city and resilient city are largely aligned. Earlier, Papa et al. (2015) also underlined their synergies and inconsistencies through a conceptual model. More recently, a variety of research frameworks have also been established to measure the resilience of smart cities and their intricate connections (e.g., Zhu & Li, 2019; Zhu et al., 2019; Zhou et al., 2021). Even as the evolving notions of “smart city” and “resilient city” have considerable overlaps between their meanings and relationships, bulk of the current research is reportedly focused on their discrete application. With an aim to bridge this knowledge gap in their integrated application, this chapter first synthesizes their conceptual evolution independently and then discusses five good practices wherein the essence of concomitantly applying both the notions is clearly reflected.

Broadly, the chapter comprises of five key sections, including section “[Introduction](#).” Sections “[Evolution of “Smart City” Concept](#)” and “[Evolution of “Resilient City” Concept](#)” describe the evolution and characteristics of “smart city” and “resilient city” concepts, respectively. Section “[Integrated Approach Toward “Smart and Resilient City”](#)” discusses five good practices of smart city applications from around the world, wherein the resilience component is duly reflected. Lastly, section “[Key Takeaway Lessons](#)” summarizes the key takeaway lessons.

Evolution of “Smart City” Concept

The roots of “smart city” concept could be traced back to the 1990s, when the term “smart growth” began to be sporadically used in an effort to save the earth, by deriving solutions to rising urban problems such as air pollution, congestion, etc. Arafah and Winarso (2017) specifically highlight the pioneer examples of Singapore and Adelaide smart city, wherein long-term transformations were initiated in 1994 to enhance their ICT infrastructure for better service delivery. Hoelscher (2016) also substantiates that the concept emerged in the late 1990s to early 2000s, from the e-governance movements and collaborations between governments and private companies in Europe and the United States. The early twenty-first century further witnessed the smart city transformation of many European countries, and their upsurge has since then become a global phenomenon (Zhou et al., 2021).

Today, many countries around the world have rolled out pilot projects for developing smart cities, and the notion of technology integration in cities is increasingly being supported and adopted by many institutions. However, as pointed by Hayat (2016), the precise content, features, and nature of smart city developments still vary in different countries, which likely reflects the lack of theoretical consistency. Even though various attempts have been made at conceptualizing smart cities, like through methods of benchmarking and indicator frameworks, the notion of how a city qualifies as “smart” or “not-smart” is still debated. Thus far, numerous definitions have also been put forward by different quarters; however, in reference to Mora et al. (2017), it is clear that the many definitions of smart city are still not coherent, due to which it is difficult to obtain a common understanding. Through an extensive review of more than 100 definitions, the International Telecommunication Union, a specialized agency of the United Nations, established that “A smart sustainable city is an innovative city that uses ICTs and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects.”

Though the precise features of smart city vary widely, Giffinger et al. (2007) pointed out that the concept has six key structuring dimensions: (1) smart economy, (2) smart people, (3) smart environment, (4) smart living, (5) smart governance, and (6) smart mobility. Based on a comprehensive review of existing literature, Khatibi et al. (2021) also summarized several other theoretical dimensions and critical factors of smart city initiatives. Sukhwani et al. (2020) further underline that the current policies of smart city can be categorized in three types, namely, (1) greenfield projects (built from scratch), e.g., Masdar City in Abu Dhabi; (2) purpose-driven SC (industrial city, etc.), e.g., Songdo International Business District (South Korea); and (3) brownfield projects (by retrofitting existing cities), e.g., Amsterdam (The Netherlands).

Evolution of “Resilient City” Concept

Originally introduced by C.S. Holling in 1973 (Holling, 1973), in the context of engineering and ecological sciences, the concept of resilience is referred to as the ability of a system to absorb any changes and its capacity for reorganization or adaptation in face of disruptions. Gradually, the concept has also been adopted in disaster science, development planning, economy, social psychology, and many other fields. Particularly, in context of cities, the term resilience is referred to as the ability of individuals, communities, institutions, businesses, and systems within a city to adapt and respond (or their ability to “bounce back”) to any changes and disruptions (for further reading, Patel & Nosal, 2017; Arafah et al., 2018; Khatibi et al., 2021; Yang et al., 2021). Cartalis (2014) provides an extensive overview of definitions, challenges, and prospects associated with “resilient city” ideology, while emphasizing that cities must have the strength to resist any acute shocks (such as earthquakes, floods) and chronic stresses (such as food and water shortage), along

with the flexibility to accommodate extreme situations and the capacity to recover quickly. For the design and planning of resilient cities, several key principles have also been recognized, such as redundancy, robustness, resourcefulness, flexibility, adaptability, etc. (OECD, 2016).

Different meanings of resilient cities have been discussed since the 1990s (e.g., Pickett et al., 1992); however, the ideology has received wider recognition after the start of twenty-first century and is today being explicitly acknowledged at global policy levels (Patel & Nosal, 2017). Khatibi et al. (2021) highlight that about 2100 cities all over the world have joined the “Making Cities Resilient” initiative (that was launched in 2010). Furthermore, 100 cities have also been selected under the 100 Resilient Cities (100RC) initiative that was launched by the Rockefeller Foundation in 2013. Notably, 100RC is established as a nonprofit organization dedicated to providing financial and technical support to cities around the world, with an objective to realize resilient cities in face of contemporary challenges (100 Resilient Cities, 2019). The organization brings together cities, experts, and other multi-stakeholder groups through its platform partners, while sponsoring a Chief Resilience Officer and facilitating the development of City Resilience Strategy. Hofmann (2021) details the overall process of city selection, strategy development, and stakeholder engagement under this program. To guide the selected cities, the Rockefeller Foundation along with ARUP (a global design firm) has developed a set of tools (City Resilience Framework and City Resilience Index) that allow cities to analyze and assess their resilience (for further reading, Galderisi et al., 2020). Although the program ended in 2019, Hofmann (2021) highlights that it still continues to work toward lesson sharing through its successor, Adrienne Arsht Center for Resilience.

Today, in the age of COVID-19, the notion of resilience has become a guiding component for cities worldwide, and the need for realizing “resilient cities” is more than ever. DeVerteuil et al. (2021) also emphasize that the discourse around “resilient city” is gaining fast traction, as it recognizes the importance of absorbing, attenuating, and surviving any crisis, rather than ambitiously aiming for warding it off or eliminating it.

Integrated Approach Toward “Smart and Resilient City”

Evident through sections “[Evolution of “Smart City” Concept](#)” and “[Evolution of “Resilient City” Concept](#),” just like the notion of smart city, the quest for resilient city is also not new. City governments around the world have for long been working to discretely apply both these ideologies to address the diverse urbanization-related problems. However, in view of their shared essence, a genuine need has now been recognized for an integrated approach toward execution of both these identical development paradigms. Particularly after the sudden outbreak of the coronavirus disease from Wuhan (COVID-19) in January 2020, when several modern and smart cities across the world (like Wuhan, Auckland, London) were faced with lockdowns and its grave social, economic, and environmental consequences, the resultant disruptions in city operation worldwide were a clear manifestation of insufficient

urban resilience. Even though the ongoing smart city developments have increased the adoption of data sensors and automation technologies in managing urban systems, it is evident that the new and emerging risks still pose challenges for the continuity of services (Zhu et al., 2020). At the same time, through the conduct of 100RC program, several shortcomings have also been observed in the execution of “resilient city” concept, as the goals of resiliency building in the partner cities are still not fully accomplished (Hofmann, 2021). With a core realization that concomitant actions are needed to make cities resilient while approaching toward smart cities and vice versa, this section mainly presents five good practices from around the world, wherein the smart city developments have effectively incorporated resilience components.

Case of Guwahati, India

In June 2015, the Government of India launched the “Smart Cities Mission” (SCM) for developing 100 smart cities across the country, with an allocated funding of around 700 million US dollars (USD) for the initial 5 years. Selected based on a rigorous two-stage competition at intrastate and interstate levels, the selected 100 cities represent all Indian states, based on a combination of population and a range of governance indicators. For the selection process, each candidate city was required to prepare a smart city proposal (SCP) that outlines their suitability for SCM. Herein, the proposal guidelines mandated to follow an area-based approach (like for upgrading certain areas through retrofitting) while also including pan-city elements (for further reading, Hoelscher, 2016; Sukhwani et al., 2020).

Guwahati, the capital city of Assam State in India, has also been selected for the coveted SCM project. Situated on the banks of River Brahmaputra, Guwahati nurtures great biodiversity and is blessed with a natural topography comprising hills, lakes, wetlands, and streams (Hemani & Das, 2016). A fast-growing metropolis, Guwahati also serves as a hub for fostering “Look East Policy” of India due to its strategic geographic location. The exponential population growth and the haphazard urbanization in recent years have, however, degraded the city’s natural ecosystem, and there is enormous pressure on availability of land and infrastructure. Located on an earthquake-prone belt, the region has also started to frequently experience landslides and flash floods, which is largely attributed to land use change (Deka & Devi, 2017).

Taking due account of the city’s rich cultural and environmental heritage alongside the existing vulnerabilities, the SCP of Guwahati (Guwahati, 2016) leverages the locational advantage of city to enhance its prospects in terms of tourism, business, trade, education, and health, while aiming to achieve a climate-resilient and flood-resilient city. Correspondingly, the SCP of Guwahati enlists several eco-friendly projects aimed at redesigning the ecological public realm of the city, like, for instance, networking the open spaces to stimulate rainwater harvesting, developing basin-specific stormwater management plan along with open space master plan, exploring eco-mobility options along stormwater drains, etc. As part

of the area-based approach, retrofitting of around 696 acres of continuously placed water bodies is planned to be taken up along with the development of 6 km long riverfront development, with an objective to mitigate floods and reconnect the city to its riverine systems. Herein, eco-restoration and bioremediation techniques are also being explored to realize landscape transformation of the degrading water bodies. Further, as part of the pan-city approach, ICT-based applications (sensor networks, CCTV surveillance) are also being operationalized across Guwahati City to offer a series of services to citizens for monitoring water resources information along with advanced flood warning systems and other services such as for traffic management.

The projects listed in the smart city action plan of Guwahati clearly reflect how smart city developments can closely be aligned with the goals of resilience building. While the smart city developments are recognized for ICT implementation to enhance service delivery and to boost economic growth, Guwahati City has been laying high emphasis on utilizing the technological advancements for mitigating the existing vulnerabilities.

Case of Kathmandu, Nepal

Typical to the South Asian context, Nepal is one of the most disaster-prone countries in the world (UNDRR, 2019), and Kathmandu Valley (capital valley) is one of the most earthquake-prone cities (GFDRR, 2017). As per the census of 2011, the urban population in Nepal increased by 58.38% as compared to a decade earlier, and the census of 2021 is very likely to confirm a similar trend in the last decade. Besides, the development of new roads and better service delivery at local level has supported the continual development of new towns and cities. While the government agencies in Nepal have successfully pooled the required lands, built the foundational infrastructure (sewage, drainage, roads, piped water supply, open spaces, public transportation, IT infrastructure, etc.), and established a handful of townships that cater basic services to the population, majority of these urban centers still do not have even the basic physical and social infrastructure and government services.

In context of smart cities, Nepal does not have a standardized commonly accepted definition. However, two attempts have previously been made by government agencies to define smart cities as follows: (1) In July 2016, the National Planning Commission of the Government of Nepal has developed a “Smart City Concept Note” (NPC, 2016); and (2) the Department of Urban Development and Building Construction (DUDBC, a federal government agency) has published the “Final Report: Preparation of Concept and Indicators for Smart Cities in Nepal.” Correspondingly, there are two approaches to smart cities: (1) fix or renovate existing infrastructure and services such as transportation, water and electricity supply, sewage, etc., by using off-the-shelf technologies to make the systems more efficient and predictable, and (2) build a whole new urban environment using the latest information technologies, sensors, robotics, and auto-control configurations, along with risk-sensitive urban planning. According to DUDBC, in Nepal, 13 smart cities plans are presently in the process of development.

Kathmandu Valley is recognized to be a potential candidate for smart city transformation in Nepal. It has 21 municipalities, including 2 metropolitan cities of Kathmandu and Lalitpur. Kathmandu Valley is one of the most at-risk cities in the world in terms of earthquake and fire risks. Furthermore, since 2016, Kathmandu Valley has witnessed floods every monsoon season. Kathmandu Valley Development Authority (KVDA) is a government agency that has the mandate to plan and implement development projects within Kathmandu Valley. In this context, the KVDA has entered a MOU with Oriental Consultants, a Japanese consulting private company, for development of four smart cities in Kathmandu Valley (OCG, 2020). While project-specific activities under the smart city projects are being designed and yet to be implemented on the ground, the government is already taking some good initiations toward making a city smart and lower disaster risks. For example, laying of underground electricity and Internet cables in Kathmandu Valley has not only improved beautification of the city, but it has also drastically lowered fire risks in the aftermath of an earthquake. There are clear benefits of moving toward smart cities by adopting ICT and AI in some service components and gradually expanding to other services, particularly from disaster risk management and resilience perspective. In that manner, the development of smart cities will be an evolutionary process in Nepal, and so will the process of managing urban disaster risks.

Case of Beijing, China

For long, the Government of China has been devoting to the promotion of smart cities, and China is recognized to be one of the first developing countries to have started the smart city planning. In 2012, the Government of China identified 90 cities as a pilot project for smart city planning, which also included Beijing, the capital of China. As one of the biggest cities in China, the number of residents in Beijing was over 21 million in 2020. From 2010 to 2020, the city has been witnessing an average population increase of 1.1% per year (Beijing Municipal Government, 2021). The consequently increasing burden on public services has resulted in increased incidents of traffic jam, low efficient public management, and other social problems.

Since 2012, the municipal government in Beijing has been operationalizing a unique smart city system, which has been supported by the rapid development of Internet economy in China. In that regard, the key characteristic of smart city system of Beijing is that the municipal government is aiming at establishing a highly efficient public service and governance system. In public service domain, the municipal government has established an online public service platform application, called as Beijingpass, through which most kinds of administrative procedures could be finished online without waiting for long (Beijing Youth, 2021), such as the social security procedures and the vehicle procedures. In the future, the Beijingpass is expected to be further integrated with many other public services based on big data sharing. In governance domain, the municipal government of Beijing is also trying to realize open governance through quick-photo platform (Beijing Daily, 2021). At present, the open governance platform has been applied in traffic governance and

related infrastructure, wherein all registers could take a photo, like, for instance, when found breaking a traffic signal, etc. In the future, more open-access platforms are to be applied to improve the governance efficiency.

More recently, the disaster prevention and disaster risk reduction factors have also come into the sight of the Beijing Municipal Government as extreme weather events are getting more frequent, especially the heavy rainfall events (like in July 2021) that have caused enormous damage to city. Accordingly, the municipal government has been working on the integration of emergency management system. The weather data and geological data collected by different departments will be shared with the emergency management department to improve the disaster risk reduction system of Beijing, especially the early warning system (Beijing Youth, 2021). In the future, open governance platform is also expected to be integrated with the emergency management system to accelerate the recovery from damages of extreme weather.

Case of Surabaya, Indonesia

Indonesia is one of the most disaster-prone countries in the world, with exposure to several hazards including floods, landslides, droughts, tsunamis, earthquakes, volcanoes, and forest fires. Often, the poor and vulnerable population in Indonesia have to bear the disproportionate burden of disaster impacts due to their lack of access to key services, limited assets, and lack of financial resources (Stanton-Geddes & Vun, 2019). In that backdrop, since 2017, the Ministry of Communication and Information Technology in Indonesia has been implementing a pilot project for the Smart City Movement, with a goal of achieving 100 smart cities with advanced technology features by 2020. The implementation of smart city in each of the selected cities, however, is determined by how the local administration adapts the idea to local features (Devega in, Syalianda & Kusumastuti, 2021). The Surabaya City government, being led by the City Mayor, is the key policy implementer in realizing the Surabaya smart city, while other government agencies are also engaged at various levels (Pangestu et al., 2021).

In Indonesia, the term smart city was first popularized in 2011, when the City of Surabaya won the Smart City Award (at the national level) for three categories, namely, Smart Governance, Smart Living, and Smart Environment (Setiaji, 2018). Surabaya won the award for smart environment because of its efficient early warning system for disasters, ICT-based trash management system, and ICT-based water monitoring system (Pangestu et al., 2021). Notably, the early warning system implemented in the city, named the Surabaya Early Warning System (SEARS), is particularly intended to support urban disaster resilience.

Further, to collect disaster data, the private sector from NATEK Studio has developed the Matakota application, which assists the Surabaya government toward smart city implementation. This application has six reporting functions, namely, traffic, disaster, criminal, fire, social, and child protection. It also provides a panic button to get a quick response from the relevant agencies in emergency situation. Matakota application further helps to enhance cooperation between several city

government agencies such as hospitals, fire departments, etc., to follow up on emergency reports. Remarkably, to avoid fake panic buttons, the application has been integrated with the Population Identification Number (NIK) which is issued by Population and Civil Registry Office (Andarningtyas, 2017). In its development, the Matakota application will be integrated with CCTV, drones, and IoT systems, through which it can access images at certain locations in real time to monitor traffic jams. The Matakota application is also very helpful for the local community of Surabaya to report disaster events to the relevant agencies, while it also helps the government to speed up its emergency response. Apart from the e-government platform, the Surabaya City government is also using Matakota to lay emphasis toward capacity building. Moreover, this application also helps to disseminate government information to the wider community in Surabaya, be it the case of its early warnings about disasters or the latest news in Surabaya.

Case of Takamatsu, Japan

While the national government of Japan published its first official document to promote smart city developments in 2018, the smart city construction in Japan has begun much later than other developed countries (MLIT, 2018). Still, some cities have already developed their unique smart city systems based on their local conditions and local problems. For instance, the Takamatsu City in Kagawa Prefecture has been facing the problems of aging society and declining population (like many other areas in Japan) and vulnerability to natural hazards. The city has correspondingly been working to establish a smart city system (based on IoT platform) with nearby cities and villages. There are two key characteristics of this system: First, it does not only focus on a single city, but a central city with small cities and villages nearby. Second, this system is disaster risk reduction-oriented system, as it is designed to collect and share the data of infrastructure to improve the disaster risk reduction system. The reason for this unique system is that one city cannot afford the high cost of a IoT platform, since the revenue of local government in Takamatsu (and also other cities in Kagawa Prefecture) has constantly been decreasing due to the demographic changes in recent years (Takamatsu Municipal Government, 2018). On the other hand, as the central city in this area, most of the residents in other small cities and villages must work or study in Takamatsu City, due to which a comprehensive data collection ability and information sharing system is necessary for Takamatsu City (Cabinet office, 2020). It is also relevant because of the fact that Kagawa Prefecture is facing a high risk of natural hazards such as trough earthquake and extreme weather events like heavy rainfall.

Moreover, the smart city system of Takamatsu City has also realized the integration of traffic data, route condition, water-level data and rainfall by connecting water-level sensors, meteorological facilities, road camera to Internet, and the application of IoT. Today, the central city, small cities, towns, and villages could check the same information in the same interface. Through this network connection, the Takamatsu City could send an early warning to high-risk areas, and the central city could

simultaneously prepare early for the rescue and recovery based on the accurate data to improve the disaster resilience of this area.

As climate change is also considered as one of the main problems in DRR 4.0 (Cabinet Office, 2017), the smart city system model of Takamatsu City can serve as a good reference to other prefectures in Japan and cities worldwide that are also facing the similar problem.

Key Takeaway Lessons

Each of the five cases of smart city developments, discussed in section “[Integrated Approach Toward “Smart and Resilient City”](#),” have unique characteristics. From context-specific objectives to key focus areas, significant variations are notable in how the smart cities are being executed. For instance, the SCM project of India is being executed with a combination of area-based and pan-city approach, while in the case of Nepal, the theoretical understanding about the smart cities is still in development. Japan, being a developed country, has started to focus on smart city application at a later stage, while China has for long been devoting attention to it. Moreover, in each of the five cases, we have also observed different focus areas ranging from ICT-based advancements for improved service delivery, e-governance systems, ICT-based environmental management, etc. One key point reflected through all five cases has been the consideration of resilience factors. For instance, in case of Guwahati (India), the existing flood vulnerabilities have duly been addressed in the smart city planning, while in the case of Takamatsu (Japan), due emphasis has been laid on enhancing regional-level urban-rural connections to overcome the demographic challenges. Deriving lessons through these good practices, the following subsections summarize the key takeaway lessons for creating smart and resilient cities.

Toward Integrated “Smart and Resilient City” Concept

Both “smart city” and “resilient city” are contemporary concepts, which have evolved over the last 20 years as strategic solutions to sustain urban livelihoods against the varied challenges associated with rapid urbanization, urban population growth, changing climate, etc. While the concept of smart city relies on the rollout of ICT to boost economic growth and enhance quality of life, the notion of resilient city intends to enhance the ability of cities to prepare well against any catastrophic event. Moving toward a common goal for urban sustainability, Tzioutziou and Xenidis (2021) underline that further deliberations and research on the operational foundations of “smart city” and “resilient city” concepts can support the development of an integrated framework. Today, as the resilience discourse is embracing broader dimensions with technological consideration, the smart city interventions are also encompassing the perspectives of disaster risk reduction.

Although there is an agreed notion that a smart city must prepare to be resilient to deal with unexpected predicaments, the integration of resilience component with the smart city approach, however, is still abstract and vice versa. Despite the everyday use of “smart city” and “resilient city” concepts in urban discourse, their universal interpretation is still not formalized (also highlighted in section “[Introduction](#)”), and their multifaceted definitions further make it difficult to concisely capture their key features in an integrated framework. Regardless, a growing number of theoretical and operational studies are today employing these two concepts together, and the resilience of smart cities has become a prominent topic. For instance, Zhu et al. (2019) conducted an empirical investigation to investigate the resilience of 187 smart cities in China.

While the traditional disaster management systems are faced with the lack of effective means to collect, integrate, and process large volumes of data from multiple sources in real time, the recent technology advancements (like the Internet of Things and big data analytics) are also providing innovative opportunities for effective development of disaster-resilient smart city environment, as pointed out by Shah et al. (2019). Today, ICTs can provide an enabling environment for generating multidimensional data through heterogeneous data sources that can help derive quick and timely situational awareness, eventually enhancing the preparedness and response to any emergency.

Relevance of Soft Assets in Creating Smart and Resilient Cities

To achieve smart and resilient city objectives, soft or nonphysical assets also play an important role, as a capital component, for enabling a city to deliver and mainstream a people-centered policy in addition to the benefits provided by traditional, hard infrastructure. In general, soft assets involve social and human capital, knowledge, technology/information, participation, external relations, and innovative approaches that drive value in city (Wataya & Shaw, 2019). Wataya and Shaw (2022) emphasize that hard assets alone do not define a city and it is the participation of people that is vital. Considering this dichotomy between hardware and software approaches as well as blended options, cities need to be smart, lean, integrated, cost-effective, and resource-efficient. While each city has their own values, approaches, and objectives, such soft assets enable a city to develop smarter solutions and more resilience by spillover or scaling-up spreading results throughout city or a community. A balance of both hard and soft assets should therefore be considered and used in the municipal decision-making process. There are different ways to incorporate soft assets to achieve smart and resilient city objectives, three of which are as explained below.

Fundamental Level in Society

According to Resilience Alliance (2022), “Resilience is the capacity of a social-ecological system to absorb or withstand perturbations and other stressors such that the system remains within the same regime, essentially maintaining its structure and functions. It describes the degree to which the system is capable of self-organization,

learning and adaptation.” From the sociological perspective, key soft assets are people/human and institutional capital and competencies that demonstrate the technical, operational knowledge, planning, and institutional capacity to create robust social systems and organizational structure.

Increasing Rapidity at City Level

When facing external risks, the capacity of a smart and resilient city to prioritize needs and implement recovery actions requires utilization of both soft assets and hard infrastructure. It is important to achieve resilience at a local level. UNISDR defines a resilient city as a city capable to withstand or absorb the impact of the hazards, shocks, and stresses through adaptation or transformation, in order to guarantee long-term sustainability, as well as its basic functions, characteristics, and structures (UNISDR, 2012). Capacity through adaptation or transformation is achieved by repetitive learning process and growth from lessons and experiences from past incidents. The learning perspective is one of the key components of the value creation framework for the public sector (Kaplan & Bower, 1999). It can provide improvements in internal capacity for better implementation, results, and stronger resilience outcomes.

Adaptation and Transformation at Community Level

Repetitive learning and this growth process develop the capacity to adapt and transform. Norris et al. (2008) emphasized this: “community resilience emerges from a set of capacities – community resilience from a set of networked adaptive capacities. This is an important point: resilience rests on both the resources themselves and the dynamic attributes of those resources (robustness, redundancy, rapidity).” Therefore, adaptive capacities consist of a set of networked resources, i.e., economic development, social capital, information, communication, and community competencies.

Moreover, the value and impact created by soft assets (spillover, scaling-up, etc.) are basically unpredictable and difficult to quantify. This unpredictability creates a sense of “risk of the benefit of spillover” (unanticipated benefit) for decision-makers. As Haskell and Westlake (2018) point out, an unknown risk of spillover or scaling-up benefits can be a disincentive for investors employing soft assets. This resistance is particularly applicable to the public sector. Municipal authorities need to demonstrate performance to citizens (taxpayers). Also, authorities may be limited in their ability to leverage the features of soft assets because of strong bureaucratic structures or silo culture within their operations. It is a major challenge to introduce innovation breaking through entrenched bureaucratic silos to create a new pathway for a beneficial holistic approach. Because of the demonstrated value addition of soft assets, local authority decision-makers therefore need to find evidence-based support for realizing the objectives and vision of smart and resilient cities, thereby benefitting its citizens.

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Part VII

Media and Communication



Introduction: Taking Media and Communication on Board in Disaster Management

80

Jaishri Jethwaney

Contents

Disaster as a Subject of Study	1264
Disaster Management Initiatives	1265
Bangladesh	1265
India	1266
Japan	1269
Sri Lanka	1269
USA	1270
European Union	1270
References	1276

Abstract

Communication holds the key to an efficient disaster management. The aims of crisis communication broadly, is to inform, educate and communicate with various stakeholders with a view to create resilience and confidence among them and communities at large. The people in charge of communication need to be trained specifically in communicating on disasters during various stages, viz., pre-disaster, disaster and post-disaster. Among the various stakeholders who need to be sensitized and trained, the most crucial include, the civil servants, who are called upon to administer/manage disasters, the information public relations personnel in the central and state governments who disseminate information to the media on behalf of the government, disaster management teams at ground zero and at head office level, the communities at the grassroots level and last but not the least the media persons who need to be exposed and sensitized to the disaster management emergency response system and the preparedness of the administration in dealing with any kind of situation so that their reportage is balanced.

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It is generally believed that truth is an easy causality during a crisis. Therefore, it is important that efforts be made to disallow the formation of grapevine, misinformation and fake news. Media often takes the centre stage post a disaster. The news media by its nature is critical of those who are in charge of disaster management to find the underlying cause of the tragedy. Misinformation, disinformation and scare mongering during disasters is a common occurrence; therefore, managing perceptions is important to ensure that the situation does not get out of hand. In the smart cities' context, it is expected that these are equipped with zero-failure communication dissemination apparatus and mechanism.

The chapter would explore the multi-pronged challenges in disaster management but most importantly how the people in charge of disaster management and communication are to be trained to do a professional job. The chapter would provide an outline of the training contents on disaster communication for various stakeholders.

Keywords

Accountability Crisis · Disaster · Knowledge -sharing · Management · Leadership · Media Training · Stakeholders · Strategic communication

Images of disasters both natural and man-made, the mushroom-shaped smoke in the aftermath of the dropping of atom bombs in Hiroshima and Nagasaki, the soul-stirring shots from the Chernobyl and Fukushima disasters reflecting human suffering, but at the same time resilience of the communities, the mayhem left by the Tsunami, the lethal Bhopal Gas Tragedy, pictures of hapless people, the blood and gore in the aftermath of wars and natural disasters, and the trauma and despondence of the survivors looking askance, remain etched in public memory for long. Media an effective chronicler of events, though not necessarily always objective, has brought disasters live in our living rooms thus making everyone a part of the multiple act of the tragic drama, every time a disaster strikes. Journalism as put by the *Washington Post* President and Publisher Philip L. Graham is “the first rough draft of history.” The Internet has ensured that what is uploaded once, its footprints remain permanently, underlining the importance of media and communication. The role and scope of communication and independent news media, therefore, as areas of inclusion in the disaster policies and laws in various countries cannot be underestimated.

Disaster as a Subject of Study

Disaster as a subject of study is not very old. The last few decades have seen disaster management being included as an area of academic study in some universities. Disasters can be defined as “severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable

social conditions, leading to widespread adverse human, material, economic, or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery” (https://www.ipcc.ch/site/assets/uploads/2018/03/SREX-Chap1_FINAL-1.pdf). Disaster management largely refers to the systematic organization and management of institutional roles and responsibilities in dealing with emergencies (Quarantelli, 1988).

The United Nations General Assembly declared the decade of 1990s as the International Decade of Disaster Reduction (IDNDR) with an overarching aim to “decrease the loss of life, property destruction and social and economic disruption caused by natural disasters such as earthquakes, tsunamis, floods, landslides, volcanic eruptions, droughts, locust infestations, and other disasters of natural origin.” This happened after the adoption of Resolution 44/236 on 22 December 1989. To support activities of the decade, a Secretariat was created in Geneva in close association with the UNDRO (https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/44/236). The first archived international assistance in disaster management is ascribed to the Red Cross which provided relief to the war affected in the Battle of Solferino in 1859. Red Cross was founded by J.H. Durant, a Swiss Philanthropist and Humanitarian in 1863 in Geneva. (<https://www.nobelprize.org/prizes/peace/1901/durant/facts/>) Now there are several international agencies and private charities that come forward and provide the needed resources to the extent possible.

Disaster Management Initiatives

Vulnerability to natural and man-made disasters varies, depending on their geographical location and preparedness in handling various kinds of disasters. Disaster management requires the active contribution of various stakeholders including communities and media, but the disaster plans of most countries do not necessarily incorporate the role of these stakeholders in full measure, especially the media. One has witnessed a lot of academic debates and research in the arena, but regrettably, the people in general, who bear the brunt of disasters may be ill-prepared in dealing with disasters when faced, rendering all the serious work done by experts to question. Capacity building and public information campaigns on disaster preparedness still remain a distant dream, even in some of the most disaster-vulnerable countries.

In the next few paras, we shall look at some of the policies and laws in a cross-section of countries that are vulnerable to disasters, to argue how important it is for the lawmakers to appreciate and include the importance of including media and communication in the overall disaster management plans and execution.

Bangladesh

Owing to its geographic location, Bangladesh is very vulnerable to natural disasters like floods, earthquakes, cyclones, droughts, Tsunamis, lightning, river bank erosion, and arsenic contamination, besides man-made and health emergencies. Bangladesh

passed a law on disaster management in 2012. Later the National Planning Disaster Management (NDPM) for 2016–20 was prepared to “guide implementation of the Disaster Management Act 2012, allowing GoB ministries and other agencies to use it to produce their Annual Work Plans. The plan takes a ‘whole-of-Government’ approach, and it also attaches importance to engagement of the private sector” ([https://modmr.portal.gov.bd/sites/default/files/files/modmr.portal.gov.bd/policies/0a654dce_9456_46ad_b5c4_15ddfd8c4c0d/NPDM\(2016-2020\)%20-Final.pdf](https://modmr.portal.gov.bd/sites/default/files/files/modmr.portal.gov.bd/policies/0a654dce_9456_46ad_b5c4_15ddfd8c4c0d/NPDM(2016-2020)%20-Final.pdf)).

The Disaster Management Act 2012 provides the legal framework. The prime minister heads the National Disaster Management Council, which is the “supreme body for providing overall direction for DM.” The Ministry of Disaster Management functions as the secretariat to NDMC. The plan has three core goals, viz., Saving lives; Protecting investments; and Effective recovery and rebuilding. Interestingly in the NPDM, there is no mention of the role, scope, or use of news media as an institution in disaster management. In the yearly plans from 2016 to 2020, there is a mention of “creating awareness,” which can be deduced as information dissemination from the government’s end.

People in Bangladesh especially those residing in the interiors and cyclone-prone areas depend a great deal on warnings from the radio. The state-run radio called the *Bangladesh Betar* with six stations and ten relay stations covers the entire length and breadth of the country. Similarly, Bangladesh Television with two stations and 13 relay stations covers over 90 percent national territory as an empirical study (Shahidul Islam et al., 2004).

India

India has been a witness to many natural and man-made disasters from time to time. The commonly occurring disasters include earthquakes, lightning, floods, landslides, gas leakages, and caving in of tunnels at coal mines, among others including Tsunami and industrial disasters. The Disaster Management Act (DMA), 2005, defines disaster as “a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man-made causes.” The Act also defines disaster management as “a continuous and integrated process of planning, organizing, coordinating and implementing measures” (https://ndma.gov.in/Reference_Material/DMAct2005).

The DMA has mentioned about media interestingly in section 67 and circuitously also in section 54. First, let us look at section 67:

67. Direction to media for communication of warnings, etc. – The National Authority, the State Authority, or a District Authority may recommend to the Government to give direction to any authority or person in control of any audio or audio-visual media or such other means of communication as may be available to carry any warning or advisories regarding any threatening disaster situation or disaster, and the said means of communication and media as designated shall comply with such direction.

Clause 54 defines the punishment for “false Warning” thus:

“54. Punishment for false warning. – Whoever makes or circulates a false alarm or warning as to disaster or its severity or magnitude, leading to panic, shall on conviction, be punishable with imprisonment which may extend to one year or with fine.” Although “whoever” has been left ambiguous, it could be interpreted to include any person or any institution including news media and social media platforms.

News media, as we see in both the sections, is seen as a tool, as a medium, and not as a stakeholder or an independent interpreter of events. The reference is also in the way of instructions under clause 67 and a warning under clause 54.

Acts and Laws on Spreading False Information

Section 505(1) of Indian Penal Code, 1860: The punishment for making, publishing or circulating any statement, rumour or report which may cause fear or alarm to the public, or to any section of the public.

Punishment: Imprisonment which may extend to 3 years or fine or both.

Section 66D of Information Technology Act: Whoever, by means for any communication device or computer resource cheats by personating.

Punishment: imprisonment of either description for a term which may extend to three years and shall also be liable to fine which may extend to one lakh rupees.

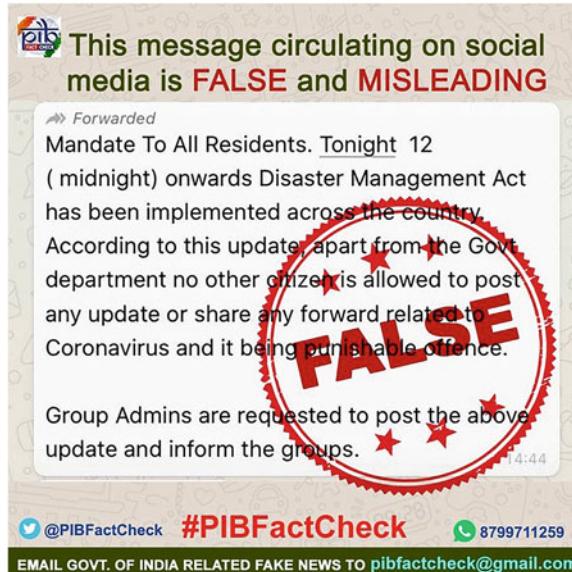
Section 54 of the Disaster Management Act, 2005: Whoever makes or circulates a false alarm or warning as to disaster or its severity or magnitude, leading to panic.

Punishment: Imprisonment which may extend to one year or with fine. (https://economictimes.indiatimes.com/news/politics-and-nation/view-disinformation-in-times-of-a-pandemic-and-the-laws-around-it/articleshow/74960629.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst)

For long, disaster plan standard operating procedures (SOPs) often have not specifically mentioned the role and scope of independent news media and communication. By its protocol default, the news media does acquire center stage as they are in the business of news, and there cannot be a more urgent time for the media to share the “breaking news” than a disaster.

The Covid-19 pandemic was put under the DMA, in 2005 by the central government and notified to the public. The unprecedented crisis saw the emergence of grapevine, gossip mongering, and false information on various social media platforms. Through social media platforms, a rumor floated that only the government of India would publish and share information on Covid-19 and not anybody else. The Government realized the mischief by some and immediately got into action through its Press Information Bureau (PIB), immediately clarifying its stand, using various

media platforms including the social media as reflected in the graphic below (Source: https://twitter.com/PIBFactCheck/status/1245643028951228416?ref_src=twsrc%5Etfw%7Ctwcamp%5Etweetembed%7Ctwterm%5E1245643028951228416%7Ctwgr%5E%7Ctwcon%5Es1_&ref_url=https%3A%2F%2Fthelogicalindian.com%2Ffact-check%2Fdisaster-management-act-coronavirus-supreme-court-20523).



The mainstream media wrote about this phenomenon immediately. Online news portal, The Print said, “Circulating fake news on Covid-19 during the 21-day ‘complete lockdown’ announced by Prime Minister Narendra Modi Tuesday can lead to a trial, and punishment of up to one-year imprisonment” (<https://theprint.in/india/spreading-fake-news-rumours-on-covid-19-can-land-you-in-jail-for-a-year/387611/>).

Media also carried stories about some journalists getting booked by the police for spreading “Fake News.” Both the DMA and the hackneyed, Epidemic Diseases Act, 1897, were invoked to arrest journalists. Media reported that the Assam government had constituted a five-member committee “for monitoring and checking of fake news in all forms of media” (<https://www.hindustantimes.com/india-news/about-500-cases-lodged-in-india-for-social-media-posts-on-covid-19/story-PBaxt7oNs9IdPNUCVRiUUM.html>). The Indian Express reported that 14 FIRs were filed against five journalists from Himachal Pradesh, some for showing live coverage of migrant laborers on reverse migration (<https://indianexpress.com/article/india/14-firs-five-reporters-himachal-fake-news-disaster-management-act-6412057/>). The news story shared that a multiple acts were invoked in almost all these cases.

Section 54 of the Disaster Management Act, which prescribes a penalty for false alarm leading to panic, was invoked in a majority of the 14 FIRs. Section 188 of the Indian Penal Code that relates to disobedience to order duly promulgated by a public

servant was invoked in almost all of the FIRs. The story quoted Mohan Lal Verma, a member of the Shimla-based Working Journalists' Association, who called the journalists frontline warriors in the COVID crisis, questioned the action taken by the authorities, reasoning that "Instead of registering FIRs, they should be assured medical compensation in case of contracting the disease" (Ibid).

Japan

Japan as a country has faced some of the worst natural disasters including the Fukushima nuclear disaster resulting from a devastating Tsunami in 2011. Under the 1961 Disaster Counter Measures Basic Act, a central Disaster Management Council was formulated in the overall policy for DRM to work as a national coordination body on disaster management. Interestingly the council chaired by the prime minister drew experts coming from various specializations including those representing the public broadcasting and banks, making it interdisciplinary and stakeholder-centric (https://www.preventionweb.net/files/29163_drmkn221.pdf).

There has been in general a perception among critics that during disasters including the Fukushima, the news media shared in large measures news based only on what the government sources shared, which could be seen as a case of "press release journalism." The real stories emerged when international media wrote about the severity of the disaster and its repercussions. Scholars since the disaster have undertaken empirical studies to look at the state of media coverage. For instance, Martin Falkner commented, "During the Fukushima disaster, the media served government objectives such as preservation of social order by playing down the size of the accident and severity of radiological releases, resulting in widely divergent coverage from serious overseas media" (Falkner, 2021).

Sri Lanka

The Sri Lanka Disaster Management Act No. 13 of 2005 prescribes a disaster management council headed by the President of the country as the chairman and the Prime minister as the Vice Chairman. The council also has the leader of the opposition, which makes it inclusive. Ministers from various ministries and also chief ministers of its provincial council are also members of the council (http://www.unlocked.lk/wp-content/uploads/2019/06/Disaster-Management-Act_E.pdf). Surprisingly however, the Ministry of Information and Mass Media as it is called does not find a place in the Disaster Management Council. There is no ascribed role or scope for the news media in the Disaster Act of Sri Lanka.

There is some criticism of the Sri Lankan media for not covering enough the news on mitigation, relief, and recovery when compared to what the various media houses might be doing in organizing succor, thus following their own agenda (Galagedarage, 2018). During the Covid-19, many journalists' associations and

groups issued a joint statement exhorting the electronic and print media companies to implement measures for the protection of media persons covering the pandemic (<https://ifex.org/sri-lanka-media-owners-urged-to-prioritize-safety-of-journalists-during-covid-19-coverage/>).

USA

In the USA, the disaster management is coordinated in unison by many agencies including the local police, fire, health to the Federal Management Agency (FEMA). The disaster management works around four key areas, viz., mitigation, preparedness/training, response, and recovery. The document details preparedness and role play by various agencies and institutions including the nongovernmental and civil society organizations. There is no mention about the role of government communication dissemination protocol or the role of the news media except for a mention of the Mobile Emergency Resource Support (MERS) which is required to provide mobile telecommunications, life support, logistics, operational support, and power generation required for the on-site management of disaster response activities.

It is in this context that the current publication, the International Handbook on Disaster Research acquires much significance because those who conceived the book realized the importance of communication and media as important players in the overall disaster management. The role of media cannot be underestimated either in the ordinary or extraordinary times, as media is the channel that provides information to ordinary citizens to make sense of the world around them. Media also informs, educates, and interacts with people. There are empirical studies that suggest that media, especially the social media, has been very effective in times of disasters by connecting communities in raising alarm, reaching out to the affected, and sharing user-generated content, often from the sites of disasters. The disaster management authorities in various countries have also made ample use of mass media, especially radio and now social media, via mobile phones to alert communities of impending disasters like cyclones and flooding, thus saving many lives, by timely relocation of communities from the disaster sites.

European Union

Europe is considered, a relatively safer place but not unaffected by various man-made disasters. Over-urbanization and urban settings are believed to amplify disaster risks such as floods, epidemics, and heatwaves. Environmental challenges and global warming also contribute to disasters of varying kinds. While it is the responsibility of individual countries to set their own disaster risk policies and laws, the European Union has put together policies and joint funds to address collective safety and resilience against any impending adverse events. Under the EU Civil Protection Mechanism, 27 EU countries and six other participating countries exchange information on disaster risks on a continuous basis (<https://ec.europa.eu/echo/what/>

[civil-protection/european-disaster-risk-management_en](#)). The Emergency Response Coordination Center (ERCC) of the EU monitors events throughout the world to ensure rapid deployment of emergency support system with national civil protection authorities.

Here too, one finds many documents and protocols on risk mitigation and disaster management, but nothing specifically on the role and scope of communication and media.

Media, in covering disasters, often focus on the lapses of the disaster authorities which in many cases on the one hand has brought corrective action on the part of the disaster managers, but unfortunately on the other hand has also invited backlash against the media from the very same authorities for allegedly sensationalizing agony and suffering. It becomes a catch-22 situation for the news media on deciding what would be in the public interest to share and what may not please the authorities. When media does its job objectively, at least some quarters look at it as an adversary, but when it pushes only the official perspective, media is criticized for being in cahoots with the authorities in keeping away the facts from the general public. A critical media in disaster situation often leads to reputation management by the authorities.

Just to cite the role of social media from the recent history when Nepal experienced its worst earthquake in more than 80 years in April 2015 killing more than 9000 people (<https://www.worldvision.org/disaster-relief-news-stories/2015-nepal-earthquake-facts>), Facebook (FB) activated its special feature *Safety Check* which helped friends and families to locate their near and dear ones. This feature meant that people closer to the site of the disaster could mark themselves safe and share with friends. Safety Check's feature also encouraged other users to share about people they knew were safe. FB came out with this feature after its engineers during the devastating Tohoku Earthquake and Tsunami in Japan had developed the Disaster Message Board in 2011 (<https://www.downtoearth.org.in/blog/how-people-turn-to-social-media-during-natural-disasters-49587>). It has been seen that people use the internet more frequently during a disaster to know not only about the location and magnitude of the disaster but also to get first-hand information from the site of the disaster. They often use social media platforms to check on their family and friends, and seek and provide support. During the flooding of many towns in Maharashtra including Mumbai in 2005 and years later in Kashmir, including Srinagar in 2014, many mainstream news channels in India ran a continuous scroll sharing messages of people to each other, especially the families and friends about their well-being.

Now on the content in this section...

The section on media and communication has been carefully curated with the rationale that Media, especially the news media, plays a very important role all through the various stages of disaster management. Media on its part sources news by various means, including being at the site of the disaster, government sources, nongovernment sources, communities, tip-offs, unauthorized sources, social media, and grapevine, among others. Each source has its own merits and pros and cons, impacting the perceptions of those affected by the disaster and people at large. Trust levels between the media and the authorities in charge of disaster management often

are at the lowest ebb in disaster times, each one suspecting the other of its intent in publishing certain news or keeping away vital information from the public.

The government often maintains a robust information dissemination network that is used both in normal and disaster times, which by its nature is not expected to be critical but only provides the government's perspective, which is also important to share.

The Corporate Inc. on its part has a well-entrenched and oiled communication apparatus that goes on in an overdrive in case of industrial disasters and also natural disasters when it decides to extend a helping hand under its Corporate Social Responsibility (CSR) drive. To cite an instance, during the second wave of Covid-19 in April–May 2021, when there was an acute shortage of oxygen in India, the large industrial houses came forward in converting their industrial oxygen to medical oxygen to fulfill the demand. The CEOs of vaccine manufacturing companies were interviewed to share when the vaccines would be available and about their manufacturing capacity and capability, but taking viewers on a virtual tour of their plants.

Entertainment media, especially the celebrities with a larger than life persona and a huge fan following usually come forward during disasters by reaching out to communities in distress and sourcing funds through events. India has had a long tradition of this phenomenon with some great results. During the Russia-Ukraine war in 2022, a number of Hollywood stars including Angelina Jolie visited the war-torn Ukraine to register her solidarity with ordinary people. Closer home, we found many Bollywood celebrities assisting hapless victims especially the migrant laborers with food and arranging for their transport back home during the Covid-19 emergency. Film star Sonu Sood became the face of Bollywood and emerged as an iconic figure during the pandemic.

The section on media and communication, keeping in view that disaster management is a multi-disciplinary and trans-disciplinary field, has looked at the entire media ecosystem to cover various aspects of information dissemination, both from the demand and supply sides, including various media platforms, government information dissemination apparatus, brand communication, media coverage, etc. It has also discussed the need for capacity building in training and hands-on skills to various stakeholders on disaster communication management.

In all there are 22 chapters in the Media and Communication section. The chapters have been contributed by academics, researchers, and professionals coming from the media sector. ► [Chapter 81, "Covid-19 Communication Strategies in India: An Analysis Using Social Amplification Risk Framework \(SARF\),"](#) by Md Shahid Akhter and Biswanath Dash draws from the "Social Amplification of Risk framework," examining the relationship between information sources with the nature of medium and social stations. The chapter highlights that risk concerning the Covid-19 pandemic was amplified or attenuated depending on social and political considerations. It calls for increased attention to the government's role in regulating and reframing communication strategies. ► [Chapter 84, "Post-Disaster Suffering: Amphan Cyclone in East Coast on India,"](#) by Subrat Kumar Mishra and Akanksha Shukla has taken up the case study of the super cyclonic storm Amphan which made

landfall in West Bengal on 20 May 2020, causing widespread damage in two states, West Bengal and Odisha, claiming 128 human lives. The chapter assesses the impact of these fatalities on the surviving members of the families based on qualitative research and reports of grief-focused journalism after the event. The study reveals that when a member of a family dies of a natural hazard, it leaves the survivors in trauma and distress on multiple fronts, viz., economic, social, and psychological. The chapter recommends workable measures for the survivors to secure their livelihood, food, nutrition, shelter, and physical and emotional well-being.

► [Chapter 89, “Disaster Communication and Trust,”](#) contributed by Nguyen Thi Thuy Hang and Tran Truong Gia Bao, deliberates on the monitoring of disasters and initiating counter-measures, positing how the media could gain the trust of the public when reporting on disasters is in full steam. The authors argue that even nations with a wealth of experience in dealing with such events, such as the USA and Japan, have faced criticism from the public in the past for their disaster communication strategies. The chapter discusses disaster communication in Vietnam by analyzing a specific case of communication during the 2020 floods in central Vietnam, identifying the causes of the communication problems, and proposing solutions to the challenge of securing public trust. ► [Chapter 83, “Interrogating the Role of Environmental Journalists in the Disaster Context,”](#) authors, Dinushika M. Yapa Abeywardhana, P.K.G.I. Lavangi Ranasinghe, and Luxshe Hariharan, argue that journalists can effectively monitor rehabilitation and restoration of essential supportive mechanisms post a disaster, despite the politicization of disasters. Under this backdrop, the ecological journalist’s role has been interrogated in various social settings. The chapter inquires the status and role of environmental journalists in the disaster context, particularly in Sri Lankan disaster events. Himanshu Shekhar Mishra, an active mainstream television journalist, in his ► [Chap. 86, “An Ethical Code for Disaster Journalism,”](#) attempts to codify the primary role and responsibilities of journalists in a disaster zone, the logistical challenges they face while communicating risk, and the moral/ethical questions that they have to face while gathering and disseminating news. The chapter suggests a standard operating procedure (SOP) that journalists need to develop to combat threats to their physical safety and health and codify risks involved in potentially hazardous/dangerous disaster zones. It also outlines a new methodology to interview disaster victims in a disaster zone with empathy and a greater sense of understanding of their trauma, loss, and pain. At a broader level, the chapter attempts to develop an ethical code for Disaster-sensitive Reporting and argues for a humanitarian approach in Disaster Journalism.

► [Chapter 95, “Media and Disaster Reporting: An Analysis of Kashmir Floods 2014,”](#) by Sabeha Mufti and Irfan Hashim analyzes the “agenda setting role” of the media with a focus on the leading media narrative at regional, national, and international levels to understand the overall media portrayal of events during the Kashmir flooding disaster in 2014. The analysis has been drawn using content analysis keeping in view the social and political realities. The findings reveal important implications for the understanding of media and the political narrative in the backdrop of the long-standing Kashmir discourse and the role of media.

Seema Goyal's ► [Chap. 96, "Role and Impact of Visual Imagery During Crisis,"](#) debates on the impact of photographs and videos and the power they possess in creating impressions and perceptions in the minds of the masses which could neither be denied nor underestimated. Any tool with so much power to shape the mind, argues the author, has to be understood and handled with extreme caution. Lack of critical thinking and understanding of the impact of a single picture or film can prove to be catastrophic, especially during a crisis when emotions run high and logical thinking takes a back seat. Panic and heightened emotional reactions resulting from insensitive or irresponsible visual imagery freely circulated on the social media platform can sometimes lead to undesirable overreactions and create additional difficulties in managing the crisis at hand.

The government often is the disaster manager in most cases, ► [Chap. 97, "Government Information Dissemination Structures and Processes in Disasters,"](#) by Shalini Narayanan makes a case about the ineffective communication as a part of the disaster management strategy which led to avoidable hardship to the common man during the Covid-19 pandemic in India. The chapter presents a case study of the pandemic as a lesson in communication during a disaster. ► [Chapter 88, "Media and Communication in Disaster Risk Reduction,"](#) by Juhi Ramrakhiyani discusses that despite many scientific and technological breakthroughs, there seems no letup in the loss of human life and property in a disaster. The aggregate of human and financial losses, collectively with redevelopment costs, she argues, makes disasters both a humanitarian and economic tragedy. Media provides a large potential and probability for enhancing disaster resilience and a chance to manage and increase the capacity building for early warning and education. As a result, with righteous use of media and communications, the author argues, the emergency organizations can strive to prepare a resilient community with increased capacity-building resources.

► [Chapter 93, "Social Media and Communication for Older Adults During Disasters: A Narrative Study of Aging Population in Kolkata, West Bengal,"](#) by Debarati Dhar aims to map the fears and apprehensions of older adults during disasters by examining their experiences. She argues that it is essential to study the various aspects (both physiological and psychological) of a crisis in the context of older adults and look at the possible ways of coping with the help of social media engagement. The central argument of this chapter is that social media can be utilized as a communication resource by older adults during a crisis. Prachee Majumder, Disha Dwivedi, and Garima Khera's ► [Chap. 90, "Social Media as a Catalyst in Disaster Risk Governance,"](#) makes a case for the role of social media that has grown exponentially, invading geographical limitations, administrative boundaries, and even the apparent limitations of technology for aid in disaster management in the face of information overload, which has come to be known as "infodemic." Carrying on with the same theme of social media, Jyotirmayee Tudu and Sourav Prakash Shit in their chapter, ► [Chap. 92, "Disaster Management and Communication Technology: The Prospect of Social Media"](#) focus on how the Indian government has used the tool of social media in spreading information to connect with the affected population. How far it has been able to establish a sustained two-way communication within the governmental agencies and with citizens and whether the use of social media in managing disasters has opened up a new chapter toward digital democracy in disaster management practices is a moot point.

Radio for long has been used effectively in reaching out to communities in far-off places in many developing countries, Mohammad Sahid Ullah's ► Chap. 82, "Keep Me Safe from Cyclones: Community Radio and Disaster Campaign in the Coastal Areas of Bangladesh," examines the broader influence of the programs broadcast from the four community radio stations in the country in the context of evacuation and preparedness measures during cyclones. The study recommends the developing of localized broadcast plans for cyclone warning campaigns, a step that would significantly contribute to the safety of the community at large.

Yet another chapter on the same medium, ► Chap. 99, "Radio for Disaster Management," Rajeev Kumar Shukla argues that although all media platforms are active partners in disaster management communication, radio proves to be the most immediate, intimate, and accessible medium due to its faster and larger reach, affordability, and simpler technology, making it indispensable in a disaster situation. When a disaster strikes, it affects a wide range of communities, interests, and professions, Ipsita Barat's ► Chap. 94, "Pandemic Survival Strategy of Hindi Film Studios: The Case Study on Yash Raj Films," attempts to gauge how the industry players, especially the famous Yash Raj Films (YRF), survived and sustained itself during the pandemic. A collective understanding has been that the industry survived by creating alliance with Over-The-Top (OTT) streaming platforms such as Netflix, Prime, and Hotstar. However, YRF had no OTT film released in 2020. YRF, despite no such alliance, was able to survive the pandemic times and continued to do so by adopting an effective business strategy.

Medium- and small-sized industries suffered the most during the pandemic globally. In ► Chap. 67, "Resilience of MSMEs During the Pandemic," Deepmala Baghel has looked at the repercussions of the Covid-19 on MSMEs and whether they were able manage the crisis in the Nagpur District of the State of Maharashtra. The results of her study indicate that MSMEs faced myriad problems following Covid-19 mainly because of their inherent characteristics of being small-scale operations, limited monetary base, and a confined area of operation. The author has suggested an appropriate policy framework, emphasizing on the need for both monetary and empathetic governance to support MSMEs' organizational resiliency.

► Chapter 98, "Reinventing Fashion Industry to Sustain Itself During Covid-19," by Meha Jayaswal gives an interesting perspective on how the Covid-19 pandemic affected the fashion industry globally and how some major fashion brands and individual fashion designers stood to the challenges when the market was absolutely down and out. The chapter discusses how some of them contributed to bringing succor to communities and reinventing their brand perspectives in a crisis.

On the same theme, in ► Chap. 91, "Pandemic and Brand Communication in India," Tanu Dang argues in the Indian context on how during the pandemic, brand attitude and brand reputation gained greater relevance over brand positioning. Consumers not only evaluated the ways in which brands dealt with the pandemic but also shifted loyalty, if their favorite brands failed to act responsibly during the crisis. Brand communications evolved new ways to humanize their brand in order to make it more relatable to their consumers. ► Chapter 85, "Outreach Strategies Adopted by Corporate Organizations for Flood-Affected Communities in India," by Kulveen Trehan, discusses the role of corporate organizations in carrying out

community outreach during floods in India, by employing various strategies and tactics of branding and social responsibility in their involvement in the flood management cycle. Their outreach efforts, the author argues, got recognized during the Kerala floods (2018), thus consolidating their role in the disaster ecosystem. Interviews with different persons involved in flood management, disaster research, mitigation, media, and corporate communication brought in focus the higher outreach marketing by companies using their products and use of social media during floods.

► Chapter 87, “Capacity Building Through Stakeholder Training in Media and Communication for Effective Disaster Management,” by Jaishri Jethwaney explores the multi-pronged challenges in disaster management but most importantly how the people in charge of disaster management and communication need to be trained to do a professional job in the face of a disaster. Among the various stakeholders who need to be sensitized and trained, the most crucial include the civil servants, who are called upon to administer/manage disasters, the information public relations personnel in the central and state governments who disseminate information to the media on behalf of the government, disaster management teams at ground zero and at head office level, the communities at the grassroots level, and last but not the least the media persons who need to be exposed and sensitized to the disaster management emergency response system and the preparedness of the administration in dealing with any kind of situation so that their reportage is balanced. The chapter provides an outline of the training content, pedagogy, and hands-on skills on disaster communication for various stakeholders.

In summation, the part on “Media and Communication” in the current International Handbook on Disaster Research hopefully will amplify the debate on the role of media and communication in disaster management among academics, policy makers, and lawmakers among others. The section expectantly would also be contextualized with other segments of the handbook to reinforce the argument that a trans-disciplinary approach to disaster management is not a choice, but a necessity.

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Covid-19 Communication Strategies in India: An Analysis Using Social Amplification Risk Framework (SARF)

81

Md Shahid Akhter and Biswanath Dash

Contents

Introduction	1278
Risk Communication	1279
Risk Communication Approaches	1279
Risk Communication Framework	1281
Social Amplification Risk Framework (SARF)	1281
Covid-19: Communication Strategies in India	1284
Institutional Mechanism	1284
Risk Communication Strategy	1285
Use of Social Media for Risk Communication: Challenges	1289
Discussion and Conclusion	1290
References	1291

Abstract

The Pandemic showed the world at large that appropriate risk communication strategies are of vital importance to deal with a disaster of unprecedented scale. Conventional communication alongside a host of social media played a range of roles from spreading awareness, building preparedness, reducing mental anxiety and associated stigma, spurring policies and action to spreading misinformation, reinforcing popular myths, blurring the distinction between science and pseudo-science. This chapter seeks to understand how effective the communication strategies were in India during the Covid Pandemic. Drawing from the “Social Amplification of Risk framework” it examines the relationship between information sources with the nature of medium and social stations. The broad objective is to understand how social and cultural factors shape the impact of communication. The study highlights that risk concerning the pandemic was amplified or attenuated depending on social and political considerations. It calls for increased

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attention to the government's role in regulating and reframing communication strategies.

Keywords

COVID-19 · Social Amplification · Risk Communication · India

Introduction

The frequency of disease outbreaks and disasters has risen over the last few decades (CRED & UNDRR, 2021). Modern society characterized with all kinds of risks indicates a sense of insecurity for the present while raising the concerns for the future (Rayner, 1987). Unprecedented scale of urbanization, deforestation, and simultaneous change in climate and consequent impacts have resulted in bringing animals and humans' sphere of existence much closer than ever before. Such close proximity intensifies chances of infectious diseases outbreak and an upsurge in occurrences of epidemics and pandemics (Harvard, 2020). The spread of SARS (2003), HINI (2009), MERS (2012), and COVID-19 are clear reminders that biological disasters are not as infrequent or region-specific as it was perceived to be at one point of time. SARS-CoV-2 (henceforth COVID-19) originated from Wuhan China and created one of the biggest global health crises within a short span of 6 months (Lee et al., 2021). The contagious nature of this disease was the major cause of public concern and it continues to create panic well into the third year of its initial outbreak. In such a situation, societies require an appropriate public health communication strategy to protect themselves from the adverse impacts of ongoing Pandemic and future disasters.

An effective risk communication strategy is vital for public ingestion of pandemic information and to convince people to behave in an appropriate manner (Bernhardt, 2004). A long and protracted spell meant that risk perceptions of people varied and tended to be low during crucial phases. The growing fatigue and high stress due to uncertainty and limited trust and confidence in governmental response contributed to a near breakdown of the fabric with which our communities are made of (Mackenzie et al., 2014). Thus, the strategies to manage these risks effectively require better communication between different individuals, groups, stewards, government agencies, and members of society (Hanafiah, 2018; Matta, 2020). A robust risk communication strategy therefore must exist at all levels from global, national, and regional to local and is a prerequisite to contain the transmission and handle the disaster effectively.

Risk communication strategies are often treated as supplementary efforts in dealing with outbreaks rather than being treated as an integral part of the successful responses to any public health emergencies (WHO, 2017). To make communication effective and to promote people-centric response, community's engagement, empowerment, coordination, and localization are imperative. Without community involvement, there is a danger of confusion and escalation of misinformation and

mistrust undermining the efforts of lifesaving tools, information, and services. What and how the communication process should be is a question which has engaged researchers across the world and several models and frameworks are proposed to capture the process through which risk messages progress from its origin to the final receiver. This chapter focuses on various communication models in general and social amplification of risk framework (SARF) in particular to examine COVID-19 risk communication practices and its entanglement with social, institutional, and cultural practices.

Risk Communication

In the classical notion of risk communication, the major sources of risk information are scientists, public agencies, or interest groups such as environmentalists or industries, eye witnesses in the case of hazardous events, etc. Such primary sources send information in the form of personal interviews, press releases, and reports to transmitters or occasionally send them directly to the final receivers. The coding or re-recording of risk information at the transmitting stations is the next step of communication. The media, public institutions, opinion leaders, and interest groups are potential transmitters of risk information. As transmitters, the mass media dominates, but interest groups often act as information brokers. The information receivers can be subcategorized into general public, affected citizens, socially exposed individuals, and members of different types of social groups. The last step of communication is the processing of the re-coded messages at the final receiver. Again, receivers can be categorized into different groups. The mass media usually serve the general public, while many mediums target specific groups or audiences. Specialized journals are again appealing to diverse groups such as science communities, risk assessors, environmentalists, religious groups, political camps, etc. In addition, citizens directly affected by the event may process the information differently from the other non-affected persons. The effects of the risk information depend upon the targeted audience and its amplification mechanisms in receiving and processing the information.

Risk Communication Approaches

A number of risk communication models have been proposed and through their use, attempts are made to outline efficient and effective practices. Broadly, risk communication is a complex activity involving different types of communicators such as media, government agencies, scientists, etc. Smillie and Blissett (2010) postulate a three-phase model, consisting of risk appraisal, source analysis, and situational analysis. In this approach, risk appraisal involves an objective overview of scientific facts. The second phase or situational analysis focuses on perceived risk through the lens of the outside world and the third or source analysis refers to responsible communicator's self-analysis.

A highly discussed risk communication model, known as Internalization, Distribution, Explanation and Action or shortly IDEA was developed by Sellnow et al. (2017). It has four key components: a) Internalization motivating receivers to attend and remember the message b) Distribution or the essential elements that disparate audiences receive during a crisis. c) Explanation to understand the accuracy of risk information, and d) Action, or the process through which appropriate actions can be taken. Veil et al. (2008) outlines strategies, which may be useful to establish a reliable risk communication model within organizations. It views preparedness and prior proactive measures before occurrence of an event to be of vital significance. According to Sellnow et al. (2009), to achieve the best practices in risk communication, nine core principles require to be valued. They are: treat risk communication as a process; infuse it into policy and decisions taking; focus on uncertainty aspects of risk; design risk messages based on the sensitivity of the culture; acknowledge diverse levels of risk tolerance; present messages with honesty; should be accessible to the public; collaboration with credible sources; and involve the public in dialogue about risk.

A message-centric approach, for example, as proposed by Zhang et al. (2020) (Fig. 1) argues that limited information and delayed decision-making at local government level are important in making the communication ineffective. This approach entails that government, experts and the public constitute the three core pillars of public health-related risk communication. In the interaction among these three components such as government-expert, government-public, and expert-public, key risk governance decision-making process remains with the government

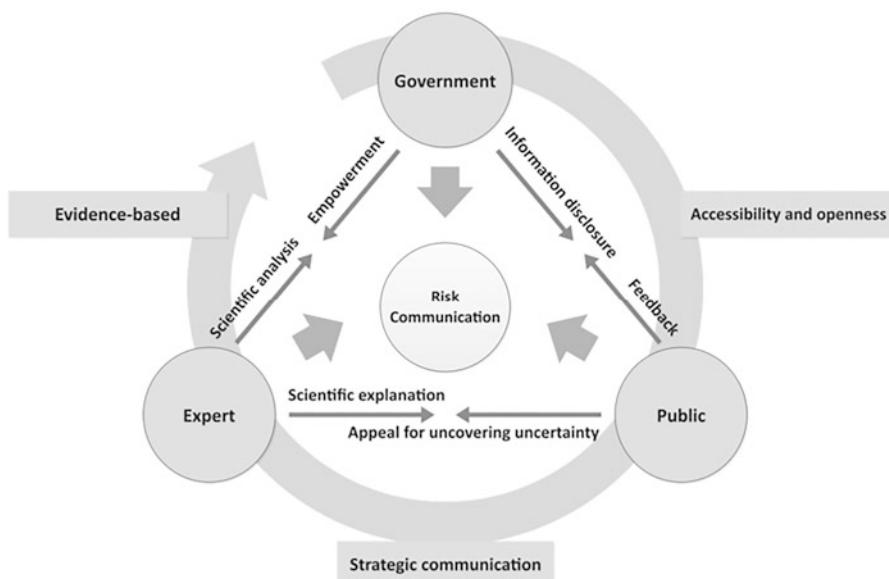


Fig. 1 Government-Expert-Public Communication model. (Source: (Zhang et al., 2020))

for example, in government-expert communication for internal risk assessment and government-public communication, to convey adequate and accurate risk information to the public, government carries key roles and responsibilities.

The Crisis Emergency Risk Communication (CERC) model developed by the Center for Disease and Control (CDC), USA is regarded as one of the most effective public health emergency communication models (Herovic et al., 2020). The CERC model views communication evolving through five phases: pre-crisis, initial, maintenance, resolution, and evaluation. It points to an evolution throughout a life cycle, be it crisis, emergency, or disaster; they evolve in phases and so also is the risk communication. The experience during the Pandemic in different country's context show the merit of such an approach particularly in a protracted disaster that itself evolved over time.

Risk Communication Framework

In the wake of the declaration of a pandemic on 11 March 2020, the World Health Organization (WHO) advised countries to follow a whole-of-society and a whole-of-government approach. Information Network for Epidemics (EPI-WIN) was introduced to fight against “infodemic” (WHO, 2020a). The use of scientific terms was often difficult for the public and it was suggested that pandemic risk messages be crafted in simple, clear, short, and to the point format for audiences (CDC, 2018). Further, the Global Outbreak Alert and Response Network (Mackenzie et al., 2014) was developed with the collaboration of 250 technical institutions across the world to establish an integrated global and national risk communication platform and to imply risk messages in a local context. Visuals and infographics messages were important for social media to promote protective measures such as hand washing, social distancing, cleaning and disinfecting objects and surfaces. WHO released a set of infographics, known as “COVID-19 – Know the Facts” and undertook other measures, for example, it teamed up with Google and social media companies for pandemic-related queries to be redirected to the WHO web page (Zarocostas, 2020). Training courses were also conducted in collaboration with celebrities to reach a diverse audience (WHO, 2020a). In the face of such initiatives, there was clear variation however over the extent of adherence to the suggested protective measures in the given context. For example, Varghese et al. (2021) (Table 1) found that European Countries differed in their adherence to a set of six basic preventive measures recommended by the WHO.

Social Amplification Risk Framework (SARF)

Social Amplification Risk Framework (SARF) is a dynamic model that does not fit well with the traditional communication model of information transmission between sources, transmitters, and final receivers. The classical models were initially developed in the late 1940s (Chandler, 1994; Lasswell, 1948), and they remain popular in

Table 1 European Countries ranked for their level of adherence

Rank	WHO recommendations	Top Adherers	Worst Adherers
1	Avoid shaking hands, hugging or kissing while greeting others	Portugal, Italy	Denmark
2	Keep a distance of at least 1 meter	Portugal, Italy	France
3	Cover nose and mouth while coughing or sneezing	Portugal	France
4	Regularly wash hands with soap	Portugal	Denmark
5	Use alcohol-based hand rub	Portugal	Germany
6	Avoid touching nose, eyes, and mouth	Portugal, Italy	Denmark

Source: (Varghese et al., 2021)

communication studies. SARF on the other hand identifies numerous intermediators that intervene between the risk event and its consequences, and recommends a causal and temporal sequence for compelling actions. From the origin to the end receiver, information flows through various channels – initiating individual stations, triggering social stations of amplification, and precipitating behavioral reactions. They produce ripple effects, which further lead to secondary impacts.

However, any model with simple logical structure may be inappropriate to analyze or capture the complexity of social communication (Rayner, 1988; Rip, 1988). For example, Lasswell's (1948) idea of "who says what to whom, how and with what effect" was the guiding tools on communication research over three decades. According to this model, the mass media is the core transmitter of information in society. With the coding process of a message, the flow of information starts at the source station, from which it goes to transmitters, where it is decoded then re-coded and transmitted further to the next transmitter or the final receiver. The original message gets altered either intensified or attenuated by each transmitter, and incoming signals can get added or omitted. The new cluster of signals is received by the next transmitter or the final receiver, which decodes, evaluates, and deciphers the information contained therein.

Signal Amplifiers: In social communication, signals without meaning are regarded as noise, and a cluster of meaningful signals on the same topic is considered a message. Any change or alteration of signals may change the meaning of the message. The change of messages during transmission is the main concept of the social amplification model.

Message Components: The amplification mechanisms of signals are based on two criteria: quantity and placement. Both are powerful agents with style and composition being additional mechanisms frequently used in coding or re-coding of messages. The coded messages can be in written or oral form. By using the mechanisms of signal amplification, different components of the message can be amplified by transmitters. Adding or deleting symbols is probably the most important mechanism in order to amplify or attenuate the original message (Renn, 1991).

Source of Messages: The framing of a message at its source is the first stage of communication. There are three levels of information source: individuals, social groups, and political institutions. At an individual level, messages are composed based on personal experiences, and it is rather rare in risk communication, unless they are directly affected by a cause of risk or eyewitnesses of a risk event. The amplification of these messages will only occur when mass media reports about this topic and agencies or fellow citizens highlight the topic as part of its own agenda (Peters, 1986). Therefore, the response of public agency, media interest, and individual action are all essential tools to fuel the amplification process.

Information Receiver: Receiver can be classified into micro, meso, and macro types, which can also be termed as individuals, groups, or institutions. Amplification during reception may differ between individuals, members of social groups, and public institutions. The cognitive processes along with emotional and subconscious processes play vital roles in filtering the incoming messages and co-determining evaluation (Renn et al., 1992). In the procedure of signal transfer, there are a number of stages through which individuals receive the signals, articulate them, and transform them gradually into an enduring belief (Renn, 1991).

SARF framework comprises mainly two stages. The first stage focuses on an event and its relation to public perceptions and their first order behavioral responses that are influenced by various amplifying/attenuating platforms. These stations of amplification can be social and individual, and the creation and process of signals rely upon qualities of these stations. In the second stage, emphasis shifts to secondary impacts and a direct link is established between the amplification of risk perception, behavioral reactions, and secondary consequences. These consequences include direct and indirect impacts such as loss of confidence in institutions, insurance, and liability cost, or alienation from community affairs (Kasperson et al., 1988, p. 181) (Fig. 2).

The consequences of an event are perceived at individual, social, and cultural levels. The response of individuals to a specific event depends on their perception, value, convictions, and surrounding social and cultural risk environment. The processes not only provide experience of a physical threat, but also disclose a new meaning or create subjective interpretations of risk (Pidgeon et al., 2003). Kasperson et al. (1988) explain how hazards that have relatively lower risk, for example, nuclear energy receive strong response (Amplification), while hazards such as smoking, air pollution, etc., which are no less dangerous are often ignored. They argue that how individuals understand and evaluate risk, and respond to it is shaped by a range of factors, namely, social, cultural, and institutional platforms. Thus, SARF suggests that social, cultural, psychological, and institutional processes may broaden or constrain the temporal and spatial scales of impacts (Renn et al., 1992).

In addition to the two stages, SARF can be further formulated through two other steps: information mechanism and response mechanism. There are four information mechanisms that intensify risk perception at the initial stage of transmitting risk messages. They are volume of information; degree of dispute or ambiguity of information; the level of dramatization; and types in which information is symbolized (Pidgeon et al., 2003, p. 14; Kasperson, 1992). There are also four types of

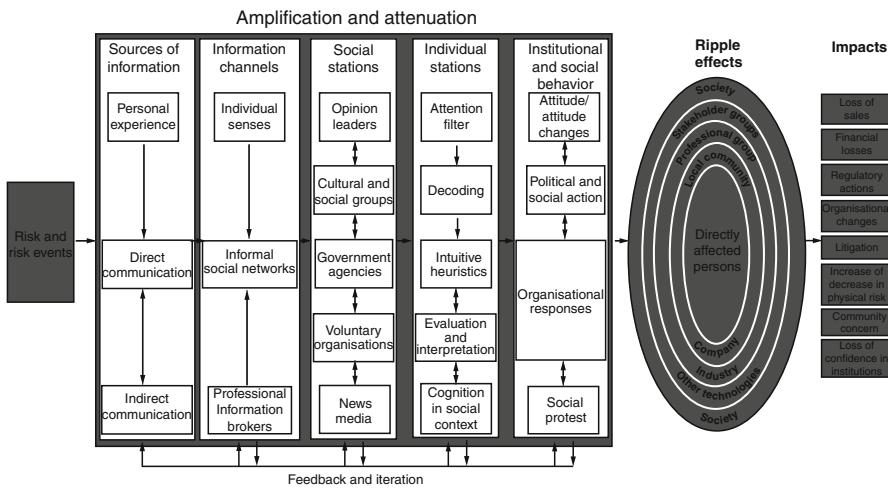


Fig. 2 Social Amplification Risk Framework (SARF). (Source: (Pidgeon et al., 2003, p. 14))

response mechanisms, which are: inquisitive form of knowing or valuing an event; the relationship among social group, political, and ideological commitments; high signal value event, for example, elevating seriousness of an existing one or introducing a new risk; the stigmatization that refers to the negative imagery of objects or undesirable individuals and groups connected to an event.

Covid-19: Communication Strategies in India

Institutional Mechanism

India's brief history of pandemics and epidemics include Cholera 1817–1899, Bombay plague 1896, Influenza 1918, Polio 1970–1990, Smallpox 1974, Surat plague 1994, Dengue 2003 and 2006, SARS 2003, Chikungunya 2006, H1N1 flu 2009, Indian Swine flu 2015, and Nipah 2018 (Chattu et al., 2018). In recent times, the Government of India has played a lead role in the management of Ebola and outbreak of H1N1 through experiences and realized that an effective COVID-19 communication strategy is essential for strengthening coordination and cooperation across all levels. The Ministry of Health and Family Welfare (henceforth MoHFW) is the nodal central agency for management of an incident amounting to a national public health emergency. Crisis Management Group (CMG) and National Risk Communication Committee (NRCC) are the institutional mechanisms at the national level mandated to ensure effective coordination and provide appropriate directions. CMG and NRCC receive technical advisories from the Director General Health Services Government of India, and similar mechanisms operate at the state and

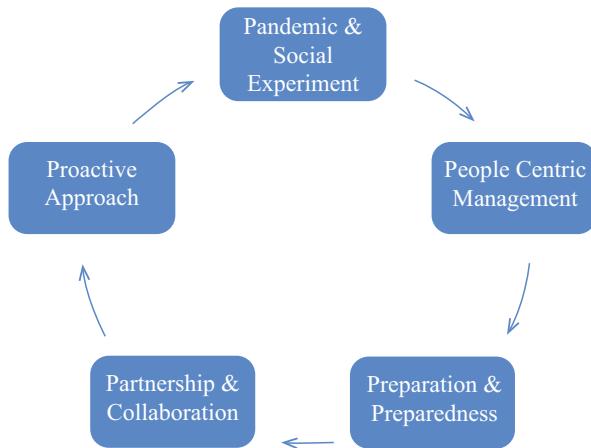
district levels in the form of State Risk Communication Committee, and District Risk Communication Committee, respectively.

The social experiment of achieving a physical distance for over 1.3 billion populations in India and over a substantive period of time provided much to learn from in terms of disaster risk communication and management. The nationwide lockdown, both voluntary and involuntary confinement and consequent challenges thereof, carry important learnings from the perspective of preparedness (French & Mykhalovskiy, 2013). The Integrated Disease Surveillance Project (IDSP), an important initiative of the Central Government underway since 2004 provided the much required infrastructure at the local level to detect risk at an early stage (Srivastava & Shainesh, 2015). This program was ably supported by other agencies such as Indian Space Research Organization (ISRO), National Informatics Centers (NIC) for district level surveillance, and the MoHFW, which in association with Indian Council of Medical Research (ICMR) provided three tier labs network and diagnostic centers, (Nomani & Sherwani, 2020), all of which are important source and widely regarded for their credibility.

Risk Communication Strategy

A general classification such as short-, medium- and long-term plans and actions can be useful to understand employed communication strategy in India over a long period. In this conception, a short-term process deals with relief-driven approaches and distribution of pandemic's information. The medium-term strategy focuses on socioeconomic recovery and welfare approach, and the long-term mostly addresses the diagnostic and prognostic remedies (Hao et al., 2020). From the initial stage itself, MoHFW began a practice of releasing a daily update on COVID-19 situation and the briefing was usually a well-publicized event and it was broadcast live by most of the television channels. Similar briefing was subsequently conducted on a daily basis by a number of Indian states. A wide range of Information, Education, and Communication (IEC) initiatives was prepared for different types of audiences such as quarantined, vulnerable groups, frontline workers including health professionals, and the general population. Public Service Broadcasters in collaboration with MoHFW telecasted a total of 36 COVID-19 affiliated videos on national television channels including the government-owned Doordarshan and they were also hosted on MoHFW website. The videos were made combining text, audio, animation, and voice-over and generally contained information on essential protective behaviors (Purohit & Mehta, 2020). A central repository of Standard Operating Procedures (SOP) and relevant Guidelines were created for quick retrieval to provide easy access to authentic information. A very effective means of communication, for example, was the consolidation of overall management approaches within five Ps: Pandemic and Social Experiment, People-Centric Management, Preparations and Preparedness, Partnership and Collaboration, and Proactive Approach (Fig. 3). The value of such an effort lies in its attempt for innovative representation of important management attributes.

Fig. 3 Five Ps of disaster management. (Source: (Nomani & Parveen, 2021))



The Center of Disease and Control (CDC) created an active web page on Twitter and Facebook to post and circulate large numbers of short messages within a short span of time. All India Institute of Medical Sciences (AIMS) the premier medical research institute in India conducted periodical webinars to communicate appropriate measures and procedures relating to treatment and institutional preparedness. For example, telemedicine guidelines were formulated and provided for wider healthcare access. An interactive epidemiological dashboard was created in several cities displaying the total number of corona cases, deaths, availability of hospital beds, and other critical information. “Break the Chain” a particular campaign by the Government of Kerala was found to be effective in communicating the importance of appropriate behavior (Line, 2020). Caller tunes, for example, were set in regional languages in order to make local people understand about the guidelines and protocols related to infection and stigma (Times of India, 2021).

A specific component of the MoHFW'S communication strategy was to include social influencers such as religious leaders and public celebrities to join the risk communication campaign. Political representatives were included on a regular basis for risk communication during the pandemic. Members of Indian Parliament or MPs, Members of State Legislative Assembly or MLAs, and that of Village Gram Sabhas and Gram Panchayats (GP) were part of the government communication plan to reach out to the wider public. This strategy was replicated during COVID-19 Vaccine drive as well during which it was further expanded to involve health practitioners of all streams, Auxiliary Nurse Midwives (ANMS), Faith leaders, Self-Help-Groups (SHG), etc.

Mass Media: Print, Television, and Radio

The mass media – print, television, radio, and internet – not only has a vast outreach but also plays a very prominent role during public health emergencies (Sharma et al., 2020). For example, during the Pandemic, frontline workers and government

agencies relied greatly on mass media to remain updated on latest government directions and information. Since pre-independence times, print media has emerged as an important means for communication in India, for example, it played a remarkable role during the country's freedom struggle (Dhanashree et al., 2020). Over the years, print media has earned credibility for its unbiased, accurate, factual, and objective reporting. It continues to carry forward the same reputation; recently it was evaluated to be the most trusted among readers as compared to web based or electronic media outlets (Saxena, 2021). As per a report of Ministry of Information Broadcasting, India has over 143,423 registered newspapers and periodicals during 2020–2021. The newsprint industry however was one of the worst affected in the pandemic and suffered severe financial crisis. During the early lockdown period, estimated losses of print media for 2 months – March and April 2020 – was as high as INR 4, 500 crores (The Times of India, 2020). According to the World Association of Newspapers and News Publishers, (as cited in Saxena, 2021), Indian publishing houses generally are facing a revenue crisis of an enormous scale and have entered into a debt trap. Porwal (2020) further points out that high production cost and new customs duty have only created additional pressure on them for sustenance.

In contrast, a positive upsurge was observed during the lockdown as far as viewership of television is concerned (Dhanashree et al., 2020). India has more than 900 private satellite television channels (MIB, 2020). In the early period of the Pandemic, keeping in mind the unusual nature of the enforced preventive measure, the central government decided to re-telecast various popular television serials. The government-owned television channel Doordarshan thus received a very positive acknowledgment for doing so. Further it initiated telecasting educational programs with an aim to augment the learning process and reach out to students particularly those in highly remote locations. A number of health awareness programs were played out on a routine basis as well to promote mental health, and reduce fear and stigma among people (Romero-Blanco et al., 2020).

Notwithstanding proliferation of satellite television, radio as a mass medium continues to perform an important role, for example, in dealing with fake news through authentic sources. In a country where internet is yet to reach majority, radio remains the most important for those left out of the digital divide (Pavarala & Jena, 2020). The Prime Minister of India thus announced the nationwide lockdown through a popular radio show “Mann Ki Baat” highlighting the importance accorded to the medium. As per a study of the Association of Radio Operators for India (AROI), radio listenership during the lockdown surged by 23% to record 51 million listenership, which is close to television (56 million) and social media (57 million) (Moneycontrol, 2020). A number of radio programs such as “Zindagi Kaise Jiye” (How to live life?), Savdhan (Be Alert), “Corona se Jung” (War against Corona), etc., were broadcasted in different languages providing information on public hygiene and sensitizing over various lockdown regulations (Pavarala & Jena, 2020). Globally, there are approximately 5000 community radio stations, and around 500 stations are in South Asian countries (Pavarala & Malik, 2007). During COVID-19, community radio ensured democratization of information for the

diversified rural populace in developing countries (Laskar & Bhattacharyya, 2021). India has 310 community radio stations, half of which are operated by Non-Government Organizations (NGO) and roughly 7% are operated by Krishi Vigyan Kendras (MIB, 2020). The mass media however is not entirely free from inaccuracy, errors, infringement, and aggrandizement (Snow, 2008; Leask et al., 2010). For example, they are required to be more accountable for their role in creating panic during the public health crisis and contributing to psychological stress and anxieties.

Social Media

Social media has brought about a significant change in communication dynamics. The web platforms and mobile-based technologies that enable users to create content collaborate and exchange among the participants and members have altered both communication patterns and development of appropriate strategies (Cohen, 2011). COVID-19-related news, opinions, and stories spread with a single touch of a screen, moving from individuals to millions across the globe within a short span of time. In the early period of the pandemic when there was no medicine or cure available, social media was widely used to spread public health awareness (Farnan et al., 2013). The easy mode of use and low-cost tools helped Government and Public Health Officials to diffuse relevant information and news to a large number of people (Merchant et al., 2011). Most of the Public Health agencies carried active social media sites, which were used to spread and communicate both among agencies and with the public (Thackeray et al., 2012). Although the role of social media in COVID-19 outbreaks is receiving attention, little is known about the mechanisms of social media use and its effects on risk perception and preventive behavior toward outbreaks.

During the Pandemic, risk information was carried over numerous websites hosted by diverse kinds of entities and in different Indian languages. The country has more than 560 million internet users, which is second highest in the world after China. There are more than two billion social media users, and on a daily basis, more than 500 billion tweets are posted from twitter (Farsi, 2021). During Covid lockdown, social media was the most preferred medium to exchange information with WhatsApp, Facebook, and YouTube being some of the most popular platforms (Internet Usage in India 2020). Based on analysis of social media messages, it is found that during the first lockdown most Indians were positive and there were fewer instances of anger, disgust, and sadness (Chehal et al. 2021; Barkur & Vibha, 2020). In the second phase of lockdown, the most trending topics were AarogyaSeva app, wear mask challenge, respect for coronavirus warriors. In the third phase of lockdown, the set of trending topics changed to issues such as Liquor Shops, Self-Reliant India, etc.

Public health professionals and healthcare organizations have long realized the value of social media in communicating health-related information (Bender et al., 2013). During COVID-19, political leaders in particular were found to have extensively used social media platforms like Twitter to disseminate or communicate with the public. A study, for example, shows that almost 90% leaders in India shared fact-

based positive or neutral information rather than statements in the form of opinions. The types of information that were shared by political leaders fall into the category of guidelines, daily updates, awareness campaigns, actions, appeals, appreciation and moral boosting, financial and non-financial assistance (Kaur et al., 2021).

Use of Social Media for Risk Communication: Challenges

During COVID-19, spreading of false information or “infodemic” posed the most serious threat to public health and management effectiveness. The scale of this challenge can be seen from a statement from Secretary General of the World Health Organization (WHO), Antonio Guterres who posted on Twitter saying that “Our common enemy is #COVID-19, but our enemy is also ‘infodemic’” (United Nations, 2020, May 28). Misinformation propagated mainly through social media created panic and anxiety. Several implausible claims relating to the virus and the spread of unproven and unscientific facts in the media posed enormous challenges to authorities (Kim et al., 2019). Facebook and Twitter being the two most important social media platforms (Mitchell et al., 2016) were also found to be major sources of such misinformation (Garrett, 2019; Vicario et al., 2016). It thus points toward a growing concern among provincial decision-makers to negotiate the way information gets mobilized in multiple directions and from diverse sources.

Some of the specific fallout of these practices include: a) maligning professional image, for example, posting and forwarding information with unethical and fabricated contents have adverse effects on the psychological condition of healthcare students, doctors, and other medical professionals (Peck, 2014). Social media service plays a crucial role in shaping the belief, personality, and interest of the commons and creates impressions in the mind of people. b) Similarly an inaccuracy, which often is difficult to be detected from a large volume of abridged, informal, and partial nature of information, can potentially create environs of panic and disturbance. To add to it, the desire to spike popularity act as an incentive for many users to post morphed or distorted videos and images (Moorhead et al., 2013). c) The psychological consequences of misinformation can exhibit in various forms, for example, anxiety, stress, trauma, worries, etc. (Roy et al., 2020).

Trusting the Source

The acceptance of information particularly in crises depends on the credibility and trustworthiness of sources. It is generally seen that people tend to believe in information shared by health experts, doctors, and scientists (68%), followed by the World Health Organization (56%) (WHO, 2020b). However, as far as politicians as an information source is concerned, there appears to be much variation. A number of structural factors can be attributed for the low level of trust such as lack of transparency, incompetent leadership, or cultural and historical factors. It is equally important to have an appropriate information channel to communicate evidence-based information effectively. A report from Myanmar suggests that as a media channel, radio is considered one of the most trusted although only 20% of the local

population receive information through radio (WHO, 2020c). Similarly, in Colombia, 88% respondents of a survey reported that they received Covid-related information through television but only 32% indicated that they trusted the channels. Other studies corroborate similar findings, for example, health workers (50%), television (44%), and newspaper and radio (38%) are found to be rated higher on reliability parameters. Importantly, while exposure to the online sources is rapidly growing, level of trust for these sources is still generally low (WHO, 2020d).

Discussion and Conclusion

The million deaths due to Covid-19 across the world have pushed human societies into turmoil and have left us economically in very dire straits. However, there are several lessons that should not be lost with regard to risk communication and its primacy in negotiating future challenges. In this chapter, analysis of India's strategy points toward the importance of advance planning, quick announcement as and when there is an outbreak, and being honest about risk messages with the public, as well as with various stakeholders. Besides, building public trust on government plans and actions, and a formulation of a communication strategy characterized with compassion and empathy have positive reception. The occurrences of health emergencies in India in the form of Bird flu, Swine flu, Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS), Nipah and, Ebola in recent times were helpful for realizing the significance of risk communication and a better understanding of its unaddressed aspects. For example, it brought to fore the requirement of a strategy that focuses on communicating awareness and proactive actions in the initial stage, a responsive and reactive action in the subsequent phases, and focus on social and mental health recovery during the final stage.

The Social Amplification Risk Framework (SARF) (Pidgeon et al., 2003) has much scope for applications and in this case, it carries relevance to understand how Covid-19 risk has been perceived and transmitted, amplified and attenuated through social filters. A review of recent studies point toward the role of social media platforms through which social, technical, and scientific risk mitigation and preparedness ideas merged through visuals and infographics and promoted protective measures. In the Indian context, several organizations such as National Disaster Management Authority (NDMA), National Informatics Centers (NIC), Indian Council of Medical Research, Indian Space Research Organization, and Programs such as Integrated Disease Surveillance, etc., collaborated for an effective risk communication strategy. Such strategies were fine-tuned with support from different levels of government, for example, National, State, and District level Risk Communication Committees.

This study draws three key lessons: the first, proliferation and popularity of social media, which warrant a rethink on conventional risk communication approaches. The COVID-19 risk communication in India reinforced two distinct features: social media on one hand helped communicate the risk with much effectiveness and on the other hand they carried a significant role in spreading erroneous and inaccurate

information, creating a distorted risk perception of an existing objective threat. Recognition of these two sides is prerequisite for formulation of better communication strategies. The second lesson is that the credibility of sources of information, which for COVID-19 were mostly government agencies, helped in achieving a positive outcome for the process of communication. Such credibility is gained through years of good performance and it is thus of utmost importance that the source agencies retain or improve their own performance for future benefits. Finally to improve and develop effective risk communication requires recognition of the role of varied social actors and cultural context in which risk messages evolve. A deeper examination of the nature of interaction is necessary to explain success and failure of risk communication strategy in different Indian contexts.

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Keep Me Safe from Cyclones: Community Radio and Disaster Campaign in the Coastal Areas of Bangladesh

82

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Contents

Introduction	1296
Cyclones and Evacuation in Bangladesh	1298
Cyclone Warning Campaigns and Peoples' Responses	1299
Study Design and Community Radio Studied	1301
Results and Findings	1303
Community Preparedness, Evacuation, and Safety	1304
Community Radio Intervention: Campaign Strategies for Preparedness Activities	1305
Safety from Cyclone and the Community Radio	1307
Community Radio and Capacity Building	1308
Discussion	1309
Conclusion	1311
References	1312

Abstract

This study examines the broader influence of four community radio stations' programs in the context of evacuation and preparedness measures with a month-long observation of people's behavior during cyclones. This study also engages 16 in-depth interviews with radio station managers, listeners' club members, and non-listeners across the coast. Study findings reveal that vulnerable people in isolated coastal areas and offshore islands continue to trust community radio for information related to cyclone preparedness and evacuation. Results of this study ascertain that listening to hazard-related programs on state-run and community radio stations has played a significant role in cyclone-related disaster prepared-

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ness activities relating to minimizing cyclone-induced life and property losses. The distinct feature of broadcasting early warnings in local dialects has increased the comprehensibility, information clarity, and reliability of the warning messages delivered by community radio. Better access to information has helped at-risk people make adequate preparations as they face impending cyclone risks. These activities together appear to have helped community radio listeners to incur a significantly lower degree of losses than that of non-listeners. However, while safety campaigns deployed by community radio stations have the potential to increase preparedness and timely evacuation, it has also been found that the capacity of stations to serve as effective channels for disaster campaigns still has limitations, largely due to inadequate training in crisis communication. This study recommends developing localized broadcast plans for cyclone warning campaigns, a step that would significantly contribute to community safety.

Keywords

Community radio · Cyclone warning campaign · Peoples' evacuation · Bangladesh

Introduction

Cyclones with tidal surges are the most severe natural disasters in Bangladesh in consideration of lives lost and damage to property. To avert these losses, studies (e.g., Azad et al., 2020; Hadi et al., 2021; Parvin et al., 2019) have confirmed that the most important cyclone mitigation measure is to temporarily evacuate the vulnerable population on issuance of a warning and protect them by arranging shelters with adequate facilities. It is necessary to better understand people's protective actions and hazard decision-making in pursuing effective and efficient evacuation inclusive of safe sheltering. In this pretext, Raj et al. (2010) argue that broadcasting information about available emergency aid resources, especially through timely warning bulletins, helps people protect their lives and property from cyclones.

Research findings from Alam and Collins (2010); Raj et al. (2010); and Paul et al. (2010) similarly ascertain that community engagement in evacuation, such as volunteers with the Cyclone Preparedness Programme (CPP), remains a major focus and self-reliance is considered the key to preparation, response, and recovery from cyclones. It is, however, evident that efficient warning message dissemination through broadcast media, radio in particular, to people at risk is an important precondition for disaster preparedness. In performing such dissemination, media – especially community radio within small communities – plays a crucial role in

developing countries (Ahsan & Khatun, 2020; Hibino & Shaw, 2014; Selvaraj & Kuppuswamy, 2019; Sen, 2020). For instance, Selvaraj and Kuppuswamy's (2019: 103) research on the *Peridar Kaala Vaanol*, station in Tamil Nadu, India, found that community radio stands as an irrefutable medium of disaster communication, especially to the vulnerable and socially excluded and economically disadvantaged.

Similar to this, Raj et al.'s (2010) study found that boosting people's confidence can help reduce the possible death toll from a catastrophic cyclone and tidal bore in Bangladesh through providing early and simple-to-understand radio warning in the local dialect. The study argues that successful public awareness programs aimed at changing the mindset and developing the capacities and skills of people might reduce the number of lives and property lost substantially. Following such a reference, the densely populated and disaster-prone Bangladesh has considered early warnings and alerts to be critical for mobilizing human and other material resources to manage cyclone emergencies (Ahsan et al. 2020). In response, this study examines the broader influence of four community radio stations' programs in the overall impact on evacuation and preparedness strategies.

Based on a month-long observation of people's behavior during cyclones as well as 16 in-depth interviews with radio station managers, listeners' club members, and non-listeners across the coast, this study finds that vulnerable people in remote coastal areas and offshore islands continue to rely on community radio for information about cyclone preparedness, evacuation, and sheltering. This study also revealed that the distinctive practice of regionally broadcasting early warnings in local dialects has improved information clarity, reliability, and understandability of the messages. Community radio's delivery of warning messages has aided those in danger of cyclones in making the necessary preparations. Together these issues appear to have helped community radio listeners incur a significantly lower degree of losses than non-listeners.

Furthermore, the study demonstrates how community radio has effectively increased disaster preparedness in cyclone-prone coastal Bangladesh, leading to significantly fewer deaths for community radio listeners. Finally, community radio stations are not mere providers of cyclone preparedness information but rather the empowerment agent of the community in multitudinous aspects, particularly by building capacity that comes in handy during cyclones. This study also shows that the programmatic and capacity-building efforts of the community radio stations had a tangible impact in terms of putting into place and strengthening community preparedness mechanisms in cyclonic disasters. On the flip side of the aforementioned prospects of community radio, several challenges were also reported by the respondents, namely, limited network coverage, signal dropping, formal language (with technical jargon) in early warning messages, and perceived credibility of warning, which need to be addressed when community radio is engaged to minimize the loss of lives and property from cyclones.

Cyclones and Evacuation in Bangladesh

The Bay of Bengal in the Indian Ocean is a hotspot for forming tropical cyclones, with 10% of the world's cyclones originating there on average. Cyclones pose a serious threat to 27 million people living along 700 km of Bangladesh's coastline. Bangladesh has had at least 70 of these severe cyclones since 1965, which typically occur every 4 and a half years and go into category three or four on the Saffir-Simpson scale. Cyclones *Bhola* (1970), *Gorky* (1991), *Sidr* (2007), and *Aila* (2009) are among those that have wreaked havoc on coastal Bangladesh, claiming lives and causing significant property damage (CRED and UNDRR, 2020). During the 1970 and 1991 cyclones, the Bangladeshi coast had lost approximately half-million and 138,000 people, respectively. However, several years later in 2007, cyclone *Sidr* hit resulted in the death of 3460 people. Following cyclone *Sidr*, the deadly cyclone *Aila* struck Bangladesh's southwest coast in 2009 and killed 190 people. Bangladesh, despite facing cyclones *Roanu* in 2016, *Mora* in 2017, and *Title* in 2018, continued to experience fewer casualties. More recently, *Amphan*, a category one cyclone that made landfall on May 20, 2020, affected 2.6 million people, destroyed 55,767 homes, damaged 76 km of embankment, and destroyed 440 km of road across more than 19 districts but only claimed the lives of 22 people. The decrease of losses from cyclones confirms that Bangladesh has developed a workable disaster management system that incorporates a set of mechanisms and procedures (Ahsan & Khatun, 2020).

Despite significant improvements in the disaster response infrastructure over the last three decades, Ibrahim et al.'s (2019) study notes that shelter evacuation rates are still low. Ahsan and Khatun (2020) and Ibrahim et al. (2019) showed that jerry-built roads, a fear of theft, a lack of belief in and mistrust of warnings, ignorance of threats, and the poor condition of cyclone shelters are the main deterrents to evacuating during cyclones. Additionally, people's decisions about whether or not to leave their homes during the warning times were influenced by past experiences with warning failures, superstitious religious beliefs, fatalism, and safety concerns for women. Hadi et al. (2021) have found that most people are still taking a "wait and see" approach mainly due to fear of losing property. The preceding study results by Raj et al. (2010: 2) support the statement that "cyclone preparedness and evacuation are not primarily about awareness." Other factors that affect how individuals respond include housing type, individual economic and social standing, where cyclone shelters are located, level of education, prior experience, media availability, neighbors' influence, and age.

Hadi et al. (2021), however, compared people's evacuation to cyclone shelters in four different catastrophic cyclones (*Gorky*, *Sidr*, *Aila*, and *Amphan*) and argue that despite significant improvement in disaster management in Bangladesh, factors influencing noncompliance with evacuation orders have remained largely

unchanged over the last three decades. Studies (Hadi et al., 2021; Ullah, 2020), however, considered that early warnings (with preparedness instructions), which are typically disseminated through media channels such as television and radio, or warning flags, megaphones, sirens, and going door to door to alert people, are major effective tools of preparedness for cyclone hazards. After delivering warnings, the media might persuade people to seek refuge in cyclone centers built along the coastline zone.

Studies and surveys (e.g., Parvin et al., 2019; Paul et al., 2010) on the devastating cyclones of 1991 and 1997 show that radio and television warning transmission played a significant role in reducing the number of cyclone and tidal surge deaths because the affected populations were able to make adequate preparations after listening to both regular and special weather bulletins. For instance, Cyclone *Aila*, and its loss of 190 people, confirmed that effective early warning systems, special cyclone bulletins, and evacuation measures seem to have saved countless lives in this event. Considering the effectiveness of warning announcements through radio and television, the government of Bangladesh has placed broadcast media at the center of its disaster preparation plans (GOB & MODRM, 2017; UNDP, 2014).

Cyclone Warning Campaigns and Peoples' Responses

The Bangladesh government has given the broadcast media a number of chartered duties that are to be carried out before, during, and after disasters under the Standing Order for Broadcast Media 1985 (last updated in 2010). Radio and television operators are obligated to uphold these obligations during each stage of cyclone disaster management in collaboration with the Bangladesh Meteorological Department (BMD), Storm Warning Centre (SWC), and Ministry of Disaster Management and Relief. In addition to this, Bangladesh has improved disaster management through the construction of shelters and evacuation plans, the modernization of early warning systems, the building of coastal embankments, the preservation and improvement of coastal forest cover, and community-level awareness campaigns (Haque et al., 2012; Paul & Routray, 2013).

Although around 0.7 million deaths have been recorded in Bangladesh over the last 50 years due to cyclones, the decrease of causality data from recent cyclones encourages the international community to consider that Bangladesh has become quite successful in cyclone early warning dissemination and reducing the number of human causalities. Studies by Hadi et al. (2021), Paul and Routray (2013), and Ullah (2003) have confirmed that the lower cyclone death toll in Bangladesh is primarily due to improvements in early warning systems and prompt information

dissemination. Despite these advancements, millions of isolated coastal residents remain outside the reach of mainstream media due to poverty and illiteracy. It makes sense that a sizable portion of the population has yet little to no access to broadcast media.

However, researchers over time (e.g., Alam & Collins, 2010; Parvin et al., 2019; Raj et al., 2010) have found that the reasons for refusing to evacuate to a shelter during a cyclone, the key cause of death, are due to fear of burglary and theft, disbelief of warnings, lack of shelter in the vicinity, poor condition of shelter, poor road network, religious beliefs, illiteracy, conservative and superstitious beliefs, confusion, distance to the cyclone shelter, misinterpretation of warnings, cultural issues, and past experiences of the failure of early warnings or false warnings. For instance, Ibrahim et al. (2019) examined the reasons for nonresponse during the warning periods and obtained a comparative picture of three recent cyclones over Sandwip island: cyclones *Mahasen* in 2013, *Roanu* in 2016, and *Mora* in 2017. They found that the majority of residents (around 80%) received warnings through megaphones, followed by radio, mobile phones, and other sources (neighbors and friends).

Raj et al. (2010: 5) study reveals that although radio (75.3%) is a significant source of information on appropriate preparation measures, around one-third (31.6%) of respondents faced difficulties to understand the cyclone signals (22.3% partially and 9.3% failed) and 30.5% showed reluctance to heed warnings. Lack of acquaintance with the technical jargon used by the media (14.3%), unclear understanding of the distinction between river and sea ports (14.3%), misunderstanding of the signal (24.0%), and general lack of concern (8.0%) were the causes of their incomprehension. Therefore, the traditional cyclone warning signals broadcast through media in Bangladesh are heavily criticized by disaster management agencies. For instance, quoting UNISDR (2007), Ullah (2020) acknowledges that disaster management organizations both at home and abroad assert that the majority of coastal residents are unable to understand radio and television broadcast warning announcements for technical reasons; one of the most frequently cited reasons is the use of “polished” “textual” language in the bulletins along with “meteorological jargon” (UNISDR 2007).

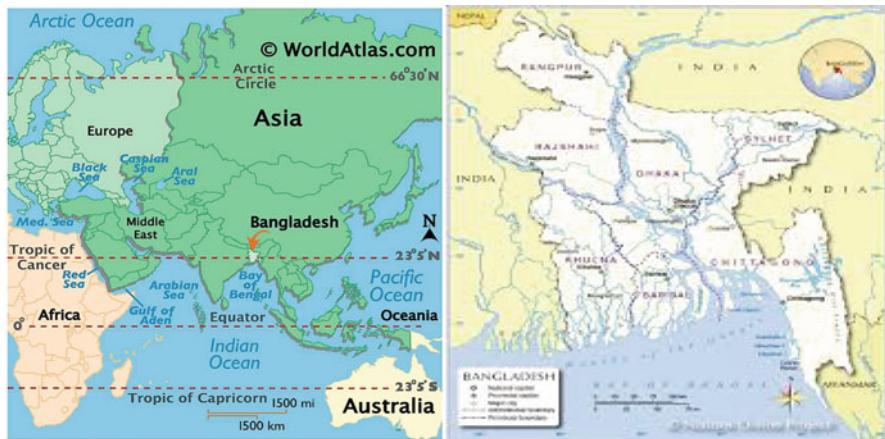
Most adults and women are illiterate in Bangladesh’s coastal region and offshore islands and are not familiar with the language used in warning bulletins and consequently fail to recognize the impending threat (Paul & Routray, 2013). Subsequently, low literacy levels are a significant variable in mediated cyclone warning messages’ success (or lack thereof). Raj, Ullah, and Akhter’s study (Raj et al., 2010) noted that 19.3% of the respondents has acknowledged that they are unfamiliar with the technical jargon used in media announcements and warnings about cyclones. Within this pretext, Ahsan and Khatun (2020), utilizing the Protective Action Decision Model (PADM) created by Lindell and Perry (2012),

address the problems entailed in overlapping processes before hypothesizing how information sources may assist people at risk in getting ready for or selecting protective measures in times of threat. They have discovered that community radio listeners suffer significantly less economic loss than non-listeners do ($\chi^2 3:11$; $p < 0:003$). Under these circumstances, this study intends to unearth the success and constraints of community radio in mitigating cyclone disaster-related warning effects through a qualitative inquiry.

Study Design and Community Radio Studied

To date, 19 community radio stations are in operation across Bangladesh. Nine of the current stations provide news, infotainment programming, weather forecasts, and cyclone hazard early warnings to roughly 2.3 million at-risk residents throughout the coastal zone (BNNRC, 2022). Three key preconditions – (a) the station must be located in a cyclone-prone coastal zone; (b) one community radio must be situated on an offshore island; and (c) one must be government-run community radio station – were followed to select radio stations for this study. With these preconditions and considering the quota (geography and ownership) and purposive (easy to reach and geography coverage) sampling method, four community radios, namely, Lokobetar, Radio Sagor Dwip, Krishi Radio, and Radio Naf (located on the map), were selected.

Lokobetar started airing in 2011 and is the first Bangladeshi community radio station located in Barguna, a deadly cyclone-prone southwestern district. A nonprofit media research and training organization – Mass-line Media Centre – established this station with Danish aid agency DANIDA. Lokobetar reaches around three million listeners in Barguna and its two surrounding districts and airs 6 hours of programming daily from 3 to 9 pm (for detail, <https://lokobetar.com/>). The second is Radio Sagor Dwip, situated on the island Hatiya in Noakhali, a southeast district of the country, which has been established to assist marginalized rural populations in disaster management and spark democratic processes including ongoing social development initiatives on the island. Dwip Unnayan Songstha (Island Development Association) in collaboration with Japan International Cooperation Agency (JICA) established the station (for detail, <https://radiosagordwip.net>).



COMMUNITY RADIO IN BANGLADESH



Study map: prepared by the author from Nation Online Project

Krishi Radio (farm radio; full name is Community Rural Radio) launched in 2012 at Amtali of Barguna district, with financial assistance from the Food and Agricultural Organization (FAO) and under the direction of the Agricultural Information Service (AIS) of the government of Bangladesh. The station has a broadcast capacity of 50 km and 8 hours of programming (from 9:00 am to 11:00 am and from 3:00 pm to 9:00 pm) with an estimated 175,000 listeners each day (for more detail, <http://www.ais.gov.bd/> and <http://www.shongjog.org.bd>). Radio Naf is located in Teknaf, in the extreme southeast corner of Bangladesh, near the border between Bangladesh and Myanmar. Approximately 1.5 million people within a 50 kilometer broadcast radius can hear this station, which was established by the local NGO Alliance for Cooperation Legal Aid Bangladesh (see for more detail, <http://www.radionaf.com/>).

The empirical data for this study is collected through intensive observations of the radio stations' activities, examining the program contents and people's response during cyclonic situations in real time. The study also conducted 16 in-depth interviews with all managers of the stations studied as well as people living in the community, station volunteers, and cyclone victims across the study areas during Cyclone *Bulbul* (November 2019). The data has been analyzed from the observation notes regarding warning bulletin dissemination and people's responses. Multiple coding of the interview transcripts (lasting between 40 min to an hour each) also contributes to understanding preparedness activities for people at risk in cyclone-prone areas. The transcripts of the interviews were thematically analyzed by two cycles of coding (Saldaña, 2016). This process involved open coding, identifying themes, clustering themes by patterns, and distinguishing meaning from these patterns. Applying all these methods, the results are summarized under four broad themes – (a) community preparedness, evacuation, and safety; (b) community radio intervention: cyclone campaign strategies for preparedness activities (c) safety from cyclone and the community radio, and (d) community radio and capacity building.

Results and Findings

Findings show that just before and during cyclone landfall, community radio stations broadcast cyclone alerts, preparedness messages, and evacuation directions that are friendly to their listeners. All radio stations under this study abandoned the regular broadcast schedule and broadcast hourly warning updates as well as religious sermons (*Humd* and *Naths*). The findings further reveal that community radio stations have a noticeable impact airing round-the-clock warning bulletins during the pre-cyclone emergency period. Stations included in the study broadcast warning bulletins, publicized emergency crisis management meetings, and provided reassuring and composed evacuation announcements in order to dispel myths, confusion, and rumors among at-risk people. In addition, the community radio

stations provided timely and accurate updates on the level of damage incurred and produced programs in which victims can express themselves first hand, established contact with the meteorological office, and broadcasted regular weather bulletins. However, due to insufficient logistics and a lack of production experience for pre-cyclone programs, the cyclone broadcast programs were unable to garner enough attention from all coastal residents.

Observation and in-depth interviews confirm that community radio campaigns have the capacity to avert immediate danger from cyclones and tidal bores. However, community radio stations cannot be completely effective due to lack of adequate training for broadcasters. The results of this study further confirm that listening to cyclone-related radio programs on state-run and community radio stations significantly influenced preparation efforts aimed at minimizing losses.

Furthermore, the empirical evidence reveals that those who are vulnerable may easily comprehend the warning messages that are broadcast by local radio stations in various coastal regions, enabling them to be well-prepared. Their dependence on alerts, hazard-related knowledge, and resources led to a reduction in the severity of tropical cyclone losses.

Community Preparedness, Evacuation, and Safety

People across the coastal region and nearby islands (chars) generally follow media announcements in order to learn basic information (awareness) about impending cyclones. It has been found that people in a high-risk zone (typically within a kilometer from seashore) respond more quickly to prepare by storing drinking water, securing dry food, and charging flashlights and cell phones ahead of those who reside inland. This study has also noted that compared to villages in clusters, people who live in solitary and dispersed settlements are more vulnerable. In addition, people living outside the cross dam (a protected earthen dam averting surges of water coming inside villages) are most vulnerable across the areas studied. People in those areas believe that cyclones are acts of *Allah*, and thus they follow the “wait and see” approach, a strategy to determine whether or not they are serious enough to seek shelter. Despite this, many people abide by government and non-government cyclone management authorities’ advice to prevent any casualties; people recall CPP volunteers’ instructions as their safety net during prior cyclones. Narrating her preparedness activities, Kulsuma Khatun (42) a widow living at Gollahkhali village at Hatiya Island says:

After hearing a cyclone (tufan) warning on the radio, I seek advice from neighbour and call [Mobile call] my son who is living in Feni town. Following advice from my neighbour and instruction from my son, I ask my daughter in law to tie up all valuable belongings [ornament, land records and cash mainly] of my family. In case of moving to the cyclone shelters, I always follow neighbours. In most cases, I do not feel to move to the cyclone shelters . . . only when the Red Crescent [CPP] volunteer urges me to evacuate [from home] repeatedly, I start moving.

Regarding the preparedness Nizam Mridha (38), a day laborer working on a boat on the river Paira from Dhalbhanga village, 8 km away from Lokobetar station, says:

Two days before the cyclone (bonna) hit I learned from the radio that danger signal number five was declared, and the announcement advised us to evacuate to the local cyclone shelter within the next 12 hours. I decided to wait for another day as moving to a cyclone shelter was challenging. So, I asked my family members to depend on Allah and seek refuge from my neighbors who have a brick house rather than move to a nearby cyclone shelter, which is around a kilometre away from our house while the neighbor's house is within a 10 minute walk. I am also concerned about the safety and purdah issue of the female members of my family.

These experiences ascertain that preparedness activities and taking refuge to the cyclone shelters depend on (a) God's mercy, (b) the availability of credible warning messages, (c) means available for refuge and safe spaces for female members of the family, and (d) getting instruction either from neighbor or male bread-earner and red crescent CPP volunteers. Here another important issue has been noted – cyclones are known by different names – *Ghurnijhor* as conventional Bangla, *Tufan* at Hatiya, and *Bonna* in Barguna.

Community Radio Intervention: Campaign Strategies for Preparedness Activities

The examination of the program content demonstrates that all the investigated community radio stations frequently broadcast programs about cyclone preparedness and evacuation. Programs about cyclones include drama (play), evacuation and safe sheltering instructions, and folk music that are very popular. The news and program structure, however, appear to be a copy of traditional radio. For instance, Lokobetar airs special 30-minute programs on cyclone and includes weather bulletins in its newscast. The programs include (roughly translated) Tales between Grandma and Grandchildren (Nani-Natir Kischa) every Saturday between 4:45 and 5:30 pm and Talk of the Shore (Upokuler Kotha) every Sunday between 7:45 and 8:30 pm. In addition, the station continues to run special weather briefings every half hour, while interrupting other regular programming as scheduled after receiving a cyclone warning alert message from the SWC. Immediately after the SWC issues warning signal numbers four and up, the station abandons all other programming and begins broadcasting evacuation instructions along with bulletins that include information on risk perceptions for hazards, pre-cyclone actions, whether to seek shelter during a cyclone, how to get there, the intensity of the wind speed, and other pertinent information. Along with these the station also starts the religious program (recitation from the holy Quran, including Islamic lyrics – *hamds* and *nath*).

Sagor Dwip radio station focuses on cyclones and river erosion throughout the year because of its location on an island. The station broadcasts a magazine style

(15-minute duration) program every Saturday and Wednesday at 11:30 am that includes “Come, Learn and Keep Safe” (*Esho Jani O Bachi*) which consists of personal accounts of cyclone victims, their coping mechanisms, and tips for finding shelter and highlights community radio’s role in warnings. This station airs a weather bulletin in the evening, considering its listeners’ needs and schedule. Krishi Radio, on the other end, focuses on agriculture, including soil erosion, the safety of seeds and seedlings, planting, and safety from insecticides and fertilizer. It broadcasts special programs on cyclones – The Disaster and We (*Durjoge Amra*) and Fisher’s Life (*Motsho Jibon*). After getting cyclone warning signal alert number seven, the station ceases its usual programming and broadcasts the special weather bulletins as instructed by SWC. The station’s national coordinator, Dr. Md. Zahangir Alam, narrates, “Krishi Radio FM 98.8 broadcast 92 consecutive hours of special programmes for the victimised people, their shelter and specifically to save their agriculture and the role was ‘remarkable’ indeed during cyclone *Mohsen* in May 2013.”

Radio Naf broadcast their 30-minute program “Learn and Live” (*Jene Nijeke Roksha Kori*), a talk show on disaster preparedness, mainly for landslides and cyclones. The Saturday program focuses on cyclones simultaneously with the same title and repeats on Monday. According to Harun-ur-Rashid, the station manager, “our station broadcasts regular weather bulletins both in the morning and evening ... [but] we take special care in broadcasting news and bulletins during the cyclonic period with a special attention to the inhabitants of the island Saint Martin through local dialects.”

The community radio policy [Clause 8.10] directs broadcasters to use formal Bangla, while incorporating regional customs and culture. However, the demand to broadcast warning bulletins in the local dialect is always emphasized, and community radio stations suppose to broadcast warning bulletins in the local dialect. Despite having the direction and request from locals, this study has noticed that the program format and language and textual analyses of news bulletins and special programs are being broadcast in formal Bangla, following the style of the state-run radio – Bangladesh Betar – and commercial radio stations’ formats. The news and warning bulletins in the local language are not possible to broadcast regularly on community radios. The reason, according to the station manager of Radio Naf, Harun-ur-Rashid, is that “we adhere to the traditional radio weather bulletin framework and receive instruction from BNNRC in the preparation of the weather bulletins.” Lokobetar station manager Munir Hossain Kamal also admits that writing news in the local dialect is difficult as there are no specific synonyms for expressing some words in Bangla. However, all cyclone-related programs try their best to broadcast by using local languages (Lokobetar uses Barisali language, Sagor Dwip uses Noakhalian dialects, and Naf uses Chittagonian and Burmese languages) but could not do so adequately on their own and engaged volunteers to do so. Being a state-sponsored station, Krishi Radio uses the formal Bangla language in programming except in special cases.

Safety from Cyclone and the Community Radio

The dependency on community radio for cyclone warning is high among the coastline people where electricity and other media are not available. It has been found that women are comparatively more concerned for the safety of their family members and including valuable belongings (e.g., national ID card, land documents, cash, and ornaments) than of their counterpart male, and they rely most upon community radio instructions when the safe sheltering is concerned. Madhabi Bala Sheel (45), a Sagor Dwip listener's club member from Purba Laxmidia village on Hatiya, acknowledges the value of radio announcements:

My husband asks me to keep this radio safe; he repeatedly says not to hand it over to anybody after there's a cyclone warning alert. . . . If the Dwip Unnayan take it [the radio set] back, I must buy one to keep myself updated on cyclone preparation activities.

During inclement weather, electricity has usually been cut off. As such, people living in isolated and distant locations consider community radio to be better option for having a credible cyclone warning message. Previous studies confirm that the credibility of a cyclone warning message is influenced by its content, characteristics, sources, conformity with the receiver's preexisting views, and previous exposure to similar warnings. Dipali Rani (46), a well-off family from the Dhopar Hat area in Amtali Sadar, mentions:

A day before the cyclone's landfall last time, I realised that the radio announced danger signal number four, and I got confused hearing the danger signal number six just a few hours ago. I discussed my confusion with my neighbor, and she confirmed that the signal number was four on that day, which made me more confused. Now, I tune into Lokobetar for any credible information regarding the cyclone.

In every case, this study has observed that the cyclone bulletins through community radio hold strong credibility because these stations mentioned the conditions from the specific affected villages and mohallas. People consider that community radio bulletins broadcast in local dialects become more reliable among people because they are easier to understand and more relevant to their personal experience. Describing the response from listeners, Sagor Dwip station manager Papia Sultana asserts:

I know that the local dialect is more effective in connecting with local people [through community radio]. Thus, my station prepares programme content as necessary for our people. More so, all volunteers and I were born and brought up here [on Hatiya], which is always a cyclone victim. Thus, we focus on the local language even though we cannot write in most cases the script in the local dialect.

All special weather bulletins, according to the Standing Order for Disaster (SOD), must include the location of the cyclone, estimated central pressure, direction and speed of movement, maximum sustained wind speed, the radius of maximum

sustained winds, areas likely to be impacted, and the approximate time gale-force winds (speeds of more than 32 mph or 52 kph) will begin to blow. They must also include the maximum wind speed, expected storm surge height, and areas most likely to be impacted. But government-run community radio is a different story. In reality, it is found that technical weather language frequently prevents community radio's special weather reports from providing all of this information.

This study has noted that the perceived credibility of information is a crucial asset during the cyclone, because it aids in preventing the spread of rumors that might exacerbate an already chaotic situation. Similarly, bulletin announcements in the local language with local jargon or dialect usually make the listeners more comfortable and the information more trustworthy as a result. By serving the informational needs of the impacted community throughout the coastal region and speaking the local languages, the community radio station becomes into a stand-alone medium during cyclonic disasters. In other words, the language, technical jargon, understandability, and sufficiency of the information in the warning message can all have a significant impact on how people perceive the risk and grasp the information contained in it.

Community Radio and Capacity Building

In Bangladesh, the cyclone risk reduction (CRR) strategy strives to lessen the harm that cyclones bring. As a component of CRR, cyclone preparedness helps those who are vulnerable comprehend and assess the level of danger, prevent it if feasible, lessen its effects, and manage the long-term psychological, social, and economic repercussions. A reliable and effective early warning system gives timely information that can be trusted, enabling those who are at risk to understand the severity of an impending cyclone's risk and take the appropriate precautions to minimize losses. Aspects of the warning network including the information's source, the channel's qualities, and the warning message's features have an impact on readiness by affecting how at-risk individuals behave to protect themselves during a disaster event. The proximity of a person's residence to the coast can increase the risk of coastal flooding exponentially.

It is observed that community radio has left its footprint on vulnerable communities by empowering them with the necessary knowledge they need to prepare and respond through round-the-clock emergency instructions prior to an impending cyclone. People relied more on the forecasts and recommendations provided by community radio due to the simplified delivery (i.e., minimizing scientific jargon) in regional dialects and names of specific locations familiar to listeners. In typical situations, vulnerable individuals tune in to the news three to five times per day. The at-risk people informed they prefer listening to the high number of special bulletins that community radio stations broadcast alongside news during emergency situations.

The field observation shows that audiences comprise students, senior citizens, farmers, small traders (makeshift vendors), tea stall owners, day laborers, rickshaw

pullers, votvoti drivers (locally made vehicle), women, young girls, children, fishermen, and NGO workers. When traveling throughout the locations under this study, it was found that a good number of people have heard the name of *Lokobetar* community radio station and often listened to its programs. Young students from *Lotabaria* and *Kakchira* villages, around 15–20 km away from station, and *Dhalbhanga* village, an 8 km away from district town, were more enthusiastic about the community radio program. The elderly and women have some knowledge of the station and not listen to *Lokobetar* program except during cyclone. Nizam Mridha (38), a day laborer at *Dhalbhanga*, says, “I follow *Lokobetar*’s instructions during the cyclone. My confidence was raised by the program during such a traumatic event.” Similar to this, Shahan Ara, a housewife from *Urashitola* village [15 km from Krishi Radio station], says:

I always listen to its [Krishi Radio] programming. Instructions relating to cyclones are incredible. May Allah live long the people from this station, because, through their instructions, I [as a woman] know now what needs to be done to prepare during the cyclone.

To boost the contribution of community radio in cyclones, listeners’ clubs install radio transistor at makeshift shops across villages and keep those transistors on throughout the cyclone period for better reach among the most vulnerable. When traveled across areas studied, for instance, it had been noted a good number of radios put out with a loudspeaker at *Kachuptra* bazaar (market) in Amtali (Krishi Radio coverage area) and *Nalchira Haat* [weekly marketplace] on Hatiya. However, those were not used and maintained properly when it was needed. Sagor Dwip station manager Papia Sultana insists, “maintenance training for listener’s club members and special training for volunteers, including us [the station management], is important.” She has confirmed even that most volunteers are not aware of the standing order.

The on-site field observation notes that BNNRC offers volunteers and staff members of the investigated community radio stations a series of courses aimed at increasing their capability. According to official data, workshops on developing content on cyclones and other topics emphasized community involvement and participatory formats. It has been found that the stations under study are staffed by over 300 volunteers, the majority of whom are male and female college and university students. Their engagement is considered a valuable asset for community radio stations. Despite the lack of data on their level of involvement with these stations during cyclones, it is inferred that a significant number of them work voluntarily.

Discussion

The cyclone warning system for coastal region of Bangladesh has been improved through an adaptation program. As a result, cyclone-prone coastal people can receive early warnings and forecasts during the cyclone seasons (March–May, October–

December). People living along the shore who are vulnerable to cyclones can therefore get predictions and early alerts throughout the cyclone season (March–May, October–December). However, early warnings are not enough to minimize damage; warning messages' timing, accessibility, and credibility are important. For instance, if a person or household at risk gets the warning right before the cyclone makes landfall, they won't have enough time to take the necessary precautions (e.g., evacuation and sheltering). Furthermore, Ahsan and Khatun (2020: 7) note, "if one warning turns out to be wrong or misleading, people will consider future warnings to be false alarms." To avoid confusion, the Bangladesh government, IFRC, and BDRCS advise adhering to the standing order standards, while promoting programming and broadcast bulletins relating to cyclone preparedness. Similar to how community radio plays a key part in disaster risk reduction, the National Disaster Management Policy from 2015 emphasized outcome-based measures for disaster preparedness and mitigation that are in line with local culture, context, and values.

Local and international agencies (GOB, 2020; UNDP, 2014; UNISDR, 2015) considered cyclone-related losses in lives and property could be minimized significantly through structural and nonstructural interventions. The construction of infrastructure for the first involves investments in the billions of dollars, and Bangladesh has made significant monetary contributions in this field. However, authorities prefer that Bangladesh should use a combination of hardware and software and choose less expensive nonstructural measures in response to cyclone risks because it is a resource-constrained and highly cyclone-prone country (Raj et al., 2010). A campaign by community radio is one of the best options as far as nonstructural measures go. Similarly, studies by Choudhury et al. (2019) and Paul et al. (2010) offer important insights into the reasons why cyclone victims are unable to take part in evacuation efforts. Three categories of inabilities are identified by Paul et al. (2010: 89–90): (a) factors associated with cyclone preparedness and infrastructure, (b) sociodemographic and socioeconomic factors, and (c) factors associated with hazard perceptions and attitudes. The trustworthiness of the warning systems was mentioned frequently among the cyclone preparedness considerations. The warning systems were perceived as being unnecessarily complex by some interviewees, inadequately given by others, and simply untrue by many others.

Community radios, in such a situation, are recommended to provide adequate space for victims and community participation and to broadcast warning bulletins in local dialects. In addition, a supplementary explanation of warning alert or instruction in plain language and the relevant local dialect is recommended, and the need for trained volunteers and skilled human resources for community radio remains urgent. Field data shows that although the studied community radio stations provide space for volunteers from within the community to participate and raise voices, more vulnerable cyclone-affected people, in particular, do not get the scope to share their experience on cyclone preparedness. Often only experts have the opportunity to speak on behalf of victims and those with lived experience.

The stations studied tried their best to value listeners, but station executives do not provide listeners' space to participate in programming more proactively, often citing adequate financial capacity and travel allowances as a barrier. This study feels community radio stations need to focus more on participation of community

members with the station. Participation in activities could help ensure the level of understanding necessary and the strategy needed for programs and bulletins to effectively broadcast and to prepare content and boost the morale of vulnerable people. In doing so, station managers need to adopt proactive initiatives through training community members on disaster broadcast with a manual that will work as a permanent resource for the station.

Overall, the empirical findings suggest that community radio performed better in terms of fewer casualties and increased reliance on risk awareness during tropical cyclones that made landfall across the vulnerable coastal region of Bangladesh. Community radio broadcasts warnings firstly on a regional scale, frequently explaining the SWC's warning messages in local dialects for better understanding; second, these stations prepared programs that focused on local characteristics, which helped vulnerable people to understand cyclone risks and have an enhanced awareness of these impending risks. These are the plausible explanations for this. Finally, because local residents ran these radio stations, consideration of regional advantages and disadvantages for cyclone preparedness was ensured.

Conclusion

Cyclones disrupt the normal functioning of a community across the coastal areas of Bangladesh. When an impending cyclone disrupts normalcy, the need for information will increase. As the people at risk depend on the media for timely and credible information about the advancement of an imminent cyclone, a community radio station can stand as a source of timely and credible information, thereby empowering the communities with knowledge and confidence to make decisions about evacuation and safe shelter. Community radio stations can deeply recognize a community's vulnerability and their information and knowledge needs and pave the way to build resilience. This indicates that community radio possesses the potential to minimize the damage and loss of life and property by learning how to respond to cyclones.

The findings of this study indicate that disaster preparedness for cyclones, particularly in terms of reducing cyclone-induced losses, has been significantly influenced by listening to disaster-related programs on both state-run and community radio. Even so, it has been noted that the distinctive feature of localized early warning broadcasting in regional dialects has improved the understandability, information clarity, and dependability of the warning messages delivered by community radio, helping at-risk residents in making the appropriate and necessary preparations to deal with cyclones. Furthermore, community radio appears to help people at risk to enhance their knowledge and awareness on disaster preparedness, which has allowed them to lessen loss over the last decade and adds some new dimensions in addressing cyclonic disasters that cause catastrophic losses of lives and property in the coastal region of Bangladesh. This study furthermore notes that community radio stations in Bangladesh differ from state-run (including Krishi Radio and Bangladesh Betar) and commercial broadcasters in their processes, approaches, styles, and content since they are community-driven, volunteer-run, not-for-profit organizations.

Community radio stations can also create a rigorous and suitable strategy to broadcasting about cyclones by disseminating reliable information through regional languages and dialects, challenging the hegemony of the mainstream, both commercial and state-owned media, and its programming practices. For such, authorities must put safety measures in place for station staff, schedule station briefing meetings to ensure effective warning signal distribution, and keep a close eye on all official announcements and activities of the national, local, and aid agencies from the ground up. In such a way, community radio stations can be a valuable asset in the fight against cyclone losses. In doing so, three issues need to be addressed. Firstly, conduct in-depth research to understand the constraints and ways to navigate those constraints. Secondly, continuously train volunteers and station workers, and thirdly, prepare a manual for station managers and volunteers which would be a great resource to coordinate cyclone-related community radio broadcasts and response.

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Interrogating the Role of Environmental Journalists in the Disaster Context

83

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Contents

Introduction	1316
Environmental Journalism and Disaster Communication	1319
Environmental Journalism in Sri Lanka	1322
Disaster Reporting in Sri Lanka: Two Cases of Sri Lankan Disasters	1323
Drought in Sri Lanka	1323
Floods in Sri Lanka	1325
Identifying Misconceptualizations and Gaps	1326
Conclusion and Implications	1328
References	1329

Abstract

Environmental journalists play a considerable role in environmental breakdowns regardless of their reporting mode. The environmental stories taken by many environmental journalists over a period of time cover a vast area of consequences of environmental issues. The reporting of destructive environmental events like disasters is also no different. Disaster events can create unprecedented socio-environmental conditions which negatively impact society. Hence, pre-disaster communication can effectively communicate disaster risks before the disaster. Even in the disaster context, they should ethically report reliable and essential information on the disaster that occurred. When it comes to the post-disaster

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context, the said journalists can effectively monitor rehabilitation and restoration of essential supportive mechanisms. Numerous political and economic forces can be seen in disaster contexts, and disaster events have been politicized due to those forces. Those forces can also influence the role of environmental journalists, and their representations may be biased in terms of disseminating sensitive information. Under this backdrop, the ecological journalist's role has been interrogated in various social settings. This chapter inquires about the status and role of environmental journalists in the disaster context, particularly in Sri Lankan disaster events. The present discussion creates a deliberative background that can be contributed to the augmentation of the discourse of environmental journalism in the disaster context.

Keywords

Communication · Disaster · Environment · Journalism · Media · Politics

Introduction

There is an ongoing debate on how mainstream media views itself and how sensitive its reporting is and its credibility among media consumers. It has opened an argument about what constitutes a “journalist” in the contemporary context. Also, it is significant to look into the facts of journalism and newsroom budgets, news trivialization, fragmented media sphere, and decreasing public confidence in the profession of journalism. Objectivity and bias, advocating ethics, and organizational agendas do impact journalism. Serving public interest with fewer biases has to be the main consideration of journalism (Vine, 2017, p. 43). A crisis of credibility and being hypersensitive might reduce professionalism of journalism and environmental journalism (Vine, 2017, p. 45). The trustworthiness of mainstream media is essential; otherwise, people tend to abandon traditional media. When a journalist tries to balance these aspects, she/he runs the risk of being blamed by the management for falling attention levels. However, credibility is a fact that cannot be left out under any circumstances. The connection between falling audience numbers and falling standards comprises other societal goals (Vine, 2017, p. 47).

According to Powers (2015, cited in Vine, 2017, p.48), changes in news media, advocacy, and technology are sparking growth in “NGO journalism.” New forms of journalism must ensure factual accuracy, fairness, and thoroughness. Journalists must not manifest their inherent personal, financial, or institutional biases (Vine, 2017, p. 48).

In some instances, journalists are excited to capture, pursue, and produce a unique story that has not been told before. They think that it will sharpen the importance of the news and theirs (Vine, 2017, p. 49), in the commercialized television world, the value of what journalists publish sway on entertainment value. The attractiveness of news tends to be painted with photogenic, articulate characters. In a way, the issue of “public interest” has seemed to have created a dichotomy between how journalists

see themselves and how the public might view them. There is an emerging trend that people are more likely to trust social media, which is a platform of news posted by people themselves than media or the government (Vine, 2017, p. 50).

According to Powers (2015 cited in Vine, 2017, p.51), journalism is converting to a platform for fundraising or misleading reporting, far from the core aims of advocacy groups. Credibility and fairness are profound values of journalism. Further, it seems that serious values of journalism have been compromised. It appears that potential solutions to the problems of journalists depend on the time and resources provided by their organizations. Hirst (2009 cited in Vine, 2017, p. 51) has spoken of the new possibility of “alternative journalism” as “a response to capitalism and imperialism as the global dynamic of domination and consolidation.” The other alternative to present-day journalism can be recognized as “citizen journalism,” which predominated during the Arab Spring. This citizen journalism is evident in places where paid journalists are afraid to report the realities of people’s lives. Other alternative forms of journalism can be recognized as radical journalism, critical journalism, activist journalism, social justice journalism, and advocacy journalism. Advocacy journalism is essential in the sense that the reporter intentionally and transparently adopts non-objective points of view on social or political issues (Vine, 2017, p. 51).

Careless (2000 cited in Vine, 2017, p. 52) describes that being faithful, accurate, credible and acknowledging the perspective do not ignore opponents of journalists, while neutrality in reporting is progressive. Advocacy journalism benefits both the host organization and the broader well-being of journalism. A national business review article about journalism at Greenpeace (Rotherham, 2017 cited in Vine, 2017, p. 52) claimed that the definition of journalism is broad and it has to be valued based on its merits. Plugging the significant fact of credibility and adapting to the digital environment while recognizing biases in traditional reporting are essential. “NGO journalism” is a debatable phenomenon. They should ensure factual accuracy, fairness, and credibility in their work. Advocacy journalism is significant to environmental issues and factors because it is far from being biased and mainstreaming working for the public interest (Vine, 2017, p. 52). To cite an example, campaigning organizations such as the Greenpeace has been quite active this field.

Environmental journalism is considered to be one of the most risky branches of journalism as the risk of being subjected to a high level of serious harm. Sometimes, it can result in the death of a person. The distinction between “environmental journalist” and “environmental activist” needs to be understood clearly. Environmental journalists in developing countries and developed countries, however, can be subjected to the same levels of vulnerabilities. Ecological issues are bound by immigration, racism, religion, and gender inequality, factors that often trigger the exposure to threats and harassment (Hiltunen, 2017: 69 cited in Freedman, 2020: 275). Environmental journalists around the world are at risk of being murdered, arrested, assaulted, threatened, self-exiled, embroiled in lawsuits, and subjected to harassment due to the exposure of influential business and economic interests encompassing political power battles, criminal activities, corruption, as well as other forms of politically, culturally, and economically sensitive factors

that they are working with. Environmental issues cover a large spectrum from indigenous rights to land and natural resources.

Environmental journalists face psychological and professional problems in reporting that include arrests, attacks, lawsuits, harassment, firing from job resulting in stress, trauma, anxiety, etc. These are both short-term and long-term effects on environmental journalists. There is no known professional (2009: 431–432 cited in Freedman, 2020: 276) body for environmental journalists, which can address these issues. Environmental journalists who had been in danger dealt more frequently with traumatized subjects; they, however, reported feeling better prepared to deal with the professional challenges. It is important to include environmental journalists' voices in research (Freedman, 2020: 276).

Physical insecurity combined with economic pressures limits serving adequately the public interest. There are five factors that influence environmental journalism which are social systems, social institutions, media organizations, routine practices, and individuals according to a hierarchy top to bottom (or macro to micro); these factors do have an impact on content produced by the journalists (Freedman, 2020: 277).

Social systems refer to ideological, economic, political, and cultural subsystems that influence news coverage of issues. The paradigms that they create are varied from country to country. It includes propaganda, nationalism, promotion, development, etc. Freedom of the press and nationalistic systems are crucial factors in this regard. Furthermore, environmental journalists are influenced by the obligation to work for pro-national interests in nationalistic systems.

There are three major institutions that influence social institutions, viz., the state, government, and official sources such as the media and non-professional citizen bloggers (Shoemaker & Reese, 2014: 97 cited in Freedman, 2020: 278). According to Powers (2016: 314 cited in Freedman, 2020: 278), contemporary transformations in media, politics, and civil society alter interactions between journalists, political elites, and civil citizens and it is the same in the environmental journalism, especially where NGOs and grassroots groups are playing important roles (Freedman, 2020: 278).

Media organizations in this regard refer to the consideration of the entire organization, and the fact of reporting content is not free from the organizational factors in which they work (Shoemaker & Reese, 2014: 135). Further, the fact of media organizations includes corporate and ownership policies, the structure of the organization, staffing resources, economic resources, media formats used to disseminate news and information, and similar and dissimilar roles of its reporters, visual journalists, and editors (Shoemaker & Reese, 2014: 164 cited in Freedman, 2020: 278).

Routine practices are developed from three sources, the audience, media organizations, and content suppliers, and routine practices are different from organization to organization. This is influenced by factors such as the organization's staffer's and freelancer's view on their mission, their self-perception, how they carry out actual reporting, the communication technology that they use, the type of the media platform and organization safety procedures, etc. (Freedman, 2020: 278).

Individual level refers to the professional and personal background of each journalist. Each journalist has their unique professional background, personal background, as well as demographic characteristics, experiences, attitudes, values, ethics, socioeconomic status, position that they have within the news organization, as well as competition (Freedman, 2020: 278). These five variables do have an impact on the contents that environmental journalists report (Freedman, 2020: 278). In this context, it is significant to have insights into the positive as well as negative facts with regard to journalism and specifically environmental journalism as we can see many natural and man-made disasters in the present world.

Environmental Journalism and Disaster Communication

Environmental issues are increasingly noticeable today, and a well-verses community is essential for sustainable ecological management. In other words, information and awareness of an environmental crisis can be conveyed to people through the media. Environmental issues expand from ground-level matters such as local garbage issues to global-level matters such as ozone depletion. Not everyone is fully aware of the details and perceived risks of environmental issues, and people need proper awareness to prevent ecological problems and mitigate their adverse effects. These practical underpinnings show that the media has become the utmost widely held and accessible communication medium for topics related to community well-being in a society characterized by constant technological development and distinguished by the significant consequences of globalization (Fallou, 2017).

The policymakers and the government need people to admit their influences on environmental issues. On the other hand, people should agree to follow the precautions in mitigating the effects of those issues. IBADRO newsletter (2020) defines environmental journalism as “current affairs journalism concerned with nature and the environment, particularly the impact of human activity on the environment, to increase public awareness.” Hence, environmental journalism plays a vital role in the fields of communication and media in terms of disseminating crucial ecological facts. “Journalism about the environment and climate change sits at the complex intersections between politics, business, science, nature, and culture, between the individual and the common and also between the local, regional and global levels” (Bodker & Neverla, 2013). Accordingly, the media can be supportive, complimentary, critical, or indifferent to emergency management.

Natural or man-made disasters are destructive events that are all too common in today’s world. The occurrence of any such disasters mentioned above would transform society in social and structural manner. According to Abeywardhana (2020), most disasters have environmental roots, and unnatural disasters have man-made causes but have intense adverse effects on the natural environment. Reporting catastrophic disaster-related information is a significant role of an environmental journalist, and then they become a substantial stakeholder in “disaster communication.” In other words, the risk of a disaster can be successfully conveyed to a target

population through an effective mode of communication. It may reduce the harmful effect of that event to a certain extent.

Niklas Luhmann (1992), while identifying ecological threats which are highly posing to the regular functioning of the current world, introduces the theory of environmental communication later on adopted to develop “disaster communication,” inquiring whether the communities can adapt to the ecological threats or not. According to Wahyuni (2019), “exploring Luhmann’s thought, thus, is an important means of providing an alternative explanation of the concept of ecological communication and its contributions to the understanding of ecological and disaster issues.” Overtly, “ecological communication” is Luhmann’s attempt to comprehend why society finds it challenging to recognize environmental risks and manage the environment effectively (Krippendorff, 1991).

Mass communication is inseparably entwined with disasters and hazard mitigation, and the role of communication in reducing the risk of disaster is manifold (Bhatti & Ariyabandu, 2002). According to Cate (1995), the role of communication and media in a disaster context can be divided into five (05) main categories:

- i. Technical communication system
- ii. Disaster-site communication
- iii. Organizational communication
- iv. Communication for scientific development and policy formulation
- v. Public education and communication

Each area enlightens the importance of the environmental journalist who can mediate in preventing the adverse effects of disasters through effective disaster communication. Since the twenty-first century is information-driven, advanced technologies and well-planned mechanisms can save people from being victims of disasters. The dissemination of reliable information before a disaster aims to encourage communities to take action to avert physical and psychological damages. In other words, effective warning mechanisms are instrumental in evacuating vulnerable groups moving emergency services and resources. According to Sharma (2005), effective disaster communication is based on three significant abilities:

- Largely technical and it has capabilities of identifying potential risk or the livelihood of a hazardous phenomenon occurring that threatens a vulnerable population.
- Ability to identify accurately the vulnerability of the population at which a warning needs to be directed.
- The ability that requires considerable social and cultural awareness in communicating information to specific recipients about the threat in insufficient time and with sufficient clarity that they take action to avert negative consequences.

By accumulating the above three capabilities, a communicative system can effectively function with the intervention of environmental journalists. Most of the time, the blame that comes to an environmental journalist dealing with disasters and

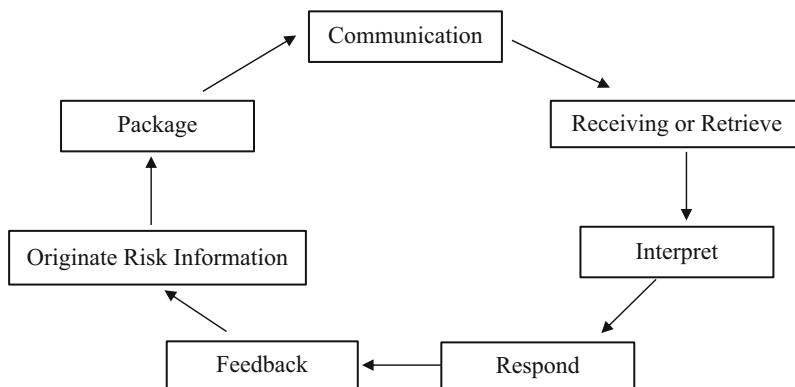


Fig. 1 The risk communication cycle. (Source: Bhatti & Ariyabandu, 2002)

any other type of environmental matter is that they are focusing on demanding matters instead of real matters that need attention. This is proven by Dynes's (1998) quote, "Media is potent in defining what a disaster is." He accentuates through the above quote that the media and the "pointers of media"/journalists can delineate an incident as a disaster or a typical scenario.

Furthermore, environmental journalism-based disaster communication has not constantly emphasized on highly vulnerable communities. It focuses on spontaneous news that can take the majority of the population (Smith et al., 2007). This further clarifies McKinzie's (2017) explanations. He highlights dominant elements in destructive narratives of journalists working in disaster contexts: the proximity to the disaster, "hero stories," religion, and resilience. Hence, the critical contention is about the environmental journalist in the disaster context that he extends his consideration only to "catchy" topics and not to the essential issues.

Disaster contexts always deal with specific risks that are perceived and unexpected. Therefore, the information that disaster victims receive is also bound to their risk, and it has been defined as "risk communication" in literature (Bhatti & Ariyabandu, 2002). Simply put, both Bhatti and Ariyabandu (2002) try to connect the process of conveying risk through communication to a cycle, and it is called "the risk communication cycle." The risk communication process starts from one whereby individuals hear a warning message to act or respond to its message to save their lives and property. This process includes three more steps, including the said components (Fig. 1). Those are as follows:

Risk communication is essential in preventing adverse effects of disasters, and the above cycle of risk communication can improve people's risk perception. Even though it consists of a message-medium receiver, disaster communication needs to be a quick flow of information like other communication forms. As Bhatti and Ariyabandu (2002) show, when the early warning is not available, the disaster event itself will become the origin of the information. Hence, disaster communication can effectively make people aware of such catalytic events in better pre-disaster and disaster context management. For that, the environmental journalist has a critical

role to play, as the piece of information that he delivers could influence thousands of individuals' lives.

Environmental Journalism in Sri Lanka

Sri Lanka is considered to promote participatory management to ensure sustainable human development through better communication and empowerment of communities. In Sri Lanka, *Sri Lanka Environmental Journalists Forum* (SLEJF) (please full form followed by acronym) is a prominent organization that works on restoring, protecting, and promoting environmental journalism and sustainable development rights of vulnerable population groups. Further, SLEFF is vital in working on challenges experienced by the people of the country. The priorities, according to them, are; (1) developing Millennium Development Goals (MDGs), (2) steps to achieve and adhere to those, (3) strengthening structures for enhancing the environment and sustainable human development, (4) creating a platform for the public for communicating more effectively with each other, (5) combine forces needed to make the country more peaceful place and also to strengthen individual's rights to freedom from want; (6) freedom to hear; (7) freedom to live in dignity (Senaratne & Wickramasinghe, 2000: 23–24).

The Central Environmental Authority of Sri Lanka has an Environmental Promotion Unit that works on environmental media-related matters. They are engaged in writing articles for newspapers on timely environmental trends, celebrating special environmental days, the management of different environmental issues, the preparation of press releases, providing coverage for different programs conducted by sections of the CEA, reviewing daily news in the media, providing news related to activities of the Central Environmental Authority to the Higher Management, and organizing preparations of replies to reviews for the media through coordinating with subject-related divisions. Further, they are engaged in organizing press conferences for media persons on special occasions, the evaluation of electronic and print media in Presidential Environmental Awards and organizing media programs on that, the media coordination of the Presidential Medal Program, the media coordination of the National Environmental Pioneer's camp and entering, and updating official web page and official Facebook page of the Central Environmental Authority.

Organizations involved in media journalism in the country are emphasizing, monitoring, and coordinating environmental education, public awareness, justice and practicing programs. They further engaged in developing special media training in environmental and developmental journalism. They have recognized human resources and parties nationally and internationally who are crucial in this process as a significant fact (SLEJF, 2000: 23–24).

Environmental journalists face many difficulties in Sri Lanka due to reasons such as editor's lack of knowledge on environmental issues and science, lack of support from editors, lack of facilities inadequacy of professional training, and pressure from the management of their host organizations. Especially with regard to issues such as

allocating space for their articles to publish in newspapers, influencers of advertisers and politicians, the complexity of environmental problems, and problems of getting information from sources. Further, in Sri Lanka, the field of professional ecological journalism is not yet well-established as there is no in-depth analysis of the environment in general. One primary reason for not prioritizing environmental journalism-related matters is that ecological journalism, which exists in the country's present context, has been created by non-governmental organizations with hidden intentions (Boyagoda, 2016).

Disaster Reporting in Sri Lanka: Two Cases of Sri Lankan Disasters

Sri Lanka is a country with an admirable climate. However, the climate has changed over the last 100 years. The temperature has risen by 1.06°C from the average temperature prevailing here. Agriculture is seen as the basic economic activity of the country. The increase in temperature, in general, is affecting agricultural production. The Northern, Eastern, North Central, and Southern Provinces of Sri Lanka have experienced continuous drought conditions for many years.

Analysis of the change seen between the average temperature over 1900–1917 and 2000–2017 suggests Sri Lanka experienced warming of around 0.8° over the twentieth century. This estimate broadly agrees with the temperature rise reported in Sri Lanka's NC2, which estimated 0.16°C of warming per decade between 1961 and 1990. Temperature rise has accelerated toward the end of the twentieth century (Second National Communication to the UNFCCC [NC2], 2022).

One of the major problems facing the world today is climate change. Changes in temperature and rainfall are caused by natural factors and human activities. Drought conditions are caused by declining rainfall and changing seasons when rainfall is available and rising temperatures. Drought and flood are the most important natural disasters in Sri Lanka. Drought is a condition in which the entire environment loses water and becomes completely dry, subject to high evaporation (Istiquar, 2013).

Drought is a characteristic of climate recovery. This is a phenomenon that appears in practically all climatic zones of the world with high and low rainfall. This is a temporary change of climate. In contrast, aridity is a permanent feature of the climate. It is restricted to low rainfall areas (Guide to Best Cultivation Practices for Drought and Floods in Sri Lanka, 2011). Drought has various impacts on the environment. Drought does not occur suddenly in a minute or two. It is gradually intensifying over time and exerts impacts. Thus, drought is having a massive impact on agricultural activities that meet one of the basic human needs of food.

Drought in Sri Lanka

Under a changing and variable climate, the risk of drought is increasing worldwide, and Sri Lanka is no exception. Thus, Disaster Management Act No.13, 2005, of the

Government of Sri Lanka has identified drought and flood as 2 among the 21 natural or man-made disasters observed in the island (Ariyaratne, et.al, 2013).

Due to a combination of political, geographic, and social factors, Sri Lanka is recognized as vulnerable to climate change impacts, which is ranked 100th out of 181 countries in the world (source from Notre Dame Global Adaptation Initiative Country Index (ND-GAIN Index), 2017). There are two primary types of droughts that may affect Sri Lanka. These are:

- Meteorological – usually associated with a precipitation deficit.
- Hydrological – usually associated with a deficit in surface and subsurface water flow, potentially originating in the region's wider river basins.

At present, Sri Lanka faces an annual probability of severe meteorological drought of around 4%, as defined by the Standardized Precipitation Evaporation Index (SPEI) of less than -2. One study suggested that between 2001 and 2013, approximately 10% of Sri Lanka's population was exposed to drought (Amarnath et al., 2007). More than 122 people in 6 districts of Sri Lanka will be affected by the drought by 2020. According to the Government of Sri Lanka, the population is around 88,500 affected by drought this year. In addition, more than 90,000 people were severely affected by the drought in the same year, according to the Disaster Management Centre (DMC).

In addition, up to 1.2 million Sri Lankans have been affected by drought between 2016 and 2017, and 19 out of 25 districts have been registered as drought districts. In the North, North Central, and Eastern Provinces, the effects of drought have been recorded such as water scarcity, lack of water for agriculture, and drinking water problems. The impact of harvest and yield due to drought in 2017 led to livelihoods of the people, especially food shortages. Flood conditions are a problem on the one hand, and drought on the other hand has a huge impact on the daily activities of the people. Drought and floods are having a huge impact on the Sri Lankan community due to the untimely availability of annual rainfall to Sri Lanka due to climate change.

Women living in rural areas are still largely responsible for securing food, water and energy for daily use. With frequent droughts especially in the dry zone areas of Sri Lanka, women need to travel great distances to access clean water sources, this adds an extra burden to their already busy schedules, and gives them very little time to earn an income, get an education or for leisure. It is difficult for women to recover from a natural disaster as they do not own land or other liquid assets that can be sold to secure income in an emergency. In terms of climate change, women can play a pivotal role in helping to mitigate the effects of climate change, by giving them the opportunity to participate as role models, decision-makers, and as environmental stewards (Peiris, 2010).

Since Sri Lanka has been categorized as one of the top 10 countries for climate vulnerability, there is an increased need to make a climate-resilient economy. Sri Lanka is particularly vulnerable to climate-related natural disasters such as floods and droughts, which affect the poor disproportionately. The agricultural sector which

contributes approximately 7.7% to the country's economy and employs 27% of the population (more than 38% of women) are significantly affected.

The National Aquatic Resources Research and Development Agency (NARA) reports that the salinity of the Nandi Sea is increasing due to the ongoing drought in the Mullaitivu district of Sri Lanka and that many fish species are dying due to declining oxygen levels in the water. Most of the drought victims are people living below the poverty line, which is compounded by the fact that a majority of people in Sri Lanka depend on agriculture, which is often affected by drought (Climate Change Vulnerability Data Book, 2011).

Drought in the northwestern and southeastern parts of the country occur due to the failure of the monsoon in Sri Lanka. In some areas, the most severe drought occurs every 3 to 4 years, which has a lasting impact on the livelihood of people at large as the persistent drought lasts for several years. The most severe drought affecting nationally occurs once every 10 years.

Floods in Sri Lanka

Considering Sri Lanka's flood reporting, they focus on rivers. Excessive rainfall is the cause of the floods. Also, factors such as irregularity of drainage systems and irregular irrigation can be mentioned. The western and southwestern parts of Sri Lanka recorded the heaviest rainfall in May 2021 due to the southwestern monsoon. It was found to be 336 mm in the Central Province of Sri Lanka (Sri Lanka Meteorological Department). Many districts were affected by floods due to heavy rains with high winds. Of these, Galle, Gampaha, and Colombo were the worst affected, with displacements and property losses.

Extreme levels of flood disasters were announced in at least two places in Sri Lanka in 2021. Similarly, 43,701 people have been affected by the floods in 9 districts of Sri Lanka, of which 5 died. A 331 mm rainfall was recorded in the Kalutara district, leaving 15 dead and 2 missing in the floods. This has caused immense income resource crunch for the families.

The risk of flooding also rises as rainfall increases. Landslide floods in central provincial districts like Nuwara Eliya and Ratnapura are having a huge impact on people and their lives. It affects income sources and has a greater impact on vulnerable people. The Disaster Management Centre (DMC) reports that the floods of 2021 and the period of COVID-19 are making people more and more vulnerable and helpless. In addition, one person died, and another was injured in a flood in the Kandy district. In addition, 2113 people were affected in Kandy and Nuwara Eliya districts, and 122 houses were affected within 24 hours.

About 90% of the flood-affected people have returned to their homes, but 98% of the houses are still unrepainted and partially damaged. People are living in those houses, and they are doing the work of renovating their houses. Extreme weather and strong winds were recorded in the Western, Sabaragamuwa, and Southern Provinces, killing at least 4 people and injuring over 900. More than 200 houses and 6 buildings

were damaged or destroyed. These are matters registered by the Disaster Management Centre, Sri Lanka, in 2021.

Of the two types of disasters mentioned above, environmental journalism is the one that reports the most about the aftermath of the disaster. Climate and weather news have a special place in Sri Lankan radio and television news. In that sense, it is possible that people can have access to information about the impending disasters on a daily basis. However, it is questionable to what extent people are aware of prioritizing these. In that sense, it is safe to say that Sri Lanka's reporting has largely been of precautionary nature. Lack of modern technological facilities and personnel to implement them in Sri Lanka, a developing country, is a matter of concern as they do not reach out to people for timely caution, despite the fact that environmental journalism contributes to reducing the risks during disasters.

Identifying Misconceptualizations and Gaps

Discussion on disaster, risk, and media relations has a long history, and people themselves have interconnected the disaster-related communication to ensure community's safety from the catastrophic events. The news media narrative is one that people are acquainted with, and it conforms to bigger "formula storylines" (McKinzie, 2017: 04). McKinzie (2017) describes these formulaic stories as "deconstruction narratives" and sums up a few major themes of the evaluation of the said news. These include the immediacy of coverage, hero stories, religion, resilience, and solidarity. Most of the media networks in the Sri Lankan context have also presented the aforementioned characteristics of disastrous events, which are not entirely negative. However, it could be said that the competition created among journalists/media channels makes them prioritize their fiscal objectives rather than ensure the community's safety in a disaster event.

According to Goldberg (2002), news media employs "fantasies of homogenization" when representing post-disaster context. It means the media propaganda is demolishing the social aspect of the disaster and the media seems to focus on the harmful and hazardous elements. This emphasizes the nature of using media channels that use virtual platforms to increase their views instead of implementing proper mechanisms to mitigate the adverse impacts of the disaster event. Goldberg's term of fantasies of homogenization further shows how media networks generalize the effects of a disaster to the entire community despite considering ethnic, cultural, or gender differences, which differently experience the impacts of the disaster. When media networks and journalists working on disaster reporting can define what a disaster is and what is not, the improper engagement in terms of disaster management increases the complexities of the said contexts. Consequently, this further interrogates whether these environmental journalists are reporting ecological and social issues with their real, catastrophic nature or fantasizing/exaggerating the said events that could misinterpret the situation. This could lead to harmful consequences for both environment and community under the disaster risk.

Ethical reporting of a disaster event is a one major responsibility of an environmental journalist to ensure the psycho-social well-being of the victimized community. Even though being objective is an essential part of reporting news, it is not uncommon to find emotionally driven news stories and content that could emotionally harm. Environmental journalists need to be honest and at the same time ethical in their reporting of disasters. If caution is not practiced, it could lead to penalizing and harming the victims to a certain extent. As Milka and Warfield (2017) emphasize when disaster events have huge human costs, journalists frequently report live from the scene, interviewing recent victims of traumatic events, and news programs frequently show “distressing” videos or images. They further show how it influences ethical violations of the victims and question the role of media in disaster reporting. In the Sri Lankan context, this is not varied as reporting of the catastrophic event has become commercialized. The aforementioned disaster events were highly visible in the Sri Lankan context in recent history, and it was reported that many of the incidents were highly insensitive and unethically reported to grab the audience’s attention.

One of the main trends visible in the Sri Lankan context has been the “breaking news culture” which reported a number of deaths and physical harm with live videos from the said contexts. The most recent example is from the Aranayake landslide in Kegalle district, Sri Lanka, and the human losses and victims were lively telecasted on every local channel without any non-disclosure based on ethical concerns. Quoting these types of issues in many countries, Milka and Warfield (2017) exaggerate that “the people who unwittingly become news subjects, can often struggle with collateral damage as a result of hasty or incomplete reporting.” Hence, advocating the reporting of trauma during disasters needs proper attention, to focus on ethical security that every environmental journalist should ensure.

According to Abeywardhana (2018), disaster events are becoming a mode of maintaining images of politicians. In other words, disaster contexts are filled with power and political mediations. Furthermore, “the involvement of political leaders in disaster communication is problematic from the perspective of emergency agencies” (McLean & Ewart, 2015). This is further proven by the quote from Olson (2000: 265) that the “politicization of the disaster increases as the impacted community, or at times an entire society, moves from emergency response through to the recovery and reconstruction phases.” These scholars emphasize the influences of political mediations in destructing disaster contexts. In that sense, political influences may affect delivering distortion of information to the community which reduces the mitigative measures of the community. When government public official fails to grasp the dynamic nature of public expectations in the pre-disaster context, they may not be able to facilitate the public in overcoming disaster risk. That obviously will keep them in peril of the forthcoming disaster.

Even though political mediations can also be positively used in managing post-disaster context, most of the power groups that activate in the disaster context function as target-oriented groups instead of being supportive mechanisms to the affected communities so far. Simply put, the disaster context became the mode of manipulating the community for political purposes in many instances in the local

context. For that purpose, political parties use media networks that are more influential to the community than all sorts of communicative channels. Consequently, the duty matters to the media are subordinated to those political priorities, and it marks certain drawbacks in the role of environmental journalists.

In Sri Lanka, this is very much visible in flooding contexts which are much more prominent compared to other disasters. Flooding disaster is the second critical disaster according to the spatial distribution of disasters in Sri Lanka, and drought is in the first place; yet flooding creates spontaneous outcomes compared to drought, and the visible impact is higher when it comes to flooding disaster (Abeywardhana, 2020). Political parties are mediating the distribution of subsidies, and it creates a safe social environment for the community to a certain extent due to fulfilling people's basic needs. In contrast, their mediation in popularizing their image and use of media for that purpose is much visible in those contexts. Hence, media in such contexts overlook their real duty which means communicating risk information and contributing to how risk is perceived among communities with reliable information.

Furthermore, the media itself becomes a power group in the context of disaster. It assigns power to the environmental journalist in delivering essential information as it has a huge impact on the well-being of a disaster-prone society. The reason is that the risk communication can enable the preparedness of the community for the disaster which directly reduces the adverse effects of the disaster. The wide range of media channels is popular among people, and people themselves can obtain essential information that they are striving to be gained in an unpredictable disastrous event. Hence, the dimensions and variabilities of disaster communication networks, which are media channels, can function as a beneficial mechanism in overcoming disaster risk as well as increasing awareness of an ongoing disaster. Given the aforementioned information, media networks and their representatives who are the environmental journalists can contribute to monitoring disaster context and mediate in rebuilding after the disaster with reliable information and dominancy in disseminating information. Henceforth, the proper identification of their role and vindicating negative consequences of their misinterpreted role-related information could leave redundant impacts of disasters to a higher extent.

Conclusion and Implications

The best way to raise awareness among the community is through environmental journalism. It is the collection, verification, production, distribution, and display of information on current events, trends, and issues related to the inhuman world. To become an environmental journalist, one must have an understanding of scientific language.

Environmental journalism is focused on creating awareness in the community; creating discussion on environmental issues; promoting safety; providing coherence to topics ignored in the general media; creating collaborations among members of the public, communicators, institutions, NGOs, and any agent involved in

environmental issues; and promoting the approval and improvement of environmental policies.

Drought and floods in Sri Lanka are serious problems and natural disasters. The manner in which these are exposed by the environmental journalists, it is hoped, would help raise public awareness about impending disasters. At the same time, it may also lead people in becoming unnecessarily scared and nervous. Despite some negative effects, environmental journalism has been contributing positively in creating informed communities, besides helping achieve sustainable development goals to keep the environment clean and green.

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Post-Disaster Suffering: Amphan Cyclone in East Coast on India

84

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Contents

Introduction	1332
Cyclonic Storm Amphan Hits the States of East Coast of India	1333
Objective, Study Area, and Methodology of the Study	1335
Original Experiences on the Sufferings and Distress of the Survivors	1336
Food, Nutrition, and Livelihood	1336
Loss of Shelter	1337
Physical and Emotional Well-Being of the Affected People	1338
Grief-Focused Media Reports of Post-Amphan Scenario	1339
Conclusion and Recommendation	1341
References	1344

Abstract

The Indian subcontinent with a long coastline of 8041 km experiences nearly about 10% of the world's tropical cyclones. Among the cyclones originated in the Bay of Bengal, more than 58% hit the east coast. Though on an average two to four tropical cyclones hit India every year, most of these cyclones impact the states of West Bengal, Odisha, Andhra Pradesh, and Tamil Nadu situated in the east coast. Due to frequent occurrence of cyclones, these states experience major casualties such as loss of life and properties and severe damage to infrastructure.

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The super cyclonic storm *Amphan* made landfall in West Bengal on 20 May 2020 which caused widespread damage in West Bengal and Odisha states of India with loss of 128 human lives. The chapter assesses impact of these fatalities on surviving members of the families based on their original experience through qualitative research and reports of grief-focused journalism after the event. The study reveals that when the member of a family dies of natural hazards, it naturally leaves the survivors in distress on multiple fronts, viz., economic, social, and psychological. The chapter recommends workable measures for the survivors to secure their livelihood, food, nutrition, shelter, and physical and emotional well-being.

Keywords

Landfall · Fatalities · Traumatic stress · Livelihood insecurity

Introduction

There are many natural disasters like flood, cyclone, earthquake, landslides, etc. which have devastating effect on the human societies across the world. Tropical cyclone is one of such hazards that originates over oceans and progresses toward the coastal areas causing heavy damage to human lives, assets, infrastructure, and society at large. Coastal states of India are also regularly hit by tropical cyclones originated over the Bay of Bengal, Arabian Sea, and Indian Ocean. These cyclones regularly cause devastation to these states due to heavy rainfall and high-speed winds. Though all coastal states of India are affected by tropical cyclones, the east coast is more prone to such natural hazards than west coast. Tropical depression is considered to be the major contributing factor for the formation of cyclones in the eastern coast of India (Deccan Herald, 2020). Odisha, West Bengal, and Andhra Pradesh are the states situated in east coast of India that experience the devastating effects of tropical cyclones resulting in large number of losses of human lives with severe damage to public and private properties. The effects of these cyclones are not limited to human casualties and infrastructure. Due to rise in sea levels, seawater inundates to the low-lying areas of coastal states which causes widespread damage to crops and vegetation and erodes the beaches as well as embankments (IMD, GoI, 2021). During the post-landfall of cyclone, there are reports of spreading of communicable diseases (James et al., 2005).

The super cyclone of 1999 that hit east coast of Odisha state has been the strongest and most deadly recorded tropical cyclone experienced in any of the Indian state causing death of 9887 people with severe damage to properties amounting to US 4.44 billion dollars (Government of Odisha, 1999). BOB 03, Pyarr, Phailin, Hudhud, Fani, and Amphan are the other major cyclones that hit the states in east coast of India during the years 2002, 2005, 2013, 2014, 2019, and 2020, respectively (Telangana Today, 2021).

Cyclonic Storm Amphan Hits the States of East Coast of India

Amphan, a deadly tropical cyclone, hit the east coast on India on 20 May 2020. Cyclone Amphan had its landfall between Digha in West Bengal state of India and Hatiya Island of Bangladesh. After the landfall, the severe cyclonic storm acquired a sustained wind speed of 155–165 km per hour spiraling up to 185 km per hour. It then moved to north-northeast and further weakened to a cyclonic storm. On 21 May 2020, Amphan centered over Bangladesh, around 275 km from the city of Kolkata toward north-northeast (Deekshith Nevil Pinto, 2021).

The cyclone caused widespread damage to the states of West Bengal and Odisha in India and parts of Bangladesh. West Bengal being the epicenter of cyclone experienced most of the casualties. Nine districts including three coastal districts of West Bengal were affected due to the super cyclonic storm. Kolkata, East Medinipur, West Medinipur, South 24 Parganas, North 24 Parganas, Howrah, and Hooghly were the districts severely affected due to cyclone, while Murshidabad, Kolkata, and Burdwan were the districts partially affected (Fig. 1). High-speed winds were coincided with astronomical tides that ravaged Kolkata and other parts of West Bengal with uprooting of trees and electric posts, damage to thousands of houses, and swamping of low-lying areas. The powerful storm caused massive

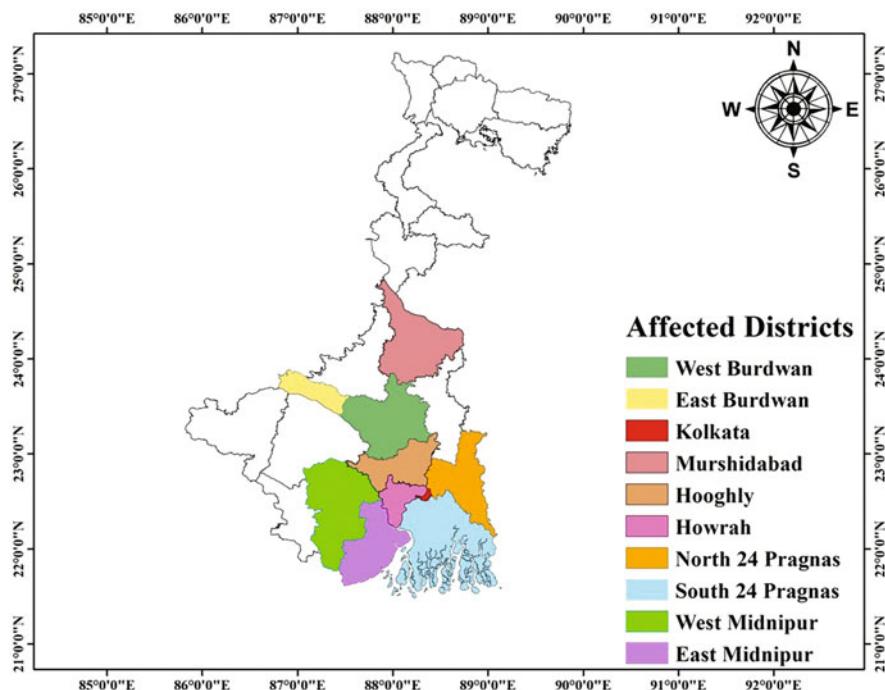


Fig. 1 Districts affected due to the cyclonic storm Amphan in West Bengal in 2020

damage to standing crops, livestock, water supply, and irrigation infrastructure. Eighty-six people reported to have died in West Bengal. The Government of West Bengal in its assessment had claimed that 21,650 km² of area were affected by the cyclone by impacting the lives of 28.56 lakh households comprising of 13.6 million people (UNICEF, 2020). The other major damages include loss of major crops in the affected areas including paddy, vegetables, and betel vines covering the gross cropped area of 17 lakh hectares; severe damage to 2.50 lakh hectares of orchards of betel vine, mango, and litchi; death of 21.22 lakh domestic animals; and loss of livelihood-supporting assets of fishing communities like boats, nets, etc. 61.80 lakh people were reported to have been evacuated and accommodated in 5136 relief camps such as multipurpose cyclone centers, schools, and other places (SIAG, 2020).

Odisha, the neighboring state of West Bengal, was also affected due to the cyclonic storm Amphan. Nine districts of Odisha, namely, Balasore, Bhadrak, Kendrapara, Jagatsinghpur, Mayurbhanj, Cuttack, Jajpur, Keonjhar, and Khordha, had been affected due to the impact of cyclone (Fig. 2). Balasore, Bhadrak, Kendrapara, and Jagatsinghpur are the four districts reported to have been severely affected due to the cyclone (NDTV, 2020).

Amphan had hit these districts of Odisha with wind speeds reaching 106 km per hour and rainfall up to 300 mm. 4.4 million people were reported to have been

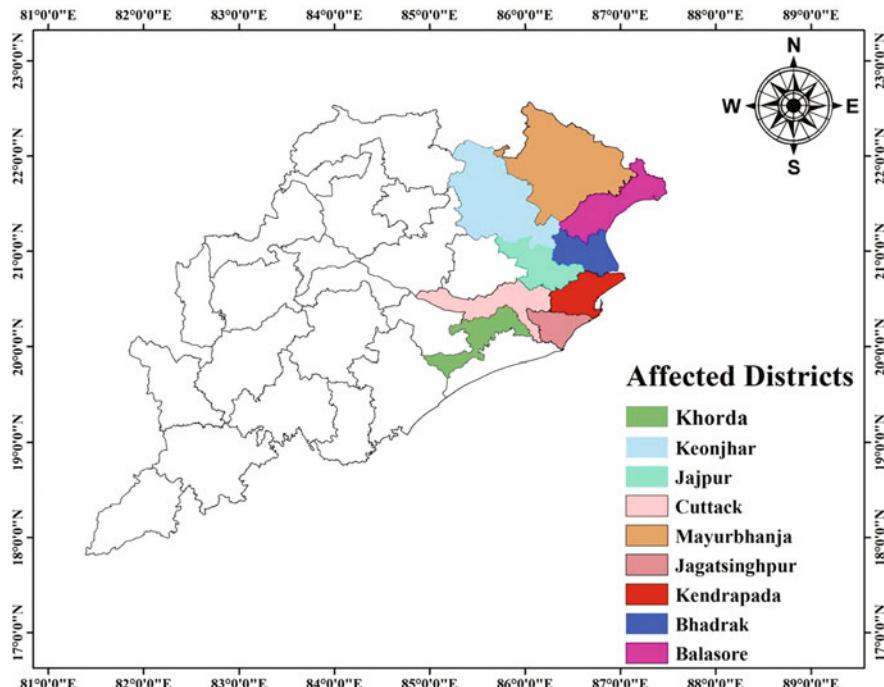


Fig. 2 Affected districts of Odisha due to Amphan cyclone in 2020

impacted in some or other way due to the cyclone with the death of four persons. There has been total collapse of 500 houses with damage to another 15,000 dwelling units. There were also casualties to more than 4000 livestock and primary poultries (Relief Web, 2021). Amphan has been regarded as the strongest ever tropical cyclone that hit east coast of India after the devastating super cyclone of Odisha, 1999 with economic loss amounting to 14 billion US dollar (International Federation of Red Cross and Red Crescent Societies, 2021).

Objective, Study Area, and Methodology of the Study

After the relief and restoration work of Amphan cyclone, a study was conducted after 6 months, i.e., during December 2020 to February 2021, to know the impact of deadly hazard on the surviving members of families of the deceased members. 321 surviving members of the 90 persons who lost their lives in the cyclonic storm have been contacted during the course of study in the affected areas of West Bengal and Odisha. The respondents were consulted through the help of a common assessment tool, focus group discussions, and individual interviews to ascertain the impact of these fatalities on surviving members of the families of deceased persons based on narration of their original experience. Twenty-four focus group discussions were organized by involving 245 respondents to know their responses on their experience after the demise of member of their family. 148 respondents were also consulted by the way of individual interview through a specially designed questionnaire. The respondents were assessed based on their participation in the discussion and vocal responses on identified parameters relating to post-disaster suffering. The focus group discussions and individual interviews were organized based on a set of checklists prepared on multiple fronts relating to insecurities caused due to loss of food, nutrition, livelihood, shelter, and emotional well-being. The questionnaire and checklists prepared were piloted in 2 focus group discussions and 15 individual interviews before its rolling out during the course of study. The field investigators and FGD observers were trained to moderate the discussions and note down relevant information by not being carried away by the emotions of respondents. FGDs and individual interviews were organized in the most affected districts of the states of West Bengal and Odisha. East Medinipur, West Medinipur, South 24 Parganas, North 24 Parganas, Howrah, and Hooghly were the districts of West Bengal where the field study was conducted. Bhadrak, Balasore, Kendrapara, and Jagatsinghpur were the cyclone-affected districts of Odisha where the study team conducted FGDs and individual interviews with the respondents. The primary stakeholders like widows, elderly persons, women, children, and disabled persons were contacted to know the extent of their sufferings as well as their coping mechanism after the disaster. Apart from primary stakeholders, other respondents like elected representatives of Panchayati Raj Institutions, teachers, informal leaders, and community-based institutions like Self Help Groups and youth clubs were also contacted to have a clear understanding of the situation. Apart from distress and destitution after the demise of a family member, the coping strategies of surviving members for running

their families and relieving post-traumatic stress were also analyzed as a part of empirical research.

Original Experiences on the Sufferings and Distress of the Survivors

Food, Nutrition, and Livelihood

The food security, nutrition, and livelihood of the surviving members of deceased members of families have been assessed as first phase during the course of study. As per the report of Joint Rapid Need Assessment Team published by the State Inter Agency Group comprising representatives of leading nongovernment organizations (NGOs) and officials of the Government of West Bengal on 12 June 2020, standing crops were destroyed in millions of hectare fields in the cyclone-affected areas of West Bengal. Especially the crops like ridge guard, bitter gourd, pointed gourd, okra, elephant foot, cauliflower, and other vegetables were heavily damaged on the point of being harvested. Other than crops, paddy fields, vegetable gardens, betel vineyards, fruits orchards, and traditional village crop store houses were also destroyed. Lemon orchards were severely damaged with uprooting of other fruit-bearing trees like mango, litchi, and jackfruit (SIAG, 2020). During interaction with the farmers, it was reported that since mango and litchi orchards were taken on lease, they had to bear huge economic loss which they had invested through lending from informal sectors. The entire farming community had to suffer as almost every vegetable field had been destroyed due to the cyclonic storm. The burden of repayment of loan further compounded the problem of farmers as they did not have enough money even to sustain basic needs of their families. Interaction was made with 321 respondents on impact of the cyclonic storm on their livelihood and nutrition security.

Source: Field Study

It can be seen from Fig. 3 that 24% of the respondents have opined that their livestock population and inland fisheries got severely damaged. On the front of availability of adequacy of food grain available with them beyond 1 month of the strike of Amphan cyclone, 52% of the respondents were of the opinion that they have insufficient stock of food grains to last beyond 1 month to sustain their families. Since most of the crops were damaged on the verge of harvest, they had to depend upon relief from other sources. Fourteen percent of the respondents reported that since their houses have been completely damaged, the places where they used to store food grains were also destroyed. They do not have enough food grain to run their family even for a week. It can further be seen from the table that 61% of the respondents reported to have inadequate nutrition intake after the landfall of Amphan cyclonic storm in their locality. It was revealed from the field study that children are the worst sufferers due to cyclone and they were not getting same amount of nutrition they used to eat resulting in the risk of malnutrition especially to

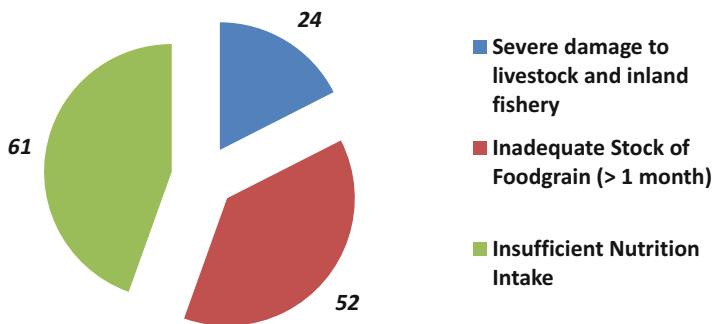


Fig. 3 Percentage of responses on impact on Livelihood and Nutrition due to cyclonic storm

the poor households. It was also reported that due to damage of Anganwadi centers and ongoing COVID-19 pandemic situation, instead of supplementary cooked food, dry rations were distributed. There were also responses of less than recommended food intake among the pregnant and lactating women increasing further the risk to them on the front of malnutrition. Since many people of the Amphan-affected districts lost their summer crops and livestock, it enhanced their vulnerability to low yield of monsoon crops. Hence food crisis was further intensified in the affected areas.

Loss of Shelter

It was revealed during the interaction with participants that dwelling units have been damaged due to the strike of cyclonic storm Amphan in the affected districts of West Bengal and Odisha.

Source: Field Study

Figure 4 indicates that 27% of the respondents reported that their dwelling units have been fully damaged, while 35% were of the opinion that those have been partially damaged due to the cyclone. Remaining 28% of the responses were that their houses were intact and not damaged due to the cyclonic storm. Hence the consequences of Amphan cyclonic storm left 62% of the surviving members of the family to live in damaged houses which were not suitable to live. Few of them were forced to live in the houses of other people of their village whose houses were not affected. Many of them had to live in constructing temporary shelters with the help of tarpaulins they received from government and nongovernment organizations. Since supply of electricity was not possible during the post-cyclone scenario in temporary shelters, this led their exposure to wild animals, snake bites, and mosquitoes. It was noticed during the interaction with the respondents that many of them did not have blankets, bedsheets, kitchen utensils, and other goods which were essential in their daily lives.

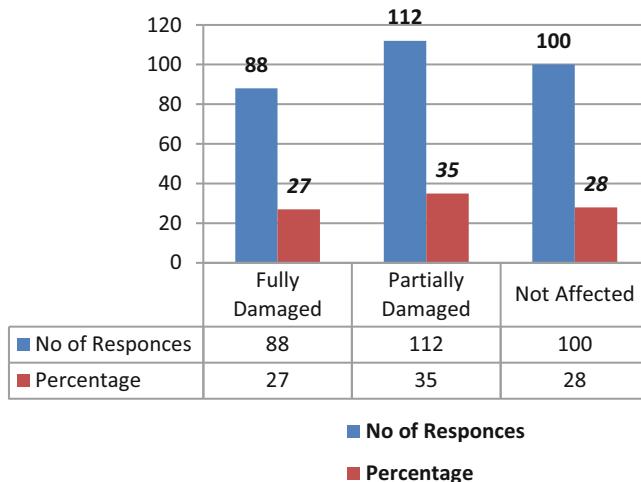


Fig. 4 Responses on damage to houses due to cyclonic storm *Amphan*

Dwelling units of people in East Medinipur, West Medinipur, South 24 Parganas, and North 24 Parganas districts of West Bengal were reported to have heavily damaged due to the cyclonic storm (SIAG, 2020).

Physical and Emotional Well-Being of the Affected People

The cyclonic storm Amphan resulted in the disruption of health system which made people to suffer without access to emergency healthcare services due to damage to basic infrastructure of primary healthcare units such as electricity and water supply after the disaster. The medical teams also could not reach to the remote and far-off places after the strike of cyclone.

Source: Field Study

Figure 5 captures the responses of surviving members of the families on the post-cyclone health services. It is clear from the table and figure that 80% of the respondents expressed that they had the experience of deficient health services due to inadequate availability of medicines, essential supplies, equipment, and staffs. Though healthcare providing personnel like doctors, nurses, and ASHA workers were available in the villages, outreach services in remote and inaccessible villages were not to the desired extent as opined by them. Removal of dead bodies was delayed, and the injured people were not also shifted timely to avail secondary and tertiary healthcare services. Respondents also reported to have suffered from water-borne diseases like diarrhea and hepatitis during the post-cyclone scenario in severely affected areas. Due to exposure of people to contaminated water and poor sanitation during and after the cyclonic storm, there were complaints of common

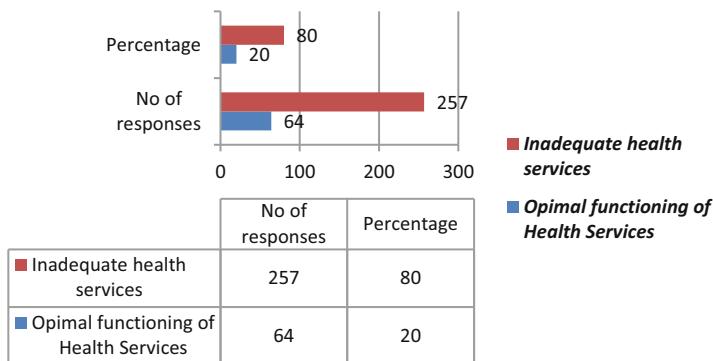


Fig. 5 Responses on the post-cyclone health services

cold, flu, throat infections, headaches, skin rashes, gastrointestinal illness, etc. which intensified further the suffering of survivors. The COVID-19 pandemic also further complicated the situation. It was difficult for the affected people to maintain physical distancing at cyclone shelters for which the numbers of coronavirus cases in the affected areas were also reported to have increased (SIAG, 2020).

Death of a member of family and other sufferings left the survivors in the state of deep shock. The post-disaster traumatic stress and loss of emotional equilibrium were clearly visible among the survivors which could not be quantified during the course of study. Damage to shelter and valuable assets, livelihood insecurity, and death of closed one made them to feel insecure and vulnerable to elevated level of psychological distress. Most of the survivors had symptoms like uncontrollable stress and feeling of grief and sadness for a prolonged period after the cyclonic storm. Other effects of psychological health such as disturbance in sleep, dependency on alcohol, and fear of socialization were also reported by the respondents during the course of interaction.

Grief-Focused Media Reports of Post-Amphan Scenario

A customized search engine was created in Google which was searched on the Amphan cyclone and its impact from 16 May 2020 to 16 August 2020. The sample consisted of five English e-newspapers, namely, *The Hindu*, *The Times of India*, *Hindustan Times*, *Indian Express*, and *The Telegraph*, and five news portals of Zee, ABP, Ei Samay, Orissapost.com, and Doordarshan, the national broadcaster. The data analysis is based on sentiment analysis of the content including media coverage on the issue in the duration specified. A critical observation on the media report reemphasizes the propaganda role of media. The content analysis of stories was done by three coders on five parameters classifying if the story had elements of nature's fury, human sentiment, governance aspects, financial measures, and civic amenities

like water supply, electricity, transport, and public health. The analysis revealed three types of coverage in accordance to the time phase. In the initial report, optimum use and graphic details of the speed, path, and route of destruction taken by the cyclone were emphasized. During the time that the cyclone hit, emotional explicit was used in the news stories with empathy, human sentiment, and loss aspects highlighted in news stories.

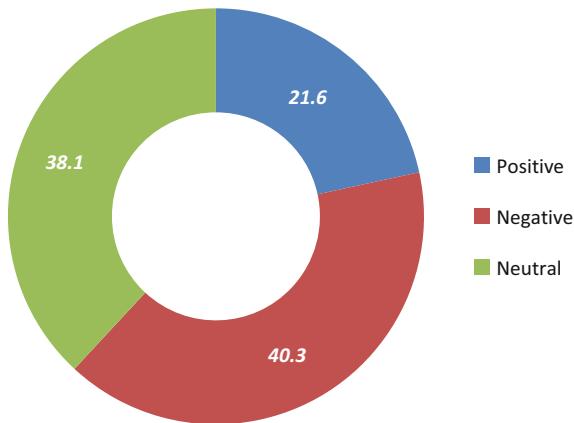
In the post-cyclone phase, to reflect the aftermath of the trail of destruction left behind, pictorial specifications of the destruction which in case of live coverage on portals and static pictures in e-news were particularly appalling were used blatantly. The media does not leave much to imagine as it glorifies the crisis and saga of destruction that the reports carried. *The Telegraph* in particular gave emphatic details of the deceased along with numbers of the office and location to reach for help. Stories ranged from the preparedness for the cyclone to the destruction during and post the cyclone and controversies regarding compensation given to families who were ineligible beneficiaries. Even celebrities found ways of making news related to the Amphan cyclone as they announced aid or dedicated songs to the crisis-ridden people of Bengal and Orissa. The thin balance between news and views gets fogged as one debates how the usage of vocabulary, words, and images can create a magnitude of emotions in the recipients.

It is true that media plays an important role in the disaster management. After a disaster, news media assists in quickly providing a narrative on how that particular incident has affected and impacted areas, thus helping authorities to more efficiently reach aid to survivors.

News media is also expected to provide an independent and authentic reportage from ground zero to people at large. This empirical study, however, suggests that media and disaster management authorities often have varying perspectives on the particular tragedy. It is also a fact that in an era of “breaking news,” media narrative at times lacks empathy and may border sensationalism. The digital space summarizes that during such events, the loud display of emotions desensitizes human sentiment rather than stir it. The thin balance and quality to put things subtly in perspective seems to have been overthrown completely by the bandwagon of breaking news and TRPs. As an average person makes a sense of the situation through the media stimuli, the text and images leave an imprint on the psyche of the people in general and survivors in particular, both in a positive and negative manner.

The sentiment analysis based on the media reports as depicted in Fig. 6 clearly shows that 40% of the media content is negative. This negativity is a summation of words having a negative connotation like storm, loss, damaged, etc. The error in automation does not allow Amphan cyclone as a name to be included in this list of negative, hence the text shows such words as neutral, whereas only 21% of the content is positive connoted by words like livestock, plants, etc., whereas these words were mainly used in sentences referring to loss. The range of stories particularly in print catered to a wider range of subjects including how failure of electricity had affected the diabetic patients’ life as insulin and other drugs need to be refrigerated at low temperatures and electric failures lasted for 3–4 days. Audio visual media concentrated more on the grief aftermath of destruction that the cyclone

Fig. 6 Sentiment Analysis based on reports of media



left behind, wailing individuals; battered streets, vehicle, and houses; floating belongings; and uprooted trees.

Conclusion and Recommendation

The cyclone Amphan of 2020 was one of the most powerful and deadly tropical cyclonic storms that occurred in the Bay of Bengal which caused massive damage to human life, properties, and infrastructure in the states of Odisha and West Bengal in India and neighboring country Bangladesh. In terms of human and material casualties, this is considered next to the super cyclone of Odisha that made landfall in Jagatsinghpur district of Odisha in the year 1999. The cyclone Amphan estimated to have caused 128 deaths, damage to properties and infrastructure to the tune of 27 billion US dollar and lives of 18 million people were affected in the states of Odisha and West Bengal taken together (SIAG, 2020).

The devastating effects of cyclones were not limited only to human casualties and infrastructure. The cyclone had caused widespread damage to crops, vegetation, livestock, fisheries, and houses in the affected areas and impacted the physical and emotional well-being of people. The study based on assessment in the affected areas and interaction with 321 surviving members of the families of deceased persons recommends the following.

(a) Food, Nutrition, and Livelihood Security

- I. Government of West Bengal and Odisha needs to provide agricultural and livelihood support to those who have lost their standing crops and productive assets during the cyclone.
- II. Since food security was the major concern of many affected households, local administration needs to ensure availability of proper quantity of culturally appropriate food with minimum nutritional requirement to

- cater to the need of all vulnerable sections of community in the affected areas such as children, pregnant women, lactating mothers, and sick and elderly people.
- III. During the pandemic period from April to November 2020, the Department of Food and Civil Supplies of the Government of India had allocated 680 Lakh Metric Tonne (LMT) food grains to the states and union territories under the Public Distribution System (PDS). About 350 LMT were allocated for distribution under normal National Food Security Act (NFSA), 2013, and Targeted Public Distribution System (TPDS). Additionally, about 321 LMT were allocated for free-of-cost distribution under Pradhan Mantri Garib Kalyan Anna Yojana (PM-GKAY) and 8 LMT under Atma Nirbhar Bharat Scheme (ANBS) (MoCA, F & PD, GoI, 2021). Under ANBS, the beneficiaries were allowed to seamlessly access entitled NFSA food grains anywhere in the country by using their same/existing ration card along with biometric/Aadhaar authentication on an electronic point of sale (ePoS) device at the fair price shop of choice. Hence, it is suggested that PDS distribution should be done on priority during the period of post-natural calamity under Antyodaya scheme which entitles 35 kg per person for 6 months. The households of the affected areas should access its benefit on the basis of iris scan which is widely recognized as automated method of biometric identification as all people in villages may not have clear fingerprint impressions. Moreover, people who have undergone the trauma of losing house and all belongings might not have their ration card/Aadhaar card to produce during the period of crisis. This will ensure security and survival of the people affected with multiple shocks.
- IV. Government should provide unconditional cash transfer support for the most affected families after returning home from the relief camps to meet their immediate priorities. Affected households may be provided with cash to start the activities like farming, construction of houses, cleaning of ponds, repair of fishing boat and net, etc.
- V. Short-term emergency farming activities like distribution of seeds, live-stock, agricultural input, and tools may be provided to the affected farmers in order to protect their livelihood. Special assistance may be given to the farmers for betel vine production. Targeted livelihood support may also be extended for the marginalized households.
- VI. As a part of long-term preparedness measure, community-based seed preservation needs to be encouraged at village level by involving Self Help Groups and farmers group in order to achieve self-sufficiency in seed production. Genetic diversity may be promoted through exchange of seeds between different groups. The groups may be oriented to produce the crops as per local agroclimatic condition and need of the market.
- VII. Fruit-bearing plants need to be promoted in coastal areas having the capacity to withstand cyclonic storms. Organic farming may be promoted through natural application of bio-manure like compost, azolla, spraying

of cow urine, and cow dung to protect their crops from natural hazards like drought and flood.

- VIII. Dewatering of ponds inundated due to saline water intrusion and cleaning of fish water ponds at village level may be taken up in the affected villages. Complete cycles from egg to spawn, fry, and fingerlings for internal circulation in the affected areas may be encouraged.

(b) **Housing and Shelter Needs**

- I. Governments of the Amphan-affected states, i.e., West Bengal and Odisha, need to provide immediate support to the affected communities with essential items like tarpaulin, ground sheet, bedsheets, blankets, mosquito nets, ground mats, solar lights, ropes, etc. to deal with the crisis arisen due to damage of their dwelling units. The respective state governments also need to ensure shifting of affected communities to the transitional shelters.
- II. The affected communities who lost their houses during the cyclone may be provided with proper financial and construction support to reconstruct their houses with appropriate designs by utilizing local materials and human resources available locally. The capacities of local people and skilled workers may be developed to cater to the reconstruction requirement of people during the post-disaster scenario. Houses may be built through self-help-built approach through which affected household can rebuild their own houses at relatively lesser cost.
- III. There should be complete rehabilitation strategy for the people whose houses have been collapsed completely. Support may be extended to the affected households by providing package of materials, tools, and grant for construction of a durable house or repairing the damaged one.
- IV. The local craftsmen should be provided with revolving fund to purchase necessary toolkits required for construction of houses. Interface arrangements may be made in market places or fairs where the house owners can interact with the skilled craftsmen for undertaking the repairs at the earliest. Rural and urban local bodies may facilitate the initiative under the direct supervision of civil engineers available with them.
- V. All the existing mud houses in the affected areas should be converted to brick houses having toilets with concrete roofs. Households and craftsmen of the cyclone-prone areas may be trained with the skill to construct model low-cost cyclone-resistant houses so that people can adopt appropriate technology to retrofit and rebuild their house to withstand such natural hazards.
- VI. Local administration of both the states may take steps to decongest the settlements in villages with adequate space between the adjacent dwelling units. This may help in controlling the speed of communicable disease during the outbreak of epidemics like COVID-19 and others.

(c) **Health and Emotional Well-Being of Affected People**

- I. Due to spread of communicable diseases and other health hazards in the post-cyclone scenario, respective state governments need to temporarily

- depute healthcare professionals from other unaffected districts to participate in the medical outreach camps.
- II. Routine immunization services may be commenced immediately after the post-cyclone scenario in the affected areas. Immunization, antenatal, and postnatal services may be immediately restored in the waterlogged areas prone to spread of communicable diseases. All pregnant women need to be provided with necessary antenatal care on priority basis.
 - III. Information, education, and communication (IEC) materials on personal hygiene and sanitation prepared by public departments need to be distributed in the affected areas since people of these areas need to have basic understanding on personal hygiene to prevent the spread of communicable diseases.
 - IV. Due to overcrowding in cyclone centers and relief camps, menstrual hygiene of women is often overlooked which puts women and adolescent girls at greater risk. Local administration needs to ensure free distribution of sanitary napkins and clean towels and easy access to privacy and sanitation through separate toilets for female population.
 - V. Since waterlogging is the major contributing factor for sudden increase in mosquito breeding and outbreaks of vector-borne diseases like malaria, dengue, etc. in the affected areas, rural local bodies like Gram Panchayat and health departments need to ensure applying larvicides to control the same.
 - VI. Local administration of the flood- and cyclone-prone areas needs to map their available health infrastructure, personnel, and services. Based on their assessment, preparedness measures need to be strengthened through constitution of medical teams, safe storage of essential medicines, and preservation of cold chain system to control the health hazards during post-disaster scenario.
 - VII. Since grief and shock are the normal in the aftermath of natural disasters due to loss of life, shelter, and livelihood which has long-term impact on mental health, counseling and other mental health services must be extended to the affected people to cope with the situation and come back to the normalcy.

Finally, governments of both the states need to ensure proper coordination among all related departments of development administration to deal with cross-sectoral issues like providing hazard-proof houses, roads, culverts, etc., securing livelihood of the affected people, maintaining safe hygiene, sanitation, and food and nutrition requirements.

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Outreach Strategies Adopted by Corporate Organizations for Flood-Affected Communities in India 85

Kulveen Trehan

Contents

Introduction	1348
People and Floods	1349
Methodology	1349
Outreach Strategies Adopted	1350
I Brand Presence and Inventory Association Frame Outreach by Corporates	1350
II Donations maximise Outreach, and Inventory forms the core of relief	1352
III Digitally Enabled Outreach	1353
Role and Scope (Brands, Outreach, and Flood Management Cycle)	1354
Conclusions	1359
References	1359

Abstract

For many years now, corporate organizations and the brands they own have been carrying out community outreach during floods in India. They employ various strategies and tactics of branding and social responsibility in their involvement in the flood management cycle. Their outreach efforts got recognized during the Kerala floods, thereafter consolidating their role in disaster ecosystem. Interviews with different persons involved in flood management, disaster research, mitigation, media, and corporate communication explained higher outreach marketing by companies using their products and use of social media during floods. Analysis of the outreach in each phase of the flood management cycle brought forth its asymmetrical nature reflected in more inclination toward relief and response phase. A three-pillar outreach model for corporate organizations has been developed based on empirical insights.

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Keywords

Corporate organizations · Brands · Outreach · Community · Inventory · Flood management cycle

Introduction

The World Meteorological Organization (WMO) Atlas (2021) shows that 44% of disasters have been associated with floods (riverine floods 24%, general floods 14%) making it the most challenging disaster to impact human life. A research study by the Asian Development Bank (Patankar, 2019) concluded that floods constitute more than half of climate-related disasters in India that are frequent and deadly. The International Disaster Database, EM-DAT (2018) states that close to 750 million people have been affected by 278 floods in India between 1980 and 2017. Flood vulnerability in India is not limited to certain parts; in fact, it cuts across the geographical divide since it receives rainfall for 4 months (June–September) in most states. Low-lying rural areas have always been vulnerable, but of late urban floods too have become frequent. Therefore, subsequent governments have been adopting flood management approaches with increased outlays in the 5-year plans. NITI Aayog in its Report of the Committee Constituted for Formulation of Strategy for Flood Management Works in Entire Country and River Management Activities and Works Related to Border Areas (2021–26) noted that the Flood Management Programme (FMP) and the River Management Activities and Works related to Border Areas (RMBA) with approx. 18,000 crores to provide financial assistance to states and union territories battling with floods were merged as Flood Management and Border Areas Programme (FMBAP) for the year 2017–2020. Clearly, managing floods is not a standalone activity as it affects the community as a whole and requires efforts by different stakeholders, including the local administration, governments (state and central), first responders like the IAF and the Indian army, specialized agencies like the National Disaster Management Authority (NDMA) and National Disaster Response Force (NDRF), NGOs, private and business organizations, media, academic community, volunteer groups, social networks, etc. (Shree & Sagar, 2016). In the context of floods, community is a composite term. While it is a geographically identified group decided by the government or the industry (Adamson, 2010), and it means humans or families with same membership, influence, integration, and fulfilment of needs and shared emotional connection (McMillan & Chavis, 1986), in relation to corporate organizations, community is also a stakeholder on which an organization relies for its goals (Cook, 2015). On the other hand, outreach is invariably used together with corporate social responsibility as an extended rib. Distinctively, outreach here would mean direct involvement by brands or corporate organizations through activities that aim to resolve their social, economic, and cultural problems that arise due to floods. Hence, community outreach by brands has been operationalized as various non-profit activities undertaken by a

brand keeping a specific geographic cluster especially in relation to causes and impacts of floods affecting them during their lives.

People and Floods

When waterborne disasters strike, civil administration is the first responder. They contact the military and the specialized agencies like NDRF to start the evacuation of citizens, flood control, and construction of bridges in order to minimize the loss of life and materials. The local administration focuses on people caught up in the floods to provide relief and aid of various kinds. So, the initial goals of managing a disaster like floods are tackled by the government machinery, military, and paramilitary agencies. At the time, communities and the people around the world are increasingly dependent on media for news and contact (Ball-Rokeach & DeFleur, 1976). Media reports, information bulletins, and analysis via other modes of communication become their sanctuary. Social sector organizations commonly called the non-governmental organizations (NGOs) get into action next as they may be already working with the community. Close on the heels are private or corporate organizations identified as brands in the outside consumer world, moving in just as the emergency rescue operations by the army come to an end. They might not be the first to reach, but their outreach gathers attention of the media and the government bodies alike. Since flood-affected areas require massive attention and long-term facilitation at all levels, discussing the potential of brand outreach or community outreach by the corporate organizations, often interchangeably used, can contribute significantly in helping the locals in rehabilitation, finding recourse and build capacities toward the new normal in their lives. Conceptually, the author draws on Luhmann's (2012) Social Systems Theory (SST) which delineates various subsystems, i.e., organizations, interactive systems, and function systems like polity and media in communication of society as a whole. It is most suited as it conceptualizes a modern world society ideal for exploring the social relations among global and localized institutions, organizations, and networks (Stichweh, 2007).

Methodology

In order to determine the role of corporate organizations in community outreach during floods, interviews were held by the author with two disaster management researchers, five corporate communication/public relations officers, two NGO representatives working on flood-affected communities, and two journalists who covered floods in Kerala. Additionally, media articles and tweets on Kerala and West Bengal floods were studied. Themes from the empirical analyses converge toward increasing outreach by private companies or the corporate sector since 2014. But they differ on how brands understand communities and develop outreach programs. While most believed that corporates have attempted to reach out to the flood-affected communities in different ways, disaster researchers and NGOs believe that

companies need to go beyond the surface of contributing at the time of calamity and get involved in the communities they aim to befriend. NGOs found lack of sincerity in corporate efforts, making outreach a mere demonstration of social responsibility and nothing deeper. However, while covering the flood-affected areas in Kerala, Journalist Shruti Mohan found the efforts of brands by global and local companies more significant and stated that they were willing and sharp in their flood response activities (Interview Feb, 2022). The overall sentiment to brand outreach was positive about their presence at the time, but the quality of their outreach raised questions on their capability and competence. As Dr. Anil Gupta, Professor of the National Institute of Disaster Management (NIDM) says, “Since brands are looking to build reputation, it is important to be an informed participant in the process of flood risk reduction and resilience building right from the word go and not join in just for media mileage as reputations are a sum total of presence and performance” (Interview March, 2022). To identify specific outreach strategies adopted, analysis of empirical responses was done as under:

Outreach Strategies Adopted

I Brand Presence and Inventory Association Frame Outreach by Corporates

Because of media focus and emphasis on social audit, corporate organization's involvement in times of natural crisis especially natural calamity has significantly risen. Organizations across spectrum are actively involved and engaged in outreach during natural calamities, now more than ever before. Ali and George (2021) in their case study on *Community Resilience on Kerala Floods* 2018 found that corporates or private organizations like Joyalukkas and Muthoot Group were actively involved in community relief and resilience besides NDRF, government and NGOs, and celebrities among stakeholders. The weightage of community involvement which was actively driven by corporates and NGOs (especially local) and social media influence contributed 30% toward urban resilience of Kerala in 2018 (Ali & George, 2021 p.124). It became the defining feature of Kerala's demonstration of effective flood management. During the interview, Bhaskar Majumdar, Head of Corporate Affairs and Corporate Communication, Egis, replied that 'for all major brands CSR is a continuing commitment by businesses to integrate social and environmental concerns in their business operations' underlining that the seriousness around CSR regulations and community outreach has started to dominate the implementation of CSR for floods (Interview January, 2022). In the last decade, outreach by brands during flood has found acknowledgment from both the disaster specialists and the communication experts; Mr. Nakul Kumar Tarun, Director of Zone4Solutions and Secretary General of Public Relations Society of India and Editor PR Voice Babji Yana expressed similar views:

Recalling his experience of a flood in Jammu and Kashmir, Nakul shared that during the 2014 J&K floods it was noted that lots of private companies came forward

and supplied medicines to medical camps established by his organization, Tehse corporate even provided drinking water bottles, dry milk for kids and sanitary napkins, continuously for 27 days by commercial flights from Delhi every morning. “Private companies,” he said, “are technically very sound and cash reached so, they can (sic) become interface between community and government and contribute in data driven risk reduction policy decision making. Specially flood which is a recurring hazard in India. Corporate houses can implement effective post disaster need assessment for better planning in future” (Interview March, 2022), whereas Babji Yana responded that “Flood is a natural disaster and a crisis. Disaster relief operations are counted as CSR activities. When in floods, apart from governmental exercises, NGO’s, corporate organisations extend their help to the people affected” (Interview April, 2022).

In the interviews, other case studies of flood in states like Assam, Uttarakhand, Chennai, and Andhra Pradesh were mentioned helping us recognize that outreach may be more recent but corporate involvement in flood-affected communities has been there for several decades. Recounting outreach initiatives by brands, Babji Yana recalls that “In 2016, when Hyderabad experienced heavy rains, the area called Kukatpally, the north-west part of the City, where I live was inundated in waist-deep waters for 3 days. Organisations and Individuals came up with relief assistance like food pockets, milk, water and medicines till waters were diverted/receded. I saw Political Parties, Religious Groups, Business Houses, Industrial Establishments and even Movie Artists Association involved in this activity. Of course, governmental exercise can’t be compared, but corporates too were actively responsive” (Interview, April 2022). In the last 4 years since Kerala floods in 2018, brands are more aggressively doing outreach. With special reference to Kerala in 2018 and West Bengal in 2020, Majumdar pointed out that “Multiple brands have been involved during flood relief activities. Starting from medical assistance, rescue and relief work, food supply, rebuilding the infrastructure and many more,” in many ways making these two cases as milestones in brand presence and association.

Media analysis of Kerala floods shows active outreach by a large number of brands from different product categories like telecommunication, mobile applications, e-commerce, food delivery apps, etc. In a report, Navanwita Bora Sachdev (2018) informed that social media companies, e-commerce and e-wallets, telecommunication service providers, online grocery, and some local IT companies were making donations and providing connectivity, traffic-related information, and food supplies to the community. In an article, Saumya Tiwari (2018) writes that e-commerce chains were collaborating with local NGOs for flood response in delivering relief kits and essentials. Despite numerous examples, qualitatively, the outreach strategies are inadequate. To begin with, there is lack of outreach for flood adaptation measures. Both the disaster scholars and communication professionals believe that outreach strategies are not inclined toward adaptation. Measures like proactive support (infrastructural) during evacuation and relocation of the flood-affected community are not included. Largely, the brands walk on the heels of the government as a contributor but not a cooperative partner as envisaged in the public-private model for welfare and social change in India. Most of them felt that limited outreach

is being done by the corporate organization to build flood resilience. Director of Value Education Trust, Annie Samuel, who was directly involved with the community during Kerala floods feels that several projects are launched as they get photo opportunities and newspaper coverage and corporate organizations do outreach in order to complete their CSR reports. Once the sensation is gone and they will no longer be in news, brands stop shop. What is required instead is a brand to adopt a community, e.g., children from fifth to tenth grade flood-hit region in Kerala, and build education infrastructure and economic support to improve their skills and ensure continuity in their education (Interview Feb, 2022). Annie Samuel says that “unless community is empowered none of the agencies can help. Empowerment programme is the need of the hour.”

II Donations maximise Outreach, and Inventory forms the core of relief

Conventional mode of philanthropy of giving money remains the most adopted strategy by brands. Donation drive by an e-wallet company raised more than ₹ 35 crore, while a leading consumer goods company donated sachets of its own product, water purifier, in their outreach program on safe drinking water for children during Kerala floods in 2018 (Tiwari, 2018). Media reports suggest that CSR, sustainability and community outreach arm of leading business organizations have been contributing to the PM/CM relief fund as outreach or corporate social responsibility during the floods (December 6, 2018). Tiwari (2018) in her article mentions that a Mumbai-based corporate also donated to the CM disaster relief fund in addition to donating brand-based inventory like purifiers and hand sanitizers. Flood-affected community needs mammoth financial resources; hence, they welcome donations. Parallel to it, governments require funding to control, communicate, and construct disaster support systems which is why donations to the PM relief funds are made tax-free. Brands, in return, earn the approval of both the local community and the party in power for future projects with not much community involvement. However, in some cases, as Shruti Mohan points out, “donations are not merely stimulated by financial exemptions but are a part of network building exercise for an organisation that wants to enter into a community and sustain itself in proximity.” Alternatively, outreach marketing is also common. Relief items that are part of brand inventory such as baby food, sachets of milk powder, and toiletries either are donated or are distributed onsite at subsidized rates (Fig. 1). Pravin Francis, a Corporate Sales Officer for a mattresses brand, on his social media handle wrote: XYZ (name changed) mattresses of Kerala provided 50% off on their mattresses for flood victims in 2018. While others were skeptical of brands using floods to introduce their products and converting the affected community into target market, Bhaskar Majumdar contends that any contribution during disaster time, particularly floods, is helpful to the cause. Many organizations may not have the bandwidth internally to provide all the required help and support during any natural

OUTREACH



Fig. 1 An illustration of brand inventory forming outreach strategy. (Source: Jasdeep Kaur Chandi, Ph.D. scholar, USMC, GGSIPU)

calamity, but their monetary contribution can always be useful. Lots of time, brands also help and support using their existing inventory. Motor vehicle companies can offer their vehicles to be used as ambulances or for relief work, network operators can create specific helplines and other offers for the affected areas, finance companies can offer their customized services, healthcare organizations can offer their expertise, etc. (Interview March 2022). Objectively for a brand, outreach marketing using the existing inventory is much easier to provide help and support on a real-time basis, and therefore it will remain a potent tool as it combines profit motive with non-profit goals.

III Digitally Enabled Outreach

Communication is vital during disasters. Floods in the two states also showed emerging forms of outreach communication that used digital technologies to combine on-ground activities with communication networks on the social networking sites. Yadav and Rehman (2016) in their case study of Chennai floods found productive use of social media particularly in disaster resilience. Several hashtags on Facebook and Twitter like #Chennairainshelp @chennairains saw information

being shared on flood situation and rescue by people all over using Google Missing Person Finder, Facebook Safety Check, and Google Crisis Response page. Largely, social media usage during disasters is not just limited to crowdsourcing and sharing emotions but also arriving at curative initiatives (p.100) where brands can be a potent force. This kind of community outreach applies the continuum of e-mobilizations, e-tactics, and e-movements as stated in Earl and Kimport's (2013) digitally enabled social change. Recent floods saw various stakeholders maximizing the use of social media to amplify call for action, spatial information of the disaster, and relief measures besides continuous updates on the floods similar to the emergence of social media for dissemination of information through Facebook during 2011 floods in Australia (Bird et al., 2012). How social media has enabled community outreach is evident from the extensive use of shared media during the Kerala floods and later in Assam and Tamil Nadu.

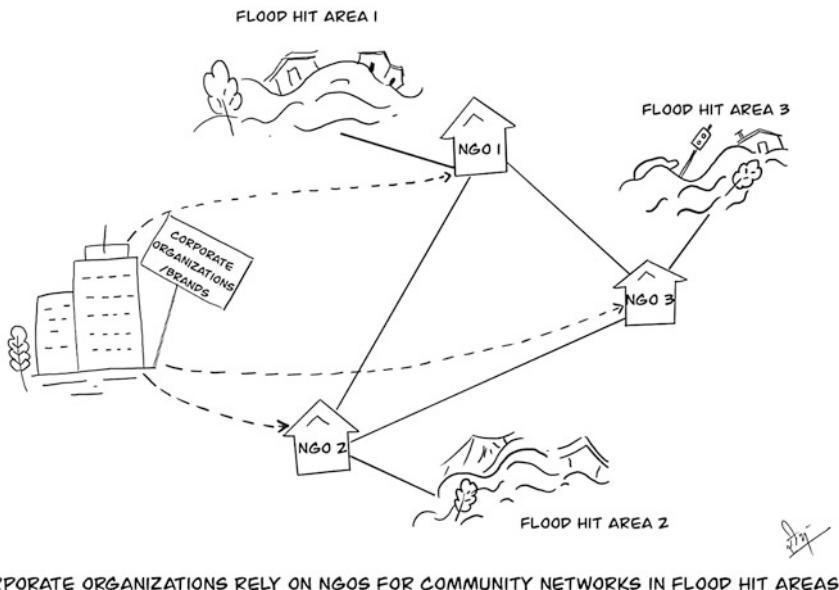
Role and Scope (Brands, Outreach, and Flood Management Cycle)

Corporate involvement in the flood management cycle (Thieken et al., 2007) is critical to understanding the scope of outreach. At the first stage pertaining to *prevention and mitigation*, corporate outreach seems like an oxymoron. Brands' insouciance in general during the prevention stage has been noted by the government, non-governmental organizations and regulatory authorities. It brings to fore the uncomfortable interrelationship between on-site industrial development and social consciousness. With neoliberalization, multi-stakeholder projects have established the corporate footprint across the length and breadth of the country. As a consequence, likelihood of several natural and manmade disasters especially floods has increased. Dr. Anil Gupta, Professor at the National Institute of Disaster Management of India, explains that the risk of floods looms large when water's natural course comes in conflict with the physical development activities or when communities are habiting the low-lying areas. Rural areas are especially vulnerable because the carrying capacity of water bodies like rivers has come down due to industrial mining. It results in siltation, causing flooding at regular intervals. Since large corporate organizations are undertaking the developmental works including highways in these areas, they are often found guilty of making the place and people susceptible to the onslaught of floods (Interview Feb-March, 2022). At the preventive stage, corporate involvement must draw from the "responsible care" paradigm which professes ethical business practices which come with social and environmental accountability so that their minimum harm to the community is done where installations are at work. He further explains that "adopting a proactive approach to community means providing proper green cover and not slashing through the water bodies, and that will create a loop of care between the corporate and the community. Between the two, most workable is the notion of responsible care that existed right in the beginning." Outreach is when industrial companies in the area adopt transparency in conduct instead of relying on the age-old practice of "extra-commercial activities" (business philanthropy) to

redistribute part of their wealth as relief funds for affected communities (Krichewsky, 2019). The biggest outreach vacuum was found at the *preparedness* stage. Low or weak participation of corporate organizations during preparedness is one of the biggest concerns raised by many during empirical data gathering. Those interviewed expressed that brands are invisible during disaster preparedness and scantily contribute to collaboration with the government on advance planning to map community needs and prepare disaster response kits. No such community mapping initiatives were found to bolster preparedness against floods. Some companies in general continue to engage in research on disaster-prone communities but as such flood community mapping or audits were not seen. Babji Yana underlined the role of companies in preparedness in the interview stressing upon that “the effective way of Brands / Organisations in flood management could be, to help clearing flood waters during floods and maintaining waterbodies, de-weeding of lakes, de-clogging of drains etc. by providing machinery and equipment to local Government in their pre and post monsoon operations.” Nakul Kumar Tarun presents the profitability of preparedness when he says that “mere donation cannot help. They need to enhance their own knowledge base to get involved in each phase of Disaster Risk Reduction process be it preparedness, mitigation or response. Mitigation measures are investment however response is expenditure. It is said that if you invest one rupee in mitigation it will save 99 rupees of response.” Urban flooding too is a problem of our times since large real estate organizations are in the fray; they should be preparing demonstrable models of building design and housing that are flood resilient, emphasizes Dr. Gupta from NIDM. One can see that *response* propels corporates into outreach. Both media coverage and interviews suggest that local businesses swiftly got into action and provided relief, while multi-national companies responded to the government initiatives. A news report (2018) published on the website www.economictimes.com informed that Hyundai Motor concentrated their outreach in ten villages around Sriperumbudur in Tamil Nadu to provide bedsheets and tarpaulin to safeguard against torrential rains. From evacuation to relocation to serving the community basic needs, corporate organizations followed the instructions provided by the government and started flood relief camps, medical camps, and ration facilities. Telecommunication companies in particular like Airtel and Jio intervened by providing data and connectivity in flood-logged areas. Though standalone initiatives have not been too many, most organizations worked to support the local administration and the government as per their planning in the form of flood-specific interventions like canoes and boats to bring people to safety. Dr. Anil Gupta is of the view that “most profound impact of outreach by brands is usually at the stage of response” when governments co-opt these corporates to impact rescue and respite (Interview Feb-March, 2022). Corporates gain as it increases brand salience for both the government and the community; however, communication has to be appropriate. A desire for immediate news development pushes the brands to send out outreach-related information to the media even when in the middle of the disaster, when relief and response work is still going on, often harming the corporate image than building it. Paarul Chand, Chief Executive Officer of PRmoment, narrates that “I have seen press releases being sent out presenting the flood relief work carried out by the brands,

in my opinion, no formal communique "is needed." So how do you communicate about the brand outreach to the world? she suggests "well, let the community served speak for themselves, just support the cause. Outreach work done should speak quietly" (Interview, March, 2022). It is back to lull during the *recovery phase*. While a few corporate organizations develop community networks with the help of local groups and NGOs are engaged in post-flood reconstruction and recovery practitioners and researchers believe that outsider brands or multinational companies who do have a production unit or distribution network in the area stop outreach programs or initiate short period out and bow out soon. Once the media attention withers away, corporates too leave the community says Dr. Samir Kapoor, a corporate communicator (Interview Jan, 2022). There are, however, corporate brands who work very hard to create community networks and provide care even when the disaster news dies down. Some companies have formed trusts and have identified water as a focus area in its sustainability program. Shah (2014) noted that one of the largest industrial conglomerates in India created the Tata Relief Committee (TRC) to respond to natural calamities. They were among the first responders toward charity, relief, and rehabilitation efforts during tsunami in Tamil Nadu and Aila Cyclone in West Bengal in 2008 and 2009, respectively. Their outreach is driven via disaster response programs. As disaster communication finds new media for reaction, advocacy, and engagement, corporate organizations use website-driven content blended with on-ground training and employability camps to show solidarity and allegiance with the flood-affected communities. As Annie Samuel advocates, "We need people to become change agents in order to build a sustainable disaster response to floods. Corporates in the flood outreach campaigns need to go beyond ration-relief and develop a vision alignment with the community" (Interview March, 2022) Empowerment via training and skill development of communities to build flood resilience and risk reduction is a necessary organ of outreach.

First hand communication in the empirical study leads to the identification of key elements in brand outreach. Besides money and materials, care, partnership, and empathy need to be integrated in brand outreach for flood-affected communities. Brands need to empathize with the affected families and communicate to them the planning aspects with them on rehabilitation. Manoj, an NGO worker in Thiruvalla, said that for the affected people, resettling needs empathy and soft handling, because it was their homes that they lost to floods. The problem, he said, arises because often the housing facilities constructed happened to be far away from their livelihood place; hence, they resist movement from their existing place (Interview Feb, 2022). In such circumstances, the companies need to map the community concerns and gather insights by listening to local issues and solutions from the people instead of a top-down approach where communication is one-way and non-participatory. Horizontal communication is best in flood-hit areas as local knowledge of terrain and weather helps the brands in designing its strategies so that funds, domain, and community knowledge result in robust flood management and care plans. It is about building networks of hope. Corporates are dependent on social sector organizations to reach to open channels of communication; what is required is



CORPORATE ORGANIZATIONS RELY ON NGOS FOR COMMUNITY NETWORKS IN FLOOD HIT AREAS

Fig. 2 An illustration of interrelationship between NGOs and corporate organizations. (Source: Jasdeep Kaur Chandi, Ph.D. scholar, USMC, GGSIPU)

commonality of vision. The NGOs who have already built a community network in the affected areas and the private organizations who are new need to collaborate early on with the aim to reduce the risk of floods (Fig. 2). Since corporate organizations have the funds and NGOs are adept at establishing the flow of communication and contact with the local opinion leaders, the two can complement each other so that an integrated outreach program can be launched in unison.

Any outreach in the future must involve scientific research to examine the efficiency of flood response toolkit. Various corporate organizations are providing research grant to disaster-themed researches. Outreach in the form of research by the triad of corporate brands, NGOs, and academic institutions is the potential future of community outreach. The future of brand outreach lies in continuity and sustainability as demonstrated by several companies after 2018. Majumdar elucidated that organizations of repute have dedicated teams or foundations involved in various community outreach programs throughout the year. Education, healthcare, skill development, and environment are few areas where organisations are engaged and involved in community outreach. Communication is a key element. While respect and trust of the community will come with day-to-day involvement, multimodal communication will create the desired cyclicity. Communication-wise, in addition to entertainment education programmes or social marketing campaigns for awareness on television and digital channels, use of closed message communication through WhatsApp and social media platforms like the Facebook and Twitter has proved to amplify the call for action as organic spheres of community formation and agenda

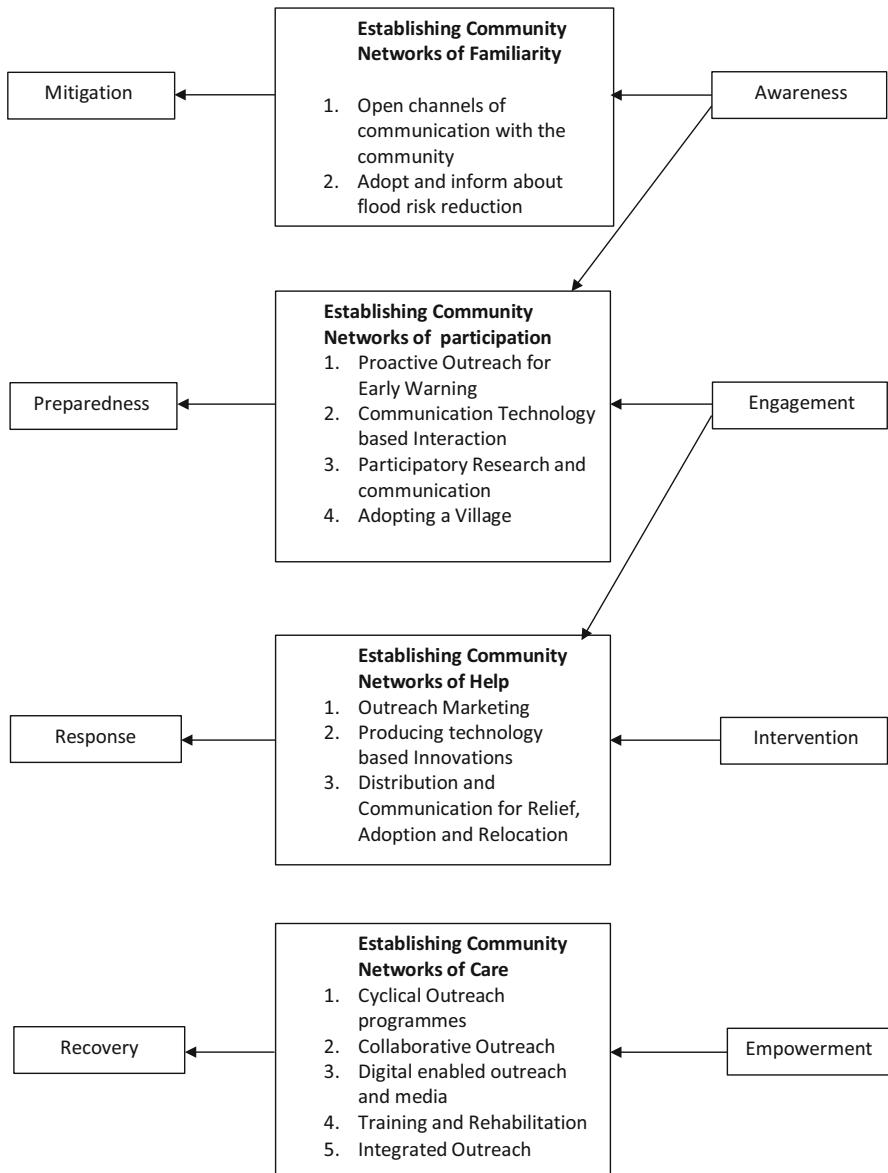


Fig. 3 Three pillars of outreach by brands w.r.t floods. (Source: Self-constructed)

building. On the basis of insights gathered, the case study on community empowerment developed by Shree and Sagar (2016) has been adapted to visualize the interrelationships between flood management stages, outreach strategy and tactics along with their functional role during each stage (Fig. 3).

Conclusions

Interviews with various experts and the media analysis suggest that corporate organizations adopt a non-structural approach to flood management that focuses on the reduction of flood vulnerability by increasing the resilience of existing buildings, preparedness, recovery plans and encouraging relocation to less flood-prone areas through flood education campaigns by providing funds for the local government and community to co-create campaigns with them. All the four steps in flood management cycle : Mitigation, Preparedness, Response, Recovery (MPRR) require corporate organizations to Create, Network, Associate, Advocate, and Act (CNAAA) by investing their emotions and cognitive competencies to develop interventions beyond financial aid. To be able to empower communities, the companies must gain in-depth knowledge about flood resilience. Relationship building is the key to effective outreach. The structural tension between corporate profit making and collectivistic responsiveness needs to be reduced by making non-profit activities become an indicator of brand performance where the prospective buyers judge it for collective values, deeds, and depth of involvement besides satisfaction obtained from the product. The guiding value of profit making needs to be redefined for a sustainable future. To put it succinctly, outreach by corporate organizations “is a delicate balance to strike, but foremost thing is that it cannot be about the brand, it is about the stakeholders, it is a question of support, neighbourly support, at times outsider support” as articulated by Paarul Chand of PRmoment, a PR consultancy.

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An Ethical Code for Disaster Journalism

86

Himanshu Shekhar Mishra

Contents

Introduction	1362
Pre-Disaster Phase	1363
Disaster Phase	1363
Post-Disaster Phase	1363
Ethics of Disaster Reporting	1364
COVID-19 and Pandemic Reporting	1364
A COVID Risk Assessment Plan for Media	1365
A Protocol for “Inclusive” Media Reporting	1366
An SOP for Reporting on Climate Disasters	1367
Conclusion	1368
References	1369

Abstract

Climate change is gradually changing the contours of global climate, leading to significant changes in weather patterns across the world. Global warming is making glaciers recede and melt faster, causing the sea levels to rise alarmingly. Scientists have also found empirical evidence of changes in seasonal rainfall patterns. These changes in global weather have led to an increase in the frequency and scale of extreme weather events in almost every part of the world. As the global community grapples with its increasingly debilitating impact on the sustainability of human life and economic and development processes, they have made it imperative for media institutions worldwide to launch effective community disaster mitigation and preparedness strategies in disaster-prone zones. The recent climate-related disaster incidents have witnessed a relatively greater media attention with reporters being deployed in large numbers in disaster-affected zones. This has brought the complexities of gathering news in

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a disaster zone under greater public scrutiny, making it imperative for media institutions to innovate and strengthen their existing news gathering processes.

The COVID-19 pandemic, the worst public health disaster in hundred years, has further highlighted the difficulties news reporters have to face in gathering news in a disaster zone. According to a study by Network of Women in Media, India, 625 journalists and media workers had lost their lives by March 18, 2022, in India since the first COVID-19 case was reported in Kerala on January 30, 2020 (Network of Women in Media, India. *In Memoriam: Journalists and media workers lost to Covid-19 in India*. From https://docs.google.com/document/u/1/d/e/2PACX-1vTkXC1UzWBeXiz39WHroeqleYml9WJu-SbQlu7nANl0zjC-c0jp_maF0XeTNAqOg/pub. Retrieved March 31, 2022). The perils of pandemic reporting have evoked a debate at a global level across media institutions and leading journalism schools on how to train reporters and media workers to safely cover a COVID-19-like pandemic in the future (Columbia Journalism School. *Reporting Safely on Covid During a Pandemic: Guidelines for CJS Students*. From <https://journalism.columbia.edu/reporting-safely-covid-during-pandemic-guidelines-cjs-students>. Retrieved March 31, 2022).

This chapter attempts to codify the primary role and responsibilities of journalists in a disaster zone, the logistical challenges they face while communicating risk, and the moral/ethical questions they have to face while gathering news on disasters. It delineates a standard operating procedure journalists must follow to combat threats to their physical safety and health and codify risks involved in a potentially hazardous/dangerous disaster zone. It also outlines a new disaster-sensitive methodology for conducting interviews with disaster victims with empathy and a greater sense of understanding of their trauma, loss, and pain. At the broader level, the chapter attempts to develop an ethical code for disaster-sensitive reporting and also argues for a humanitarian approach in disaster journalism.

Keywords

Disaster journalism · Media ethics · COVID-19 communication ecology · Crisis communication · Pandemic reporting

Introduction

Disaster journalism can play a very critical role in all three critical phases of disaster cycle: the pre-disaster phase, the disaster phase, and the post-disaster phase. Media institutions need to formulate a protocol for disaster reporting by codifying the roles and responsibilities of field correspondents. It should include a special “training module” to train and educate a set of reporters about different types of disasters, the logistical and physical challenges they could pose, their differential impact on the affected populace, and the safety protocol they must follow while gathering news. They must be trained to carry emergency kits and have evacuation plans since they work in a climate of fear and uncertainty in a disaster zone. The “training module”

should include basic knowledge about disaster laws and disaster management policies, including the official responsibilities assigned to different central and state agencies in the national and state laws. Such a long-term training and capacity building strategy is very essential to equip news correspondents and camerapersons with requisite basic skill base to report on disasters.

Pre-Disaster Phase

In the pre-disaster phase, the role of reporters primarily includes “forewarning” the society about the possibility of an impending disaster like a cyclone or flash floods in a given disaster-prone region. This would include prompt and timely broadcast of Met Department’s forecast and warnings about the above-normal rainfall predictions and the threat of flash floods, etc. Reporters also have a central role in disseminating critical information in a disaster-sensitive region to strengthen disaster mitigation and disaster preparedness measures and promote a risk reduction behavior among the common people. Media institutions need to critically evaluate the disaster mitigation measures initiated by state agencies at regular intervals and ascertain their efficacy. They also need to highlight policy gaps that exist in official policies and legal framework. This would help strengthen the resilience of communities residing in disaster-prone regions/areas.

Disaster Phase

When a disaster strikes a region or a given area, media institutions need to act with alacrity and speed in alerting both the community and state agencies about the scale and intensity of the disaster incident. They need to effectively “communicate risk” to the disaster-affected populace and disseminate primary information about the safety protocol they need to follow in a disaster zone and the institutional arrangements operational in “ground zero” to provide safe shelter homes. The information about the extent of damage in “ground zero” is critical as it would help direct the flow of rescue and relief operation in the right direction. The nature and extent of damage caused by the disaster incident need to be highlighted as it would provide primary information to state agencies about the kind of relief measures that are necessary to help the disaster victims. The degree of freedom and space reporters have in a given disaster zone will condition their ability to relay and disseminate information about the disaster to the larger mass. Media institutions need to keep their central focus on the disaster incident till they deem it necessary in national interest.

Post-Disaster Phase

After a disaster incident is over, the focus should shift on post-disaster recovery, rehabilitation, and reconstruction of lives and livelihood opportunities. At present, media institutions tend to shift their focus away from a disaster incident once it is

over. Disasters have a debilitating impact on the most vulnerable and poor sections of the community living in a disaster zone. They suffer irreparable losses, in terms of both their meagre resources and losing their modest livelihood opportunities. They are most insecure economically, and their interest and plight need to be highlighted. It is incumbent upon the media institutions to analyze and highlight the gaps wherever they may exist to ensure that every affected disaster victim is adequately rehabilitated. This would necessitate a public audit and assessment of the long-term rehabilitation and reconstruction measures required in the post-disaster phase. This would help expedite the recovery process in the disaster-affected community. Some disaster incidents like a devastating earthquake, floods, or a tsunami would require a short-, medium-, and long-term rehabilitation and reconstruction measures.

Ethics of Disaster Reporting

Media institutions should strictly follow the established code of ethics which outlines stringent norms for compliance with laws, rules, and regulations. The ethics of disaster reporting is essentially based on the principle of truth and fairness. Reporters should gather news in a disaster zone in an objective, fair, and credible way. They must be unbiased and honest in both gathering news and collating facts related with a disaster incident, as it would help direct relief and rescue work in the right direction. Unfair and biased reporting can negatively impact the disaster relief and rescue work as broadcasting wrong facts can mislead the disaster relief agencies and create panic in a given disaster zone. This could harm the credibility of both journalists and the media organizations they work for. The advent of new communication technologies, social media, and online news platforms has made disaster reporting one of the most complex professions in the world. It has brought a greater focus on tenets of media ethics and morality. Reporters are increasingly facing intense public scrutiny, as their work is now readily available to a large mass of people on both conventional and new media platforms on a real-time basis.

At the same time, media institutions must also employ stringent ethical norms for disaster news gathering. The failure to follow these ethical norms would open them to both public censure and greater intervention from media regulators. Considering the growing challenges posed by disaster incidents, media institutions will also have to innovate their news gathering processes, develop special investigative methods, and enhance the usage of new communication technologies apart from employing stringent procedures to follow media ethics and norms. They are increasingly under great pressure to be unbiased, fair, and independent in disaster reporting.

COVID-19 and Pandemic Reporting

The coronavirus pandemic outbreak has exposed the fault lines in crisis communication and public health communication systems worldwide, including in India. The failure of the disease outbreak reporting systems in most developed countries like the

United States, China, the United Kingdom, and Italy to employ emergency pandemic containment measures and effectively alert citizens to the danger posed by a highly infectious COVID-19 (coronavirus disease in 2019) has raised fundamental questions about the efficacy of their pandemic outbreak control protocols. This had far-reaching ramifications for the global community as it aggravated the pandemic crisis, leading to an unprecedented pressure on the most advanced healthcare systems worldwide (Sirleaf & Clark, 2021). During the first three waves of COVID-19 pandemic in India, the media institutions played a critical role in strengthening the public health communication systems by actively sensitizing common people about the urgent need to follow COVID safety protocols for self-protection.

In the first phase of a nation-wide lockdown starting with midnight of March 24–25, 2020, in India, the TV news channels, newspapers, web portals, radio networks, and social media platforms emerged as primary platforms for the dissemination of critical information related with COVID-19 pandemic. But as they disseminated critical information to the common people, they faced complex ethical, moral, and safety-related issues. At the larger level, the COVID-19 pandemic has posed a grave threat to the health of journalists who have battled many kinds of risks to their lives while reporting on the pandemic since its outbreak in Wuhan, China, in December, 2019. Reporting on the worst public health disaster since the Spanish flu influenza pandemic of 1918–1919 has proved to be extremely hazardous and challenging for reporters in every part of the world (Perreault & Perreault, 2021).

A COVID Risk Assessment Plan for Media

Reporting on a public health disaster like COVID-19 pandemic is potentially very hazardous for reporters, camerapersons, and other media workers. They have to work in a climate of fear and uncertainty which usually grips the pandemic-affected area/region. They have a relatively higher degree of exposure to the virus as they have to work and gather news and information close to “ground zero.” This necessitates that they follow a stringent safety protocol to manage risks and keep themselves safe and secure (Nieman Foundation for Journalism at Harvard, 2022). When the COVID-19 cases began to rise slowly in India in March, the central government imposed a stringent nation-wide lockdown starting midnight of March 24–25, 2020, and media institutions became the primary source of information on COVID-19 pandemic for hundreds of millions of Indians stranded at home. As cases rose in India and a large number of reporters and camerapersons contracted the virus, newsroom operations were affected across the media spectrum. Media institutions had to restructure and recalibrate their news gathering operations to respond to the challenge of continuing seamless broadcast of news as the shadow of COVID lengthened over India. They had to employ new methods of news gathering to keep journalists and media workers who were deployed in the field to do pandemic reporting.

In a short span of time, media institutions had to develop a risk assessment plan and a safety protocol to keep their office space and field staff safe. Soon, the tenets of disaster journalism were on display everywhere. To ensure adequate distance between reporters and camerapersons from subjects of news, the length of boom mikes of news channels were reformatted and made longer. Reporters had to follow a strict protocol of avoiding unnecessary interface with the public and avoid visiting their newsrooms. Many news channels made it mandatory for their field staff to travel in office vehicles to ensure their safety and security while carrying out news gathering operations. They were instructed to carry a COVID protection kit, which included basic sanitation materials including masks, headgear, and body coveralls. They were told not to visit any COVID care unit or health facility.

To limit the exposure of office staff, many media institutions made it mandatory for a section of the editorial staff to work from home. Only a bare minimum staff were allowed to work from office, to ensure that work space was secure and emergency operations could be continued in the case of an emergency. New communication technologies and mobile journalism allowed journalists living and working even within containment zones to ensure seamless broadcasting of news. Some news channels constructed makeshift studios at the homes of anchors and editors to enable them to safely report on the pandemic.

Despite these precautionary measures, a large number of journalists were infected with COVID-19, and news operations were affected across the media space. As per the database released by the Network of Women in Media, India (NWMI), 624 journalists and media workers had died of COVID-19 in India by February 21, 2022. Media institutions also had to grapple with complex moral and ethical issues while reporting on COVID-19 pandemic. The primary focus was on the need to protect the identities of COVID victims so as to shield them from any kind of social ostracization and stigmatization. Newsrooms had to reformulate their editorial policies to ensure that media coverage was fair, transparent, and inclusive all the time.

A Protocol for “Inclusive” Media Reporting

Media institutions have played a critical role in shaping the social discourse surrounding the COVID-19. Though the media reportage has conditioned the perception of common people about the threat posed by pandemic to public health, serious questions have also emerged about the nature of media reporting, especially during the “Tablighi Jamaat” congregation at Markaz Nizamuddin in March 2020. The Jamiat Ulama-i-Hind filed a petition in the Supreme Court alleging that an attempt was made to “demonize” the minority community in a section of the national media and sought directive to immediately stop dissemination of “fake news” related to the Tablighi Jamaat, which blamed the members of the religious congregation for deliberately spreading COVID-19. The apex court during the hearing observed that “Freedom of speech and expression is the most abused right in recent times” (Press Trust of India, [2020](#)).

This was not an isolated case in the world. In Ukraine, an LGBT group *Insight* filed a law suit against the head of Ukrainian Orthodox Church Patriarch Filaret for making an allegation during an interview to Ukrainian national TV network ‘Channel 4’ that COVID-19 pandemic was God’s punishment for the sins of men, the sinfulness of humanity...First of all, I mean ‘same sex marriage’. This statement exacerbated social tensions in the midst of the worst public health disaster in the last hundred years and was widely debated and reported by Ukrainian media organizations. It was widely perceived as “dangerous” by the LGBT community which could have led to more discrimination against them (Bacchi & Georgieva, 2020). As concern grew over stigmatization and stereotyping of “marginalized” groups in the media space, new theoretical parameters for media reporting also emerged. UNESCO issued a document titled “Guidelines for Inclusive Media Reporting on COVID-19” to warn the world community that “Disinformation, stereotyping, and stigmatization are extremely bad for outbreak control” (Tuneva, 2020).

An SOP for Reporting on Climate Disasters

Reporting on a climate-related disaster incident poses different kinds of complexities and challenges for correspondents. Climate-related disasters cripple critical infrastructure in the affected region, especially the urban and rural roads, national and state highways, transport services, power and water supply systems, mobile and communication, and other such critical infrastructure. Apart from incapacitating the rescue and relief measures after a disaster strikes a region, they also make it very challenging for news reporters to travel to “ground zero” of a disaster-hit zone. When Jammu and Kashmir suffered from the worst floods in more than a hundred years in the first week of September, 2014, landslides in several parts of the valley destroyed the road and highway infrastructure in several places. This made it difficult for the news correspondents to immediately reach the “ground zero” by road. I had to wait for more than 16 h at Palam Air Force Station to get a seat for myself and my cameraperson in an Air Force AN-32 transport aircraft to fly to the Srinagar Air Force Station.

When we landed in Srinagar Air Force Station late in the night, we had no access to any government or private transport facility. I had carried three sim cards but not a single one could be activated as most of the mobile towers had collapsed in flood-ravaged Kashmir valley. I realized that we had no contingency plan to manage the uncertainties and grapple with logistical challenges in a disaster zone. I struggled to contact security officials for a couple of hours who could guide us as where we could safely stay at night and how we could commute in the city which was flooded in several places at night. After several queries with security officials, we were transported to a CRPF official’s home where ad hoc arrangements had been made to house reporters and camerapersons for the night. The first morning came with far more complex challenges. The communication facilities had broken down, seriously complicating both the news gathering operations and the relay of critical information out of the disaster zone.

A reporter has to grapple with several logistical challenges – from restricted movement inside a disaster zone to accessing credible official communication in the wake of collapse of basic communication infrastructure. This also impedes the flow of news and information from inside the disaster zone. The collapse of mobile towers seriously impaired our ability to uplink our feed from disaster as broadcast journalists struggled with bottlenecks in sending the video feed to their news headquarters. This weakened the crisis communication processes in the disaster zone, as the flow of primary information about the unprecedented flood crisis was considerably delayed.

Disasters create a circle of uncertainty and despair in the worst-affected geographical area. The psychological impact of disaster tragedy on disaster victims is deep, and many of them suffer from acute anxiety and psychiatric issues. This necessitates the need to follow a disaster-sensitive (humanitarian) protocol to interview disaster victims. The news correspondents must approach disaster victims for an interview with empathy and utmost caution and care. They must be very sensitive to the sense of loss that pervades a disaster zone. They must carefully assess the trauma a disaster-affected individual or family has undergone before deciding whether they are fit for an interview.

There are issues related with the safety of life and health of news correspondents too as the fear of an epidemic outbreak is very high in a disaster. A few days after flood waters had entered the Srinagar city, I saw dead bodies of animals floating very close to the overflowing river banks. In one instance, the body was floating just next to a make-shift tent a disaster victim family had set up to survive the wrath of the floods just next to their flooded colony. The floods in Srinagar had seriously impacted the health operations in major hospitals at a time when the injured citizens needed urgent healthcare facilities.

Conclusion

The COVID-19 pandemic hit the world at a time when global community was struggling to cope with the rise in number of disaster incidents following abnormal changes in global weather. It was akin to a pincer movement as the media institutions were forced to deal with the complexities of gathering news on both COVID-19 pandemic and the climate-related disasters simultaneously. It caused immense hardship for news reporters deployed in disaster zones at the time of COVID-19 pandemic. For instance, when large parts of India were under stringent lockdown in May, 2020, the news reporters and camerapersons deployed along coastal areas in West Bengal and Odisha to report on the Super Cyclonic Storm Amphan, the strongest cyclonic storm in Bay of Bengal in last two decades, faced the twin challenge of protecting themselves from the wrath of both the Super Cyclone and the COVID-19 pandemic while gathering news in cyclone-affected coastal districts of West Bengal and Odisha.

The emerging post-COVID-19 world is all set to pose far more complex challenges for media institutions since the pandemic has debilitated the global economic

structures and unleashed an unprecedented socioeconomic crisis worldwide. The number of poor people facing loss of income, poverty, and hunger has increased manifold during the last 2 years. The economic recession during the pandemic has weakened the global community's efforts to attain targets enshrined in the United Nation's Sustainable Development Goals (SDGs), especially those related with combating hunger, poverty, and climate change. In the emerging post-COVID world, media institutions will have to recalibrate their priorities, mobilize global opinion toward combating poverty and hunger, and initiate institutional measures to strengthen their ability to work as a disaster watchdog. Also, the rise in the number of climate-related disaster incidents world over is gradually becoming a huge challenge for the global community. The Global Assessment Report 2022 (GAR2022) released by the United Nations Office for Disaster Risk Reduction has revealed that between 350 and 500 disaster incidents were recorded every year in last two decades. GAR2022 has warned that the number of disaster incidents is expected to increase to 560 per year by 2030 (United Nations Office for Disaster Risk Reduction, 2022). To cope with this growing challenge, the media institutions must initiate policy measures for the capacity building and training of news correspondents and camerapersons.

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Capacity Building Through Stakeholder Training in Media and Communication for Effective Disaster Management

87

Jaishri Jethwaney

Contents

Introduction	1372
Role and Scope of Capacity Building in Managing Disasters	1374
Why Those in Charge of Disaster Management Need to Learn About Media and Communication?	1374
Research Insights from the Survey	1375
Information and PR Officials	1375
Media Persons	1376
Policy Makers	1376
Information Overload in Crisis Times	1377
Ethical Discourse: Media's Responsibility	1378
PCI Norms on Reporting on Natural Calamities	1378
Diminishing Trust Levels	1378
Social Media: The Game Changer	1379
Is Disaster Management Equivalent to Reputation Management?	1379
Government's Outline on Capacity Building Strategy	1380
Preparing Stakeholders in Disaster Communication	1381
Defining Stakeholders	1381
Users of the Curriculum	1382
Training Approach	1382
Faculty: Who Could Ideally Undertake Such Capacity Building Training Programs	1383
Objectives of the Proposed Course Curricula	1383
Recommended Modules: An Outline	1384
Information/Public Relations (I&PR) Officers of the Central and State Governments ...	1384
District Commissioners/Civil Servants	1385
BDOs/Panchayat Heads	1385
Civil Defense, Police, and Para-military Personnel	1386
NGOs/CSOs	1386
Media Personnel	1387

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Conclusion	1387
References	1388

Abstract

Communication holds the key to an efficient disaster management. The aims of crisis communication broadly are to inform, educate, and communicate with various stakeholders with a view to create resilience and confidence among them and communities at large. The people in charge of communication need to be trained specifically in communicating on disasters during various stages, viz., pre-disaster, disaster, and post-disaster. Among the various stakeholders who need to be sensitized and trained, the most crucial include the civil servants, who are called upon to administer/manage disasters, the information public relations personnel in the central and state governments who disseminate information to the media on behalf of the government, disaster management teams at ground zero and at head office level, the communities at the grassroots level, and last but not the least the media persons who need to be exposed and sensitized to the disaster management emergency response system and the preparedness of the administration in dealing with any kind of situation so that their reportage is balanced.

It is generally believed that truth is an easy causality during a crisis. Therefore, it is important that efforts be made to disallow the formation of grapevine, misinformation, and fake news. Media often takes the center stage post a disaster. The news media by its nature is critical of those who are in charge of disaster management to find the underlying cause of the tragedy. Misinformation, disinformation, and scare mongering during disasters are a common occurrence; therefore, managing perceptions is important to ensure that the situation does not get out of hand. In the smart cities' context, it is expected that these are equipped with zero-failure communication dissemination apparatus and mechanism.

The chapter would explore the multi-pronged challenges in disaster management but most importantly how the people in charge of disaster management and communication are to be trained to do a professional job. The chapter would provide an outline of the training contents on disaster communication for various stakeholders.

Keywords

Crisis · Disaster · Management · Training · Stakeholders · Media

Introduction

Disasters are the most dreaded phenomena, but inevitable. About 190 million people are directly affected annually by emergencies due to natural and technological hazards, with over 77,000 deaths (<https://www.unrr.org/event/unrr-geti-who-unitar-e-learning-course-resilience-local-governments-multi-sectoral-approach>). The impact may

vary, depending on the level of preparedness, availability of resources, flexibility in decision-making, and most importantly an understanding of what would be in public interest. In other words, in a disaster situation, an avid understanding of the phenomenon of *intent versus public interest* and the honesty of purpose on the part of the authorities would determine how a disaster situation was handled.

Most natural disasters, if probed deeply, are indeed the outcome of humankind's blatant exploitation of nature. The flagrant exploitation of natural resources and the larger ecosystem, which includes, among other things, the building of large-scale hydroelectric power projects, deep in the mountains by changing the course of rivers, the blasting of mountains to make way for tunnels and power installations, the displacement and uprooting of thousands of families to make room for building infrastructure; the nuclear power proliferation, exposing thousands of habitants to radio-active emissions; more and more coal-based thermal power projects emitting deadly smoke from their chimneys; the denuding of forests for modern living and maintaining modern lifestyles, thus taking away the natural habitat of the wildlife, the greenhouse gases from burning fossil fuels for electricity, heat, and transportation, are some of the irreversible consequences of development, resulting in natural and manmade disasters. The future generations shall have to pay a heavy price for the "development" unleashed by the present one. The Father of the Nation, Mahatma Gandhi, once said, "There is enough for everyone's needs, but not greed." Who plays with the environment more, the rich or the poor nations may be an issue of academic debate, but the more important question for us to ask ourselves is, are we prepared to cope up with the current and impending disasters? How supple, flexible, and plausible are our systems and processes that would help countries and communities to bounce back, post a disaster, is what we need to work on.

Building disaster-resilient cities is the new buzzword. The smart cities are expected to be strong enough to withstand the impact of disasters. There are varying views on whether there should be standard indicators for the smart cities to be followed. For one school of thought, the indicators have to be standard to gauge their resilience and effect of disasters. The other school of thought believes that indicators should ideally depend on the vulnerability of various regions to natural and manmade disasters, the socioeconomic divide, and the resources to handle disasters, among others. While the disaster management authorities have started including the role of communication in building disaster-resilient cities in their plans, the role of independent news media has not yet been fully understood, realized, and explored. If there is anything that acquires center stage, post a disaster, it is the independent news media. Therefore, understanding the information needs of the news media and making them an important stakeholder and partner in reaching out to communities are as important as information dissemination from the authorities through various means including the mass media. A synergy between the supply and demand sides of information thus would go a long way in effective disaster management.

Role and Scope of Capacity Building in Managing Disasters

Within the context of disaster risk reduction, the *Sendai Concise Guide on Disaster Reduction* defines capacity development to be “the combination of all the strengths, attributes and resources available within an organization, community or society to manage and reduce disaster risks and strengthen resilience” (<https://www.unrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030>). The UN General Assembly Resolution A/RES/71/276 endorsed the recommendations of the Open-ended Intergovernmental Expert Working Group on Indicators and Terminology Relating to Disaster Risk Reduction on 2 February 2017. United Nations General Assembly, 2017. Report of the Open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction). Capacity development according to these guidelines covers four major areas, viz., *Leadership* (leadership development programs, partnership and coalition building, and identifying and supporting champions of change), *Institutional strengthening and development* (including strategic planning or reform, establishing disaster reduction risks, legislative actions, decentralizing initiatives, and organizational effectiveness measures among others), *Knowledge sharing* (education- and training-based capacity development to focus on building and enhancing individual organizational awareness and knowledge, supported by a combination of classroom-based education and informally through social marketing, on-the-job training, coaching, and mentoring and organizational-level actions that need to support information gathering, sharing, and dissemination), and *Accountability* (creating and strengthening coalitions and networks, conducting public information campaigns or townhall meetings) (*Ibid* p. 19).

In this chapter, we shall take for discussion the training and education-based capacity building needs of various stakeholders on communication and the engagement with news media on the following indicators:

- Current information and communication management practices relating to disaster at national, state, district, and grassroots levels
 - Identification of problems, challenges, and roadblocks in managing communication relating to disaster management
 - Identifying the training needs of various critical stakeholders
 - Reviewing current practices in media in covering disasters
 - Recommending a course curriculum to suit the role and scope of various stakeholders in managing disaster communication
-

Why Those in Charge of Disaster Management Need to Learn About Media and Communication?

Communication is one of the most important ingredients in management, and disaster management needs it all the more as the situation arising out of a disaster is often extraordinary which, among other things, requires reaching out to those

affected by that particular disaster with information on various measures, including mitigation and rehabilitation. Some researchers have reported improvements in disaster-related knowledge and behavior in their study of communication imperatives in natural and manmade disasters across many countries (Bradley et al., 2014). The scenarios in various countries, at the same time, were so disparate that there in general was an absence of high-quality robust trials relating to disaster communication that needed to be remedied. For the study, the research team searched 5,224 unique articles, of which 100 were judged as potentially relevant. Out of the sample, 25 studies met the inclusion criteria, and 2 additional studies were identified from other searching. The studies evaluated interventions in all the four stages of the disaster cycle including a variety of manmade, natural, and infectious disease disasters. The countries from where the studies were picked included Australia, Canada, Hong Kong, Taiwan, Singapore, Japan, China, Egypt, Iran, India, the Republic of the Congo, Haiti and Caribbean islands: St. Vincent and the Grenadines, and Turks and Caicos Islands. The research study suggests that the digital media may provide better research opportunities. To quote, “Modern internet-based interactive social media present opportunities for risk communication, and may facilitate evaluation because it may be possible to invite recipients to complete knowledge or behaviour questionnaires, or even to request position-based information from mobile devices” (Bradley et al., 2014).

A 2008 field survey among information and public relations officers from 11 states, including the vulnerable ones, from India brought home some findings and insights that are important from the perspective of the need for synergy among various people in charge of disaster management.

Research Insights from the Survey

In-depth interviews with the key stakeholders were conducted to assess the problems encountered by them in disaster communication. The findings indicated the following issues from among various stakeholders from within the media ecosystem:

Information and PR Officials

- Reluctance on the part of various departments to pass on information to information officers
- Time constraint to handle crisis communication amidst other work responsibilities
- Non-availability of officers to provide latest information on the disaster, when needed
- Lack of manpower and logistical support in handling crisis
- Problem in getting authentic and accurate information on a regular basis (i.e., updates on the number of casualties, the impact and extent of damage)

- Urgent need for training in new communication technology and tools
- Lack of clarity on confidentiality and sensitivity to information

Media Persons

- A general lack of trust about government data
- A belief that government conceals more than shares
- Competition among media, an important factor in being “First with News”
- Perception that government officials were not efficient and quick in sharing information
- Lack of guidelines or policies among media organizations for covering disasters

Policy Makers

- A general lack of trust in the efficiency of information officers
- Lack of synergy in the work of civil servants and information officers
- Lack of appreciation of media’s need for information
- Critical of media going overboard in making news sensational

Most information and public relations officers spoke of a continuous trust deficit between them and the bureaucracy, represented by young district magistrates from the Indian Administrative Services (IAS), often on their first field job, who would not consult with them on media strategies or interface but take their own call. Many among them, in 2008 when digital media and communication technologies were coming up, spoke of the need to augment their skills especially in handling technology (In a USAID consultancy project on capacity building in training and education in disaster management undertaken by the present author, in 2008, these findings emerged in the baseline survey. A training needs analysis of 11 states, including in-depth surveys in vulnerable states, like Assam and Gujarat were used to draw conclusions and suggest recommendations for developing the course curriculum. The consultancy was taken by her when she was a professor at the Indian Institute of Mass Communication.).

Media information is a strong facilitator for creating awareness on disasters. Preparedness includes action to reduce risks, which also needs community intervention, resources, and motivation. An inclusive approach is, therefore, called for, to cover vulnerable groups, such as women, children, elderly, and physically challenged.

Technology has a great role to play in connecting with the stakeholders, but it is of equal importance that those in charge of communication understand the media functioning and its sociology and ideological leanings, besides acquiring the knowhow in preparing media and communication strategies, including outreach, social mobilization, and participatory research especially at the grassroots level, where the media reach and accessibility are often low. The disaster management

authorities generally use multiple media platforms to reach out to various stakeholders, both at the time of issuing warning and also in the aftermath of disasters. Some empirical studies suggest that the coming of the digital media, specially the mobile phones, has greatly facilitated both the authorities in reaching out to people and the communities in knowing about the impending disasters when the authorities have used the mobile technology to connect with vulnerable communities in the far-flung areas. Community radios at the grassroots level have also contributed phenomenally in disaster times. The state of Odisha in India is a test case on good practices in achieving successful community outreach through technology in disasters caused by cyclones, especially after the super cyclone in 1999. The cyclone unleashed vast devastation, but a huge learning for the state, nonetheless.

Information Overload in Crisis Times

Every crisis brings with it an information galore, making it often challenging for an average news consumer. For instance, the Covid-19 pandemic that broke in 2020, not sparing any country, was followed by what the critics termed as “infodemic,” with all kinds of information pouring in from sources from all over the world, making the understanding of the situation challenging for people, amidst the fear of what the coronavirus was capable of unleashing in their lives. When a crisis strikes, the independent news channels, newspapers, and online news portals may not necessarily have the same perspective on disaster handling as that of the authorities, which becomes a cause of friction between them.

The media outlets generally send their team of reporters to the disaster site, who besides their own understanding of the situation also gather insights from the local sources and anonymous voices, which may or may not find resonance with government's perspective of the situation. In an era of digital media and a hyperactive social media, thousands of videos get uploaded by many including the local people who happen to be at the site of the disaster, resulting in a huge information overload post a disaster. This also would mean a huge surge in misinformation, disinformation, fake news, and mischief mongering by vested interests and anti-social elements. Bad news often spreads like wildfire; therefore, it is important that the authorities handling the crisis also understand the dynamics of news making and its dissemination in disaster management and engage with the stakeholders accordingly.

Over a period of time, some media academics and journalists have prepared training modules in conflict reporting (Howard, Ross). This has been done in a hope and belief that a reliable media that is neutral, accurate, and objective would be able to help in better management and governance (Conflict-sensitive reporting-UNESCO.pdf). Grief journalism is becoming one of the latest areas of study in disaster times. If the survivors feel the brunt of apathetic and insensitive reporting many a time, the other side of the argument is that journalists who cover disasters see so much suffering and antipathy that it tells upon their own mental health, which should also be a cause of worry and an important area of addressing and research.

Ethical Discourse: Media's Responsibility

Media has a responsibility to report with high ethical and professional standards. Referring to a number of past instances when the media reportage was inciteful and inflammatory contributing to fuel conflict in a number of crisis situations, the International Media Support's (IMS) booklet underlines the importance of being fair in disaster reportage (<https://www.mediasupport.org/wp-content/uploads/2012/11/ims-csj-handbook-2004.pdf>). News media is expected to not only use the highest standards of professionalism but also appreciate the need for sensitive reporting in times of grief and devastation.

The Press Council of India, a Media Watch body has issued the following *Norms of Journalistic Reporting* in covering natural calamities and disasters:

PCI Norms on Reporting on Natural Calamities

“(i) Facts and data relating to spread of epidemics or natural calamities shall be checked up thoroughly from authentic sources and then published with due restraint in a manner bereft of sensationalism, exaggeration, surmises or unverified facts.

(ii) Natural or man-made hazards become disasters through acts of commission and omission of the society. Therefore, the disastrous impact can be minimized by preventive action taken by all the stakeholders including the media.

(iii) Media should give wide publicity to the do’s and don’ts and the potential benefits of disaster mitigation so that the society follows them before, during and after the occurrence of the disasters. People should be detailed on standard guidelines. The issues of children and women which are the most vulnerable groups during and after disaster should be handled carefully by the media.

(iv) It is necessary to have complete cooperation between the media and all governmental and non-governmental agencies. The extent of the coordination and cooperation between them determines the nature, the degree and the scale of the preparedness to prevent or meet the disasters” (p.35)

Source: <https://presscouncil.nic.in/OldWebsite/NORMS-2010.pdf>

Diminishing Trust Levels

It is commonplace to find an uneasy relationship between the media and the government in times of disasters. Media in general comes under fire from the authorities for sensationalizing news, thus aiding in creating adverse public opinion against those in charge of managing disasters. The news media on its part believes that the government and concerned authorities hide more than share. The Covid-19 public health emergency proved beyond doubt an open unease between the two institutions. Hundreds of FIRs were filed against journalists, and some were also taken into custody on charges of spreading “fake news.” In a study of 125 fake news dispatches in India during Covid-19, it was found that digital media accounted for over 94% share, while the mainstream media was at 5.6% (Al-Zaman, 2021). Fake

news, the scholar argues, produces tension, misunderstanding, and disbelief, especially in the digital age and social networking age.

The audio-visual medium, especially the television channels, is often criticized for being apathetic and insensitive to victims' state of mind, when they interview the survivors and the next of the kin of the dead. The late Joseph Scanlon, Professor Emeritus and Director of the Emergency Communications Research Unit at the Carleton University, in his insightful paper writes that whatever the perception about the media on their disaster coverage, there was no doubt that the media played an important role at all the stages of a disaster, but the media itself may not be aware of it. To quote him, "Mass media participation is critical, for example, for effective warning and the mass media may be the glue that binds societies in certain occasions. Yet the media are also responsible for many of the misconceptions that exist about disaster, misconceptions that may lead to errors of judgment when disaster strikes. A review of texts suggests Journalism scholars are unaware of this. Strangely, the one area where media scholars have shown the most concern – the way journalists deal with survivors and relatives of victims – is the area where the limited available research suggests the media are not as guilty as painted" (<https://training.fema.gov/hiedu/docs/emt/scanlonjournalism.pdf>. Accessed 18 Dec 2019).

Social Media: The Game Changer

The onset of social media, in a way, has changed the paradigm of disaster communication. If, on the one hand, social media is criticized for provocative "user-generated content" and posts coming from anonymous sources, social media, on the other hand, provides opportunity to disaster managers to access posts of those in distress and the community voices and concerns, identify sources, and also know the severity of the effect, besides identifying and reaching out to communities with succor and rehabilitation. The wide reach and access of social media can be befittingly used during all the stages of disaster management, viz., preparedness, response, and recovery (Chan, Christopher Jason). The social media tools and strategies thus can be made use of for information dissemination, disaster planning and training, collaborative problem-solving and decision-making, and information gathering. (<https://www.oecd.org/governance/risk/The%20role%20of%20Social%20media%20in%20crisis%20preparedness,%20response%20and%20recovery.pdf>)

Is Disaster Management Equivalent to Reputation Management?

Post a disaster, often hounded by an aggressive news media and a possible adverse public opinion, the government and disaster management authorities get worried about their image. They see in it the politics of malice and the handiwork of the vested interests. Media is often browbeaten for reflecting what the government

would not like the public to read and watch. A crisis brings with it myriad perceptions, based on many factors, such as grapevine, skewed media coverage, fake news, misinformation, and disinformation, among many others. Therefore, it is very important for the government and concerned authorities to handle perceptions that are not based on informed stimuli. Wrong perceptions float around because there could be delay in information sharing from the official sources. Hence, it is essential for the government and the concerned disaster management authority to manage perceptions while these are at an embryonic stage.

What are the lessons for disaster/crises managers?

- Develop a strategy based on worst-case scenario
- The vital importance of pre-thinking
- The initial critical few moments when a crisis breaks are very important.
- Know the media mind and their stand on the issue
- Isolate the crisis team from the daily grind.

Failure in a crisis handling happens due to one or all the following reasons:

- Lack of openness, honesty, or availability of the spokesperson in the initial period
- Failure to prepare for the worst case
- Failure to share information timely to let the grapevine develop
- Failure to communicate honest, human emotion and concern
- Short-sightedness of the organization in putting long-term goals before short-term goals

Government's Outline on Capacity Building Strategy

The National Disaster Management Authority (NDMA) in a white paper prepared between 2012 and 2014 has outlined the following key elements on capacity building through training and education:

- *Capacity development goals of training are clearly defined and agreed in advance by the concerned stakeholders.*
- *Training is context specific and need based.*
- *Institutional arrangements are streamlined.*
- *A system to assess training needs is developed and operationalized.*
- *A system to vet and approve training designs is devised and put in place.*
- *A system to track the efficacy and impact of training is developed and piloted (<https://nidm.gov.in/pdf/ncrmp/Deliverable%2015.pdf>).*

The chapter noted that most of the above outlined elements either were missing or rarely were included in the training practices related to disaster management and disaster risk reduction at the national, state, and local levels.

Preparing Stakeholders in Disaster Communication

Disaster management is a trans-disciplinary area that needs a complete synergy among various departments and institutions handling the emergency and preferably allowing a one-window approach for the disaster survivors. Therefore, it is important that those in charge of disaster handling be trained in crisis communication.

Based on the stakeholder theory, it is believed, much can be achieved in managing a disaster, but only if all the stakeholders are recognized, well-coordinated, and respected (Fazari & Kasim, 2019).

Defining Stakeholders

Drawn from economics in the context of commercial enterprises, the expression “stakeholder” over the years has become universal when defining important constituencies across economic, political, and social spectrum. Milton Friedman’s theory that gained ground in the last century posited in the context of organization that shareholders were but just one of the stakeholders. The ecosystem, he argued, included anyone who had invested in the company, was involved, or was affected, including the company, employees, vendors, suppliers, special interest groups, and government agencies, each one qualifying to be among stakeholders. Friedman’s argument was that a company would succeed only if it satisfied all its stakeholders and not just those who had invested in it (Friedman, 2002). Bucholtz and Carroll speak of the three values attached to the stakeholder model that include *descriptive* value which provides language and concepts to describe organizations, *instrumental* value that relates to the fulfillment of the organizational goal aimed at growth and sustainability, and normative value, the presumption that stakeholders have inherent value (Donaldson & Preston, 1995).

The NDMA’s training and capacity building referred above has recommended training in media and communications, but only for the information and PR officers (I&PR) at both the central and state levels. The counterargument to this is that the I&PR officers no doubt are the experts appointed by respective governments, but they are not necessarily the spokespersons. The media interface often is done by ministers and bureaucrats. At the district level, it is the district magistrate, an administrative services officer who is in charge of the overall disaster management and also all communication activities. Similarly, panchayat heads, local police, para-military forces, and disaster management teams are important links in the effective management of a disaster, who many a time are called upon to share information and speak to news media and communities. The chapter underscores the importance of training for all the stakeholders in information dissemination, communication and media handling.

Let us see who these stakeholders are and what they must learn on crisis communication.

Users of the Curriculum

Some of the critical stakeholders who need to understand and assimilate media and communication dynamics and currents and under-currents of communication in disaster situations include the administrators/government (grassroots/state and center), information and PR officers at central and state levels, disaster management officers, hospitals, and emergency services. In a disaster situation, many other organizations such as the corporate sector, NGOs, CSOs, Resident Welfare Organizations (RWAs) and people at large need to be looped in for extending support in cash and kind, including providing volunteers and blood donation, if required. Last, but not the least, an important stakeholder is the news media as it serves not only as a conduit between the authorities and the people, but it has a watchdog function. The reporters and news editors need to be exposed to the working of the disaster management authority and sensitized on disaster reporting.

Keeping in view the core area or expertise of various stakeholders, the following training programs and course modules are suggested. The training curriculum has been designed in a manner that it would address the training needs of the key stakeholders in the disaster communication process.

1. Government information and PR officers
 2. District magistrates/civil servants
 3. Block development officers/panchayat heads
 4. NDRM disaster teams/police and para-military personnel
 5. NGOs/civil society organizations
 6. News media reporters and news editors
-

Training Approach

The training of various stakeholders outlined above is recommended to be approached in two ways:

- (a) Organizing training of various stakeholder groups individually in exclusive module(s) on disaster communication with a general run on disaster management per se.
- (b) Including an extensive module on disaster communication in the orientation training programs of the administrative services officers (IAS), Indian Information Services (IIS), and other services of the central and state governments that are relevant to disaster management.
- (c) These short-term programs can be orchestrated and curated under the aegis of the National Disaster Management Authority through a media institution of repute.

Faculty: Who Could Ideally Undertake Such Capacity Building Training Programs

Disaster management is a trans-disciplinary field; therefore, any capacity building program ideally would have a cross section of experts drawn from across diverse fields. For a course in media and communication, the suggested faculty resources can be drawn from media schools, disaster management faculty at premier universities that run courses in disaster management, well-known NGOs and CSOs with a proven record and scholarship in disaster management and research, and the NIDM. The faculty should also include media practitioners who have covered disasters and are well-versed in both classic and online media.

The country has over 300 universities, covering central, state, and private ones that have media schools/departments spread throughout the various states, employing hundreds of faculty members. The NDMA can shortlist a few media schools based on their credentials and draw a list of “master trainers” and “resource persons” who can work on the training modules in details, providing both the conceptual framework and innovative pedagogical tools and hands-on skills.

Objectives of the Proposed Course Curricula

The Disaster Communication course curricula for the various stakeholders has been developed keeping in view the following broad objectives:

- **Developing a proactive communication approach during disasters to:**
 - Warn people about impending disasters
 - Prevent any vacuum in communication
 - Prevent grapevine from becoming overactive
 - Provide timely information based on facts during all the phases of disaster management
- **Sensitizing various stakeholders on the role of communication in disaster management so that they can:**
 - Provide information on mitigation, rehabilitation, relief, evacuation, and compensation when the disaster strikes
 - Mobilize support (monetary, technical, and moral) from citizens and organizations
- **Synergizing the efforts of various stakeholders during disasters to:**
 - Achieve greater efficiency in the work-related areas of disaster preparedness, response, recovery, mitigation, and reduction
 - Enable them to collectively work better toward the common goals in disaster management, especially rehabilitation of victims
- **Enhancing the capabilities and skills of stakeholders in handling media with a view that:**
 - Media can be involved in playing an active role in disaster management

They understand the information needs of media and are able to cater to them more effectively

- **Improving their communication skills and other soft skills so that:**

Government officials are able to address the concerns and queries of people more effectively and promptly

Senior government officials/leaders are able to communicate clearly, precisely, and most importantly empathetically with various people involved, thus avoiding unnecessary panic and chaos during disaster situations

Recommended Modules: An Outline

The following modules suggest the conceptual framework and thrust areas:

Information/Public Relations (I&PR) Officers of the Central and State Governments

Objective: To enhance the capacity of I&PR functionaries in disaster communication, with a focus on writing for the media, media handling, use of communication tools, digital media, and development of soft skills

Duration: 2–4 weeks

Core Modules

1. Understanding disasters and disaster communication
2. Task and responsibilities of an I&PR person
3. Planning and preparation in disaster communication
4. Understanding media: evolution, sociology, and the broader ecosystem
5. Digital media skills: functioning of online news portals, social media platforms, user-generated communication; challenges, feedback/interface with online communities
6. Evaluation and impact of media narrative

Skill Enhancement Modules

7. Understanding news/conceptual framework
8. Writing for media (press releases, press note, press brief, backgrounders, rejoinders, etc.)
9. Media handling (organizing news conferences, interviews with journalists, follow-up, strategic handling of critical media)
10. Public awareness through public information campaigns and “third-party endorsement”
11. Using ICT and soft skills
12. Community outreach and social mobilization

Pedagogy

Facilitator-led discussions; case studies with audio-visual clips of disasters that have occurred in the past; classic cases of success and failure in handling disasters; examples of media coverage; role-plays; hands-on skills; simulations; mock drills; group work; best practice sharing; case studies; ad campaigns during disasters; examples of pamphlets/handouts that can be made on spreading awareness

Teaching support of disaster management experts to be enlisted for modules 1 and 2 in the core category

District Commissioners/Civil Servants

Objective: As it is used for objectives, in my view it is fine. It is used in the similar manner for Objectives for various courses

Duration: 3–5 days

1. 1. Leadership skills
2. Understanding media
3. 3 Understanding news
4. Perception management
5. Media interface (hands-on skills on how to prepare for a media interview, press conference, and media brief)

Pedagogy

Facilitator-led discussions; sharing of case studies: classic failures and success stories; role-plays; simulations

Faculty

The faculty would ideally consist of media academia of great standing; media practitioners who have covered disasters and well-versed in upcoming and new media, management, and practices; and most importantly senior officers from the NDMA.

BDOs/Panchayat Heads

Objective: To enhance the capability of BDOs/panchayat heads in community sensitization and mobilization in disaster preparedness, rehabilitation, and providing emotional support to traumatized people through folk and other interpersonal media

Duration: 3–5 days

1. Understanding disasters
2. Need for leadership among panchayat heads and BDOs
3. Mobilizing communities/self-help groups

4. Use of folk media in sensitizing communities on disaster preparedness
5. Learning the use of IT, community radio, and mobile phones in reaching out to communities
6. Preparing stories for community radio from grassroots

Pedagogy

Role-plays; mock drills; video clips/films on disaster management

Faculty

District magistrate, I&PR experts, and folk artists drawn from within communities and local resources

Civil Defense, Police, and Para-military Personnel

Objective: To sensitize them on the need of communication in times of disaster; understanding media and its role in disaster management and community outreach; art of listening and articulating their concerns and sharing with authorities

Duration: 1 week

1. Disasters and role of communication
2. Understanding media
3. Leadership skills
4. Community outreach
5. Media literacy

Pedagogy

Mock drills; video clips; films on disaster management; facilitator-led discussions

Faculty

NDMA officers, I&PR experts, and media faculty

NGOs/CSOs

Objective: To sensitize NGOs working at the grassroots level and in urban areas on disaster communication; to mobilize local community organizations and public to participate in the disaster management; and to developing skills in media interface

Duration: 3–5 days

1. Understanding disasters
2. Community mobilization
3. Enlisting volunteers, mock drills
4. Media literacy

5. Use of IT, community radio and mobiles, community newspapers/wallpapers, and pamphlets in reaching out to communities

Pedagogy

Facilitator-led discussions; role-plays; mock drills

Video clips; films on disaster management

Faculty

I&PR experts and folk artists drawn from within communities and local resources

Media Personnel

Objective: To sensitize media reporters on disaster management, sharing standard operating practices (SOPs) followed in disaster management, thus facilitating media to report disasters sensitively and authentically and source information efficiently and from credible sources

Duration: 2–3 days

Core Modules

1. Disasters and disaster management preparedness at macro and micro levels
2. Disaster communication, stakeholder segmentation, and challenges
3. Speaking for the voiceless
4. Grief journalism: legal and ethical perspectives
5. Skill enhancement modules (writing, editing skills)

Pedagogy

Facilitator-led discussions; case studies of recent disasters: critiquing media coverage; case studies of international disasters; interactive VCD/DVD comprising a tool kit on disaster management; dos and don'ts in disaster coverage (participative discussion); hands-on skills; simulations; role-plays; mock drills; sensitization on appropriate use of terminology; footage keeping in view public's sensitivity

Faculty

Senior members of academia drawn from media schools and NDIM senior officers in charge of strategy and operations

Conclusion

There are two realities: one, the world is faced with many current and future disasters, both natural and manmade that need to be addressed and handled to save the humanity of anxiety, sufferings, deaths, and destruction; and two, we live in an age of information and a global world where the problems are not bound by geographical boundaries. Information dissemination is central to an effective disaster

management. The digital media with a large chunk of user-generated content, *sans* editorial filters, often has the potential to create difficult situation for both the disaster managers and the news consumers. It is therefore important that information disseminated from various sources not only is fact-based but at the same time is empathetic and sensitive. Effective communication is a learned discipline. Disaster management, a trans-disciplinary phenomenon, requires synergy not only from among various disciplines but also with various stakeholders. Preparing them for effective communication and media handling will surely contribute toward handling disasters professionally and more importantly empathetically with a human touch.

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Media and Communication in Disaster Risk Reduction

88

Juhi Ramrakhiyani

Contents

Introduction	1390
Need for Appropriate Media and Communication	1391
Types of Media: Effective Advances in Communication Technologies	1391
Conceptual Framework	1393
Disaster Communication Via Proper Media Channels	1394
Role of Information Dissemination in Disasters	1395
Media and Tools for Dissemination of Messages	1395
Need of the Hour: Effective Electronic Media	1396
Challenges and Limitations	1397
Positive Outcomes	1397
Negative Outcomes	1397
Conclusion	1397
Bibliography	1398

Abstract

Population explosion, unplanned urbanization, overutilization of resources, unscientific development in risk-prone zones, environmental degradation, unprecedented climate change, and rapidly changing demographics reflect the increasing vulnerability of India to debacles. The development of multi-hazard surroundings to which hundreds of thousands of human beings in the world are uncovered highlights the significance of making sure that the affected population is better prepared. The aggregate of human and financial losses, collectively with redevelopment costs, make disasters both humanitarian and economic problem. Even as sizable scientific and material progress is made, the loss of lives and property due to disasters has not yet reduced. Hence, media and communications forge a link between the public and government to bridge this gap. It is the core element and performs a crucial function in rescue, response, and recovery.

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operations. In a country like India, media provides a large potential and probability for enhancing disaster resilience and chance to manage and increase the capacity building for early warning and education. As a result, with righteous use of media and communication, the emergency organizations can strive to prepare a resilient community with increased capacity building resources.

Keywords

Disaster management · Indian context · Emergency organizations · Media and communication

Introduction

With increasing trends of debacles over the world, mankind has been exposed to huge loss of lives and property. Estimating the frequency and severity of debacles occurring all over the world, it becomes of utmost importance to strengthen the preparedness, risk reduction, and response strategies. The increasing use and acquaintance with technology even at the remotest places have made the world just one click away. Taking advantage of the technological resources, it will help not only to prepare for a better understanding of disasters but also to strengthen the mitigation measures leading to disaster risk reduction. These advancements have changed and improved the scientific findings, increased capacity, and have created better networking and connecting, better resource utilization and mobilization, and greater participation and awareness aiming for sustainable development.

Although disasters cannot be avoided, the risk of calamities can be avoided by taking proper risk reduction measures. Mostly all the developing countries in recent times have faced increased frequency, intensity, dimension, and trends of disasters be it natural or anthropogenic in nature. Hence, the need for proper **risk reduction** along with proper preparedness and management approaches has to be emphasized upon.

Among the various aspects of disaster management, communication plays an important role as it connects affected people and communities with relief measures. Communication and information dissemination is the foundation of all the activities of the society. But many a times, communication becomes one of the biggest menace when it fails to address and implement disaster solutions, both conceptually and their application. Better communication is achieved when the communication done is accurate, reliable, and accessible. The ever-increasing demand for efficient communication in disaster risk reduction and management has aimed to achieve minimum rate of fatalities and damage to property. Communication is an important key in all the phases of disaster, i.e., pre, post, and during the disaster, and gives a way forward to make a resilient society against various debacles. It therefore would be prudent to choose that media channels that will provide not only information but share real-time reality of the situation. It further reflects the need to have accurate and efficient communication via proper media channels to reduce the confusion which otherwise

may lead to dissemination of inaccurate mitigation measures. Various factors highlighting the urgency to work on the process of media and communication are efficient logistics distribution, synchronization, and multi-sectorial cohesion.

Need for Appropriate Media and Communication

Many a times in debacle-like situations when warnings are not accessible in remote areas, not accurate enough, not in vernacular language, and not consistent, then media and communication play a crucial role of disseminating the correct information to the society and communities at the time of catastrophe.

Communities are so overwhelmed in the face of a disaster that they often lose track of progress and development. Therefore, it is important to gather correct and accurate information by reaching out to the local native people in addressing their problems. Communication and media should not just focus on the lives and property lost but must also aim at preventing further damage by proper dissemination of warning and information. The inability of society to cope up further makes the development and economy paralyzed, unraveling the unpreparedness of our society.

Media and communication play a vital role in preventing humanitarian mis-happenings by providing not only timely information about various remedial actions to address the emergencies but also help in demonstrating how resource allocations can be achieved. Media plays an important role in transmitting information and facts from the place of disaster incident to the targeted society and specific communities.

With an increase in disaster-like situations all over the globe at an alarming rate, it is only important to have a better and effective communication with an aim (1) to understand the types of media platforms, their access, and reach among the target communities and (2) to know how frequently or timely information and relevant data can be provided by various media platform.

Types of Media: Effective Advances in Communication Technologies

During the onset of a disaster, it is of utmost importance to keep the morale of the affected community high, create self-confidence in them, prevent panic, and maintain law and order by assuring and making available all the necessary help readily and quickly. Disaster media and communication implies to pass on the “right information at the right time.” In a country like India, there are three major types of media: (1) electronic media (TV, radio, electronic gadgets), (2) print media (newspaper, leaflets, hoardings, brochures, and pamphlets), and (3) satellites, wireless communication, and DTH. Technology has a crucial role in information gathering, analysis, and dissemination during all the phases of a disaster. Hence, when integrated with considerable linkages (Fig. 1), media can work effectively for resource utilization (Table 1).

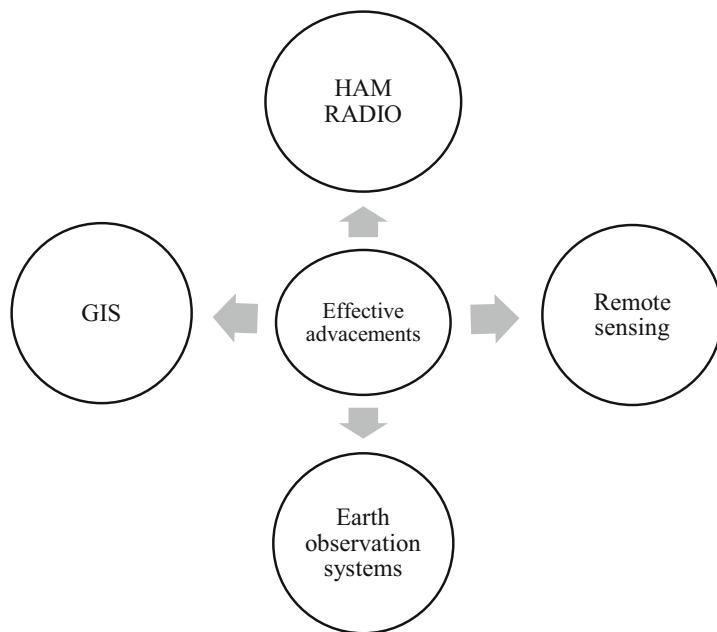


Fig. 1 Advances in communication technologies

Table 1 Linkages between communication technologies and hazards

Hazards	Satellite information	Print media	Radio and TV
Floods	Meteorological data	Education for evacuation and local strategy for communities	Dos and don'ts, transmitting warnings and alerts
Volcanos	Thermal sensor data	Education for impacts and localization of resources	Transmitting warnings
Earthquake	–	Educating about construction evacuation and building codes	Dos and don'ts during all the phases of disasters
Cyclone	Meteorological data	Transmitting current status and evacuation	Warnings and alerts

1. HAM Radio

With effective and sophisticated technology, the electronic media has made the world to connect just by one click, but imagine a scenario when all the ground-level communications and network gets disrupted during calamities like earthquakes or floods. During such emergencies HAM radios can play an important role.

HAM radio, also known as amateur radio, is the use of radio frequency spectrum for purposes of wireless exchange of messages, self-training, and emergency communication. HAM radios have been of great help at the time of natural calamities. HAM radio, in fact, has become a core requirement for reaching out to remote areas. HAM radio involves the combined use of two units – transmitter and receiver – which facilitate a two-way communication across the world. HAM radio station acts as “second saviour” of communication when existing public communication links fail to act.

2. Remote Sensing

By developing the potential of early warning systems with the help of space technology, mobilization of resources including communication and tele-medical services can be carried out. Remote sensing provides a database from which the evidence left behind by past disasters could be interpreted. When disasters affect large areas, no other system works efficiently than remote sensing which provides a matching spatial coverage. Remote sensing allows for the monitoring of event during the time of occurrence; hence it gives a real-time scenario which when communicated leads to more timely remedial measures.

3. Earth Observation Systems

Satellite communication capabilities, fixed and mobile, are vital for effective communication, especially in data collection, distress alerting, mapping locations of calamities, and coordination of relief operations in the field. Satellite maps help to map the situation which can be further communicated and implemented at the place of the disaster. Communication satellites play a vital role in providing information about disaster warning and relief management.

4. Geographical Information System (GIS)

GIS uses geographical and computer-generated maps as an interface for integrating and accessing massive amounts of location-based information. It is of great help in communication of disaster preparedness and response.

Conceptual Framework

All catastrophes are chaotic and dynamic in nature creating emotional, physical, and social disorder. It is always a matter of concern that often panic, somehow wholly and truthfully unfounded, resulted in deadly disaster loss. The community, being the first responder, reacts immediately at the onset of a disaster. Hence, for effective management and communication, it is important to correctly channel and portray the use of media so as to not only disseminate information but make sure it is an accurate one which would provide a way forward to the affected people. Media and communication act as core aspects in the exchange of information and social interactions. The concept is to make sure that the disseminated information is not sourced, hoaxed, invalid, and uncertain with a potential to create chaos and fear which is troubling to the society (Fig. 2).

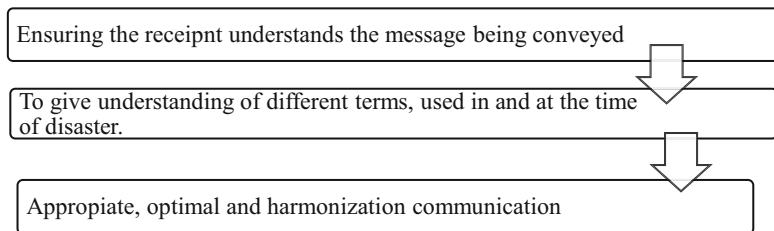


Fig. 2 Information dissemination method

Disaster Communication Via Proper Media Channels

This includes mainstream broadcast media such as TV, print, and radio, direct mailers such as flyers and brochures, outdoor mediums such as billboards, collaterals such as airline and bus tickets; and localized tools such as community radio, person-to-person contact, street plays, and other community events.

Disaster communication plays a vital role in raising awareness among the communities regarding different types of disasters, disaster-prone locations, and disaster preparedness and mitigation, along with survey of post disaster need assessment in a sustainable way to minimize the potentials hazards with the active help of media.

Well-planned interactions with the media could be of great help to bring down the intensity of damage done and will help to save greater amount of life and property. Hence passing of information and facts is very important in the process of efficient media and communication in disaster management.

Effective communication acts as a liaison between the government and local communities to ensure proper allocation of resources. The need for proper media and communication channels for disaster communication arises out of the ever-increasing scenario of misinformation, disinformation, rumour-mongering, and fake news, which has multiplied with the augmentation of social media platforms and user-generated communications.



It observed that media was negatively correlated with the perceived information obtained via social media and the traditional methods of communication and media were preferred more. While the social media has its own benefits of providing real-time experiences faced by the communities at the time of disaster, it also helps them to receive an immediate response action (Fig. 3).

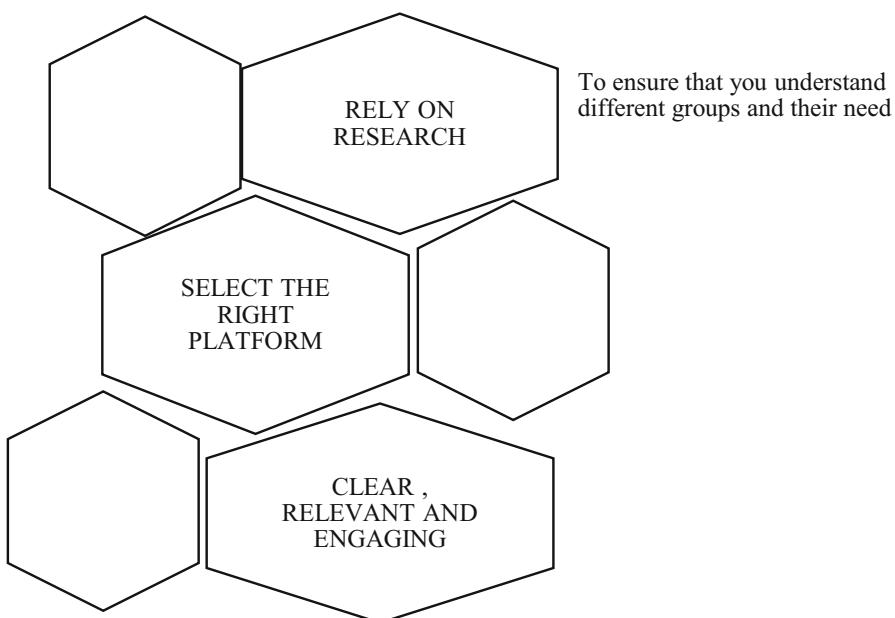


Fig. 3 Ways to communicate about risk

Role of Information Dissemination in Disasters

It is a well-known fact that information is power and influence. The perception of disaster risk and its management plays a vital factor in the better understanding of behavioral and emotional decisions that the affected communities in the disaster-prone areas are likely to make. Some of the anthropogenic and natural disasters are preventable; hence the media can educate and forewarn people about the consequences of human movements and operations that may lead to catastrophes.

Media provides information on the pertinence of securing communication, identifying susceptible spots, and focusing attention on vulnerable or disaster-prone areas. The role of information dissemination becomes important as it can be circulated using different mediums keeping in mind individuals of different ages, genders, regions, etc.

Media and Tools for Dissemination of Messages

Different tools and technologies are required to effectively and properly disseminate messages and information to a large section of target audience, down to the last mile. The major thrust of the strategy focuses on opting for measures and tools that have a direct impact on the specific group or community helping all the divisions and sectors of the society. This includes mainstream broadcast media such as TV, print,

and radio, direct mailers such as flyers and brochures, and outdoor mediums such as billboards.

When observed it came to light that most of the rural people and also communities living in remote areas predominantly relied on television broadcasts and Doordarshan, the public broadcaster, to obtain disaster information. Young section of the communities often obtained information with a constant use of social media and the Internet.

Need of the Hour: Effective Electronic Media

While natural disasters cannot be prevented totally, their effect and impacts can be mitigated or reduced to a large extent. Hence, timely and adequate actions are required which calls for a large amount of resource allocation, which can be mobilized quickly and judiciously if a correct information dissemination path is to be followed. With the help of timely, accurate, and accessible news media primarily electronic media, a real-time scenario is exhibited, and hence prompt actions are now available which lessen the loss of human life and property. It is not possible to publish and outsource print media, i.e., newspapers and leaflets, every half hourly or hourly basis, but it is definitely possible to warn and inform mankind with continuous update via electronic media either by running news, graphical representations, or scrolls. It is not only easily accessible but the quickest and fastest means of information dissemination and plays a pivotal role in saving lives. Besides this, electronic media plays an important role in the societal governance, as it helps to educate the society at every stage of disaster and plays the role of an educator in the aftermath of a disaster. Furthermore, modern communication tools come in the form of state-of-the-art technology at low cost options at every phase of disaster (Fig. 4).

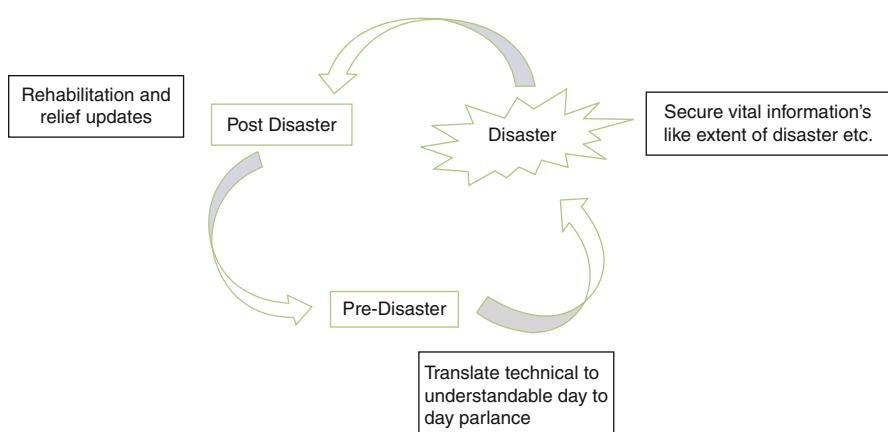


Fig. 4 Role of electronic media at all phases of disaster

Challenges and Limitations

One of the greatest barriers which needs to be addressed is language in disaster management. It has been observed that local language is mostly used and preferred by a large section of the most vulnerable within the communities. Therefore, all efforts reaching out using local/vernacular language and material prove to be effective. Language becomes a major bottleneck in the remote or inaccessible areas. People who have rudimentary knowledge or no understanding of the language suffer the most. Also the print media is not only inaccessible but it is so difficult for newspapers or leaflets to reach the remote areas, especially in times of floods and cyclones as often the roads and trails are disrupted compared to areas which are well connected otherwise.

Positive Outcomes

It is usually the media that declare debacle as official.

- Instant information with real-time scenario
- Continuous, factual and timely dissemination of information
- Greater coverage of spatial area making it easier to locate the places with intense disaster effect
- Timely resource allocation

Negative Outcomes

- Hoax, miscommunication
- Exaggeration of incidents and events
- Sentimental issues and irresponsible covering
- Uncontrollable price rice
- Bias reporting

Conclusion

Regular monitoring, interaction, and communication with media before the debacle proves to be an effective pathway for information flow and provides a way forward in the aftermath of a disaster. Despite all that it is not always possible to prevent all the losses and damages, even with effective implementation decisions, but honest efforts pave the way for future learning. Such efforts also create positive perceptions about the authorities in the public mind. Losses and damages often are unequally distributed across systems, regions, and sectors and are not comprehensively addressed by current financial, governance, and institutional arrangements, particularly in vulnerable developing countries. Hence, an inclusive disaster risk reduction

(DRR) has to be focused on. Continuous monitoring and evaluation is mandatory to strengthen the preparedness and rehabilitation processes with the help of media and communication. Media acts as a quick vehicle in the dissemination of information on risk reduction in the best, quick, accessible, reliable, and accurate manner. Hence, it should be used effectively and efficiently.

Inclusive governance that prioritizes equity and justice in adaptation planning and implementation leads to more effective and sustainable adaptation outcomes. Although media and communication play an important role in disaster risk reduction, they are not synonymous, and without compromising the integrity of either one, much can be done to communicate to the public.

With proper integration of media and communication, integrated, inclusive planning and investment in everyday decision-making about urban infrastructure, including social, ecological, and gray/physical infrastructures, can significantly increase the adaptive capacity of urban and rural settlements. Development processes are timely, anticipatory, integrative, flexible, and action focused; therefore proper dissemination of information becomes imperative in disaster management.

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Disaster Communication and Trust

89

Thi Thuy Hang Nguyen and Truong Gia Bao Tran

Contents

Introduction	1400
Disasters in Vietnam and the Role of Media	1401
Disaster Communication: Case Study	1403
Trust	1408
Conclusion	1411
References	1412

Abstract

It is not only because of climate change that many societies today face devastating hazards, but Asian countries like Vietnam must deal with emergencies that can have natural or man-made causes. Examples include earthquakes, tsunamis, floods, landslides, droughts, and pandemics, such as the recent COVID-19.

Therefore, disaster risk management is an important task for all governments and the mass media. Not only does the mass media play a pivotal role before, during, and after disasters occur, but it is also responsible for raising awareness of potential risks and measures to mitigate the negative impacts of disasters. Monitoring disasters and initiating countermeasures are two particularly important tasks for all those responsible for disaster management.

However, how can the media gain the trust of the public when reporting on disasters that are already taking place? Even nations with a wealth of experience in dealing with such events, such as the USA and Japan, have faced criticism from the public in the past for their disaster communication strategies. After all, although people often panic during catastrophic events and then demand

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immediate responses, it always takes time to determine the reasons for a disaster and for communicative problems as well. This chapter discusses disaster communication in Vietnam by analyzing a specific case, the communication during the 2020 floods in central Vietnam. It then identifies the causes of the communication problems and proposes solutions to the challenge of securing public trust. The research results are based on the analysis of disaster communication in the context of a case study; methodologically, we rely on content analysis.

Keywords

Disaster · Communication · Trust · Vietnam

Introduction

The role of communication has been acknowledged as vitally important in disaster management. Communication before, during, and after a disaster can generate warnings, connect victims, and contribute to dealing with disastrous consequences. A trustable and easily accessible system of communication is also key to disaster recovery of a community. Communication plays an indispensable role in all four stages of disaster management, including alleviation, preparation, response, and restoration.

The emergence of new media and information technology in the past two decades has resulted in a larger capacity of the communication system during a disaster. Paul (2001) analyzed the contents related to disaster rescue, pinpointing an exploration into the theoretical definitions regarding interaction and applying that interaction in disaster communication. Tanner et al. (2009) analyzed disaster communication on the Internet, focusing on mobilizing information in local television channels in relation to disasters in order to make implications for health protection and for future emergencies too. Muller and Gawenda (2009), in a report by the Centre for Advancing Journalism in Melbourne University, have pointed out six roles of Australian newspapers in reporting news concerning local forest fires. Veil (2012) analyzed the strengths and drawbacks of lacking mutual knowledge among administrators and news correspondents in reporting on the emergent state. Meanwhile, the author emphasized five benefits that newspapers can offer the public. This trend of research was clarified in the context of Japan by Takekawa (2014), after the catastrophic 2011 earthquake and tsunami.

Several authors discussed disaster communication in a world where communication is rapidly changing (Haddow and Haddow 2013). In this chapter, the authors have indicated the roles of technical tools, applications, and new connections between public and local authority in emergent and disastrous events. Haddow and Haddow also pointed out ways for effective disaster communication, comprising transparency, increasing accessibility, and information reliability together with the collaboration between different means of communication. Particularly, the role of

social media in disaster communication was analyzed in thorough detail by Palen and Hughes (2017), Lovari and Bowen (2019), Mirbabaie et al. (2021), etc.

Several research studies have centered on the practical dimension of communication in reporting on disasters. Ewart and McLean (2018) classified news reporting on disasters into three major categories: planning for pre-disaster news reporting, exclusive interviewing and writing skills about disasters, and editing and production. Peterson (2014) compared the means of news reporting on the storm Katrina and Haitian earthquake to indicate the political characteristics of disaster news. News reporters need knowledge about the history, economy, and politics of the affected area. Lacking these knowledge types possibly leads to cliché and shallow manners of disaster news reporting.

The definition of disaster, disaster management, and disaster communication in Vietnam is mainly based on the United Nations' perspective. A disaster is "a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources" (ISDR, 2009, p.9). Several scientific studies on disaster communication include Phan Van Tu (2016), Nguyen Minh (2020), etc. Vietnam Disaster Management Authority has issued the handbook of instructions for information and communication in disaster prevention (Vietnam Disaster Management Authority, 2021). Nevertheless, Vietnamese has witnessed no research study exclusively centered on disaster communication and trust via case analysis in terms of disaster communication in Vietnam.

In this chapter, initially, we list the common disasters in Vietnam, followed by a case study on disaster communication in Vietnam – news reporting on the floods in central Vietnam. This region frequently suffers from natural catastrophes, one of which is the heavy rainfall and flooding in 2020 that caused a substantial loss of human resources and property. 355 news articles on this catastrophic event in *VnExpress* and *Tuổi Trẻ Online*, two news sites with the largest numbers of readers in Vietnam, from 2020 to 2021 were analyzed. In addition, readers' responses and comments were included in the analysis. We aim to answer the following questions: How do the public form their trust in disaster communication? What do they trust and why? What makes them skeptical about information reliability? How do administrators and news reporters gain the public's trust?

Disasters in Vietnam and the Role of Media

According to the United Nations Office for Disaster Risk Reduction (UNDRR), in the past 20 years, globally, it is estimated that disasters of various types have increased by 75%, caused over one million casualties, and affected over four billion people, which leads to the economic loss of approximately 3000 billion USD. A noticeable fact is that Vietnam is among the five countries which suffer the most severely from global climate change. "Within 20 years, disasters such as storms, floods, landslides... have caused more than 13,000 deaths, property damage of 6.4

billion USD, and threatened approximately 60% of land and over 70% of the population with disastrous risks" (Nguyen Van Ngan, [2021](#)).

On April 22, 2021, the Prime Minister issued Decision 18/2021/QĐ-TTg to set regulations on predicting, warning of, and reporting on disasters and disastrous risks for activities on preventing, responding to, and minimizing the damages of disasters and restoring disastrous consequences in Vietnam. Accordingly, the disasters that need predicting, warning, and reporting comprise the following: (1) storms and tropical depressions; (2) heavy rains, floods on the rivers within the territory of Vietnam and rivers that flow through multiple countries, flooding, flash floods, landslides, and subsiding land; (3) heat, droughts, and saltwater intrusion; (4) strong winds from the East Sea and fogs on the East Sea and the land of Vietnam; (5) sea level rising higher than coastal areas and islands of Vietnam; (6) whirlwinds, lightning, hail, cold, and frost; (7) forest fires due to natural causes; (8) earthquakes whose magnitude is greater than or equal to 3.5 (on Richter scales or equivalent) and which can affect Vietnam; (9) earthquakes whose magnitude is more than 6.5 Richter or equivalent and which occur in the ocean and can cause tsunamis affecting Vietnam; and (10) tsunamis which occur due to earthquakes in remote oceans and can affect Vietnam.

According to the statistics published by the Central Steering Committee for Natural Disaster Prevention and Control, "in 2020, Vietnam witnessed 16 types of disaster, specifically: 13 hurricanes in the East Sea; 264 strong winds, whirlwinds, heavy rains in 49 provinces and cities; 120 flash floods, landslides; particularly, the heavy rains and floods occurring from the 6th to 22nd of October 2020 in Central Vietnam; 86 severe earthquakes, droughts, saltwater intrusion, sliding riverbanks, shores, subsiding sea dams in the Mekong delta" (Nguyen Van Ngan, [2021](#)).

"Communication plays an important role in providing information, knowledge, skills, raising the public's awareness, and effectively contributing to disaster prevention and control, which partially minimizes the number of casualties and residents' properties" (Vietnam Disaster Management Authority [2021](#)). Accordingly, communication is required to meet the demands for rapid speed, high accuracy, and accessibility to diverse groups of the public. The content should be brief, understandable, and appropriate based on each type of disaster, conditions, characteristics of the local area, and each group of residents. The content and frequency of information should be frequently updated and adjusted accordingly to the duration and risk levels of the disasters. It is required to use all means including direct and indirect ones to communicate, including television channels, voice channels, printed newspapers, electronic newspapers, social networks, direct communication, local methods, etc. The format and content of communication products should be attractive, appealing, and accessible to target groups and use local dialects in the areas for the ethnic minorities.

Communication prior to the disaster plays an educational role in terms of laws, knowledge, skills, and solutions to preventing and controlling disasters. During the disaster, communication must provide information related to the conditions, duration of the disaster, cautions, instructions on coping with the disaster, managing and steering activities, and coping with disasters at multi-administerial levels. After the

disaster, communication reflects the activities of steering and restoring disastrous consequences, instructing on solutions of restoration, and lessons which can be withdrawn. Therefore, the Government of Vietnam has issued quite detailed and specific guidelines concerning communication activities for disaster prevention and control. In the next part of this chapter, we will analyze a specific case in terms of communication during a disaster, in more detail, that is the information communicated on *VnExpress* and *Tuổi Trẻ Online* in relation to the floods in 2020 in central Vietnam.

Disaster Communication: Case Study

VnExpress is the online newspaper with the largest number of readers in Vietnam. In 2020, the newspaper attracted over 40 million frequent readers, more than 10 billion views, and five million comments from readers. The age range of readers is from 18 to 60 years. *Tuổi Trẻ Online* also remains one of the five online newspapers which have the largest numbers of readers in Vietnam. According to Similarweb, in March 2022, total visits *VnExpress* was 148.3 million and total visits *Tuổi Trẻ Online* was 61.5 million. Hence, disaster communication in these two newspapers has profound impacts on the public.

In relation to the floods in central Vietnam, statistics points out there were 184 articles on *VnExpress* and 171 articles on *Tuổi Trẻ Online* with the content as follows (Fig. 1).

As there was not a big gap between the number of articles regarding the disastrous flood on *VnExpress* and on *Tuổi Trẻ Online* (184 and 171, respectively), both

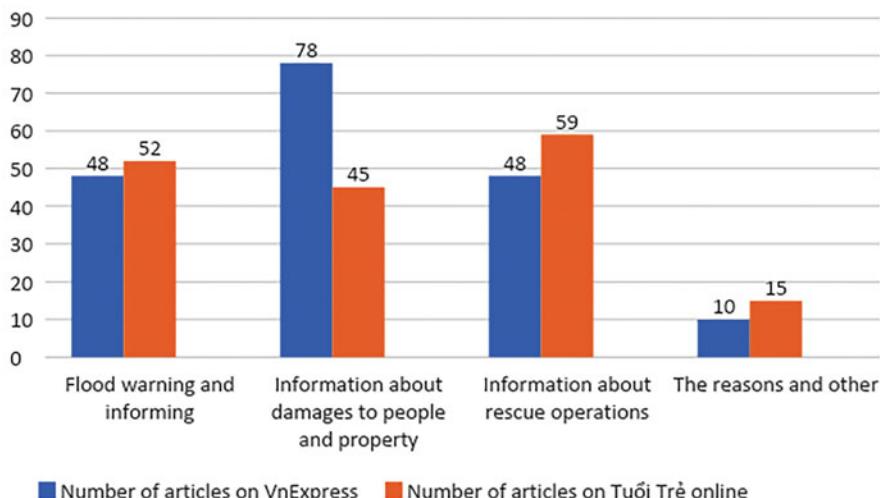


Fig. 1 The articles related to the disastrous floods in central Vietnam on *VnExpress* and *Tuổi Trẻ Online* in 2020–2021. (Sources: Statistics by authors)

newspapers' efforts in spreading awareness of the importance of this topic were relatively similar. The content of each subject of the two newspapers has various similarities – communication in terms of floods and heavy rainfall in central Vietnam before, during, and after the disaster. We will now analyze the content of these articles in more detail.

Firstly, the warnings and informing related to the floods and rain accounted for 26% of the articles about the disastrous floods and rain on *VnExpress* and 30% of those on *Tuổi Trẻ Online*. The two newspapers frequently updated their readers of the heavy rainfall, rising flood levels, and warnings for areas against the risks of landslides. Specifically, a series of articles in October 2020 on *VnExpress* gave warnings against flooding and rainfall. "The central is facing 3 tropical depressions" (*VnExpress*, October 10th 2020), "Tropical depression in the East Sea" (October 10th 2020), "Storm weakens, another tropical depression in the East Sea" (*VnExpress*, October 14th 2020), "Hurricane Nangka weakens to tropical depression" (*VnExpress*, October 14th 2020), "Tropical depression entering the East Sea" (*VnExpress*, October 15th 2020), "Heavy rain continues in the central" (*VnExpress*, October 19th 2020), "Severe hurricane at level 8 approaches the East Sea" (*VnExpress*, October 20th 2020), "Heavy rain in the central, rising flood" (*VnExpress*, October 29th 2020), etc. In comparison to *VnExpress*, *Tuổi Trẻ Online* also published a larger number of news articles about the warnings of the floods and rain, provided information about the conditions and duration of the disaster, and instructed on coping with the disaster, in order to meet the public's needs and expectations of this topic. October 2020 alone, in which the disastrous weather phenomena occurred in central Vietnam, witnessed the publication of 30 articles on *Tuổi Trẻ Online*, which continuously warned and informed readers of the rains and floods.

Secondly, the damage to persons and property by heavy rains and severe flooding took up the largest proportion of the content in disaster communication (42%) on *VnExpress*, attracting the greatest interest and number of readers' responses. Seventy-eight out of 174 described damage to persons and property in the disaster. On October 15, 2020, *VnExpress* reported: "Two landslides buried 30 people within two nights"; 70 commentators expressed their grief toward this loss. On October 18, 2020, *VnExpress* published three articles concerning the damage due to the disaster: "Floods and rain devastated the central for 12 consecutive days," "Floods and rain cut off many areas in the central," and "84 casualties due to floods and rain in the central." A couple of days afterward, *VnExpress* continuously informed readers of the disastrous damage: "102 deaths, 160,000 houses flooded due to floods and rain" (October 19th 2020), "Hill slide destroys border guard station Cha Lo" (October 10th 2020), "People's great loss due to the great flood" (October 21st 2020), "Residents cross the river on cable lines" (October 22nd 2020), etc. On October 28, 2020, *VnExpress* wrote the article "Record-breaking numbers of the floods and rain in the central," but the records had sad connotations: "Flood on the Kien Giang River (Le Thuy district, Quang Binh) peaked at 3.91 meters in 1979 but at 4.88 meters on October 19th 2020, causing continuous flood." On November 28, 2020, Deputy Minister of Agriculture and Rural Development Nguyen Hoang

Hiep spoke to *VnExpress* about the damage and lessons from the floods and rain in the central: “The disasters have become more severe; never in history have floods and rain occurred as severely as this time. 249 deaths, 57 missing, over 1500 houses collapsing; nearly 240,000 houses damaged or removed of their roofs. The substantial damage to agriculture includes the loss of 4000 hectares of rice, 7600 hectares of vegetables, 12.670 hectares of fishery; 38.500 cattle, 3.200.000 poultry; 165 km of dams in the sea, riverbank, 50 km of damaged revetment; 88 sliding spots along the shore with the total length of 141 km. The total loss is estimated at 30.000 billion VND. These are uncompleted statistical data. The hurricane and floods have long-lasting effects uncountable in numbers” (Tat Dinh, “Damage uncountable in numbers due to the rain and floods in the central,” *VnExpress*, October 29th 2020).

On *Tuổi Trẻ Online*, 26% of the articles of disaster communication reflected the severe damage to persons and property; October 2020 alone witnessed 25 articles about this topic. Many of the articles described the great grief of the families who lost members right in the titles: “Mountain landslide, families separated during the floods in the central” (October 10th 2020), “Gruesome grief in Tra Leng: Student collapses on returning to her village to look for her parents” (October 29th 2020), “Landslide in Tra Leng: It couldn’t be more gruesome” (October 30th 2020), etc. (Fig. 2).

Thirdly, on *Tuổi Trẻ Online*, articles about rescue activities made up the largest proportion, accounting for 35% of the articles about the disastrous floods and rains in central Vietnam. Fifty-nine articles on *Tuổi Trẻ Online* were centered around this topic, affirming the steering role of the government in while-disaster rescue operations (“Helicopters to distribute aids for residents in isolated areas due to landslides,” October 23rd 2020; “Prime Minister Nguyen Xuan Phuc: Financial aids for residents to repair houses,” October 30th 2020), the participation of the health sector



Fig. 2 Flood in Quang Ninh district, Quang Binh province (Photo: Đức Hùng. Source: *VnExpress*, 19/10/2020)



Fig. 3 A military helicopter and its crew braved strong winds and rough seas as they lifted a crew member of Vietship 01 up from the ship. As the rescue mission took place, storm Linfa was heading to the central region (Photo: Giang Huy. Source: *VnExpress*, 3/11/2020)

(“Ministry of Health demands activation of mobile units for aids in the flooded area,” October 29th 2020; “Ministry of Health supplies more medicine for Quang Nam, assigning 7 units to the central,” October 30th 2020), the involvement of foreign affairs sector (“Units for foreign affairs commits to support residents in the central,” October 19th 2020), the engagement of the military (“Region 5 Command Unit together with 200 soldiers search for the 45 buried people in the landslide area,” October 29th 2020; “Thousands of residents, soldiers climb hills to carry aids to the isolated areas,” November second 2020), etc. In addition, support and aids come from people across the country, businesses, international organizations, governments, etc. (Fig. 3).

Twenty-six percent of the articles about disaster communication on *VnExpress* analyzed aids and rescue operations (48/184 articles), equal to the number of those about warnings and information about the rain and floods in the central region. The articles on *VnExpress* centered on the rescue operations by the government: “Thousands of billion spent on repairing roads after the rain and floods” (October 19th 2020), “Soldiers help residents restore their lives after the floods” (October 25th 2020), “Prime Minister claims no hunger, no homelessness” (October 24th 2020), “Propose 6500 tons of rice for 4 provinces in the central” (October 26th 2020), etc. Additionally, aids and support for residents in the central were from the whole country, artists working inside and outside Vietnam (“Artists donate for residents in the central,” October 13th 2020; “Vietnamese artists in America call for donations for residents in the central,” October 20th 2020), women (“Women cook thousands of meals for flooded people,” October 20th 2020), youths (“Youth rescue flooded people to be awarded the title Youth with Bravery,” November 16th 2020), national and international organizations (“UNICEF aids the central with 61 billion VND,” November 17th 2020), etc.

In the two newspapers, another subject about the disastrous rains and floods in the central area is analyzing their causes. *VnExpress* published 10 articles about this subject, and the number was even 15 for *Tuổi Trẻ Online*, taking up 6% and 9%, respectively, of all the articles about the disaster. The newspapers attempted to indicate the causes in the articles “Mass flooding in the central because hydropower plants discharge floods through the spillway” (*Tuổi Trẻ Online*, October 11th 2020), “Why continuous rain and floods?” (*VnExpress*, October 15th 2020), “Controversial effects of small-scale hydropower plants on rain and floods” (*VnExpress*, October 30th 2020), etc. Mr. Nguyen Van Huong, Head of the Weather Forecasting Department, National Centre for Hydro-Meteorological Forecasting, indicated four causes for the heavy rain in the central region. The first cause is the intertropical convergence (of the Northwest and Southwest winds) starting from the Bengal Bay, traveling across central Vietnam to the Philippines. The second cause is hurricanes and tropical depressions. The third one is the cold air, which is constantly supplied from the north, together with a moisture-rich East wind, all of which form a huge moisture-rich air that was measured 5.000 meters from the surface. All of them were situated in the central, causing more rainfalls and continuous floods. The fourth cause is the terrain blocking winds – the Truong Son Range, which blocked the cold air and Northwest winds flowing to the central, forming a strong atmospheric convection which results in heavy rain (“Expert’s specifications for landslides in the central’s mountains and hills,” *VnExpress*, November second 2020).

Nevertheless, disaster communication is a complicated issue. During the disasters, particularly the rains and floods in the central region in 2020, while the causes and impacts require a certain amount of time for evaluations and accurate conclusions, the discernible effects led to the public’s feelings of insecurity and need for urgent solutions. While the authorities cannot fulfill these needs, a crisis of belief begins, and any attempts to rebuild trust after the disaster seem challenging. Impacts of environmental disasters cannot be restored even during a long period, which further increases the difficulties in communication.

We analyze the percentage of positive, negative, and neutral news stories in two online newspapers by defining what would be positive, negative, and neutral news on disaster communication (Fig. 4).

It is noticeable that neutral news took up the largest proportion (45%) with a total of 80 out of 171 articles related to the disastrous floods on *Tuổi Trẻ Online*. The number of negative articles (48/171) and positive articles (46/171) were similar, accounting for 28% and 27%, respectively. *Tuổi Trẻ Online* maintained a relatively neutral tone when writing and reporting about the floods in central Vietnam as well as the rescue efforts. Meanwhile, on *VnExpress*, with 85/184 articles about the disastrous, negative news made up the largest proportion of 46%. These negative articles were mainly centered around loss of human life and properties as well as confrontations to the government about the causes of the floods. Twenty-six percent of the articles were positive news which provided information about rescue activities. The remaining 28% were neutral news about warnings against the floods. When reporting about disasters, *VnExpress* has a concise way of presenting the information, which is quite professional. They constantly update data about the loss caused

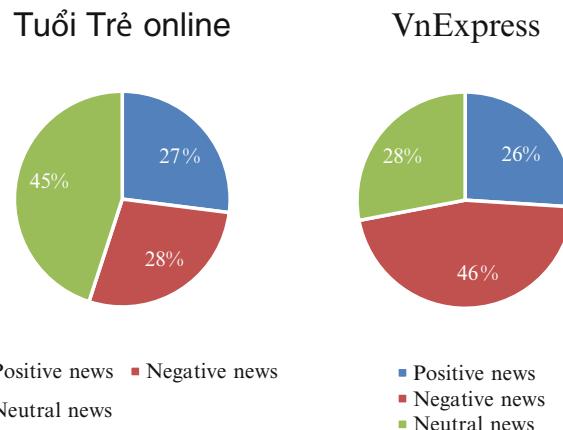


Fig. 4 Percentage of positive, negative, and neutral news on *VnExpress* and *Tuổi Trẻ Online* on disastrous flood in middle Vietnam 2020

by disasters – the topic readers are most concerned about, so this explains why this online newspaper receives the highest readership in Vietnam.

Communication about the rains and floods in the central area in 2020 gained a certain level of trust of residents in giving warnings and information about the weather phenomena and the damage to persons and property. Nonetheless, the public's trust decreased when they read about the rescue operations, aids, and cause analysis of this disaster. In the next part, we will analyze in more detail the public's trust during the disaster via the readers' comments in the newspapers.

Trust

The rain and flood events in central Vietnam in 2020 were a terrible disaster for its residents. From September 2020 to November 2020, the central area faced eight hurricanes in succession, two tropical depressions, and two constant periods of rains and floods starting from the sixth to 22nd of October 2020. The heavy rainfalls and flooding in the central region in 2020 are regarded as an extreme historic weather event, with the caution level of IV (disaster which causes serious damage to property, environment, persons, cattle, and poultry, which are too difficult to restore, which weaken the economic and financial conditions of multiple regions and provinces) according to the five-level scale for disaster risks in Vietnam. The rains and floods in the central region in 2020 were predicted by the hydrometeorological forecasting units. On September 13, 2020, the National Centre for Hydro-Meteorological Forecasting, Viet Nam Meteorological and Hydrological Administration, Ministry of Natural Resources and Environment, published hydro-meteorological evaluations for the year 2020, predicting that the central region is prone to extremely severe

floods. Thus, the government successfully built the public's trust in disaster forecasting.

During the disaster, the press provided diverse information about the conditions and duration of the disaster with rapidity, accuracy, and accessibility to target groups of the public. The information about the disaster remained one of the topics that drew the largest attention of the public, which was evident in the public's subscription to and interaction with the newspapers. We compiled statistics and noticed that there are a total of 2.774 readers' comments in 184 articles about the rain and floods in the central region on *VnExpress*. In addition to comments of grief and sympathy for the loss of the people in the central region, a large proportion of comments questioned the authorities' specifications for the constant rains and floods.

Particularly, when the Head of the Weather Forecasting Department, National Centre for Hydro-Meteorological Forecasting, indicated four causes for the heavy rain in the central, immediately 46 responses from the public skeptically questioned the lack of nonnatural causes such as deforestation and mass construction of hydropower dams blocking the flowing of rivers (Gia Chinh, "Why continuous rain and floods in the central?," *VnExpress*, October 15th 2020). Hence, the authorities' explanations could not truly convince the public.

Deputy Minister of Agriculture and Rural Development explained the causes of the rain and mass flooding in the central in an interview with *VnExpress*: "Large-scale hydropower lakes never discharge floods illegally, and the small-scale lakes are "not determinable"" (Tat Dinh, "Cannot determine whether small-scale hydropower lakes discharge floods illegally," *VnExpress*, October 20th, 2020). Fifty-eight comments from readers raised questions like: "Each lake has its measurement for floods discharging. If it is claimed that small-scale lakes are 'not determinable', then who supervises and takes responsibility for accidents?" and "Once it's a hydropower lake, it needs supervising?" The public probably had incomplete trust in the explanations of the authorities.

In the government's online newspaper, in the explanations for "Why the central faced heavy rain and continuous floods," only the weather patterns for heavy rain were mentioned as the cause of constant rain, whereas the central "fully stores water" "in the previous hurricanes and tropical depressions, resulting in predictable landslides and flash floods in the central" (Do Huong, *Government Electronic Newspaper*, October 16th 2020). Such explanations are not satisfactory to the public since they do not focus on the problem. It is, therefore, hardly possible to gain the trust of broad sections of the population through such statements. According to specifications of independent experts, Assoc. Prof. Vu Trong Hong, former Deputy Minister of Agriculture and Rural Development, President of Vietnam Water Resources Development Association, "Constant serious deforestation and degrading vegetation result in severe landslides when the central region faces flooding. 'Grief-stricken consequences of claiming forest resources'" (Thuy Linh – Vu Long, "Why disastrous floods, landslides occur constantly in the central," *Lao Dong Newspaper*, October 30th, 2020).

According to the statistics by the Forestry Administration, between 2016 and 2019, the area of damaged forest rose to 7.283 hectares, showing that Vietnam lost

2,430 hectares of forest annually. The major causes for the reduction of natural forest area are the shift in the use of land and overexploitation, especially in the coast of the central and Central Highlands. Deforestation has decreased vegetation in the drainage basins and the resistance to flowing floods, leading to rapid movement of floods. Besides, deforestation in the upstream areas is a result of logging, agricultural development, implementation of hydroelectric power plants, etc. All are responsible for the catastrophic floods and landslides in the central region. However, the causes provided by the government are only centered on climate change and the instability of the weather, so the public seem not persuaded.

Besides, experts are responsible for the public's skepticism. On October 30, 2020, Vietnam Digital Communication Association organized the forum "Small-scale hydropower plants and the flooding issue," in which the specialists presented conflicting ideas about the effects of small-scale hydropower plants on rains and floods. Specialist Nguyen Tai Son stated that small-scale hydropower plants did not cause floods to occur but reduced their number. Nonetheless, Dr. Nguyen Ngoc Chu refuted this idea. Dr. Chu asserted that small-scale hydropower plants could not contribute to the regulation of floods but increase their consequences: "The amount of discharged water is not greater than the natural flow, but the flowing speed increases, leading to more serious damage by flood waters" (Gia Chinh, "Controversy related to effects of small-scale hydropower plants on rain and floods," *VnExpress*, October 30th, 2020). In addition, he posited that the construction of multiple small-scale hydroelectric power plants possibly paralleled the exploitation of the natural forest. The article attracted the interest of a large proportion of the public, with 241 comments.

We analyzed 241 comments and found that 146 comments agreed that small-scale hydroelectric power plants increase the severity of floods, 46 comments refuted the possible effects of small-scale hydroelectric power plants on floods, and 59 comments proposed other specifications related to climate change, global warming, etc. (Fig. 5).

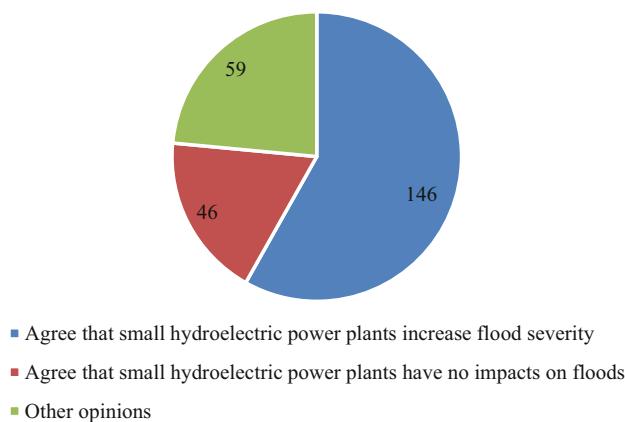


Fig. 5 The number of readers' comments about the impact of hydroelectric power plant on floods

A multitude of responses of the public showed a great concern: “Each expert proposes an idea conflicting with those of others, which brings about skepticism for people like me” (Mon), “Hope that after these storm and floods, the experts can provide guidelines for the future to relieve the suffering of people” (Uyen), etc.

In disaster communication, the key action is to build trust of the public. During a disaster, when people are terrified and disoriented, the guidance of the government, specialists, press, and communication units can contribute to orienting and building trust of the public. In conclusion, we will propose several principles for building trust of the public in disaster communication.

Conclusion

In this chapter, we have indicated a few disasters in Vietnam and analyzed disaster communication reflected on a specific case that is communication about the rains and floods in the central area in 2020 and the public’s trust. The public only gain trust in case of access to rapid, accurate information about the conditions, duration of the disaster, warnings, instructions to face the disaster in a detailed manner, and logical, direct explanations for the disaster’s causes. During the catastrophic rain and floods in the central region in 2020, the skepticism about the real causes of the disaster resulted in the public’s distrust. How can the government regain the public’s trust? We propose several measures.

First, independent specialists and civil and social organizations should be engaged in evaluating the impacts and damage of the disaster. When the public no longer trusts the government and governmental organizations, more trust is placed in independent experts and social organizations which are regarded as objective or supportive.

The *second* principle emphasizes statistical data and scientific statements. When the audience distrust the government, they maintain their trust in scientific data. Consequently, the provision of scientific data on the mass media in a manner understandable to the public can partially lift their skepticism.

The *third* principle revolves around the ability to control. The government’s ability to control manifests in determining the causes, effect size, solutions of restoration, and solutions of prevention in the future. The government is responsible for large-scale management; thus it is vitally important to have the public acknowledge that the initial statements are parts of a long-term plan to control disasters.

The *fourth* principle is cautiousness. If the public’s trust is lost, any action or statement is viewed in the angle of skepticism. Thus, the government should not necessarily make quick conclusions; instead, emphasis should be placed on evaluating the current status, which builds the public’s trust.

The *fifth* principle is responsibility. The public constantly ponders: who takes the responsibility? It is a must to hold an individual or organization accountable for inaccurate claims, not validated information. The public can easily lose trust but also willingly forgive if they are informed of the responsible individual or organization that apologize and propose solutions for the future. This is how trust can be restored.

Trust restoration proves a challenging issue that requires time; however, in case of utmost determination, the government can always find a solution.

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Social Media as a Catalyst in Disaster Risk Governance

90

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Contents

Introduction	1414
Social Media as a Catalyst for Disaster Risk Governance	1414
Cases of Social Media Use During Disasters	1415
Australian Bush Fires	1415
Kerala Floods	1416
COVID Response	1417
Challenges of Governing Social Media	1418
Discussion and Glance at Policy	1419
Why We Need a Social Media Policy in India	1419
Areas of Policy Intervention	1420
Conclusion	1420
References	1420

Abstract

In the last one decade, social media has grown exponentially, invading geographical limitations, administrative boundaries, and even the apparent illiteracy of technology for aid. Meanwhile, this development has helped to veer off from the traditional trajectory of predominantly one-way line of communication in mainstream media, from a media-audience relationship to a media-actor/responder frame. Although there are various usages of social media before, during, and after a disaster such as early warning dissemination, preparedness guidelines, occurrence, aid requirements, and information shared in the immediate event become critical for effective response, often however resulting in a flood of information on social media, popularly referred to as “infodemic,” posing a major challenge in the decision-making process and overall management of disaster. Hence, there is a requirement of “social media policy” that places emphasis on the state-specific

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mandates for the usage of social media during the time of disasters for acting as a catalyst in the decision-making process and enhancing the response mechanism during the time of disasters. This chapter tries to explore the current integration of social media in disaster management plans while exploring the current trends and challenges in the usage of social media for disaster response.

Keywords

Social media · Technology · Communication · Disaster · Governance

Introduction

A result of the multiple international and intercontinental conflicts and a continuous race for information, the accelerated technological advances and innovations are probably few of the positive outcomes from the turn of tumultuous situations. Until the last century, sharing of information or access to information in a shared time or concomitantly by more than one point of access became critical for conflict resolution and management. Internet emerged as a merger of multiple networks in the next few decades, primarily reserved for the military and gated academics. However, the need to *access* and *share information* modernized, and Internet slowly started evolving as a necessary additive in multiple uses. A product of the Internet, today, social media bypasses the dominance of traditional forms of communication media, including telephony, radio, television, paper mail, and print media. Instead, social media has expanded infinitely, through blogs, web feeds, and other forms of expression through the virtual communities and networks. Social media is often treated as a collaborative project, between multiple stakeholders. Micro-blogging websites such as Twitter have been lauded as one of the key tools to facilitate the organization of social congregations by serving as a stitching mechanism (Jeff Hemsley, 2018). Facebook, a social interaction platform where people from different walks of life converge, has also worked in tandem with people in different geographies.

Social Media as a Catalyst for Disaster Risk Governance

Disaster risk governance has evolved to be an entrepôt, critically placed between risk information and a processing system, wherein information is fed and then disseminated as decisions. These decisions affect how risks are perceived and how different agencies of change foresee impacts and act on them. According to the “Risk Governance Framework” of the International Risk Governance Council (IRGC, 2017), the processing system is none other than governance, which regulates how risk is appraised, and related concerns are analyzed and communicated, and management decisions are taken. It engages risk management through multiple actors and assigns rules, principles, and mechanisms to streamline decision-making. In a complex world where governance and its evolution may hold the key to disaster risk

reduction (Albris et al., 2020), social media provides a futuristic opportunity for polycentric decision-making and managing the impact of such decisions. Crowe (2012, 93) maintains that “the concept of how social media is impacting traditional response scenes, situational awareness, and public information...is merely the beginning of this conversation.” This is particularly due to the attributes of social media that allow for quick and cost-efficient methods of communication across the disaster management cycle rendering itself to multiple uses beyond the reaches of traditional emergency management. For example, research suggests that using convolutional neural networks (CNN) in geo-coded hyper-resolution images from social media platforms such as Twitter can extract flood depth information at a 65% success rate and monitor landscapes for urban flooding (Wang et al., 2018). Similarly, the emerging significance of citizen science has also pushed the “human sensor” factor into weather forecasting, where “in-field” assessment of hazard circumstances can result in “real-time” or live mapping of the actual occurrence (Rossi et al., 2018). A comparative analysis between human-rendered mapping and forecasted reach of hazard can expand on furthering the reach of social media into disaster reporting, response, and recovery. Social media has helped digitalize aid giving community network structures and improve relief to the last mile. In the instance of multiple collectives and groups working in tandem, questions on reliability of information can be a critical hit to giving and receiving help. In such cases, social media has aided to “cross-fertilize” information, wherein information is automatically screened as it is under scrutiny by multiple groups during or after disasters and is actively validated by ground-truthing (Mauroner & Heudorfer, 2016). Social media is a most viable channel of disaster mitigation through avoidance of loss. In a study spanning 496 households in the aftermath of the Bangkok floods (2011), it was discovered that social-media-enabled households reduced flood losses by an average of 37% (USD 3708 per household) (Allaire, 2016). Similarly, social media had positive and significant impacts on resilience-building behavior of farmers in Zanjan Province of Iran (Bathaiy et al., 2021). Additionally, considering countries with intensive agriculture such as in India, droughts, floods, and erratic weather patterns come as unwelcome obstacles to sustenance. Social media can be used by both central and regional governments to ensconce the value of social media in educating communities for improving coping capacity and resource planning as a G2C (government-to-citizens) communication tool. Social media adds on to governance as a vital tool as it performs the task of social cohesion, bringing together stakeholders for collective decision-making and an inclusive and integrated disaster risk governance.

Cases of Social Media Use During Disasters

Australian Bush Fires

Bush fires have blazed persistently in Australia for centuries. Regional government agencies, such as the Forest Fire Management Victoria (State of Victoria (Department of Environment), 2021), have tracked significant events, from the most recent

fire event in 2019–2020 to dated historical events such as the “Black Thursday” fire disaster in 1851. With multipronged losses spanning natural, economic, and cultural assets, lives, and trauma every year (Pitman et al., 2007), it is understood that the devastation in the country evolved to be chronic.

Throughout this timeline, modernization of communication technologies, in terms of cost and reliability, gave both the community and institutions space to improve action against the risk – deliver real-time to near-real-time information to at-risk populations, endorse collaborative field operations by the community and emergency managers, disseminate warnings, volunteer resource management, etc. In January 2013, when the Derwent Valley, Bicheno, and Forcett fires in Tasmania were ravaging through the homes, bush, and farmland, the community quickly picked up social media as an information dissemination channel alongside traditional information broadcasting devices. The “Tassie Fires – We Can Help(TFWCH)” Facebook page was initiated as an effort to organize the string of information and queries related to evacuation, shelter and refuge center, areal extent of fire, road closures, and largely requests for help (Irons et al., 2014). With a follower count of almost 21,000 within the first few days of creating the page, emergency services, such as the police, started sharing updates, charities, and donations opened up in a bid to assist in rescue and care. TFWCH also crowdsourced volunteer groups and utility workers to help local farms and industries recover in days’ time before the government support system could respond, thus avoiding substantial economic losses. The page was later developed independently into a social website on the Internet.

After the 2009 Black Saturday fires, Victoria woke up to widespread power outages, animal casualties, and land lost in February 2014 owing to fires from lightning strikes. In the 13 days, both emergency management organizations and people on the ground were galvanized into action, sharing around 7981 tweets through Twitter (Abedin & Babar, 2018). Users utilized “mention,” a tool commonly used in microblogging platforms, to attract the attention of emergency response institutions. Nearly 45% of the tweets by these institutions had been re-shared among the community for use.

Prior to the 2019–2020 bush fires, the New South Wales government released its State Emergency Plan(EMPLAN) and specified in its supporting plan the use of Facebook, Twitter, and Instagram as appropriate channels for broadcasting warnings and messages. During the fire season, the Australian Capital Territory (ACT) Emergency Services Agency posted 397 times. They shared graded warnings based on risk, updates on firefighting efforts on the ground, and also livestreamed media conferences on Facebook for remotely viewing users (Atkinson et al., 2021).

Kerala Floods

Kerala is the southernmost coastal state of India located at tip of the peninsula. In the year 2018, Kerala witnessed one of the deadliest disasters due to incessant rains, breakage of dams, and consequent massive flood. This was rare one in a hundred-year disaster which left that state in complete chaos as it was not prepared to

withstand such level of flooding. This event affected more than four million people, more than one million people were sheltered in relief camps, and around 500 people were killed. As per government data, 387 deaths were confirmed.

Communicating here became a challenge as phone lines were either busy or damaged. However social media platform with its wide reach to larger audience provided easy dissemination of information from victims. It enabled rescuers to attend to the people struck at unknown locations (Babu et al., 2019). This also ensured timely help is provided and any potentially fatal consequences could be averted. Further relief requests and needs were identified through group and individual posts and messages. Through which the necessary aid was arranged and distributed via volunteer networks united online. More importantly social media helped people stay connected and share about their whereabouts as well as well-being with family, friends, and acquaintances. The hashtags had significant role to play and were popularly used as #Keralaflood, #Keralafloodrelief, and #emdrf. Apart from this, people also shared general information such as on weather, road conditions, eyewitness photographs/videos, location status, do's and don't's, and even their emotions and sufferings. According to a research by Rekha Rani Varghese and Yadukrishnan T (Varghese & Yadukrishnan 2019), five social media websites had been frequented the most, viz., Facebook, YouTube, Twitter, Instagram, and WhatsApp. Out of these five, the most effective as per their study was WhatsApp followed by Facebook and Instagram. They also analyzed the time spent on these websites where they found that YouTube, WhatsApp, and Facebook were frequented for longer duration in the order mentioned. They also discovered that large number of people used Facebook Safety Check and few used Google person finder too.

COVID Response

During the spread of COVID-19, citizens who have access to social media platforms such as Twitter, Facebook, Instagram, TikTok, and WhatsApp as well that has a feature of sharing updates through status messages have played a vital role in impacting the actions of the community. A major part of the generation, specifically GenZ and millennials, used social media platforms during first wave of COVID-19, for not only sharing the insights on COVID-19 but also unverified claims of infection dense areas, symptoms, and rumors that resulted in uncontrollable virtual noise – resulting in widespread infodemic. To respond to such issues of infodemic, during the time of disasters, a mandate regarding the legal consequences of spreading rumors through social media platforms should be brought in place for keeping the disaster response process smooth.

From the first wave to the fatal second wave of Delta, the social media platforms were used for finding out the resources such as medicines, blood, hospital bed, oxygen cylinders, etc., as the second wave of Delta created a major pressure on the available resources. It was observed that the community strongly came forward as the *first responders* by using social media as a tool.

Challenges of Governing Social Media

Social media is a veritable tool of behavior and action. At the heart of the Web 2.0-based application lies the exchange of content between two or more users where they establish their identity, interest groups, and networks and initiate actions. What is thus most significant about this contraption is that it functions through the expression of intention, perception, and other back-end philosophies of the social media design. This *use* is also the biggest challenge to its sustainability in the disaster management domain. For example, during the 2011 East Japan earthquake and tsunami, platforms such as Twitter and Facebook became of unparalleled importance as people took to vital response and relief operations simply through the sharing of crisis information (Peary et al., 2012). Their communication on media, through community-based status reports, location-specific query building and resolving, and damage and injury counting, became streams of information in real time. In other words, social media aided in emergency management by letting people inadvertently take on the role of conscious and motivated risk information sensors (Resch, 2013). However, backed by a still-traditional perception of policy and action, most emergency management institutions on the other hand enforce hierarchical mode of operations through *commands, which are one-way directives*. This perspective limits quick multi-actor collaboration on the ground and leaves little space for people to become more than just beacons for *receiving help*. Although social media provides several typologies of information which can be segregated into thematic interventions throughout the crisis management cycle, the reluctance of the crisis management governing body to utilize them renders people on the other side unable to participate in recovery, rehabilitation, and restoration of their own communities.

Trust-building is a critical factor required for a successful collaboration through social media. An analysis of its usage in communicating risk during urban floods in Bandung City of Indonesia in 2018–2019 claimed that poor results could be attributed to a *lack of trust as to how social media could be used, or misused, or even be ineffective*. It was a visible impasse as the local emergency management body could not place trust in the citizens' intelligence and "authenticity." Meanwhile people also doubted the local authority's "willingness" to *take their queries placed through social media seriously and act promptly* (Mansyur et al., 2020).

Social media governance is a particularly tedious paradigm in itself as the prospect of accountability is difficult to be visualized at the policy-making stage and implemented on the ground during or after crisis situations. Since social media converts into streams of data flow, concerns such as regulation of privacy and ethical standards, presence or lack thereof of strategies to safeguard the objective of the emergency management governing body, priority management of crises, risk communication, and education and training of personnel among others take precedence immediately. Digital disparities, such as the lack of accessibility to Internet services, are made possible due to geographical limitations, and also complex socioeconomic causes such as illiteracy take away the opportunity to avert risks through social media. In such cases, the inability to deliver correct and effective risk

communication through social media lessens its purpose and likeliness to be utilized within the domain further.

Discussion and Glance at Policy

Social media policy for disaster risk management is required to address the following objectives:

- Avoiding a situation of infodemic
- Responding to disaster in an organized manner
- Ensuring authenticity of information
- Increasing the scale of outreach by receiving real-time information

Why We Need a Social Media Policy in India

Social media policy in India is required for *streamlining the activities of disaster risk management*. IEC (information, education, and communication) is a significant component of *disaster awareness*. All the IEC material consists of a major guideline that directs the individual to not spread rumors with reference to disasters. Due to the integration of social media in the process of disaster risk management, the problem of *infodemic* and rumors has increased, thereby creating major challenges in organized and smooth response during the time of disaster. Rumors during the time of disaster can not only hamper the process of disaster response but also lead to increase in the adversities during the time of disasters due to the creation of panic generation among community.

Safety Check feature by Facebook has been found useful during the time of disasters as Facebook community. During the dust storms of May 2018 in India, 10,000 people used the feature to mark themselves safe from the dust storms that claimed the life of people from Uttar Pradesh, Andhra Pradesh, West Bengal, and Delhi (<https://www.firstpost.com/tech/news-analysis/facebook-safety-check-feature-used-by-10000-people-to-mark-themselves-safe-during-dust-storms-in-india-4472679.html>). This highlights the significance of collaborative approaches in the process of disaster risk management. Disaster risk management is everyone's business. The integration of social media platform in the disaster risk management process by the government is essential considering the rapid sharing of information. Hence, social media policy for public-private collaborations in the workflow of disaster management is much required for government regulations.

State-specified common hashtags: During the time of disaster, the social media community use different hashtags for disaster communications. Hence, it is required that the "state" must come up with *common hashtags* that people must use during disasters, and it can be used by the government through the integration with geospatial and 4IR technology to generate the geospatial knowledge, which will ultimately help in providing the coordinated response.

Areas of Policy Intervention

- Agenda point 7 of Prime Minister's 10-point agenda on "Utilise the opportunities provided by social media and mobile technologies for disaster risk reduction."
- Transformation in *disaster response* is evident since the advent of social media. Social media acts as a catalyst in disaster response phase of disaster risk management through quick movement of information. Also, it acts as a platform for two-way communication, thereby enhancing the overall response process and mitigating the risk.
- Considering the relevance of social media and technology, it is significant to strategize the usage of social media in terms of a policy document that are legally binding for the purpose of avoiding ruckus due to the spread of rumor during disasters, thereby making the community/the user of social media and technology more responsible.
- A social media strategy/policy document should also contain framework of collaborative approaches as the collaborations and partnerships between government and industry will enhance the workflow/cycle of disaster management.
- Inclusion of usage of social media in disaster risk management plans.
- SOP for using social media platforms during different kind of disasters.
- Mandate for using specific hashtags during disasters as suggested by the National Disaster Management Authority or State Disaster Management Authority.

Conclusion

The root cause of the existence of social media lies in its ability to share information from one to manifold, with nominal to no burden of exuberant efforts or costs to the users. When applied to disaster risk governance, the tool has shown to proliferate but is limited by the actual treatment and response to it, whether by public administrations, emergency management organizations, communities, and individuals. The above-mentioned case studies of contemporary disaster situations and their turnout with respect to the use of social media help infer the urgent need to streamline its use and introduce implementation frameworks. They can be in the form of policies that guide an organized way to utilize the tool without the fear of virulent rumor-building, incorrect information transmission, and disparity among responders to disasters. Additionally, such policies will be more effective when designed as specific strategies, SOPs for execution, and built with clear rules of responsible action.

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Pandemic and Brand Communication in India

91

Tanu Dang

Contents

Introduction	1424
Brand Communication During Pandemic	1425
Brand Collaborations During Pandemic	1428
Corporate Social Responsibility and Brands	1429
Digital Presence of Brands	1430
Conclusion	1431
References	1432

Abstract

The recent Covid-19 pandemic, which shocked the entire world by its spread and devastation, has changed the way brands sell and people buy. There has been a transformative change in how brands connect and communicate with the audience. The pandemic outbreak and subsequent lockdown coupled with the increased risk of health and hygiene made the brands rethink about their strategy and performance. During the pandemic, brand attitude and brand reputation gained greater relevance over brand positioning. Consumers not only evaluated the ways in which brands dealt with the pandemic but also shifted loyalty if their brands failed to act responsibly during the crisis. Brand communications evolved new ways to humanize their brand in order to make it more relatable to their consumers.

The crisis made the brands more focused on consumer experiences. Successful brands were quick to adapt, innovate, and ramp up experiences and safety measures for their consumers thereby enabling trust and promoting business recovery. Through various examples from India, this chapter attempts to analyze brand communication during the pandemic. It attempts to make an important

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contribution to literature by providing evidence of the various strategies that some brands adopted at the time of disaster. By analyzing these strategies, this chapter attempts to guide brands in strengthening their communications and adding more meaning to their message.

Keywords

Brand communication · Consumer behavior · COVID-19 · CSR

Introduction

COVID-19 emerged on the global map as a crisis that no marketer was prepared for. All countries faced the dual challenge of combating health crisis and dealing with dipping GDPs. The Chief of International Monetary Fund, Mr. Kristalina Geogieva compared the economic situation prevailing in 2020 to the period of Great Depression of the 1930s and pointed out that with about 170 countries witnessing negative GDP growth rates, this could be the year of worst global fallout. Pandemics have been a part of human history, however many global experts have termed this pandemic as a “Black Swan” event. The magnanimity of such epidemics might have varied over the years but they have always disrupted business, altered buying behaviors and greatly impacted marketing and branding strategies. There may be several factors responsible for this impact (Jonas, 2013):

- (i) Decreased consumption levels as customers choose to skip purchasing certain commodities and services purchased earlier.
- (ii) Higher indirect costs arising from lost labor and manufacturing.
- (iii) Offsetting and cascading impacts resulting from disrupted services like travel, etc.

Some of these changes are often temporary but many are permanent and have a lasting impact on the way business is conducted. Indian economy has suffered a major setback during the pandemic. The impact of the pandemic was seen across all sectors. The tourism, hospitality, and aviation industry that contributes around one tenth to Indian GDP was greatly impacted by the travel ban. The overall sectorial loss is expected to be around USD 16.7 billion, with direct and indirect job losses of close to 50 million (Grant Thornton – FICCI, 2020). Imposition of lockdown during the pandemic gave an initial boost to the Fast-moving consumer goods (FMCG) sector due to inflated panic buying demands of food, groceries, organic products, health, hygiene, and sanitizing products but the supply was soon disrupted by cumulative effects of lockdown, manufacturing protocols, supply chain disruptions, etc., leading to a flat growth in the sector. Remote working and travel restrictions surely proved beneficial for the telecom sector with increased demand of data and network. Business Standard, 2020 reported an estimated 1% increase in overall traffic and 20% increased viewership on OTT platforms. The closure of schools

and higher education institutions further created new opportunities for EdTech companies to bridge the gaps of online learning. Recent developments in business have forced the firms to reconsider their present and future marketing and branding strategies in order to maintain a constant revenue stream. Though most businesses ensured to convey their messages in tune with the global health emergency, they also anticipated future changes in market, more competition, and a requirement for innovative and aggressive marketing strategies. Most brands adopted business models that were conducive to short-term survival and long-term resilience and growth. While none of the brands were prepared for a disruptive event like COVID, most of them maintained the spirit of determination, supportive collaborative efforts, and used innovative communication strategies to engage the buyers.

Several researchers in the past have looked at the marketing activities during many forms of crises with a broader perspective. The shortage of supplies and services, rising costs, and change in buyer behavior leading to changes in profitability (Kotler, 1974), the ability of brand equity to mitigate product harm during crisis (Gao et al., 2015), marketing crisis, threatens marketing goals, reduces ability to control marketing environment and gives short response time (Clark, 1988) are some examples. In an attempt to arrive at a definition of marketing crisis, Clark T. (1988) pointed out that “Marketing crisis has more to do with how the marketers view the situation rather than how the situation actually is. In such a crisis scenario, marketing decision makers are a critical key to dealing with crisis.” However, there is little evidence of knowledge around marketing during pandemic, which offers an unexplored opportunity to study and document the marketing practices undertaken by brands during this time.

Brand Communication During Pandemic

Brands are intangible assets of a company that customers interact with. In most cases a brand is something that consumers need, value, associate, and communicate with. Brand communication is a powerful tool used by organizations to nurture relationships with its internal and external publics. Therefore, marketers put considerable effort in designing brand communications that contribute toward creating and maintaining positive attitude of the customers toward the brand. Brand communication has always played an important role in creating positive attitude toward the brand (Kempf & Smith, 1998). Research has shown that emotionally driven messages often create a positive brand attitude and brands, specifically in the Indian market, have always tried to touch the emotional chord of buyers through their messages. But during this pandemic, brands owners realized that it was time to use empathy and connectedness as main drivers of communication. Marketing communication by most brands focused on 4 Cs – Care, Compassion, Community, and Collective Action. Brand messages were creative and innovative, intertwining the lockdown experiences of the customers and convincing them in the most creative way on how their product or service was either the need of the hour or how the brand was concerned about their well-being. Communicating during the pandemic was like

walking on a tight rope for the brands as they had to continue communicating without sounding insensitive to the crisis. The message of social distancing was echoed by all prominent brands in their creative ads. The Indian dairy brand known for its creative ads reminded people to wash their hands, maintain social distancing, and stay indoors throughout the pandemic. In fact when Doordarshan re-broadcast the popular mythological shows Ramayana and Mahabhatta, one of the brand not only sponsored the show but, on demand of the customers, built up on the public nostalgia by running its old ads according to the dates when the show was originally broadcasted. According to marketing experts, this helped it gain a spotlight while other brands were struggling to make an impact in the midst of the pandemic.

Communication is an important socializing phenomenon and the power of communication in relationship building has been recognized by theorists in its various connotations. In marketing too communication plays a pivotal role in building brand awareness, brand recognition, and brand recall. As Kempf & Smith (1998) pointed out, brand communication is the most important component in maintaining customer interactions and cultivating positive brand attitudes like brand satisfaction and trust. Several studies in the past have also shown that consumers' brand satisfaction can be greatly influenced by direct brand communications. In most cases effective communication is used in combination with other marketing strategies by the brands to build long-term relationship with its buyers. This communication may be one way in which brands deliver messages through mass media to introduce a new product, create brand awareness, enhance brand visibility, and gain consumer attention. The primary goal of this communication is to influence purchase behavior of the customer favorably toward the brand. However, with the emergence of digital technology and proliferation of digital platforms, brand communication has become interactive and engaging. This has not only led to a massive change in demand and supply of products but has also made the exchange of information between brands and its consumers more dynamic and audience centric.

During a normal situation, most brands communicate to create brand awareness. Advertisements are placed across media to maximize the level of awareness, recognition, recall, and cognition (Voorveld & Noort, 2014). However, brand communication in a time of uncertainty, like the COVID, is very different, as it aims to build brand resilience and retain customer trust. In the midst of the uncertainty that grappled people during COVID, messages that breathed trust and support caught consumer attention. Brands aimed to garner trust by putting across transparent, meaningful, and simplistic messages. Most of the brand messages during the pandemic were seen performing either of the four functions – providing pandemic-related information, providing customer support, offering community help, or comforting and nurturing. While working toward forming the United Nations after the Second World War, Winston Churchill famously said, "Never let a good crisis go to waste." Similarly, brand communication during pandemic ranged from banal to opportunistic to exploitative (Aronczyk, 2020).

Most of the initial messaging undertaken by brands during first wave of COVID were focused around safety, hygiene, and social distancing. Some of the brands created distance in their logos while some others shared their own version of social

distancing through creative messaging. Some brands even used the opportunity to introduce new products based on social distancing themes. With hand washing being the primary guideline issued by all the health organizations, prominent soap brands in India launched hand washing challenge on social media to raise awareness about washing hands for 20 s as recommended by WHO. Apart from popularizing the habit of hand wash, the campaign garnered effective audience engagement resulting in billions of views online. Brands also garnered audience engagement by honoring COVID warriors, sharing their stories, and offering them discounts. A popular mango drink (name the brand) launched an Instagram Augmented Reality (AR) filter through which the users logging in though Instagram accounts could scan its logo to read about the inspiring story of a COVID hero. Another popular brand also launched a campaign under which it curated 100 stories from across the country about people who selflessly helped other people during pandemic and carried them on its liquid hand wash packs. On the packs, the company's logo was replaced with the image of the "Covid Protector" along with their story. It also launched a website to honor these COVID warriors.

Brands, advertising in India, realized that during crisis, messages need to be community-centric. India has a collectivist culture where physical and emotional closeness is important for individual well-being and the community acts as a safety net during crisis. Therefore, communication based on a community's reality has a better chance of being persuasive (Prabhakar, 2022). With the increasing complexities of pandemic seen in the second wave, brand communication joined the struggle for vaccination and oxygen supplies, supporting physical and mental well-being and addressing the issues of loneliness and COVID fatigue. Marketing budgets were curtailed to include CSR activities like supporting health facilities, creating vaccination awareness, increasing employee relief fund, distributing food supplies, and providing assistance to those who were affected. Brands employed affirmative storytelling, demonstrated purpose, and put a greater emphasis on consumers' personal challenges (Fig. 1).

Brand messages primarily went through various stages during the pandemic. With the first hit of COVID and the insecurities it brought along, brand communication mostly focused on health, cleanliness, social distancing, and consumer safety. Despite a growing number of people getting infected with the virus, brands continued to deliver messages of connectedness, solidarity, warmth, and reassurance. As companies came back in business, the messaging focused on consumer safety, contactless practices, home delivery, and adherence to the COVID protocols. Brands also promised better experiences, improved services, and prompt feedback to consumer concerns.

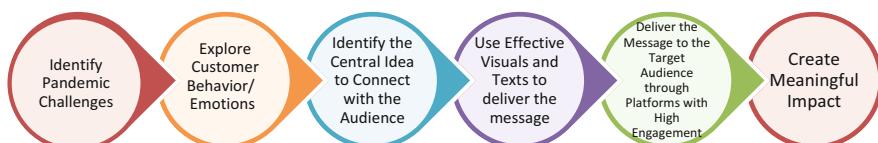


Fig. 1 Brand messaging strategy during COVID

Brand Collaborations During Pandemic

Pandemic made the marketers realize that collaborative working can help them sail through the storm collectively. “The basic aim of collaboration is to pursue goals collaboratively that otherwise would be difficult to pursue” (Di Benedetto et al., 2019). Pangakar (2007) found that when organizations engaged in alliances, it not only helped them to improve their chances of survival during global financial crisis but also helped them to reduce costs, boost production, and bring value to the customers.

This pandemic took the world by storm. It also revealed that there were stark differences among countries in terms of availability of infrastructure, information about the pandemic, and preparedness to deal with the crisis. The situation went out of hand even for the developed Western economies who found it difficult to provide necessary services to its various communities. The situation in developing economies was even worse owing to limited resources, infrastructure, and health facilities. Thus, most brands in collaboration with government and NGOs attempted to coevolve their practices and develop collective capacity to deal with the pandemic.

Major stress was on government and health sector as they were directly responsible for managing and controlling the pandemic. As quoted by New York Times (2020), pharma companies in the USA, China, and Germany shared knowledge and resources to develop antidote for combating COVID-19. Most countries focused on cooperation rather than competition and even relaxed laws to find medical solutions to the pandemic. Pharmacy giants collaborated to find vaccine for the deadly virus. The international financial, technological, and marketing expertise combined with research, development, and manufacturing capabilities of the country led to successful development and distribution of vaccines across India. These partnerships extended beyond vaccines as global pharma giant signed an agreement with Indian generic manufacturers for manufacturing Remdesivir, a drug that became a life savior against the deadly virus.

As lockdown prevailed and people were forced to work from remote locations, it led to sudden increase in demand for data. OTT platforms too became the popular entertainment arena for people locked inside their homes. An FMCG brand capitalized on the situation by teaming up with telecom company to provide up to 2 GB of data with the purchase of its products. The co-branding agreement was based on two important consumer insights: greater data use and individuals spending more time at home, which led to increased food and beverage consumption at home. The brand also collaborated with 20 brands from across the industry to launch a social media campaign that thanked several delivery partners and unsung heroes like truck drivers, delivery persons, farmers, etc., who worked tirelessly during the pandemic to bring happiness to millions of customers. The special branded packs carried custom messages aimed to thank respective brand and unsung heroes in a fun and quirky manner.

On similar lines 75 brands came together to launch a campaign with the aim to boost consumer confidence and give a head start to the jolted economy. The campaign urged the customers to help revive the economy through their purchases.

The campaign not only delivered a positive note about the collective efforts but led to increased online engagement from ten million consumers. Another remembered campaign in this category would be of a popular chocolate brand that used machine learning technology in its advertisement (name brand) to support several local businesses. The ad displayed names of local stores based on the location from where the ad was being watched.

Corporate Social Responsibility and Brands

Corporate Social Responsibility has always been an important determinant of company's perception in the mind of the people. CSR is the responsibility undertaken by the decision makers of the company to take actions that promote the welfare of society as a whole along with their own interests (Davis & Blomstrom, 1975). Huge amount of money is spent by companies in philanthropy, minority aid, and cause-related marketing (CRM) in order to improve their corporate image (Esen, 2013). Many consumers believe that even during the time of crisis, brands focus on profitability than consumer benefit but during this pandemic it was observed that most of the brands not only refrained from unethical practices but also proactively engaged in numerous CSR activities, especially those through which they could provide immediate help and assistance against the virus.

Socially responsible behavior became a major determinant for brand success during the pandemic. Research data shows that consumers switched brands during the pandemic if they felt that their preferred brand wasn't being socially relevant and responsible during the crisis. In a normal situation, it is very difficult for the brands to gain consumer attention and shift their purchase behavior, as their preference for specific brands is already established. However, the current volatile situation motivated buyers for brand substitution if it offered greater value proposition for the buyer. A report by Global Edelman Trust Barometer report, "Brands Amidst Crisis" found that 81% customers considered a brand's engagement in CSR activities as a major factor influencing their purchase from the brand during the pandemic. In the study, 65% customers also admitted that an organization's response to the pandemic crisis will be a major determinant of their future brand choices (Edelman, 2020). Consumers were also intolerant to brands that acted poorly in response to the uncertainties that arose during COVID. According to a March 2020 poll conducted in 12 worldwide markets by Statista, consumers from China and India were the most inclined to give unfavorable reviews of brands that performed poorly in the aftermath of the COVID-19 outbreak (Guttmann, 2020).

An American multinational entertainment and media company spent nearly \$27 million to support community initiatives across the globe during the pandemic. It also used its channel to provide people with timely information, engaging content along with extending its support to large-scale fundraising activities. Apart from providing masks to several countries, the company also managed disposal of used gowns, gloves, masks, and medical supplies. A cash contribution was also made by

its Indian counterpart to Project Mumbai for supplying urgent PPE kits to frontline workers in hospitals of Mumbai.

As stated in CSR report of a non-profit organization of an Indian multinational conglomerate, the company initiated several welfare schemes to benefit the community during the pandemic. Through its various schemes the company tried to extend support in providing food, medical grade oxygen, masks, vaccination, and employee benefits to the people during the pandemic. A prominent electronic company too donated oxygen concentrators, oxygen cylinders, and medical kits to the Government of Karnataka to support the initiatives to fight the pandemic. The oxygen concentrators were flown in internationally to reduce fatalities among the weaker segments of the society in the state of Karnataka. Several top blue chip companies of the country spent CSR funds to support health care initiatives of the government, while some also backed the digital learning and patient tracking software. PPP model was effectively implemented to combat the crisis as government units too supported extension of existing medical facilities through their CSR budgets.

Hospitality industry was the worst hit during the pandemic with curbs on travel, imposed lockdown, and the increasing threat of getting infected, but few prominent hotel chains remained in conversations by opening their doors to doctors and health workers during the emergency. Many hotels also offered quarantine facilities to mildly infected patients. Several travel websites started regularly updating the travelers about the status of COVID and the number of infected patients in the areas who wanted to travel soon after the first wave. Innovative models of corporate philanthropy greatly helped the country to fight the pandemic.

Digital Presence of Brands

India's presence in the digital space has increased considerably. As per the Digital India Report 2022, internet usage increased by 5.4% as 34 million new users joined in the year 2021–2022. Throughout the globe, technological advancements and expansion of cultural boundaries have led to increased use of social media as communication medium as well as a source for gathering information (Tam & Jeong-Nam, 2019). Customization, ease of access, and speed are making digital mediums becoming popular means of reaching out to customers (Dang, 2021). With the imposed lockdown it became the only means. The restrictions on traveling coupled with reduced physical contact further made social media the only resource to search for product information.

While businesses faced a downturn during the pandemic, digital media space became the only source available with the brands for remaining relevant and creating brand experiences. With lockdown imposed in most countries during the pandemic, it became important for the brands to offer digital shopping experiences to the buyers at their door step. Buying became “phygital.” Brands used engaging social media content to build new online communities and keep their brand name ticking in the public mind. As per a report by Mckinsey, the digital transformation has impacted in

such a way that India has already achieved such digital progress by 2020, which was not expected before 2024.

Overcoming the suspended video production facilities, brands successfully utilized user generated content to achieve greater audience engagement, improved reach, and higher return on investment (ROI) at a lower cost. A mobility service provider launched a campaign to promote hygienic traveling and safety precautions taken by drivers. The brand also asked the riders to share their traveling experiences through videos, which were shared on the company's page to build a shared view on safety. Similarly, food brands encouraged people to try new recipes and share it on their page. Sports brands asked customers to stay indoors and engage in various activities. One prominent sports brand delivered the message of staying fit while staying indoors through its campaign, which included videos of people working out in their homes. They also popularized fitness challenge using hash tags and initiated digital workout series named where athletes invited users to fitness challenges. It became quite popular with sports enthusiasts across the globe.

The pandemic also saw a steep rise in circulation of misinformation and fake news through online platforms. While a popular social media platform delivered the message of connecting to help each other during crisis, critics chastised it and other popular social media platforms for their inability to stop the spread of misinformation and fake products through their platforms.

Conclusion

The pandemic was a learning time for most brands as they had to take action relatively quicker than they would have in normal times to stay relevant, responsible, and remembered. Those who were slow on adapting to technology and collaborative working found themselves running short of the new challenges. Even after the return of normalcy, markets are operating in the phygital mode, giving equally rewarding physical and digital experiences to their customers. This crisis also shifted marketing from demand economy to trust economy, and brands realized that a little deviation from the expected lines of behavior during crisis could lead their customers to try alternate brands. Empathy, support, and solution remained keywords for brands as they tried to score best on the report card of their customers. The situation also saw some successful public-private partnerships and CSR initiatives that helped combat nuances of the crisis. Brands have learnt to deliver tailor-made communications and personalized products to their customers and this will remain a trend for future brand communications.

The current disruptions in the marketplace have made the customers even more demanding. Consumers want frictionless, anticipatory, relevant, and personalized experiences. Therefore, brands will have to use machine learning, data mining, and artificial intelligence in their operations to deliver the desired experiences to their customers. Brands will have to build resilience and empathy to compete in the market. The ways in which brands tackle the challenges put forth in the crisis

situation will influence their performance in the post crisis world providing greater opportunity, higher agility, and improved relationships with the buyers and suppliers.

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Disaster Management and Communication Technology: The Prospect of Social Media 92

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Contents

Introduction	1436
Materials and Methods	1437
Media, Disaster, and Communication Technology	1437
Prospect of Social Media	1439
Reachability	1439
Multiple Channels of Communication	1441
Conclusion	1442
References	1443

Abstract

A major concern in disaster management is how to minimize damage to the society. In this endeavor, the prime focus has always been given to saving lives. However, in recent times issues associated with loss of property have emerged as another area of concern. During disaster, the most critical challenge before the disaster managers is how to sustain communication with the affected population and also with those who are likely to be impacted by it. Such a challenge generates the understanding that communication tools do have a significant role in managing disasters. Moreover, the above thinking conventionally has been found to be channelized through the traditional Media like Print media, Radio, and Television. Due to the faster changes in communication technology, we have now social media, which has emerged as an alternative communication tool for study among the scholars working on disaster research. Taking into account the above technological shift, this chapter focuses into how the Indian government

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has used this tool in spreading information to connect with the affected population. How far it has been able to establish a sustained two-way communication within the governmental agencies and with citizens is an area that needs to be assessed. Does it bear the prospect of being a crisis management communication tool in addressing disaster-related issues? All these concerns have been elaborated with the core argument that the use of social media in managing disasters has opened up a new chapter toward digital democracy in disaster management practices.

Keywords

Media · Communication · Disaster · Technology · Citizen and Government

Introduction

Over the past several decades, the frequent occurrence of natural disasters has significantly increased. This has caused in large scale, human injuries, deaths, and damage to property (Klomp, 2016). The loss associated with these disasters runs into billions of dollars, with thousands of deaths and injuries (Lu et al., 2016). This has imposed great challenges before the world community on how to address or manage the consequences of natural disasters (Klonner et al., 2016; Kryvasheyev et al., 2016). To reduce its impact, various management tasks, which include, mitigation, preparedness, response, and recovery, have given prior focus in most of the legal and governmental initiatives. In this process, communication tools have a substantive role. It has been acknowledged among the scholars that communication channels are crucial as they have the immediate responsibility to share information about disaster to the public. In fact, there has been a plethora of research work with regard to communication strategies during various disasters and the role of media. The focus of this chapter while admitting the role of media as a communication technology in disaster management practices is to discuss specifically the prospect of social media as an emerging tool in reaching out to a disparate set of publics. Social media is labeled as new media technology, which has opened a new chapter in communication technology, emerging as an alternative tool to manage disasters effectively. In this context, it is significant to learn about its prospect in creating an effective engagement among various government departments and citizens toward disaster management practices. Does this trend have any substantive association with the idea of digital democracy has been elaborated in the discussion section of the chapter.

The discussion section of the chapter is subdivided into three sections. The first section deals with an overall understanding on the relationship between media, disaster, and communication technology. This has been analyzed in the context of how communication technology is a critical determinant in shaping the relationship between media and disaster. The above aspect is elaborated with two significant trends. One, about information sharing, which primarily connects disaster with

media and the other trend is how media as a communication tool has received a specific attention under global conventions and also in various domestic legalizations and laws. This discussion is followed with a new shift in media communication technology popularly referred as social media that would form a part of the second section. It deals with the prospect of social media technology in setting a new trend in complementing the relationship between media and disaster. This will be analyzed through its capacity of wider reachability and accommodating multiple flow of information. Moreover, how this shift is visible in case of India would be the focus of the third section. It will present a narration on how Indian government has mobilized social media as a communication tool in its disaster management strategy. Finally, the chapter ends with the observation on how the application of social media technology has on the one hand opened up space for democratization in disaster management practices but on the other, it is not free from certain concerns. Gradually, concern appears to be visible over important issues like who is using this platform and the authenticity of information exchanged in this space. In this regard, it is argued that social media technology definitely has the prospect of circulation of information much faster in comparison to other legacy media including newspapers, radio, and television. A cautious approach is recommended to handle social media keeping in view the ethical and normative role of media.

Materials and Methods

This chapter is framed out of secondary sources of literature. As the focus of the chapter is to analyze the prospect of social media as a communication tool for crisis management, attempt has been made to provide a general understanding on it.

Media, Disaster, and Communication Technology

There is no dispute that in minimizing the impact of natural disasters, immediate effort has always been given to save lives. There has also been a significant decrease in casualties in many countries relating to disaster hazards. In this regard, credit goes to the advance communication technology system, which not only enables governments to detect the possibility of an impending disaster but also provides the pathway to disseminate information on disaster through early warning system. Such facilities, at least, become a critical factor in rescuing lives from catastrophes. In this attempt, the role of media is crucial as it acts as a channel to reach out to the masses. The definition of media has been contested, especially in the social media context where one finds a humongous amount of user generated content, which is accessed and also found credible as many empirical studies suggest. In the context of mass media definition, some analysts consider it as a medium of mass communication through which communication can be sent to large numbers of people. Such media include Radio, Television, newspapers, etc. Some scholars have used the term

media in the context of communication technologies along with the content transmitted by it, including the social media applications coming under the above context.

There are various ways to determine the relationship between media and disaster. The primary concern usually begins with how media covers issues of disasters. Here, the role of media is expected to be of a neutral entity, which is expected to be concerned with what is happening and how it has happened, sharing objective information. Under the above circumstances, a disaster is generally considered as an event and media as a communication medium that provides information to the public. In disaster management, information sharing is valued as a significant component in establishing the relationship between media and disaster. However, how media is communicating has always been a matter of much debate owing to various factors including the commercial interests, race for Television Rating Points (TRPs) and the breaking news syndrome to be one up in competition, bringing in unwarranted sensationalism in the disaster narrative.

If we take into account various global conventions, media is primarily referred as a medium of communication to generate public awareness and information sharing platform. In the Hyogo Framework for Action 2005–2015, communication has been given an important focus for raising public and institutional awareness. In its key activities, this framework has insisted on application of communication and space-based technologies along with dissemination of information. It has emphasized on engaging media to promote resilience and also to act as a stakeholder. Despite such priority, the Sendai framework for Disaster Risk Reduction 2015–2030 has identified the gap that there is a necessity to share information on disaster risk governance. In order to achieve the commitments of this framework, media has to be one of the key stakeholders in disseminating knowledge on disaster risk understanding where it could be utilized effectively as a channel of disaster communication at global and regional levels.

If we consider the role of United Nations Office for Disaster Risk Reduction (UNDRR), in 2013 it has established a network among journalists known as DIRAJ (Disaster Risk Reduction Network of African Journalists), which is a group of journalists who submit articles and cover disaster risk reduction problems in their local and national news networks. The network has evolved to include 50 African journalists who guarantee that news on catastrophe risk reduction would be widely reported in local and national media. The UNDRR will seek to expand the DIRAJ beyond Africa to Asia and the Americas in order to ensure that journalists communicate effectively on disaster risk reduction issues, not only to raise disaster risk reduction awareness but also to hold governments accountable for protecting citizens and public goods through the development of disaster risk reduction strategies. To empower journalists, a variety of journalism education tools are proposed to be provided. Investment will also be made in building and enhancing social media networks to support ongoing journalism networks.

Taking into account disaster as an emergency situation, the role of media has been viewed more broadly under this framework. Media has also to undertake a responsible and inclusive role on its way of reporting and communicating strategy. The most significant aspect is that both traditional and new media along with the

communication technology as a whole have received prime attention under this global commitment. It has also specified the role of media, whatever its form, to portray its role as a communicator in disseminating accurate and nonsensitive disaster risk, hazard information. In this process, it needs to represent disaster-related information in a simple, transparent, easy-to-understand, and accessible manner. Further, they have to also adopt specific disaster risk reduction communications policies in cooperation with the national governments. It could be argued over here that media as a communication technology needs to educate and create awareness among people in accordance with the national practices.

Such an expectation from the news media in disaster communication, however, is not free from criticism on the way it communicates. Concern has been persisting among the critics that media could also spread wrong information. It could also promote myths that might affect the recovery process (Monahan & Ettinger, 2017. p. 479). The above anticipation also needs to be discussed in the case of new media technologies and social media being one among them. In fact, the conceptualization of media as a communication technology has got more attention in the globalizing environment. Such a shift has broken the conventional way of communication where media continued to be the sole source of information to the general public at large. Its arrival has invited the space for dynamism in the communication system that motivates this chapter to look at its prospect.

Prospect of Social Media

One can find a number of writings on the potential of social media as a revolution in communication technology in present times. Social media consists of a group of social networking applications, the most popular among them being Flickr, Face book, Twitter, and You Tube. The applications of these social media platforms runs through the internet. While defining what constitutes social media, Palen et al. (2009) write, “These apps are supporting high social engagement and user-content development typically at a one-to-many or a many-to-many scale.”

Most social networking platforms work on a variety of devices, including smartphones, desktops, and tablets, which have the ability to act as a communication tool for cyber informatics knowledge system. In the case of natural disasters, social media has been used to “increase situational awareness and improve emergency response” (Steiger et al., 2015). It is claimed that in disasters, social media activity has gained attention in the year 2007. In order to discuss its prospects, two themes have been identified, viz., reachability and multiple channels of communication.

Reachability

Social media has got both technical and popular recognition that it has the potential to solicit varieties of information by using the public as information source (Latonero & Shklovski, 2011). It is distinguished from the traditional media on the basis of its

reachability. The later form of media is only confined to the place of its performance. Social media has no such limitations. Chan identified five features of social media, including *connectivity, collectivity, completeness, clarity, and collaboration*. All these features indicate that it has a wider reach and access. In the context of disaster management, government agencies are now opting for social media platform to alert communities and to disseminate situational pronouncements that are authoritative. From an organizational standpoint, disaster response agencies may use social media to engage with the public and perhaps seek ground information in catastrophe circumstances. It not only generates massive volumes of data, but also varieties of data types like text, images, and videos. If we look at the pattern of users of social media, it is a platform that can be used or accessed by government agencies and also by other agencies including citizens. There are 3.96 billion total social media users across all platforms as of January 2022 (source?). Every month, an average individual switches between seven different social media platforms. Adults now spend more time on social media than ever before, averaging 95 min each day across all platforms. Despite the doom and gloom, Facebook remains the most popular marketing platform on the planet (93%). Instagram is ranked second (78%). In 2020, Facebook will account for a quarter of all digital ad expenditure (25%), compared to Google (28.9%), Amazon (10.3%), and others (35.6%). Over the course of 2022, Facebook Messenger is expected to reach a staggering 3 billion users. The above database indicates that the use of social media is gradually expanding. It provides the user a unique opportunity to share critical information on large-scale spatiotemporal data to emergency managers (Granell & Ostermann, 2016).

In general, disasters are marked by a strong demand for information. Such requirement counters complexity when there is less scope with the dissemination and for information accessibility (Shklovski et al., 2010). It is quite obvious to consider social media as a supplementary datamine for handling emergencies. In this process, certain features of social media messaging enhance its prospect of reachability, like Volunteered Geographic Information (VGI) to show geographic reference (Goodchild, 2007; Sui & Goodchild, 2011). Rather than pushing information to residents, the aforementioned technology allows emergency responders and policymakers to extract social media data to monitor shifting events in disaster areas.

People, in general, serve as sensors in disaster zones, providing real-time, geo-referenced information to complement crisis information provided by expert sources (de Longueville et al., 2010a, b). It could also be a very effective communication mechanism in all the phases of a disaster. It plays an important role in all stages of a disaster, viz., pre-, current, and post disaster (Houston et al., 2014). In recent years, social media has progressed from being a passive information outlet (i.e., disseminating static disaster preparedness information) to an emergency management tool capable of disseminating real-time warning information, receiving requests for assistance, and establishing situational awareness based on user activities (Lindsay, 2011). It can also be utilized to boost the social capacity of information generation and dissemination through peer-to-peer backchannel interactions. Schnebele and Cervone (2013) showed how volunteered geographic information (VGI) from social media sources may be integrated with remote sensing images and

digital elevation models to create flood hazard maps in their research. Even a small amount of VGI can dramatically improve the quality of hazard mapping. The coded data may be analyzed over time and space to offer real-time situational awareness of occurrences. Liu et al. (2008) have illustrated how the activity of disaster-specific Flickr groups may be tracked over time to document disaster impact, response, and recovery activities. The Automated Web Text Mining (ESA-AWTM) system, developed by the Australian government, analyzes Twitter interactions and offers near-real-time event identification, warning, and monitoring (Cameron et al., 2012). The “Tweet Tracker” program for disaster assistance helps to track, analyze, and monitor tweets. This application can distinguish between geo-referenced and non-geo-referenced tweets, do keyword searches, and generate and show trends for user-specified keywords introduced by Kumar et al. (2011). In near-real-time, information derived from social media data can assist policymakers in understanding the big picture of the emergency scenario.

Multiple Channels of Communication

Social media as a communication technology has offered the scope for multiple channels of communication. It enables both sender and receiver to interact and communicate with each other on various issues. Such a feature often attracts the attention of scholars to view it as a tool to promote democratic tendencies in the digital sphere. It is also argued that social media contains the potential to establish and build communities online. It has the ability to connect people through various formats and platforms where they could share information and also their ideas. Even, it can encourage debate and mobilize action (Price, 2013). Such changes have opened up the trend of participation where the end user could communicate with the source.

Disasters provide a unique opportunity to investigate how the idea of time might challenge established communication trust paradigms. Indeed, following the earthquakes in Chile, a recent study found that catastrophes provided a chance for communities to improve interpersonal trust (Dussaillant & Guzmán, 2014). By examining the verification of information during catastrophes using a guardianship of trust model, this method expands on previous work that categorizes the functioning of social media (Jung & Moro, 2014; Houston et al., 2014). The importance of geographical information in social media data for disaster management was discussed in the preceding section. Disaster mapping is a crucial tool for disaster management to understand what is going on. The factors that govern and ensure trust and influence power in connections between individuals and emergency services organizations are highlighted in this approach.

It has long been recognized that geographical data from social media may be utilized in catastrophe mapping to help disaster managers to better detect dangers and estimate losses (Huang & Xiao, 2015, Kryvasheyeu et al., 2016). In addition to the above, it is to be noted that this platform also provides opportunity to share their experience through exchange of ideas and opinion through the features like blogs. It

has been acknowledged in the Sendai Framework that focus must be given to 360-degree communication and advocacy campaigns, which would include the role of media and especially the various social media platforms and applications. This task opens up the scope for interaction among disaster practitioners, government, and nongovernment organizations and the users and the population as a whole. In this regard, a feature like “blog” has a huge potential to connect with multiple users.

If we consider the Indian government’s initiative, the above prospect of social media is also found to be visible in disaster management practices. Indian government has come up with a central Act of Disaster management in the year 2005. Under this Act, government is committed to raise public awareness and take necessary step toward sharing relevant information on disaster. Such a commitment has materialized further, given the public information campaigns launched by the government from time to time. In this activity, the role of both the traditional and new media was apparent. In 2016, the Indian government initiated the step toward opening up social media profiles of officials at the National Disaster Management Authority (NDMA). This was followed up with the creation of Information, Education and Communication (IEC) cell within the NDMA according to the data published by Govt. of India on its NDMA website. The NDMA also has its Twitter handle, which is followed by almost 2.4 lakh people. NDMA also runs its own blog, which is regularly updated. It encourages the officials and disaster management practitioners to contribute their viewpoints on several themes on crisis management. Along with the above, the other applications like You Tube and audio-visual materials are also used to generate awareness on how to respond to disasters.

Conclusion

The foremost challenge before media as a communication tool is, how it covers disaster events. Concerns persist that media could glorify myths and also disseminate false information. Acts, such as these may lead to reactionary behavior, bringing challenges for response and recovery aspects. The above anticipation in the case of social media also could not be escaped. One finds a huge amount of fake news, rumor mongering, and hate narrative on various social media platforms, which many a times comes from anonymous sources. There is no dispute that as a communication technology, social media has grown in popularity as a viable avenue for expanding disaster management’s horizons, but the socioeconomic imbalance in the utilization of social media data should make us wary of using these technologies for such reasons. Social media is also not free from the continuity of digital divide concerns where gaps persists among those who have access to information and communication technology and the others who do not have (van Dijk, 2006). Certain socioeconomic groups, such as those with little money, lack of education, and the elderly, may lack the means and abilities to use social media and thus get excluded from the information exchange via social media in critical times. Concerns also persist with regard to the generation of situational information. It completely depends upon the

knowledge and intent of the user on what and how to share information. Depending on whether users are aware of how their social media information is being used, this type of information might be active or passive. Some scholars have raised concern on the way situational information is extracted. Using social media for disaster management is a difficult process, and there is no one “silver bullet” answer in this relatively young and developing industry (Croitoru et al., 2013). The dissemination of official statements and situational updates to the community is one of the most critical duties in natural disaster management. This requires disaster managers to have a better knowledge on the social network structure in which disaster-related information could be disseminated or exchanged. The advent of internet networks has opened up new avenues for research on the information sharing behaviors of diverse actors (e.g., regular users, authoritative agencies, and news media) during natural disasters. Many investigations have indicated that these networks have a hierarchical structure. Cheong and Cheong (2011) conducted a social network analysis of tweets related to the 2011 Australian floods and discovered that “local authorities, political personalities, social media volunteers, traditional media reporters, and people from not-for-profit, humanitarian, and community associations” were the most prominent users in disseminating disaster-related information. According to some scholars (Kogan et al., 2015), the most essential nodes in disseminating helpful information during the 2012 Hurricane Sandy crisis were the local government officials and the media. However, the tendency of democratization invites for an active role on the part of the general users who could effectively contribute their experience and knowledge through this communication technology.

Despite that social media offer a lot of promise for enhancing risk communication and catastrophe information distribution, there are some issues about the quality of information gathered from social media data (Goodchild & Glennon, 2010; Goodchild & Li, 2012). In case of Tohoku earthquake and Tsunami (2011), it was reported that long after the victims had been rescued, the flood of pleas for help persisted (Lindsay, 2011). Finally, the chapter concludes with the observation that there is an expansive prospect of social media as a communication technology as it enables the mechanism of an overall communication network where user could play the role of sender and receiver of messages, information, and ideas. Its efficacy in serving the broader purpose of media needs to be investigated further.

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Social Media and Communication for Older Adults During Disasters: A Narrative Study of Aging Population in Kolkata, West Bengal

93

Debarati Dhar

Contents

Introduction	1448
Literature Review	1449
Responding to Common Needs and Problems of the Elderly	1451
Excerpts from Case Studies	1453
Discussion	1455
Conclusion	1456
References	1456

Abstract

It is not unusual to hear common discussions about creating or strengthening or re-establishing strong social links, especially communication networks, in the context of aging people and disasters. Research studies believe that informal networks and professional interventions in community care for the elderly exist. However, the larger pertinent question remains unanswered: What are the unique challenges the elderly face regarding effective communication during crises. Older adults are often more vulnerable during disasters because of age-related changes and chronic situations. Over the past decade, the use of social media has increased even among the elderly population. While several organizations and communities have used social media as an effective platform to communicate news and other relevant information about disasters among the public, very little is known about how aging people use social media to plan, implement, and recover from disasters or any other matter such similar crises. Hence, through a narrative analysis of substantive data from the field, this chapter attempts to understand the significance of social media as an operative communication source for aging people during disasters. This study aims to map the fears and apprehensions older adults have during disasters by examining their experiences. It is

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essential to study the various aspects (both physiological and psychological) of a crisis in the context of older adults and the possible ways of coping with the help of social media engagement. The central argument of this chapter is that social media can be utilized as a communication resource by older adults during a crisis. This chapter conceptualizes a range of recent available literature using an inductive methodology. This chapter would emphasize the current global Covid-19 pandemic situation. It would collect data through in-depth interviews and case study methods from a selective sample of respondents (aged above 60 years). The universe of the study is Kolkata, West Bengal.

Keywords

Social media · Communication · Older adults · Disaster · Community care

Introduction

There have been two significant substantial consequences of the Covid-19 pandemic on older adults and their use of information communication technology. First, their Internet usage has increased throughout the epidemic, although many have experienced isolation, loneliness, and reduced mobility. As a result, they have turned to their phones and the Internet for assistance. The second point is that, before the epidemic, older adults were less active in smartphone usage than younger generations. Interestingly, this generation's use of the Internet has risen much more. That is why a new digital divide is forming among the digitally lagging older people. Covid-19 pandemic has resulted in a phase of devastating and continuous crisis that was depicted through social media and its engaged audiences. The pandemic witnessed a time of innovative developments among several social media outlets, and the question here is to see whether such innovations were inclusive of older adults or not. This brings us to a recommendation that possibly a reliable mobile network combined with learning digital skills is vital for older adults to take advantage of developing technological solutions, many of which will improve their quality of life. It has to be noted that in the longer run, falling behind on digital or Internet skills might have adverse effects on the elderly. Technological intervention in communication and social networking among older adults has been well explored in a study where older adults have been found to depend on new media in their daily lives (Dhar, 2018).

Conventionally, social networks could be defined as a network or link consisting of those with whom we have ongoing relationships (Berkman et al., 2012). Through such networks, individuals are linked into smaller groups and the larger society. However, the advent of new information technology provides a new dimension to this traditional definition by making the concept of networking vast and immediate. The idea of a network emphasizes relationships between people rather than groups or institutions; it is a particularly suitable tool in the search for understanding of the social aging process where relationships are central.

The unrestrained spread of Covid-19 has called for unprecedented measures, to the extent that the government had to impose lockdown and quarantine norms in the nation. Aging can be described in many ways. For instance, it can be used to study and reflect upon the profound processes of social change that aging brings with it. One of the central arguments of this chapter is that it emphasizes the point that signs of aging are not only about the more significant concern of how to provide care to the elderly as the world undergoes a dramatic generational transformation. It is more intense, and beliefs and practices associated with aging throw light on the much broader social-cultural phenomena, i.e., the connection between individuals, families, and states. Interestingly, aging people's perspectives are much more multifaceted and, simultaneously, nuanced, just like a media discourse. In examining aging in these ways, this chapter builds on several frames of earlier work, questioning and contributing to the ways we broadly study and theorize modernism, innovation, social change, and aging and, of course, social and cultural life and the subsequent changes because of the pandemic globally.

This chapter will be divided into two segments – in the first part, it will be discussed how older adults are suffering in different ways, especially during Covid-19, and how they are currently dealing with these struggles. The second part will focus on the interests of older adults in other emerging technology solutions that would further improve their quality of life. And, more significantly, how these solutions can be best implemented for the older adults to adopt them. This study explores how the so-called “young-old elderly” – who still have relatively good health and are still mobile – used the Internet before and during the crisis. The study also maps their expectations and fears of getting older and discovers their interests in different tech solutions that solve emergency issues. For the narrative review, an extensive search has been done for secondary data like research papers, recommendations, and documents from different national and international organizations associated with aging people from March 2020 to March 2022 (though not limited to). An exhaustive search of data has been done from all possible resources. Though the impact of Covid-19 is notable among older people, the effects of the Covid-19 pandemic on the mental health of aging people have not yet been done broadly in the Indian context.

Literature Review

Age-related discrimination has been apparent in the existing literature and media reports. Images of older people being reduced to bodily parts and portraying the unfavorable preconceptions of older people as depressed, lonely, abandoned, or defenseless have been utilized often in the media and popular culture. Additionally, the discourse on intergenerational conflict brought on by the epidemic and pitting generations against one another (younger people's perceptions of older people as a burden, etc.) leads to higher rates of abuse, marginalization, and stigmatization of the elderly. It has become more critical, especially when the world is under a Covid-19 pandemic. Studies show how with the increasing rate of coronavirus disease in 2019,

aging people faced excessively hostile effects, including complications, concerns about disturbances in their daily schedules, and caregiving access. They also faced difficulty adapting to technologies and were concerned that loneliness would only deepen prevailing mental health conditions.

Several studies have stated the shielding effects of social involvement and gathering on the mental well-being of older adults and its positive impact on cognitive functions (Douglas et al., 2017; Loyola et al., 2018). There has been a significant transformation around the world from the traditional joint family to individuals, and then the involvement of the market, and the state, as the critical positions of aging care. Such changes in modes of aging involve quite notable alterations in considerations of the human condition. The substantive data (ethnography) collected from the field in Kolkata suggests that the widespread belief presently is that majority of the older adults among the middle and upper-middle classes have their children settled abroad, which has resulted in these aged persons organizing life in different novel ways.

Older adults are more vulnerable comparatively during disasters and similar situations. For them, receiving and understanding emergency warning signals and taking appropriate measures might be difficult due to declining physical, sensory, and cognitive capacities. In recent years, it has been shown that the use of social media has expanded considerably. Social media platforms have altered the way individuals meet, communicate, and interact in a computer-mediated world. In disaster response, social media platforms are becoming increasingly important, as noted in several studies (Cohen, 2013; Sarcevic et al., 2012). So, it shifts the entire argument toward the usage and cognitive capacity of using social media tools during disasters and emergencies by older adults. As reported by a study by Cohen (2013), social media tools were initially utilized by the general public to communicate and are gradually being adopted by emergency responders.

The pandemic has caused sudden shifts in the lifestyle of aging people. The destructive effect of isolation among elderly people has been well documented (Vahia et al., 2020a). We have spoken to a few elderly people in Kolkata for this study. The respondents were a part of the more extensive doctoral study on media and gerontology undertaken in 2012–2017 in Kolkata, West Bengal. The secondary data suggests a much more nuanced picture. Approximately 1 year into the pandemic, several studies have shown that older adults may be less negatively affected by mental health outcomes (Lei et al., 2020; Douglas et al., 2017). It is interesting to note that the longer-term effects of Covid-19 remain unclear. Mobility for the elderly outside their houses is crucial in physical exercise and continuing with daily activities like buying groceries, socializing, and visiting doctors.

“Disasters are characterized as a condition in which the social fabric is ruptured and becomes dysfunctional to varying degrees, resulting in maximum community upheaval and displacement” (Britton, 1988; Fritz, 1961). We need to accept that not only are the physical actions affected during pandemic protocols but also emotional well-being. Several studies have defined mental well-being consequences of quarantines like higher risk of depression, stress, emotional disorder, irritability, and lack of sleep as signs associated with higher rates of emotional vulnerability in elderly

people (Huang & Zhao, 2020; Mazza et al., 2020). Elderly people tend to have lesser reactivity capacity to stress than younger adults. Still, given the magnitude of the Covid-19 epidemic, there was a larger concern about the global cognitive well-being crisis among older adults (Ostacoli et al., 2020). It is quite possible to trace the legal discourse around elderly care in India to the international “gerontological” discourses that somehow totally ignore the needs of aging people in diverse socio-cultural locations. The UN Department for Social Affairs (DESA) published a policy paper on Covid-19 and senior citizens in April 2020. This outlines the problems faced by older people across the world “older persons are frequently overlooked in development and humanitarian strategies and their funding. Considering the higher risks confronted by older persons in the Covid-19 pandemic, development and humanitarian strategies must explicitly identify and consider their needs, challenges, and strengths at all levels and in all settings.” (<https://www.un.org/development/desa/ageing/news/2020/04/issue-brief-on-olderpersons-and-covid-19-a-defining-moment-for-informed-inclusive-and-targetedresponse/>)

Responding to Common Needs and Problems of the Elderly

The Covid-19 pandemic has had a significant impact on older adults, not only in terms of the number of deaths but also in terms of the physical, social, and emotional effects of the physiological and psychological requirements: shielding, physical isolation, and social distancing. Then again, the impact on homebound elderly residents because of the pandemic measures implemented by the governments across the globe added with a reduction in local home care services had been profound. Furthermore, many elderly people avoided getting medical help as their anxiety and panic intensified, potentially resulting in increased health issues. Moreover, many were also found to be in complete isolation during the whole period of the pandemic. In the course of research on present-day networked society and the situations of the elderly before and during the covid 19 pandemic, it became clear that the distribution of networks, if extended to all possible sectors of physical and psychological wellbeing, could prove to be beneficial for the aged. The concept is that older people must remain valued as a resource for their families, their communities, and society as they were before the pandemic.

The Covid-19 pandemic situation has been difficult in all aspects. The older adults being more exposed to medical complications face the emotional repercussion of social isolation, feeling of liability, and restricted freedom. Moreover, besides the physical and psychological problems, there are challenges to using technology as that had become the only communication mode during the pandemic. So, older adults are in a position of excess grief, loss, and financial constraints. All of these make them more vulnerable to higher rates of psychiatric problems. As the pandemic broke out, it was evident that elderly people were at risk health-wise. It is to be understood that both natural and conflict-related disasters tend to pose grave threats to human safety, health, and well-being: other than direct deaths, increased risk of disease, damaged social services, disrupted livelihoods, and displaced homes. This

also shows that the ratio of more emergencies is directly related to the security concerns of older people. Nonetheless, the fact that older adults comprise a more significant part of the population, which is more vulnerable during emergencies, does not imply that they are weak in general, as many of them continue to function fine and remain wholly involved and engaged in the daily lives. Interestingly, older people are considered resources in their immediate and more extensive networks, predominantly during emergencies and crises. Their extensive long experience can make them models of personal resilience, motivation sources, and applied knowledge. They can give voluntary aid, care for family, participate in recovery initiatives, and support causes.

Aging often brings difficulties preventing the elderly from living independently and accessing services. The first question that the existing literature in the related area of aging poses is that is elderly abuse and discrimination gendered. This is another dimension to be explored in the larger argument. There is an urgent need for better data gathering and disaggregation for addressing age-related discrimination. The state of elderly women is highlighted in one of the UN reports, “In 2050, women will comprise 54 percent of the global population aged 65 years and over, and 59 percent of the total population aged 80 years and over. Women experience greater economic hardship as they age, owing to a lifetime of gender-based discrimination, particularly in education and employment, ending up with few savings and assets. They are also denied rights owing to the intersection of ageism, widowhood, disability, invisibility and negative attitudes about their value and capabilities.” (https://sustainabledevelopment.un.org/content/documents/26120MGoS_discussion_paper.pdf pp14–15). Older people are often marginalized and subjected to various social and cultural problems besides economic difficulties. “A study by Pew Research Center published in January 2019 found that people older than 65 years were more likely to share fake news in the US. It’s not hard to imagine a similar situation in India —more than 200 million WhatsApp users are in India. In addition, WhatsApp is ubiquitous and is often the primary source of new information, especially news. So, getting fake or false news becomes another source of depression among the elderly” (Chaudhary & Suresh, 2020). Older people are less familiar with technology and applications and face the highest risk of falling prey to disinformation and misinformation about any topic possible under the sky. Hence, it could be stated here that access to information is another challenge. In addition, data on elderly violence have persistently excluded older persons living in low- and middle-income nations, despite some evidence to the contrary. The media has extensively covered instances of Covid-19-related elder abuse and neglect. Older adults are more likely to experience domestic violence, such as physical, psychological, financial, and sexual abuse, while physical distance orders are being enforced.

The study by Chaudhary and Suresh (2020) further notes that “loneliness is a serious concern among the elderly, and could be a result of lower economic resources, death of contemporaries or spouse, lack of an active social life and dissatisfaction with familial and social relationships.” Additionally, older persons

are more likely to live alone, which increases their vulnerability to some of the adverse effects of loneliness on their mental health. Social distancing and quarantine procedures, which may make it difficult for people to acquire food and income, especially if they live alone, have worsened such risks. Even before the pandemic, older women's considerable unpaid caregiving responsibilities and the discrimination they have faced their entire lives might impact their health, happiness, probability of developing a disability, and access to healthcare in old age. The Covid-19 epidemic has substantially affected older persons in many countries worldwide. The government declares the physical, social, and emotional effects of the specific requirements, such as shielding, physical isolation, and social distancing (Sclater, 2020). The quarantine inferred a fundamental change in the existence of aging people, including a reduction in social interaction or participation in any gathering. These changes have adversely affected their mental well-being (Vahia et al., 2020a, b). To summarize all the studies in this review, it can be said that risk factors and vulnerability because of social isolation in aging people are much higher and needs to be appropriately addressed for practical solutions.

Excerpts from Case Studies

This chapter, with selective case studies on aged people and their experiences of communication through social media, tried to determine the role of social media in crisis response, preparedness, and recovery. The purpose of case studies is to explore what it means for aged people to socialize in crisis or disaster situations through social media and how helpful it has been in dealing with the pandemic situation imposed by Covid-19. Social media provides them with a much broader and more interactive environment. For an aged person, the influence of the Internet and new media technology on the daily social lives coincides with the time probably of withdrawal from the workforce market, becoming a grandparent, experiences of losing spouse, friends, relatives, and loss of health and mobility. Social networking sites, blogs, and mobile platforms mediate the present-day relationships with family members, friends, and broader social networks, especially during the pandemic. This factor relates to how social media can be integrated and used in the lives of older adults. From the older people's experiences, it is evident that the older generation used social media tools to overcome the vulnerabilities imposed by the Covid-19 pandemic. Besides socializing, older adults think that information and education related to financial and health issues are another significant draw for them. The Internet has become more of a need to them. From depression and diabetes to dementia, the elders can get and give support and information within the comfort and convenience of their homes.

1. *One female respondent of 65 years of age recounted how she started exploring the possibilities of new media when her only son decided to shift to Germany a few years back, around 2009. She studied it thoroughly with the help of relatives*

and other family members. She emphasizes that learning to use social media has been one of the boons in her life, which she realized in the Covid-19 scenario. She happily reveals that now she enjoys using the smartphone and laptop and never feels isolated. She admits that the crisis caused by the Covid-19 has not been easy, but she thought she survived thankfully because of social media. Right from information gathering to connecting online, she could do it all. Her son was, however, responsible for taking care of her daily needs (all in the online mode).

2. *One respondent around 70 years of age said that the Internet is the world for him even though his entire family lives with him except one son staying in another city. Explaining the importance of smartphones and Internet connectivity in his life, he said, "smartphone is like my partner and companion; I spend almost 10–12 hours a day with it doing several things." For him, connectivity was not the basic necessity during the pandemic but keeping a check on the updated situation and other protocols was his main concern, and he thanks social media for that. He believes that silver surfers like him depended on social media when the Covid-19 made the entire world stay indoors. He further clarified that staying engaged through social media has been the only way to overcome anxiety and stress issues, given the pandemic scenario, which is nothing less than a major disaster.*
3. *One 69-year-old female respondent said that she uses the Internet more for health information, which has been a blessing in the Covid-19 crisis. She said that she was not much into online buying or banking, but the pandemic has compelled her to learn both, and she has no looking back regarding dependency. She has also learned online banking and enjoys purchasing and ordering services online. This lady believes every individual, despite age, should use social media as it not only helps in socialization or extracting information about anything in the world but also is a great aide in daily lives, mainly when a crisis occurs. To support her belief, she has also taught basic mobile phone skills to her full-time house help.*
4. *Another female respondent of 67 years who was self-admittedly "mobile-challenged" a few years back now acknowledges that she is superbly computer and mobile phone friendly. She enjoys her time spent "online." She lives alone as her husband died a few years back, and her two daughters are settled in other cities after marriage. She enjoys writing and pens down any thought that crosses her mind. She admitted that she has been depending on social media for every information she realized she is responsible for her well-being, especially during the pandemic as her daughters were away. She mentioned the requirement of living healthy as she fears the idea of getting hospitalized alone. She admits that more than the pandemic, her husband's death affected her, and she felt lonely. She stepped into the virtual world to find a way out of that misery, which she adapted after some initial learning setbacks. When asked how her experience interacting with friends in the virtual space was, she replied that making friends online is much easier comparatively. However, she specifically mentioned that one must be careful in the virtual area; it depends on the mindset of whom to trust and how much information must be disclosed.*

Discussion

Based on the substantive findings, some exciting revelations can be made about how social media has made inroads into the life-world of the aged people and its relevance during a crisis. Although maintaining social contacts continues to be the primary purpose for using social media by older people, many of them now rely on virtual platforms to define their daily communications comprising sharing links, chats, photos, videos, extracting news, and updating status with their fast-growing social network and all that in increased pace during a crisis. This makes us talk about how the proper intervention can lead to improvising communication among the elderly through social media during emergencies and unprecedented situations. In the experiences shared by the older people who live alone, it has been noted that they worry about the uncertainty of being hospitalized alone or dying alone. It draws attention to the significant problem of care in the context of aging people, and it shows how the crisis in respect for the most vulnerable members of society existed even before the pandemic revealed the breadth and depth of the problems. The mental health of older adults is generally a concern, especially for those who live alone.

Another underlying tone that could be drawn from the respondents' accounts is that they have expressed how meeting their relatives, children, and peer groups have always provided them with a sense of fulfillment and security. The pandemic has changed the entire scenario and restricted their daily sources of joy. However, the larger argument is that the situation is similar for aged people and aged people are comparatively more vulnerable. There are many studies bearing testimony to this point. As anticipated, it has been found that the decreasing scope of staying socially connected has been challenging for older adults. Total restriction of social interaction among aged people has generated adverse concerns for their health, especially those with prolonged diseases and age-related syndromes. Earlier studies have validated a relationship between social seclusion and loneliness with prolonged conditions, disability, and physical inactivity in the aging population (Loyola et al., 2018).

Cultural effects on older women are also of utmost prominence. In a traditional setting in India, it is usually the wives who serve as the primary caregivers in the household. Moreover, domestic help services and other paid caregivers have been restricted by all the impositions. All of these have led to the women becoming the sole carers of the husbands and house. It is also applicable in the case of older women. For some elderly women, it eventually became a habit over a while. In the words of an aged woman (respondent), "My children are abroad, my husband is ill, my house help can't enter the home, I cannot go out, and I am not as smart as my smartphone. So practically, I am physically, socially, and emotionally distanced in all ways!" The ongoing pandemic has made older people lonelier with a feeling of helplessness, considering they are doubtful of stepping out. What has also been observed from the responses of the aging people is that reliance on information technology is not the ultimate solution for them because nothing could replace the importance of actual socializing in their age group. It was discovered that older women and men were least likely to have access to and the ability to use online

communication tools. The consulted respondents clarified that they did not want the “new normal” to exist online because that would lead to more isolation. Reduced public services, isolation, and deteriorating mental health could be the effect of the pandemic among aging people.

The government needs to be more explicit about considering the rights and needs of older persons, particularly in developing countries. During Covid-19, the narrative review has revealed that the gathering, monitoring, and analysis of data that is broken down by sex, age, disability, and location are crucial for comprehending the risk that the pandemic poses to the elderly, the discrimination, violence, and abuse that they encounter, and the various roles that they play in their families, communities, and economies that can help societies develop flexibility and contribute to the recovery process post-pandemic situations. The diversity of older people and their requirements must be recognized. An age-specific mainstreaming approach should be added to the principles identified for promoting healthy aging.

Conclusion

Instead of a conclusion, this chapter tried to establish that older people must be treated as the resource they have always been for their families, communities, and society. With the “new normal” concept emerging post-pandemic, older people should not be pushed to live a lonely life just because of their age. They must get help or appropriate support if they need to separate themselves. In conclusion, the present paper suggests that the mental and physical well-being of aging people is depressingly affected during the Covid-19 pandemic. WHO and other expert organizations have recommended keeping older people physically and mentally healthy during this pandemic. It is an essential requirement of the hour that an integrated and multidisciplinary evaluation between geriatricians, psychiatrists, and caregivers is done. Older people form a diverse group with various capacities, skills, and resources. Appropriate mediated communication may help enhance older people’s support in emergencies and disasters to minimize harm and help them maintain the highest possible health and functional capacity or fastest recovery. Thus, it could be said that in planning interventions or responses to the needs of older people during crises or emergencies, it is helpful to consider the type of support that social media could provide in increasing communication possibilities for them.

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Pandemic Survival Strategy of Hindi Film Studios: The Case Study on Yash Raj Films

94

Ipsita Barat

Contents

Introduction	1460
Yash Raj Films (YRF) Business Model	1461
The OTT Myth	1465
YRF Survival Strategy	1467
Conclusion	1468
Conglomeration Is a De-Risk Strategy	1468
References	1469

Abstract

In contemporary times conglomerates of the Hindi film industry such as Yash Raj Films, Disney UTV, Fox, Reliance Entertainment, Eros, Dharma Productions, Red Chillies Entertainment, and others are referred to as “studios” by the industry. One such prominent studio remains Yash Raj Films (YRF), a family-run private limited studio founded by Yash Raj Chopra in 1970 and run by his son Aditya Chopra. The company does film distribution in Indian as well as overseas markets. In addition, YRF also operates (as subsidiaries) through horizontal integration in allied entertainment industries like music, television, merchandising, digital, and comics.

According to the Federation of Indian Chambers of Commerce and Industry (FICCI) 2018 report, the value of the Indian Media and Entertainment Industry reached INR 1.67 trillion in the year 2018. However, COVID 19 pandemic struck this Hindi film industry in 2020 and stalled its growth. As per government regulation, multiplexes and single-screen cinema halls were shut down. As a result, film productions were also delayed for a considerable period. This chapter will attempt to gauge how the film studios, for instance, YRF, survived and

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sustained during the pandemic. A collective understanding is that the industry survived with the aid of its alliance with over-the-top streaming (OTT) platforms such as Netflix, Prime, Hotstar, and so on. However, YRF had no OTT film released in 2020. Therefore, this research aims to understand how a studio like YRF survived during the pandemic times. The research will use an ethnographic method of qualitative interviews. This involves fieldwork and interviews with scriptwriters, producers, directors, actors, editors, cinematographers, production designers, and exhibitors. The interview and field visit will be an exploration of the business strategy of YRF, attempting to locate the methods and means of the survival strategy of the studio during pandemic times.

Keywords

Pandemic · Studio · Yash Raj Films · Cinema · Media · Survival

Introduction

“Bollywood,” an industrial and cultural condition of contemporary Mumbai (Bombay) cinema, has been studied often in the context of globalization and neo-liberal economic policies of the Indian state (Ganti, 2004; Prasad, 2003; Rajadhyaksha, 2003). In this context, the role of the diaspora has been argued as pivotal (Desai, 2004; Dudrah, 2006; Mishra, 2006). Bollywood has been identified as one of the many implications of the socio-economic changes resulting from neoliberal policies adopted by the Indian government during the 1990s (Punathambekar, 2013; Prasad, 2003; Rajadhyaksha, 2003; Vasudevan, 2008). Academic discourses around post-1990s Hindi cinema from Mumbai (Bombay) have widely tackled “Bollywood” with regard to the representation of the Indian diaspora (Dudrah, 2012; Mishra, 2006; Prasad, 2008; Rajadhyaksha, 2008). However, outside the ambit of diasporic engagements, scholars such as Tejaswini Ganti (2012) have taken an anthropological approach focusing on the “social world of Hindi filmmakers,” “filmmaking practices,” and “ideologies of production” of Bollywood cinema. Based on an ethnographic account, her work elucidates the changes in the modus operandi of the Hindi film industry from the 1990s till 2010. Following the same methodological approach, this chapter locates the business model of Hindi film studios in the new millennium, taking the Yash Raj Films case study (YRF). This new business model, a convergent business model, makes these studios, such as YRF, risk-free, helping them survive even during a crisis like COVID 19.

In the book *Ideology of the Hindi Film - A Historical Construction* (1998), Madhava Prasad states that from 1950 to 1970, the film industry was spread over three distinct sectors – production, distribution, and exhibition. Moreover, each of these sectors involved many individual independent entities instead of large syndicates. With the studio model of operation, the ownership patterns have altered significantly, resulting in a conglomerated industry. The vertical integration of the film business refers to the integration of critical segments like finance, production,

distribution, and exhibition (Ganti, 2004, p. 233). Thus, ideally, a vertically integrated film company would finance, produce, distribute, and exhibit its films. However, integration between any two tiers of the chain, such as production and distribution, as in the case of studios, can still be referred to as vertical integration. Horizontal integration means acquiring additional business activities in the same industry (Nelmes, 2012, p. 30). In other words, it may refer to a merger or a new business in an allied industry segment but the same stage of production. Thus, a horizontally integrated media company will not simply make films but also operate in other media segments such as television, special effects, music, home entertainment, retail, and gaming. In contemporary times, large-scale vertical and horizontal integration transpire among a few conglomerates of the Hindi films industry, such as Yash Raj Films, Disney UTV, Fox, Reliance Entertainment, Eros, Dharma Productions, Red Chillies Entertainment, and others, which are referred to as “studios,” by the industry.

Yash Raj Films (YRF) Business Model

YRF is a family-run private limited studio founded by Yash Raj Chopra in 1970 and currently run by his son Aditya Chopra (*ibid.*). The company follows a vertically and horizontally integrated model of operation. According to the company’s website, it “controls almost every part of the value chain from production to post-production, domestic and international distribution, music and home entertainment, marketing, design, digital, licensing, merchandising, talent management, brand partnerships, music studios and film studios – all in-house facilities, which makes it one of the most coveted entertainment conglomerates in the country” (See YRF website “about us” section. Yash Raj Films. (n.d). The Company. Retrieved 2016, June 17 from <http://www.yashrajfilms.com/AboutUs>). The company began with film production and then spread vertically into the distribution business, distributing in-house films and once made by other production houses. The company does film distribution in Indian as well as overseas markets. YRF also operates (as subsidiaries) through horizontal integration in allied entertainment industries like music, television, merchandising, digital, and comics (Aashish Singh stated in the interview that with the realization of the changes in traditional monetization, they decided to diversify their business). Despite being a private limited family-run company, the company operates with a corporate business structure. In this regard, Aashish Singh furthermore states:

The structure of the company is very corporate. The way we handle the business is very transparent and professional . . . Yash Raj Films is not a listed company, but it is corporate in its structure, in its behaviour, in the manner in which it conducts its business. (Aashish Singh| interview, October 21, 2014)



YRF office at Andheri Mumbai (October 14, 2014). (Personal photograph by the author inside YRF office (14th October 2014))

YRF was formed in the year 1971. Under its banner, Yash Raj Chopra made films like *Daag* (1973), *Kabhi Kabhi* (1976), *Silsila* (1981), *Mashaal* (1984), *Chandni* (1989), *Lamhe* (1991), *Daar* (1993), *Dil to Pagal Hai* (1997), *Veer-Zaara* (2004), and *Jab Tak Hai Jaan* (2012) among others (The information is retrieved from the milestone section of YRF website, which has information on all films directed by Yash Chopra. See Yash Raj Films (n.d.) YRF Milestones. Retrieved 2016, June 20 from <https://www.yashrajfilms.com/about-us/yrf-milestones>). Later his son Aditya Chopra made films like *Dilwale Dulhania Le Jayenge* (1995), *Mohabbatein* (2000), and *Rab Ne Bana di Jodi* (2008), also under the same banner (See Yash Raj Films (n.d.) ADITYA CHOPRA CHAIRMAN & MANAGING DIRECTOR – YRF Retrieved 2016, August 10 from <https://www.yashrajfilms.com/about-us/aditya-chopra>). The first office of YRF was inside an apartment in Juhu Mumbai. Its informal setting contrasts with the new corporate office in Shah Industrial Estate in Andheri (West) Mumbai (I have personally visited the new office of YRF during my field research in 2014 and recorded audio-visual material about the studio property. Mr. Sanjay Shivalkar, producer, YRF, described the old office in Juhu, Mumbai (interview| 14th October 2014)). Inaugurated in 2005, the new office has two recording theaters, a tracking suite, a film mix theater, a dubbing suite, and a Foley suite. At present, Aditya Chopra is the Chairman and Managing Director of YRF (However, as in the case of many corporates and industries, Aditya Chopra heads the group because of kinship connections). The film production unit comprises salaried employees, including writers, cameramen, and editors. In this regard, YRF producer Sanjay Shivalkar stated, “people working here are all salaried employees, all of them and not on a contract basis. There are always 4–5 films on the floor, so we always need hands” (Sanjay Shivalkar| interview, October 14, 2014). Each floor of the YRF office is dedicated to an individual aspect of the film business. The first floor houses the conference room and other office cabins; the second floor is dedicated to the business aspect of filmmaking, and the third floor to the creative element. The fourth floor is a personal office of the chairman Aditya Chopra (The said observation

has been made during my visit to YRF office in Andheri West on several occasions during my fieldwork in October 2014). Production-designer Sumit Bose (who worked as a production designer of the film *Dhoom 3*) stated, “the creative and business team of YRF itself decides the production-designing budget. The entire budget is proposed before the film goes on the floor” (Sumit Bose| interview, October 31, 2014). YRF started its subsidiary Y-Films in 2011 to make youth-oriented films and online content. It began with the production of films like *Luv Ka the End* (Ashish Patil, 2011), *Mujhse Fraaaaanship Karoge* (Nupur Asthana, 2011), and *Mere Dad Ki Maruti* (Ashish Patel, 2013). Compared to traditional YRF films, these films are youth-centric, low-budget films and lack star power (See <http://yfilms.in/>). A subsidiary of YRF called YRF Entertainment operates in Los Angeles as a Hollywood production and financing company with Uday Chopra, youngest son of Yash Raj Chopra, as the CEO (See <http://www.yrfentertainment.com>). It produced the Hollywood film *The Longest Week* (Peter Glanz, 2014) and partly financed the film *Grace of Monaco* (Olivier Dahan, 2014) (*Ibid.*).

The distribution division of YRF distributes both in-house productions and films produced by other producers/production houses in India and the overseas market. Apart from in-house productions, YRF has also distributed films like *Happy New Year* (Farah Khan, 2014), *Kabhi Alvida Na Kehna* (Karan Johar, 2006), and *Kal Ho Na Ho* (Nikhil Adwani, 2003), among others (*ibid.*). Aashish Singh states that distribution offices were first opened in London and New York, along with the release of the film *Dil To Pagal Hai*. Distribution offices in India were set up soon after, followed by a distribution office in Dubai. The studio also has sub-distributors worldwide (Aashish Singh| interview, October 21, 2014). The distribution segment of the business is a stable source of income, which reduces the risk involved in the filmmaking business of YRF. Sanjay Shivalkar stated:

YRF never loses our money. We break even... We are our own distributors. In certain films, we make 50 per cent profit and others we make 25 per cent profit. The profits get distributed evenly. (Sanjay Shivalkar| interview, October 14, 2014)

Post-2006, YRF follows the strategy of product diversification. Films like *Dhoom 2* (Sanjay Gadhvi, 2006), *Jhoom Barabar Jhoom* (Shaad Ali, 2007), *Chak De! India* (Shimit Amin, 2007), *Rocket Singh: Salesman of the Year* (Shimit Amin, 2009), *Ek Tha Tiger* (Kabir Khan, 2012), *Dhoom 3* (Vijay Krishna Acharya, 2012), and *Kill Dill* (Shaad Ali, 2014) can no longer be labelled as a single genre or category. In 2008, the studio also co-produced an animated film *Roadside Romeo* associated with The Walt Disney Company. Furthermore, there was an increasing tendency to integrate elements in the film that plays well in other media markets and the traditional theatrical market (FICCI-KPMG media and Entertainment Report 2012 states “Depending on the genre and star-cast of the film, studios can recover anywhere between 40–80 per cent of their production costs before the film is released. Rights for cable and satellite, music, home video and select merchandizing are all sold prior to release of the film in theatres. In select cases, even overseas rights are sold upfront. Reduced dependence on box office collections to recover money

has mitigated business risk for production houses and provides an upfront return for much before the actual release date" (FICCI-KPMG, 2012, p. 70)). By 2005, YRF attempted to monetize allied revenue platforms by spreading its business horizontally across television, home video, music, merchandising, publication, and digital market. For example, YRF started monetizing satellite rights with the film *Hum Tum* (Kunal Kohli) in 2004 (Sanjay Shivalkar | interview, October 14, 2014). Furthermore, the overseas market also expanded due to the setting up of distribution offices across the globe. Post-Veer Zaara, YRF started distributing indigenously across all territories and launched its home entertainment and music division (Sanjay Shivalkar| interview, October 14, 2014). The merchandising division began with the film *Fanna* (YRF sold three products showcased in the film *Fanna*, a Mirchi Pendant (worn by Amir Khan in the film), a cup-saucer set, and an autographed ceramic mug (Aashish Singh| interview, 21st October 2014)). yFX, the VFX division started in 2016, is a relatively new subsidiary but brings forth a considerable amount of revenue for YRF. At the same time, subsidiaries such as Digital and New Media envisions the future as they are already mainstream delivery platforms for a certain kind of cinema.

Key subsidiaries of YRF include the following:

- Film Production: YRF produces 6–7 films annually.
- Film Distribution – India: Apart from home productions, YRF also distributes films solely as a distributor across Indian territories.
- Film Distribution – International: Apart from distributing home productions, this subsidiary also distributes films outside the YRF banner in international territories.
- YRF Studio: It comprises the fully equipped shooting floor that YRF uses for home production and renting purposes. The shooting floor has three sound stages, a vertically integrated array of film services and technically trained staff.
- yFX: Started in 2016, yFX is the VFX division of YRF. Its ambit of VFX work includes 3D asset build, animation, matte painting, compositing, and visual effects. Once again, as in the case of all other subsidiaries, it manages both home production and offers its services to other production houses.
- YRF Entertainment: This new subsidiary makes OTT content for YRF. It has announced its first OTT series, *The Railway Men* [Unreleased], in 2021.
- YRF Home Entertainment: YRF Home Entertainment distributes and markets DVDs, VCDs, and Blue Ray Discs and recorded music in the United Kingdom, the United States of America, the United Arab Emirates, and India. Under the title Forever Classics, YRF home entertainment acquired and released several classic films from external banners like R.K films (R.K Chopra films) and B.R films (B.R Chopra films).
- YRF Music: This subsidiary of YRF markets and distributes its music through its label YRF Music. It started its operation in 2004 with films like *Hum Tum* (Kunal Kohli, 2004) and *Dhoom* (Sanjay Gadhvi, 2004) in the overseas market. YRF launched its music label worldwide with the music of the film *Veer Zaara* (Yash Chopra, 2004). It furthermore continued its operation with films like *Bunty Aur*

Bubli (Shaad Ali, 2005), *Salaam Namaste* (Siddharth Anand, 2005), *Neal n Nikki* (Arjun Sablok, 2005), *Dhoom 2*, *Fanna*, *Chak De India*, *Jhoom Barabar Jhoom* (Shaad Ali, 2007), and *Ta Ra Rum Pum*. It has also released music albums of artists like Rabbi Shargil (*Avengi Ja Nahin*, 2005) and Ali Zafar (*Jhoom*, 2011).

- Merchandising: The merchandising division of YRF was launched in 2013 and sold merchandise related to all upcoming YRF films.
- Licensing: YRF has a vast repertoire of films, audio-visual, and music content, which holds exclusive copyright. The Licensing division monetizes this content by selling licenses to all possible delivery mediums such as television, radio, OTT, etc.
- Digital and New Media: This is the new distribution segment of YRF which only deals with the distribution of YRF content to online streaming platforms.
- YRF Talent: It is the talent management division of YRF.

These subsidiaries make the company a horizontally integrated organization with multiple stakes in allied media industries such as home entertainment, television, music, publishing, and merchandising.

The OTT Myth

India's increasing Internet penetration and the government Digital India initiative fuelled the OTT (Over the Top) consumption in India. The exact reflection is visible with the rising growth of India's online broadcast sector. These online content providers also referred as OTT platforms include names such as ALT Balaji, Eros Now, Voot, JioCinema, MxPlayer, Hoichoi, Sun Direct, and Zee5 and international providers such as Disney+ Hotstar (formerly Hotstar), Netflix, Amazon Prime, Viu, SonyLIV, and AppleTV+. Conversely, there was also a steady rise of OTT subscribers in India. The IBEF report stated that OTT video subscriptions increased by double and reached 62 million in 2020 from 32 million in 2019 (IBEF, 2021).

The pandemic hit the country during 2020, with lockdowns imposed nationwide. Most film productions halted during the pandemic, and the most significant blow to the Hindi film fraternity came with the pan India closing of single screens and multiplexes. With a complete shutdown of the theatrical film release, producers and distributors had to resort to OTT as the key delivery platform during the pandemic scenario. The bandwagon started with the OTT release of the film *Gulabo Sitabo* (2020), directed by ace director Shoojit Sircar, and casting big stars like Amitabh Bachchan and Ayushman Khurana. The film was initially supposed to be a theatrical release; however, the theatrical release differed indefinitely due to the pandemic. The film producers Ronnie Lahiri and Sheel Kumar struck a deal with the OTT platform Amazon Prime and released the film in the OTT first mode (Previously the practice in the Hindi film Industry is to release a film in an OTT platform approximately 8 weeks post its theatrical run). Media reported that the film made with INR 40–45 crore budget recovered INR 60 crore with the OTT first Amazon Prime Video deal. However, the Multiplex chains in India like PVR

Cinema, INOX, Carnival Cinema, Cinepolis, etc. condemned the act. INOX India released a statement in response to OTT first mode. The report stated:

Inox would like to reiterate that as the backbone of the cinematic value change, this [theatrical] windowing pattern has done wonders in terms of revenues for the content creator and all other stakeholders, as it offers the opportunity to extract the best from all available mediums which include cinemas, OTT platforms as well as satellite. Inox would like to urge all content creators not to skip the theatrical run and stay with the age-old established windowing pattern, which is in the best interests of all stakeholders in the value chain. (Inox Leisure Ltd, 2020)

Followed by the film *Gulabo Sitabo*, films like *Shakuntala Devi* (Anu Menon 2020), *Laxmi Bomb* (Raghava Lawrence, 2020), *Dil Bechara* (Mukesh Chhabra, 2020), and *Sadak 2* (Mahesh Bhatt, 2020) were all released first on an OTT platform making the trend of OTT first a customary practice among film producers. The OTT release became lucrative for small- or medium-budget film with theatrical release facing a complete shutdown. OTT guarantees a specific revenue pre-release, therefore de-risking the film, which is not the case for theatrical revenue. Theatrical revenue is dependent on box office success. However, this OTT first mode was viable primarily for low- or medium-budget films. This was because currently, OTTs are not able to compensate big-budget films and make OTT first model financially rewarding for them.

Furthermore, blockbuster films earn considerable revenue from overseas theatrical rights, and OTT first release would mean a zero-revenue earned from selling overseas rights. For example, blockbuster films *Sooryavanshi* (Rohit Shetty 2021), *83* (Kabir Khan 2021), and *Radhe* (Prabhu Deva 2021) all had theatrical releases despite COVID 19 continued restrictions. As per media reports, the producers of the film *Sooryavanshi* held back the film's release for 2 years to have a theatrical first release. For a big-budget Hindi film with a budget of INR100 + crore the OTT revenue alone cannot guarantee complete recovery. A big-budget film must resort to multiple revenue platforms and accumulate profit from various sources by selling overseas rights, telecast rights, streaming rights, merchandising rights, etc.

A studio like Yash Raj Films, Disney UTV, Fox, Reliance Entertainment, Eros, Dharma Productions, and Red Chillies Entertainment functions differently from a stand-alone production house. Out of many other production and distribution houses based in Mumbai like Aamir Khan Productions Private Limited, Rajshri Productions Pvt. Ltd., Percept Pictures, Red Chillies Entertainment Pvt. Ltd., and Shree Ashtavinayak Cine Vision Ltd., only a few production houses are defined as "studios." Yash Raj Films, Viacom 18, Disney UTV, Fox Star Studio, Reliance Entertainment, and Eros International are "Tier 1" studios, and Times Group, Balaji Motion Pictures, and Excel Entertainment are "Tier 2" studios (Aditya Krishna interview, October 21, 2014).

One defining feature of any studio is that they distribute films not made in-house. The distribution of films is a significant source of revenue, which gives studios a greater extent of flexibility and de-risks the filmmaking business. Another defining feature of a studio is that all studios have a vertically and horizontally integrated

business approach. Therefore, studios function as corporations, where capital from one division can be invested in the others. Furthermore, the horizontally integrated business approach allows the monetization of the content (film) across media subsidiaries such as television, home entertainment, music, gaming, merchandising, and Internet content creation. This phenomenon de-risked the filmmaking business in India under the aegis of studios. This De-risk formula allows the studio to take more significant risks, make big-budget films, and recover costs by monetizing the content (film) across delivery platforms.

During the pandemic crisis in 2020, several studios also resorted to producing the small-budget film, selling their films to OTTs with the first OTT release model. However, such numbers are less with few films like *Chhapaak* (Meghna Gulzar, 2020), *Panga* (Ashwiny Iyer Tiwari, 2020), *Shikara* (Vidhu Vinod Chopra, 2020), and *Dil Bechara* (Mukesh Chhabra, 2020) produced by Fox Star Studio, *Shimla Mirchi* (Ramesh Sippy 2020) produced by Viacom18 Motion Pictures, *Bhoot – Part One: The Haunted Ship* (Bhanu Pratap Singh 2020) and *Gunjan Saxena: The Kargil Girl* (Sharan Saxena, 2020) produced by Dharma Productions, and *Kaamyaab* (Hardik Mehta 2020) produced by Red Chillies Entertainment. However, most studios, including Yash Raj Films, had no film releases in 2020. In 2021 Yash Raj Films released its film *Bunty Aur Babli 2* (Varun V. Sharma 2021), YRF's first post-COVID release theatrically in November 2021, followed by its OTT release on Amazon Prime Video in December 2021.

YRF Survival Strategy

In the year 2020, YRF did not produce any films. However, its vertical distribution division distributed two films this year, produced by different production houses – *Jai Mummy Di* (Navjot Gulati, 2020) and *Malang* (Mohot Suri, 2020). *Jai Mummy Di* is a co-production by two production houses, Luv Films and T-Series Films. After that, Yash Raj Films joined hands merely as a distributor. For *Malang*, Yash Raj Films entered a deal with the production house Luv Films and was solely involved in the film's worldwide distribution. However, both films were pre-pandemic and were released in theaters. Nonetheless, these films being only distributed by YRF (with no role in production) is an instance of how YRF derived revenue for the company despite not producing a film of their own in 2020.

YRF earns considerable revenue from film and music royalties. The very idea of YRF Home Entertainments and YRF music was launched on this same idea. YRF wanted to make revenue by re-running its old films and music systematically. Year on year, YRF earns a considerable income from royalties from old films and music. In 2019, YRF had to face court proceedings because of not paying royalties to the amount of 100 crores to artists. The amount is indicative of revenue sourced by YRF from the Home entertainment and music division of its company. In 2020, YRF partnered with leading multiplexes, including PVR Cinema, INOX, and Cinepolis, to screen iconic YRF films such as *Dilwale Dhulhaniya Le Jayenge*, *Dil to Paagal Hai*, and so on.

YRF also earned considerable revenue by selling satellite rights of his unreleased films in the year 2020. In addition, it made new alliances with Disney+Hotstar as its OTT partner to showcase YRF's old films. In contemporary times, satellite and digital rights bring considerable revenue to the production house or the distributor (or both), depending on who owns the rights. YRF, during the year 2020, signed deals with streaming platform Amazon Prime for the digital release of 2021 slate of films. It is primarily because of YRF Tire 1 Studio status that such deals are manifested pre-release, which becomes instrumental in the survival of a studio like YRF during the pandemic. In 2020, YRF also geared up to start a new business venture, wherein it will create its streaming platform called YRF Entertainments with an approximate 500 crore investment.

With the pandemic hitting the film industry, a studio such as YRF, instead of laying off employees, came forward to help lower economic group daily film workers. It started a foundation in the name of its founding member – Yash Chopra Foundation – which became the sole instance where a studio came forward to support workers who during pandemic, because of stalled film productions, could not find any work and therefore perished. The foundation credited money directly to workers bank accounts, enabling their survival during the pandemic period. However, YRF studio remained functional during the pandemic barring the lockdown days. In the case of the year 2020, YRF home production films like *Shamshera* (Karan Malhotra) and *Pathan* (Siddharth Anand), both unreleased as of July 7, 2022, were being shot at YRF studio. Though the shooting of the film *Shamshera* was stalled due to lockdown, approvals were taken right after from the Producers Guild of India, and shooting resumed, albeit taking all precautionary measures. Alongside YRF studio, the VFX division of YRF was also functional during the pandemic, where a considerable amount of work was also being perused from home. Therefore, during the pandemic, YRF was continuously operational, working on the slate of forthcoming films, which were scheduled to release after the pandemic, such as *Shamshera* and *Pathan*. Thus, unlike smaller production houses, a studio such as YRF was well equipped to sustain a crisis such as pandemic. This is because, unlike a small production house which produces one film at a time, a studio such as YRF always has a slate of films. YRF usually releases 7–8 films annually (as co-producers, distributors, or both). Some films are made in-house; others are financed (term used is co-produced); for some, the role is restricted to distribution only. An extensive portfolio of films under the banner ensures that the risk is diversified.

Conclusion

Conglomeration Is a De-Risk Strategy

A vertically and horizontally integrated finance, production, distribution, and exhibition model, like in the West, is setting its footsteps in Bollywood especially following the entry of Hollywood production companies in the new millennium. A very few integrated conglomerate players, most having foreign collaborations, own a

majority share of the industry. Large-scale vertical and horizontal integration transpire among few conglomerates such as Yash Raj Films, Disney UTV, Fox, Reliance Entertainment, Eros, Dharma Productions, Red Chillies Entertainment, and others referred as “studios” by the industry. One such conglomerate is Yash Raj Films. There are sixteen subsidiaries under the banner of YRF films, making it an entertainment conglomerate of the Hindi film Industry.

Studio such as YRF functions as a corporation, where capital from one division can be invested in the others. The distribution of films is a significant source of revenue, which gives studios a greater extent of flexibility and de-risks the filmmaking business. The distribution of films not being limited to one territory, country, or media platform, YRF has distribution offices all over India, Dubai, the United States, and the United Kingdom. They also sub-distribute films worldwide (Aashish Singh| interview, October 21, 2014).

Furthermore, the horizontally integrated business approach allows the monetization of the content (film) across media subsidiaries such as television, home entertainment, music, gaming, merchandising, and Internet content creation. This phenomenon de-risked the filmmaking business in India under the aegis of studios. A studio usually releases 8–10 films in a year (as co-producers, distributors, or both). Here, losses incurred from one film can be recovered from the profits of another. Thus, to some extent, studios such as YRF are more likely to escape the impact of any crisis such as the COVID 19 than the individual producers, who are more susceptible to such risk.

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Media and Disaster Reporting: An Analysis of Kashmir Floods 2014

95

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Contents

Introduction	1472
Understanding Kashmir Floods	1472
Media and Disaster Reporting	1474
Review of Literature	1475
Research Design	1477
Data Interpretation	1477
Discussion	1482
Conclusion	1483
References	1485

Abstract

In contemporary times, massive industrialization, resultant pollution, and exorbitant population growth including various other myriad reasons have led to drastic climatic changes and a spike in natural disasters. In such situations, media forge a direct link between the public, administration, and emergency services in reportage and information dissemination pertaining to disaster management, preparedness, and response. This research paper aims to explore information about media coverage in the Union Territory of Jammu and Kashmir in response to 2014 massive floods.

In the aftermath of this disaster, it damaged the region's infrastructure, snapped electricity, destroyed communication network for months, and ruined business sector worth millions, affecting every section of society in the Kashmir valley in multiple ways. In such a situation, the role played by media in disaster reporting presents an interesting area of study. This study was conducted to analyze the "agenda setting role" of the media with a focus on the leading media narrative at regional, national, and international level to understand the overall media portrayal. The analysis was drawn using content analysis and bring to the fore, social

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and political realities. The findings reveal important implications for the understanding of media and political narrative in the backdrop of the long-standing Kashmir discourse and the role of media.

Keywords

Kashmir floods · Disaster reporting · Agenda setting · Media narrative

Introduction

Media is considered as the most dominant source of information by which we gain information on different crises of the world around us. Apart from reporting on contemporary political and socio-economic issues, media also reports on various disaster situations. Media activism is very prominent in the wake of any calamity or disaster. It not just informs but generates discourses, questions, or criticizes. Media treatment to issues of environmental is visible at regional, national, or international levels. The role that media can play in times of hazards includes raising awareness about the emergencies warnings, its dissemination, and details of hazards about its impact including physical, economic, social, psychosocial, etc. Journalists usually collect data from multiple sources about damage, destruction, and causalities when everyone around is confused and not clear about the situation.

Jammu and Kashmir has been the center of national and international attention since 1947, when the British gave up their century's old control over the Asian subcontinent, and simultaneously divided the region into India and Pakistan. The seven-decade-old conflict in Kashmir has witnessed some landmark news-events and political developments that received attention across the globe. But at the outbreak of the September 2014 floods in the region, more space and coverage was allocated to the Kashmir, thus setting an agenda for public debate and discussion. Media organizations from regional, national, and international level presented contesting versions of this devastating calamity. Thus it can be argued that news media's treatment of disasters largely depend on the role of the media. On an issue like Kashmir conflict, media acts as a focal point and creates public opinion thus shaping not only politics, but also basic thinking impacting issues like disaster reportage.

Understanding Kashmir Floods

Kashmir Valley is located in the northwest Himalayan region. It is embedded by the mountain ranges with Zanskar on the northeast side and Pir-Panjal on the southwest end. A distinguishing feature of the Valley is the presence of river Jhelum which stretches over the entire Kashmir valley from Verinag in south up to Wular Lake in northwest. Interestingly when river Jhelum exits from the Wular lake, it then enters into Pakistan. According to Bhat and others (2018), the maximum topography of the

valley is precipitous, which is exposed to frequent inundation especially during extended hours of precipitation, thus making more than 5.5 million people living in low-lying areas prone to multiple geographical hazards, including floods.

One such disaster which is taken as the subject of this study for the present research is the 2014 floods in Jammu and Kashmir. This disaster was by far the most serious natural disaster in contemporary history of J&K. On seventh of September 2014, flash floods caused due to continuous 7-day heavy and unprecedented rainfall washed away everything from everywhere, causing large-scale panic and anxiety in the region. The intensity of floods was such that it engulfed the whole land mass into a water body with most habitation submerged. According to media reports river Jhelum was flowing around 5 to 6 feet above the danger mark in Srinagar and Anantnag districts with the discharge rate of $70,000 \text{ m}^3/\text{s}$ against the normal discharge of $25,000 \text{ m}^3/\text{s}$. According to Fayaz (2014), the worst disaster recorded in over 50 years left 280 people dead, damaged the region's infrastructure, snapped electricity cables, destroyed communication links, and business losses amounting to an estimated \$US6718.583 million. As compared to Srinagar, floods do not affect much in Jammu division; however, there have also been incidents of landslides, damaged roads, collapse of some bridges, etc. in the region. The Prime Minister of India, Narendra Modi, on the one side at that time called the incident as national calamity while on the other side rejected foreign aid to Kashmir.

During the devastating floods Kashmir valley remained cut off from the rest of the world as all essential services remained closed for days. The situation in the valley got little tense when various media houses based in New Delhi began to airdrop their journalists in the valley to cover the floods, but despite showing actually the tragedies on ground, it remained confined with the political and security prism only. All the national channels only provided the space to the rescue efforts of Indian security and did not give enough and expected coverage to the local suffering and efforts. In this context, Hafsa (2014) revealed that militarized coverage of the floods by India's national media increased the anger of Kashmiris. They also accused the Indian army of prioritizing its relief operations – focusing on rescuing the families of military personnel, the politically influential, and Indian tourists visiting the region.

Whereas International media coverage was far more objective, it included representations of all actors involved in the flood relief efforts, including local Kashmiri people. The reporting also included a balanced political context of the ongoing conflict in the region. Local media which started publishing news 18 days after the flood presented a different picture of the overall scenario. They significantly featured the efforts of local population, self-help groups, community-services, relief camps, and other sections of the society for their brave acts in saving many lives through ways of rescue operations and with aid food and shelter for flood victims. Although these contrasting narratives did not lead to any serious form of agitations as compared to previous years from 2008, 2010, and 2016 when serious mass unrest was reported in the region but somewhere the socio-political framing of floods created a trust-deficit among the people of the valley with New Delhi in response to treatment and mainstream coverage of the Kashmir floods.

Hence it can be argued that media coverage of the 2014 Kashmir floods was not without any agenda. Therefore, the aim of this study is to analyze the portrayal of Kashmir floods in the backdrop of agenda setting theory in the selected sample of print media sources from local, national, and international perspective. It is important and pertinent to analyze and compare how newspapers focused on different phases of Kashmir floods, discussed responsibility issues, and used positive or negative tones with different framing techniques to influence both public opinions and disaster-related policies.

Media and Disaster Reporting

Media as the fourth pillar of society has a key role in building public awareness and information about all vital aspects of any disaster. Disaster and its reporting are classified by the nature of media treatment which usually depends upon the purpose and contents, for example, responsibility, sustainability, etc. For example, 2004 Indian Ocean Tsunami and 2010 Haiti Earthquake showed that media can have both positive and negative effects.

If we look at the historical perspective regarding media and disaster, National Research Council in February 1979 organized the first awareness workshop in the USA on the theme of media and disasters. Whereas the first official report entitled *Disasters and Mass media* was published in 1980 by National Academy of Science. The report was the first attempt which tried to focus on the role of mass media during disasters.

Whenever any disaster-related incident happens, it is always the local media which is considered as the primary sources of awareness and information as compared to the national and international counterpart. In this context, Liu's (2010) study revealed that, during any disaster people living in remote communities and geographically diverse locations with no access to internet are solely dependent upon traditional media sources for information regarding disasters. Further, media treatment of disaster is also influenced by the various socio-political actors to divert the attention towards a particular agenda or opinion. Therefore, the role of media in terms of understanding of disaster, its reporting, and use of language becomes all important. Van Belle (1999) in his work states that media coverage often influences agenda setting through public and political demands for disaster relief and reconstruction efforts. Similarly, Zaheer (2016) reports that agenda-setting role of media may divert the attention of government and public to emergency response and relief distribution and may ignore the more important phases of preparedness and mitigation. However, Joseph Scanlon and Alldred (1982) argued that, in many disasters, it was observed that media remained focused on the single story event such as the coverage of 2005 earthquake in Pakistan, ice Storm in Ottawa, Hurricane Katrina in the USA, and fires in Russia.

However on the flip side rather than being sensitive, responsible, and represent credible information, media has also been criticized for its insensitive coverage and exaggeration for giving unwanted importance to some issues as during the Nepal

earthquake (2015) and Uttarakhand floods (2013) to mention a few. Further one of the main parameters of media that mainly affect disasters is the competition among media houses to grab the attention of its audiences towards the discourse. While on one hand there are so many factors associated with the reporting of disaster, on the other hand journalists as a part of society also face various pressures and pulls while reporting for disasters.

During any disaster situation, media organizations are also in competition with one another in breaking news and producing a unique narrative of the disaster to generate larger public attention, readership, and advertising revenue. Besides, news sources play a significant role in news production as they have access to information which can change the course of news through their relationship with media, thus influencing news outputs and, consequently, public engagement with political institutions. The principles of objectivity that journalists follow while reporting also contribute to the multi-dimensional issues of disaster as it affects the slant of a story and its implications. Scholars like Schechter (2003) and Stromback (2005) argue that in case of any crisis situation it is exceptionally difficult to apply the traditional principles of reporting.

As per the above-mentioned arguments, the question thus arises as to which type of role the media play during a crisis which can be only determined by analyzing the patterns of media reporting, the potential constructive role of the media, how media communicated the crisis, and whether or not ethical standards and norms of journalism were followed. Hence by understanding the different narratives of media and disaster relationship, this section of paper presents useful critical frameworks on how media contribute to disasters and how disasters shape the media treatment.

Review of Literature

Disaster of any kind be it natural or man-made like floods, earthquake, plane crash, building collapse, tsunami, etc. needs quick response and instant efforts to coordinate the emergency services. Such coordination requires immediate and real-time information within and between different organizations for an efficient disaster management for the larger welfare of society. This literature review focuses on the role of communication in disaster management by analyzing the previous studies in perspective of floods only.

Khumairoh et al. (2021) in their study “The role of communication as the disaster risk reduction in Indonesia capital city transference policy” described the role of government in preventing people to face the dangers of natural hazards, disasters, and conflicts through the effective communication. The result of this study shows that disaster communication can play a major role in helping the government to share the information to the society in order to sustenance the disaster risk reductions. Similarly, Malik and Hashmi (2020) in their study entitled “Flood Realities, Development Faults and Perceptions-Natural and Anthropogenic causes of 2014 Flood in Kashmir” argue that 2014 floods in Kashmir Valley were greatly caused by the anthropogenic causes ranging from unplanned urbanization to poor developmental

policies, encroachment on Jhelum flood plain and lakes, ill-conceived dredging, human greed, breaching of dikes, and a neglected history.

In conflict areas like Kashmir, reporting of the disaster interpreted the intended political realities, thus revealing how disasters can be politicized by media to suit the interests of the warring parties in contested zones. Wasim Khalid (2015) conducted a comparative research into how the media framed stories to cover the realities of flood disaster in Kashmir. In his study "Media Propaganda and the Kashmir Dispute: A Case Study of the Kashmir Floods," the author aims to analyze whether the coverage by the New Delhi-based media was mere propaganda for the army or objective reporting of the disaster. The findings revealed that there was a lot of difference between the media reporting of two regions. The author concludes that the national media's coverage of the 2014 floods in Kashmir, its reporting, was biased and subjective as it was clear from the content analysis that reports of the disaster by the Indian national media rarely represented the local, Kashmiri point of view.

Drawing on qualitative interview evidence from 50 flood victims in south, central, and north Kashmir, Venugopal and Sameer (2017) in their study entitled "Natural Disasters amidst Political Crisis: The 2014 Flood in Kashmir" examine the role of the state and central governments, the army, local volunteers, and the media. The authors conclude that floods have in a sense provided Kashmiris with further evidence to confirm three widely held beliefs. Firstly, the floods provided evidence that the state government is ineffective and that the central government does not prioritize them. Secondly, it confirmed widely held perceptions that the Indian media is hostile to them, that it willfully distorts the reality of what happens in Kashmir. Thirdly, it reinforces the belief that their safety and well-being rests within elements of Kashmiri society itself.

Deliberating about the challenges that news correspondents face while traveling in a disaster-affected zone to gather and transmit news and information from there, Mishra (2021) in his study "Challenges of News Gathering in a Disaster Zone: A Study of Jammu and Kashmir Floods" argues that, at a broader level, the outflow of credible information from a given disaster zone is largely conditioned by the ability of news correspondents to access and gather critical information in a disaster zone which can help direct relief and rescue operations in the right direction and also strengthen them.

Kuppuswamy (2017) in her study entitled "A Study on the Print Media Coverage of Disasters" analyzes print media coverage of Vardah Cyclone of 2016 in Tamil Nadu in two leading national and regional newspapers. The author in her study argued that media frames found in the newspapers were responsibility, economic consequences, human interest, and recovery. National newspapers were responsible in giving worthy news in all the phases of disaster management whereas regional newspapers had a good coverage of news before the disaster and during the disaster. Media act as mediators between public, affected people, and civic authorities during any disaster.

In this context Das (2020) in her study entitled "Media and communication in times of crisis: Case study of Pune flood, 2019" focuses on one such crisis situation that occurred in Pune city, in the Indian state of Maharashtra. The study concludes that media plays a significant role in covering a natural disaster in regard to public

interest. It has a wider reach and informs the actual intensity of a crisis situation. From the audience perspective, the study infers that readers need to understand that there are certain constraints of the media too as media faced all odds for spot reporting or get stories from the affected area.

Research Design

A research objective must be accurate, result-oriented, and achievable; so that it must be completed within available time, infrastructure, and various other research resources. Hence based on present research study, the objectives drafted are as under:

- What has been the nature and extent of news coverage given to Kashmir floods.
- To analyze the audiences negotiation during the crisis situation.
- To compare the leading narratives presented by selected newspapers in their coverage.

The study seeks to explore and understand the nature of print media coverage given to 2014 Kashmir floods. In this research, the event-specific coverage by print media was studied using elaborate content analysis for making inferences about how media construct Kashmir floods. Furthermore, within the context of sampling, the researchers have taken only those selected sample of newspapers into consideration which are published on daily-basis and in English text. Moreover, as it was not practically possible for the researchers to study all the daily based newspapers, therefore a representative sample of newspapers were selected, from local, national, and international perspective and within which selected number of stories were analyzed and interpreted based on the need and demand of the present research study. Moreover in order to gauge how audiences negotiate with different sources of information, an online structured questionnaire was circulated among selected professional audience to record and analyze their responses during Kashmir floods.

Data Interpretation

For the purpose of this study, the researchers undertook a selected number of articles pertaining to the coverage of the Kashmir floods for analysis from the local, national, and international newspapers. The time frame for this study was taken three weeks after the incident took place, i.e., from September 7, 2014 to September 27, 2014.

Based on stratified sampling, a representative sample of 15 news stories was chosen from each stratum (newspaper) with an equal size of the sample from each newspaper. The international media took a while to respond to the floods, so their coverage started a few days later and lasted until September 20, 2014. In this context, selected sample of stories from the *New York Times*, *The Times of India*, and *Greater Kashmir* was chosen. The news stories were selected on a random sampling basis

Table 1 Representation of stories used by newspapers during 2014 Kashmir Floods

S. no	Number of stories	Sources
1	15	International media
2	15	National media
4	15	Local media
Total	45	

Table 2 Themes used during the 2014 Kashmir Floods by newspapers

S. no	Themes	International		National		Local	
		No.	% Age	No.	% Age	No.	% Age
01	Health	07	35	03	15	05	25
02	Human interest	07	35	04	20	12	60
03	Politics	05	25	10	50	03	15
04	Others	01	05	03	15	0	0

with Kashmir 2014 floods as the main characteristics. Hence, a total representative sample of 45 stories was generated from all 3 newspapers (Table 1).

The results pertaining to the thematic representation on which the stories were reported by the selected print media sources, the results revealed that the *New York Times* in its coverage of the Kashmir floods has mostly covered stories about human interest angle (35%), health perspective (35%), and politics over the floods (25%). And in comparison, *The Times of India* has dominantly used the political framing perspective (50%), human interest (20%), and health (15%) in its reportage of the Kashmir floods. Whereas *Greater Kashmir* has portrayed a completely opposite picture, it has used human interest (60%), followed by health (25%) and politics (15%), in its portrayal of the 2014 Kashmir Floods. The results also indicate that among all newspapers, *The Times of India* has used the political perspective of floods to a larger extent than others, and only *Greater Kashmir* has a maximum number of stories under the human-interest category. Further, international media responded to the floods as per the nature of the news treatment and provided a balanced view to all the themes as the events unfold (Table 2).

Sources play an important part in making a story more reliable, objective, and balanced. In this context, during the analysis of selected stories from all the newspapers, the researcher also finds it very pertinent to identify the sources that have been used in reporting to 2014 Kashmir Floods. The study found that in a maximum number of stories from the *New York Times* and *The Times of India*, 40% and 44%, respectively, have been reliable on official sources mostly. The data regarding the international media coverage further reveal that it has also provided a good amount of space to other important sources with 28% to eyewitnesses and 20% to victims of floods. Similar types of results are being recorded from the national media perceptive with 20% each to eyewitnesses and victims of floods. However, located on a national prim, the coverage could have been more balanced with more space given to different sources. In the context to *Greater Kashmir*, the results further reveal that 40% of the stories have used eyewitnesses, 28% have provided space to victims, and

Table 3 Types of sources used by newspapers during coverage of Kashmir Floods

S. no.	Sources	International		National		Local	
		No.	% Age	No.	% Age	No.	% Age
01	Official	10	40	11	44	06	24
02	Eyewitness	07	28	05	20	10	40
03	Victims	05	20	05	20	07	28
04	Anonymous	03	12	04	16	02	08

Table 4 Sources of information used by masses during Kashmir Floods

S. no	Sources of information	Number	Percentage (%)
1	Newspapers	10	17
2	Online	24	40
3	Television	08	13
4	Radio	06	10
5	Word of mouth	12	20
Total	60		

the remaining 24% to official versions of sources. Hence evident that select newspapers have provided space to all the important perspectives during the 2014 Kashmir Floods (Table 3).

The data on the information negotiation by the audiences during Kashmir Floods revealed that the majority of the population, 40%, used various online platforms as their sources of information. Besides only 17%, 13%, and 10% of the respondents used other traditional tools of information which include newspapers, television, and radio, respectively. Further, when the respondents were asked how they access the internet, the majority of participants, 70% of the sample among those who have internet access, preferred smartphones both before and after the floods for their information means. The reason for the same is attributed to its portability and availability of internet facilities at any time without much interference.

One of the interesting observations that came to the fore was that 20% of the sample revealed the word of mouth as their preferred means of information during the floods. This includes those respondents who have limited access to other major informational mediums and consider word of mouth as a reliable source of information (Table 4).

Social media played an important role in facilitating various emergency responses at all stages of any disaster and distributing information among the masses in a limited amount of time. In this regard, our findings revealed that social media play a crucial role in the context of Kashmir floods as 70% of respondents collectively consider social media as mostly used in many ways as it helps in connecting people together and is highly used in any crisis situation to remain updated and act accordingly. The data further reveal that 13% of the masses consider that the dominant use of social media sites has facilitated the propagation of messages during a disaster which also facilitates the rapid diffusion of rumors (Table 5).

Moreover, when the respondents were asked about the overall role played by the media during the Kashmir Floods, 80% of the participants believed media coverage

Table 5 Role of social media during floods

S. no	Response	Number	Percentage (%)
1	Highly useful	16	25
2	To some extent	06	12
3	Spread rumors	08	13
4	Connecting people	20	33
5	Others	10	17
Total	60		

Table 6 Role of media played during Kashmir floods

S. no	Response	Number	Percentage (%)
1	Creating awareness	18	30
2	Sharing updates	16	27
3	Information of health and hygiene	14	23
4	Sensational	08	13
5	Others	04	07
Total	60		

helped them in various ways which include awareness, providing updates to the masses about the crisis, and distribution of information about health and hygiene. The data also revealed that 13% of the respondents believe that the media sensationalize the incidents of disaster. Such type of reportage was mostly seen within the National Media Coverage of Kashmir Floods where the newspaper carried details that were misreported and only focused on the operations of army forces. Such type of coverage included exaggerated or sensationalized stories, which can turn the attention of audiences away from emergency relief and response (Table 6).

Besides when the respondents were asked about the possible role of the government during the 2014 Kashmir Floods, only 33% of the respondents supported the argument whereas another 30% consider that government did not play a pivotal role during the floods and the remaining 17% were unable to respond toward the given statement. Kashmir floods in 2014 created havoc across. During any disaster, the primary role of the government is to address all the important aspects of risk management. During the Kashmir Floods, the inability of the government to control the damage caused by the flood was evident due to the lack of proper disaster management facilities. As the rescue operation is not led by anyone because there is not any communication between officials with no means available to people to contact anybody in the government (Table 7).

Media also assists in disaster management by educating people, warning about hazards, information about affected masses, informing concerned officials, highlighting public needs, and also loopholes in government's disaster schemes and its management. In order to gauge the audience's response to whether media reportage of floods helped the government to implement disaster management plans, 36% of the sample supported the argument whereas 13% of the respondents believe

Table 7 Do you believe government played an effective role in handing the crisis

S. no	Response	Number	Percentage (%)
1	Yes	20	33
2	No	10	17
	To some extent	12	20
4	Not at all	08	13
5	Others	10	17
Total	60		

Table 8 Do media coverage of Floods help governments to influence for disaster management

S. no	Response	Number	Percentage (%)
1	Yes	14	23
2	No	08	13
3	To some extent	08	13
4	Not sure	20	34
5	Others	10	17
Total	60		

Table 9 What kind of stories grab your interest during Kashmir Floods

S. no	Response	Number	Percentage (%)
1	Flood causes	19	31
2	Flood management	12	20
3	Facts based	16	27
4	Research based	10	17
5	Others	03	05
Total	100		

that media coverage does not help in disaster management planning. The remaining 34% of the sample was unable to respond to the given statement (Table 8).

The media are essential for warnings to be effective and are the most important source of public information in the wake of any disaster. In this context, when the respondents were asked about their stories of interest, mixed types of responses were recorded. 31% of the sample believed that they are interested in those stories which are related to the cause of floods, whereas 20% of the opinion for news content is focused on the management of floods. Moreover, 27% and 17% of the sample revealed that stories that are based on facts and research grab their interests accordingly (Table 9).

Moreover, whenever any disaster occurs, media professionals also face various pressures and challenges which also play a significant part in shaping the narratives of disasters. In this context, when the respondents were asked to put forward their responses, 27% of them were of the view that limited time space to report the disaster is the main challenge that journalists face, whereas 23% of the sample revealed that in order to meet the expectations of all sections of society is the main challenge that comes across to journalists while handling the crisis. 20% of the respondents

Table 10 Challenges for journalists

S. no	Response	Number	Percentage (%)
1	Meet expectations	14	23
2	Lack of time	16	27
3	Not sufficient disaster reporting training	10	17
4	Spot reporting	12	20
5	Others	08	13
Total	60		

revealed that spot reporting is also a major challenge that journalist face while reporting for disasters. Interestingly, 17% of the sample revealed that an average journalist often does not have sufficient disaster management/negotiation skills due to which various challenges are faced by them (Table 10).

Discussion

In the context of reporting on Kashmir floods, the international media reported on various issues. News stories from the *New York Times* were chosen as the international sample in order to understand the news coverage. The newspaper provided spaces to health communication stories, flood victims, role of local volunteers during crises, and lack of essential medicines among others. Besides media from the global perspective, also reported was how population based in Kashmir viewed the army's role in the flood. The coverage also contextualized the stories by connecting the long-standing seven-decade-old Kashmir dispute with floods by highlighting why people of Kashmir were rejecting aid provided by the Indian agencies. Besides, it also portrayed the role of volunteers during crisis and survivors of the floods.

For national media, the online archives of *The Times of India* were accessed to analyze the data. It was worth to mention here that national media decided to report on the crises when the Prime Minister Narendra Modi planned to visit the region. Until then the media from the national prism did not report a single story regarding floods, despite a wide range of stories were there in public domain generated from ground zero. It was also surprising to notice that news about Kashmir floods were not even portrayed among the top lead stories in the mainstream Indian media scenario. As opposed to international media, the coverage from Indian media was dominantly focused on the rescue operations conducted by security focusing mainly on armed forces with limited space provided to the flood management operations that were conducted by the Kashmiri populations. When the researcher looks deeply into the content of such stories, the prime focus of attention was mainly the non-Kashmiri populations. These mainly include tourists, people visiting Kashmir for work, and other non-local labors. The research findings also reveal that the Indian media did not report international aid offers that were provided to Kashmir when Indian government refused to accept foreign aid.

Besides, for the purpose of this study local media narrative was also taken into account, and in order to fulfill this purpose, *Greater Kashmir* a daily English newspaper published from Srinagar was considered. The reporters based in the Kashmir region initially reported aspects of floods that were related to its managements and possible precautions and flood damage at various places. But when the devastating floods hit major parts of Kashmir, the media persons were not able to respond and provide information to the masses. For days connectivity was snapped, and families did not hear from each other for as many as 9–10 days, leading to a virtual despair that was reflected on the social media. Journalists on the ground were only able to cover different narratives of Kashmir floods when some sort of management was done and journalists were able to move a bit from one place to another in makeshift boats.

The news stories published from the abovementioned newspaper criticized the government of India and Indian national political parties over the politics during the Kashmir floods in the name of relief and rescue operations that were undertaken by army. As compared to the other media outlets, it was mainly the social media platforms used mostly by the Kashmiris populations based in and outside valley to come together on such digital channels that became the only source of communication as and when possible as all other vital media organizations based in capital city of Kashmir Srinagar were totally submerged. After the activities resumed, the local media portrayed the real, grassroots image of Kashmir floods to the outside world. The reports presented the information while communicating the risk and act as a bridge of communication between victims and general public. The extensive reportage of role of local Mohalla communities, self-help groups, youth associations, and other sections of society in managing the crisis motivated the general public to help the victims. In case of any disaster, it's the role played by the local media by being at the ground to do spot reporting to present the actual happening. In case of Kashmir floods, it was also the coverage of local media outlets which diverted the attention of the officials, international media, and associated sectors towards the actual realities. It also diverted the attention of the government for the need assessment. The coverage also showed which agencies and authorities worked in the front line and also brought the scale of devastation of the disaster into public knowledge.

Conclusion

Media activism is very visible and prominent in the wake of a calamity or disaster. Media not just sets the agenda for proper disaster management but also reports on multiple dimensions of the issue, i.e., social, humanitarian, problem redressal, etc. In the wake of any disaster event, communication is a core component and plays a very crucial role in rescue, response, and recovery operation. As Kashmir is geo-strategically located at the intersection of India-Pakistan and China, it has attracted media attention at national and international level for various geo-political reasons. In 2014 September, a massive deluge struck Kashmir causing

damage to life and created havoc all across. It was a massive disaster leaving behind a trail of death and destruction as all communication links snapped.

The disaster and crisis management failure was so visible that chaos and lack of coordination/mismanagement at all levels attracted media attention across. This chapter attempts to study the Kashmir scenario during this calamity through the prism of media treatment at local, national, and international level. For this purpose local popular newspaper *Greater Kashmir*, a mainstream newspaper *Times of India*, and an international newspaper *New York Times* were selected, and their coverage of Kashmir floods has been analyzed and interpreted. The issues looked are themes, sources, role of media, and audiences perception.

The coverage given to the floods exhibited an interesting graph revealing a thematic pattern. The international media dominantly covered aspects like issues of human interest and health and gave very little attention to the politicking of the disaster, whereas the mainstream national media presented the issue in a dominantly visible political frame giving very little attention to the other aspects like health, problems, and local issues. On the contrary local media extensively focused on the humanitarian aspects of the issues. The international and national media sourced their reportage on official interpretations and minimally on eyewitnesses and the affected populations, while the local coverage was entirely based on oral stories, eyewitnesses, and experiences.

A striking feature very prominently visible was that the national media focused entirely on the role of the security forces in rescue and relief while exaggerating the same. This deflected the attention of the audiences from the actual issue of emergency and relief operations. Moreover the audience's perception of the issue revealed that non-state actors played a major role in the issue redressal as there was complete lack of coordination and no communication with authorities and government was a common discourse. Audiences were of the opinion that media had no role in the disaster management as most of the local media itself was paralyzed and caught up in the deluge.

An analysis of the reportage revealed that most of the reportage focused only on the causative factors like massive unplanned urbanization, improper housing, land management, ghettoization of low-lying flood-prone areas, etc. An interesting feature revealed in the international coverage was the relationship of conflict and disaster. The reportage revealed the dissent among the Kashmiris as they refused to accept the politically backed relief from the Indian sources. National media focused mostly on the operations of airlifting tourists and non-locals in special flights while ignoring the local humanitarian aspects of floods. The local media were the only reliable agency highlighting the role of local self-help groups and other organizations. This triangulated pattern of media covered and its response among audience's evolved as an interesting finding revealing the biases in the system. Noteworthy to mention that role of the social media was neutral and most effective in the time of this crisis.

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Role and Impact of Visual Imagery During Crisis

96

Seema Goyal

Contents

Introduction	1488
Visual Perception	1489
The Observer, the Storyteller, and the Aide	1490
The Observer	1490
The Storyteller	1491
The Aide	1492
Conclusion	1493
References	1494

Abstract

Reactions of people at large to a crisis are results of their understanding and perceptions. In today's world driven by social media, with almost instant availability of reports and imagery related to any new or ongoing crisis, reactions and perceptions are quickly created in the minds of people far and wide. People react to and read visuals differently, depending on their understanding of the situation. It is important to understand the way images can lead to strong reactions based on how they are interpreted, and many a time misinterpreted. This chapter specifically looks at the role of visual imagery created during various crisis situations and its psychological and social impact. The way the angles, colors, and content within the frame or window of the camera are created directly leads to forming impressions in the minds of the viewers who are not always in sync with the full reality or severity of the situation. Panic and heightened emotional reactions resulting from insensitive or irresponsible visual imagery freely circulated on the social media platforms can sometimes lead to overreactions and create additional difficulties in managing the crisis at hand. It is important to understand the social responsibility that lies with the creators of these images. Even so, visual

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images can be a great tool for informing and sensitizing people about a crisis. The challenge is to understand the difference between “right” and “wrong,” and “subjective” and “objective” interpretations and perceptions of these images. This chapter looks at visual images created and circulated in the media during some of the past disasters and has attempted to analyze their impact by broadly categorizing them under various heads based on the role of the creator, the observer, the storyteller, and the aide.

Keywords

Social media · Visual imagery · Media literacy · Photography · Television · Journalism · Video

Introduction

Camera does not lie, A picture is worth a thousand words, Seeing is believing – these are just a few common phrases that lend a certain amount of credibility, belief, and trust in photographs and videos. The impact of photographs and videos and the power they have for creating impressions and perceptions in the minds of the masses cannot be denied or underestimated. Any tool with so much power to shape the minds needs to be understood and handled with extreme caution. Lack of critical thinking and understanding of the impact of a single picture or film can prove to be catastrophic, especially during crisis when emotions run high and logical thinking takes a back seat. Panic and heightened emotional reactions resulting from insensitive or irresponsible visual imagery freely circulated on the social media platform can sometimes lead to undesirable overreactions and create additional difficulties in managing the crisis at hand. These visuals can also leave long-lasting impressions on the psyche of the viewers. The iconic photograph of the *Bhopal gas disaster girl* taken by Pablo Bartholomew in color and Raghu Rai in black and white, in 1984 following the Bhopal gas tragedy, is deeply engrained in the minds of many, even today constantly reminding them of the horrific tragedy (The Famous Pictures Collection, 2013).

As the well-known and frequently quoted photographer and filmmaker, Elliot Erwitt aptly puts it “Photography is an art of observation. It has little to do with the things you see and everything to do with the way you see them.” In today’s world driven by social media, with almost instant availability of reports and imagery related to any new or ongoing crisis, reactions and perceptions are quickly created in the minds of people far and wide. People react to and read visuals differently, depending on their understanding of the situation and cultural upbringing. It is important to understand the way images can lead to strong reactions based on how they are interpreted, and many a time misinterpreted. Photographic memory and the power of instant recall of images and the way they impact the overall mood and behavior patterns of the audiences may leave irreversible psychological impact in the long run.

Nevertheless, visual media can also be of great advantage and use. Not only as a tool for communication, but also to assist and help in crisis management. However, the need to handle and regulate the use of this media carefully during a disaster is of utmost importance. It is imperative to understand the social responsibility that lies with the creators of any visual content for mass consumption. The challenge is to understand the difference between “right” and “wrong,” and “subjective” and “objective” representation, interpretation, and perception.

Visual Perception

Many factors determine how the mind perceives visuals. The viewer's background, culture, past and present experiences, preconceived notions, and education are just a few of them. There are several theories put forward on how visuals are perceived. For example, Gestalt theory essentially says that the mind perceives the whole by putting together various elements or grouping them based on similarity, proximity, continuity, and closure. Gestalt theorists have shown that how an image or visual is perceived depends not only on past experiences and on what they want to see, but also on the viewer's mental state when looking at the visuals (Lester, 2003).

Semiotics or the science of signs and cognitive abilities also impact how visuals are interpreted. Different signs and symbols may have different meanings depending on the audience and their individual or cultural perceptions. For example, different colors mean and imply different things to different audiences – red can represent love, passion, anger, danger, and so on depending on the audience's understanding and cultural upbringing; black similarly can hold different meanings like mourning, or rebellion, or protest.

Bloomer (1990) in her book *Principles of Visual Perceptions* highlights different cognitive aspects such as memory, culture, habituation, expectations, and selectivity that can impact visual perception.

What needs to be emphasized and understood is that visual imagery is extremely impactful and influences minds and evokes emotional response. Even though different audiences may react to images differently, some images tend to evoke similar impact across audiences such as images of children suffering, death, and destruction. For example, sometimes photographers may purposely choose children as their subject to evoke heightened emotional impact. Pictures of corona patients looking at their children or loved ones from across the glass partition used for isolating them had an immense emotional impact globally. The Bhopal picture showing a child being buried with the hollows of the eyes graphically directing us to take note of the devastation and impact of the gas tragedy even led to the photographers themselves breaking down in tears (The Famous Pictures Collection, 2013).

Knowing and understanding the audience and its psyche is crucial to evaluate the impact of visual imagery. It is also pertinent to comprehend the content creator's mind. Who is the creator of the content? What is the intent? Who are the audience and what are the possible desirable or undesirable impacts of these images? These

are some questions we should ask ourselves when we consume any visual content which is related to a real event.

The Observer, the Storyteller, and the Aide

To appreciate and analyze visual content, we must spell out the difference between the roles of the content creator and the purpose behind these creations, especially during crisis or disaster. Based on the intent, we may broadly categorize the role of the creator as that of the observer, the storyteller, and the aide.

The observer creates the visual content for mass consumption and often claims to be the unbiased observer of events or a creator of the journalistic representation. The storyteller aims to bring you the stories before, during, and after the event, often dramatized and sensationalized, compelling the audience to look at disaster from their viewpoint or perspective as a story, many a time with the intent to play on the emotions by creating some element of drama. The aide uses and creates visual content with the intent to help before, during, and after the event, often using visual imagery to assist in rescue and recovery. Each one has their own important role to play.

The Observer

Visual content can be instantly created by anybody with simple access to a camera. In today's world, it is easily and readily available in the form of a mobile phone that almost everyone carries. When disaster strikes, instantly cameras start rolling, often without much thought. Instant reactions are to click and share. This is a dangerous situation. By sharing any live content during crisis without proper understanding and media literacy, the observers and the reporters of such content on social media can do irreversible damage. Videos and pictures go viral at alarming rates, especially during disaster. Taking the case of coronavirus pandemic and the images circulated on social media showing the handling of dead bodies by hospitals in India, created not only panic, but also fear. The panic and fear created lead to fresh challenges for the disaster management agencies. Many people avoided getting tested for the fear of being taken to the hospital. It is of utmost importance for the creators to follow certain standard protocols in public interest. Media coverage is like a rat race today. Every news channel wants to run a breaking news story with the prime objective of increasing viewership. The live coverage of the 26/11 attacks in Mumbai in 2008 resulted in providing the terrorist, who were also watching the news, live updates and key information regarding the strategy and rescue measures being taken by the rescue agencies, jeopardizing the rescue efforts in the process. After this episode, new guidelines for coverage of emergency situations were drawn up by India's News Broadcasters Association, an autonomous industry body for TV news channels (Mirchandani, 2018). Media ethics and responsibility must be an integral part of journalistic reporting of such occurrences.

When looking at visuals and videos of any such happening, the viewers also need to look deeper and keep in mind whose viewpoint is being depicted in the pictures related to a specific disaster. A research study undertaken post the Nepal Earthquakes in 2015 showed a difference between the tweets generated by the *locals* as opposed to the *global* twitterers. According to this study, “*locals* focus more on relief and recovery imagery more than the retweeting *globals* do, whereas *globals* focus more on people suffering and rescue activities” (Bica et al., 2017). The perspective, priority, and purpose of the images captured and posted on social networking sites by people directly impacted by the event are generally very different from those created or shared by an outsider, looking at it from far. Due to the direct impact of the event on the lives of the local people, the images created by them are more convincing and tend to be considered more authentic. Therefore, careful and cautious handling of these images is important. This is easier said than done in today’s virtual world.

Governments have laid down standard broadcasting guidelines. However, today the content on social media is created by people without knowledge of these guidelines. Even those trained to follow these guidelines sometimes fail to recall them during a volatile situation. Visuals evoke instant reactions from the heart and not always from the mind. Images of disaster and human suffering bring out strong and emotional reactions. Sometimes these first observations by the observer and the creator of the instant visual content can be instrumental in creating panic. Even so, they could also play a critical role in bringing out facts and action can be accordingly planned. The awareness and realization of the impact of these instantly created and shared content is important for both the creator and the consumer of these images.

The Storyteller

Stories are often told with visuals to add a certain amount of attraction and appeal for the audiences and to grab their attention. Stories related to a disaster are human interest stories that people believe in and are instantly drawn to. These stories can have both positive and negative impact during crisis. The good part they play is in sensitizing the masses about the gravity of a situation and the need for action. There have been several times in the past when the stories of people affected by the crisis have played a big role in mobilizing resources and people have come together to help. The camera angle and positioning of the subject within the frame creates not only an image, but also a story in the viewer’s mind. This can be intentional or sometimes unintentional. Storytellers often use camera techniques and skills to create dramatic visual imagery, bringing forth sensitive reactions, and the enormity of the disaster may sometimes be over or understated by these visuals. There have been times when images not related to the event have gone viral, suggesting them to be images of that event. Various justifications have also been given as to the relevance of these images to the present event even though they were taken at another time and place. The study undertaken after the Nepal earthquake specifically gives the example of the picture of a young boy holding his younger sister which

went viral. The picture in fact was taken in Vietnam in 2007 but was tweeted as “young boy protecting his sister in Nepal” in 2015. There are other similar examples mentioned in the study with one thing common in them – *a sense of drama* (Bica et al., 2017). But is this ethically and morally justifiable? It is crucial to be able to tell the difference between the real and the created reality, which is often beyond the understanding of the masses.

Images engrained in the minds of the people through representations of calamities and disasters in movies also tend to impact the way people react to the images of real disaster. Sontag (2003) writes in her book, *Regarding the Pain of Others*, “The understanding of war among people who have not experienced war is now chiefly a product of the impact of these images.” Sadly, watching these images repetitively on television and in movies at times also tends to desensitize the audience to the real events. Sontag also talks about the attack of World Trade Center on September 11, 2001, which to many seemed unreal and like a movie or created reality. In some ways, it removed the audiences from the reality and true horror of the happenings. Such responses make one question and wonder how much of these violent images of destruction and devastation should be a part of our lives through recreations in movies and television dramas.

A large population is ignorant and unaware of the reality and believes without checking the facts when looking at the viral content. Today many social media content creators and bloggers are obsessed with only the number of likes and forwards they receive without much thought or concern about the impact. This once again calls for an initiative to educate and increase media and visual literacy among the general population. A large part of this population is also social media content creator and consumer, and their balanced understanding of this new omnipresent media is important. Unnecessary dramatization and distortion of facts for personal objectives, such as increasing the number of likes, should be the last priority while circulating images during an ongoing crisis. However, if slight overemphasis or dramatic representation can lead to higher sensitization and positive response and the coming together of the masses to help, these exaggerated and dramatized images are still justifiable. The key is to be able to find the right balance while telling a true story through dramatized or exaggerated visual imagery. Similarly, when it comes to the consumer of these images, it is crucial to be able to know the difference between “good” and “bad” and indulge in a bit of retrospection and thought before hitting the forward or share button.

The Aide

The immense importance and role of visual imagery as an aide during disaster cannot be negated. Be it satellite imagery or live imagery from the site of disaster, their use and relevance in disaster management is enormous. We are all aware of the relevance of satellite imagery, especially in forecasting disasters and in evaluating the extent of the impact of disasters such as tsunami, cyclones, hurricanes, and forest fires. First reports or images made available by the people present at the site via social media

can be of great importance for generating timely and appropriate rescue response. Images shared by eyewitnesses of the crisis can also indicate the nature of help that needs to be made available. For example, when an image shows a person trapped under a collapsed wall, we know there is a need to get appropriate equipment that can lift and clear heavy rubbles. Similarly, images encourage and motivate the people to lend a helping hand to the victims. Photographs also assist in identification and search of missing people. Pictures often show the suffering and emphasize the need for empathy. As brought out in a study by Liu et al. (2008) on the emergent role of online photo sharing in times of disaster, “sharing photos in such situations can be informative, newsworthy, and therapeutic.” The study also points out the increasing importance of eyewitness photos. They can provide a true pictures and insight into the severity or enormity of a disaster.

Images and photos cut across language and literacy barriers. This makes them a very effective tool during crisis. Visual rescue instructions are always more effective and easily understood. Creators of such material use signs, symbols, and graphic representations to help during crisis. Simple visual representations can be used for self-help before the rescue team reaches the site. The fact that almost everyone today carries a mobile and has Internet access also implies that there is huge scope to provide help to victims during disaster times via mobile applications and by providing easy access to self-help material over the Internet. However, this may not always be possible as during several natural calamities, Internet access is affected. Yet, the use of mobile apps with ready access to already downloaded reference material on the mobile can be encouraged in disaster prone areas.

Conclusion

Looking at the visual content that is generated during and after a disaster, one needs to understand the mind of the creator and be a little more critical, analytical, and aware of where the image is coming from. One also needs to understand the cultural and social factors at play. Visual imagery during disaster or crisis is of critical importance. Equally important is the positive role it can play, provided it is handled in a responsible and balanced manner. Be it the observer, the storyteller, or the aide, the one fact that is common to all is the concern and empathy for the disaster victims. The utility and role of images created by all need to be handled carefully with the clear understanding of the intent. Government agencies have a critical role to play in terms of authenticating and endorsing such images that are freely circulated across social media platforms. Clearly defined rules of conduct need to be drafted and updated frequently to ensure ethical and responsible media content creation and circulation. Social media ethics must be clearly defined. The key to it is media education and media literacy. Not as a specialized program in colleges and media institutes, but as a general course that is part of the school curriculum. Social media ethics and understanding of its impact need to be taught at an early age in today’s virtual world where blogging, Youtubing, and social networking are an integral part of daily life, especially for the young. The utility of visual imagery for

rescue and recovery during crisis should be optimally tapped by encouraging the creation of self-help mobile apps. One shoe does not fit all. When disaster strikes, reactions to media and visual images are different of those directly impacted and those removed from the happening. What relevance and impact an image has varies depending on many factors (cultural, regional, religious, mood, location, education level, so on and so forth). The role of these images during disaster will also depend on where, for whom, and for what purpose they are created. Creating and sharing these images is no rocket science, but having the ability to appreciate and use them effectively and purposefully for the larger good is altogether a different ball game.

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Government Information Dissemination Structures and Processes in Disasters

97

Shalini Narayanan

Contents

Introduction	1496
Government Information Dissemination Structures and Processes in Disasters	1497
India's Disaster Management Information Structures and Processes	1497
Disaster Communication During the Initial Phase of the Covid-19 Pandemic in India ...	1499
Conclusion	1501
References	1502

Abstract

The massive earthquake that hit India on the 26th of January 2002 in Bhuj in Gujarat was a wake-up call for a coordinated response to disasters in the country. Seventeen thousand people lost their lives and over 165,000 were injured following the earthquake. By August that year, the Government of India had signed an agreement for a Disaster Risk Management program with the UNDP. By 2005, the National Disaster Management Authority, NDMA, a single-point entity for disaster management under the aegis of the Ministry of Home Affairs, was in place with “the ethos of Prevention, Mitigation, Preparedness and Response.” The system got tested over the years in the wake of many natural and man-made disasters such as the tsunami of 2004, cyclones, etc. But the ongoing Covid-19 pandemic which started in 2020, being declared a disaster, has pushed the disaster management system in India under even greater strain. The mechanism under the NDMA, with state governments having their own Disaster Management Authorities, has never before faced such a challenge. As per the National Policy on Disaster Management 2009, “Communication and sharing of up-to-date information using state-of-the-art IT infrastructure remain at the heart of effective implementation of the disaster management strategy.” This chapter makes the case that ineffective communication as part of the disaster management strategy led to

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avoidable hardship to the common man during the pandemic in India. The chapter presents a case study of the pandemic as a lesson in communication during a disaster.

Keywords

Disaster · Communication · India · Covid · Pandemic · Government

Introduction

A disaster denotes disarray and chaos and is a dynamic event which creates disorder. At such times, communication becomes critical as it connects those affected with first responders, support systems, and family. Information systems at such times need to be reliable and accessible. In fact, communication is a vital tool in the entire disaster life cycle of preparedness, response, recovery, and mitigation. Disaster communication is an integral part of disaster management which can help in raising public awareness at all stages – from disaster preparedness to early warning to mitigation efforts to rehabilitation. Community action before, during, and after a disaster is strongly shaped by the kind of information and communication that is disseminated about a disaster, using participatory communication, that is, involving the community at each step. Such communication is effective in bringing stakeholders together to reduce the risk of disasters.

An important aspect of the communication that is going out to the public is that it needs to be credible. The government being the repository of public funds and legitimate pursuer of public good largely enjoys the trust of the people. Thus, the role of the government in communicating for the purposes of disaster management becomes crucial. Whether it is with regard to the Early Warning Systems or EWS or about the strategy for mitigation, the public largely looks up to the government for communicating required response from the citizens. Putting in place a structure for disseminating information throughout the life cycle of a disaster thus becomes crucial on the part of the government. Also, other disaster risk reduction measures that are formulated by the government and need change in public behavior such as preparedness and mitigation strategies need to be disseminated, sometimes on a long-term basis. These could include communication about the building of a wall to prevent a tsunami from causing extensive damage, to reinforcing concrete buildings to make them earthquake-proof, etc. Policies and procedures brought in by the government in such regard for purposes of mitigation need sustained communication campaigns for behavior change. The four elements of effective disaster communication are customer focus, leadership commitment, situational awareness, and media partnership.

When it comes to the messages being communicated, it is important that during a calamity, they be clear, concise, action-seeking, and relevant. The communication vehicle being used is also as important as disasters often impact the telecommunications networks and make it difficult to reach the exact audience aimed at. Today

there are a plethora of options available for mass information dissemination, both legacy and new media. Among the legacy media, radio is one media vehicle that is likely to reach those affected during a disaster, as compared to say, television. New media including social media are increasingly playing a larger role in disaster management, but they bring their own challenges. One of the characteristics of new media is the flow of information from one to many and from many to many. This results in a disruption of hierarchies which in turn affects the proper channelizing of any information. Equally disturbing is the spread of misinformation on new media, which can create confusion and wreak havoc on all aspects of disaster management – the early warning, relief, rescue, and rehabilitation efforts.

Government Information Dissemination Structures and Processes in Disasters

Government information dissemination systems and processes during a disaster are vital for serving the public in such times. Information dissemination comprises two elements – the physical structure of telecommunication and other vehicles such as satellites and the messaging that goes out via those structures.

Given the importance of communication in disaster management, governments across the world have instituted systems for disaster communication management to help the government coordinate all aspects, as well as give stability to decision-making functions. These information structures are aligned to the governance structures and exist at the central, state, district, and local levels. The requirements for effective communication as well as information technology support for disaster communication include voice, video, and data connectivity for both key stakeholders and decision-makers, real-time dissemination of warning and information to local authorities and threatened community, and last mile connectivity at the disaster site for rescue and relief operations as well as providing communications to the community. In India, these form the guiding principles for the National Disaster Communication Network.

Here it may be mentioned that India is a signatory to the Tampere Convention of 1999 which is a legally binding international treaty for employment of telecommunications resources, signed by 75 countries, recognizing that “the timely deployment of effective telecommunication resources for rapid, efficient, accurate and truthful information flows are essential for reducing loss of life, human suffering and damage to property and to the environment caused by natural disasters.”

India's Disaster Management Information Structures and Processes

With a landmass stretching for nearly 3.3 million square kilometers in a subcontinent capped on one side by the youngest mountain range in the world and the sea on the other three sides of its peninsula, India is geographically prone to natural disasters. Combine that with it being the second most populated country in the world (and

rapidly heading toward becoming the most populated), and the scale of disasters becomes huge.

It was only after the massive earthquake on 26th January 2002 in the western district of Bhuj in Gujarat state, following on the heels of the Orissa super cyclone, that India woke up to the lack of a coordinated disaster management structure in the country, an essential element that gives a permanent, always-ready mechanism to deal in the event of disasters. With over 17,000 people dead and more than 165,000 injured in the earthquake, it was one of the biggest disasters to hit the country, causing losses to the tune of millions of rupees. Media reports of the disaster spoke of mismanagement in relief supplies and medical aid reaching those affected in the immediate aftermath of the disaster, even as international humanitarian aid started pouring in. Within 7 months of the earthquake, the Government of India had signed an agreement for a Disaster Risk Management program with the UNDP. By 2005, the National Disaster Management Act was in place which provided for the setting up of a National Disaster Management Authority, NDMA, with the Prime Minister at its helm. The NDMA was a single-point entity for disaster management under the aegis of the Ministry of Home Affairs with “the ethos of Prevention, Mitigation, Preparedness and Response.”

The NDMA’s vision is “to build a safer and disaster resilient India by a holistic, pro-active, technology driven and sustainable development strategy that involves all stakeholders and fosters a culture of prevention, preparedness and mitigation.” The stress on involving all stakeholders “through sustained and collective efforts” in the disaster management plan is a cornerstone of the National Policy Framework which clearly spells out this key feature by saying that one of the themes underlying it is: “Community-based disaster management, including last mile integration of the policy, plans and execution.” To that end, there is a defined structure that works at every level for disaster management.

Given the scale of India, geographic and political divisions have been created for ease of administration, and the country is thus divided into 28 states and nine union territories, UTs. These same states and union territories also make for easier governance of disaster management and communication during disasters, which flows along the governance structures. Thus, just as at the center there is the National Disaster Management Authority headed by the Prime Minister, at the level of each state, a State Disaster Management Authority, SDMA, also exists, headed by the Chief Minister of that state.

The overall stated objective of the National Disaster Communication Network is to “provide reliable, responsive and dedicated communication and IT support for effective Disaster Management during all phases of disaster at the National/State/ District levels.” To that end there is a vertical connectivity with the National Executive Committee, NEC, overseeing the efforts of the Integrated Operations Centre of the Ministry of Home Affairs and of the NDMA’s Operations Centre, which in turn oversee the inputs from similar command centers at the state and district levels called the State Emergency Operations Centre and the District Emergency Operations Centre. Communication flows two ways between the three levels of governance – national, state, and district. At the district level, coordination is also

sought with civil society organizations such as non-government organizations and self-help groups, along with vertical and horizontal interactions with all levels of governance structures including those at the block/village level.

An important aspect of disaster communication is the use of Information, Education, and Communication, IEC, activities to reduce disaster risks. As per the model framework adopted by the NDMA for use at the district level (Model Framework for District Disaster Management Plan, DDMP), among the mitigation measures to be adopted for reducing disaster risks should be IEC activities which should form part of non-structural methods to be adopted as part of mitigation strategies. Also listed among preparedness measures as part of knowledge, management, networking, and sharing is the stress on uploading of information on resources on India Disaster Resource Network (IDRN)/State Disaster Resource Network (SDRN). The National Disaster Response Force or NDRF is also on standby for assistance during any disasters and is trained to respond immediately in disaster areas.

As the efficient management of information and media in times of disasters is needed to keep chaos at bay, training and interaction strategies with media/pre-event awareness for the media are also recommended. To prevent multiplicity of voices and have continuity in information dissemination, the nomination of an official spokesperson about a disaster event is essential too. Such a spokesperson becomes the sole contact for the media for any and all information related to a particular disaster. Media management, including press releases, and giving out of sitreps or situation reports are other tasks that need sensitive handling at such times. Hence, information management and dissemination as well as media management strategies form an integral part of the Standard Operating Procedures (SOPs) for model disaster management.

Disaster Communication During the Initial Phase of the Covid-19 Pandemic in India

The classification of disasters depends on their severity and types whether man-made or natural, e.g., tornado, fire, earthquake, accident, etc. Epidemics also fall under the category of disasters, and the Government of India declared the Covid-19 pandemic as a disaster on the 14th of March 2020. As of writing this chapter, the third wave of the pandemic was just about ending in India in March 2022 in 2 years. The unprecedented scale of the epidemic has put it at par with the Spanish flu that struck about a century ago and affected a third of the world population. In the initial months, the world and India were still grappling with facts about the Covid-19 virus. In the absence of clear scientific evidence of how to control its spread, or how to combat the infection, or a vaccine, communication from the government to the public was changing frequently. It must be stated here that unlike other natural disasters such as floods and earthquakes, the telecommunications structures remain mostly unaffected during health disasters and the structure of the information dissemination system exists. As such, during the Covid-19 pandemic, all media, legacy and new, were available to the public and were well utilized by the

government to carry its messages. New media, including social media, played a big role in helping the public remain connected even during the lockdowns. In fact, the consumption of social media, particularly social messaging platforms such as WhatsApp, went up by as much as 40% during the first phase of the pandemic.

Of the recommended ten principles of disaster communication, especially in times of health disasters, the first norm of public communication is that the government should strive for maximum credibility. The others include engaging in clear communication, communicating with empathy and honesty, recognizing that uncertainty is inevitable, accounting for levels of health literacy and numeracy, empowering people to act, appealing to social norms, considering diverse community needs, and being proactive in combating misinformation (Hyland-Wood et al., 2021). For an effective government communication strategy, community engagement through reference groups such as young adults, senior citizens, etc., as well as effective use of digital tools is essential. Community reference groups can help the government identify the media tools to reach the affected as well as the framing and toning of messages, e.g., whether the use of sign language or a children's program on television or some other social media platform will help reach the targeted populace adequately. While using digital tools such as the *Aarogya Setu* app in India, concerns regarding the privacy of the data are being maintained, need to be addressed, etc. The government's handling of the Covid-19 pandemic in as far as communication is concerned drew flak from many. Ghosh (2021) says: "The evolution of the government communication since the announcement of the Janata Curfew on 19 March (2020) is a fascinating study in how not to do public health communication" (pp. 209). The problem lay, according to her, not in the dissemination mechanism but in the messaging itself which sought to deliberately misinform the public on how the lockdowns would ensure the complete wipeout of the virus in 3 weeks, then 40 days, etc., in a bid to allay the fears of the general public about Covid-19 in the early days. Also, the shifting goalposts gave a further blow to the credibility of communication from the government. The choice of the word "social distancing" for the campaign to combat Covid-19 was also a misnomer as it did not convey the fact that *physical* distancing was required to be maintained. The use of masks was also not made mandatory by then. However, the greatest flaw in the public health communication in the initial days of the pandemic was the use of fear to make the people compliant to the restrictions imposed during the lockdown. This atmosphere of panic led to the exodus of thousands of migrant laborers from urban centers to their homes in rural India, leading to many tragedies in its wake.

An analysis of the structure of government information systems during the pandemic shows an adherence to the basics of crisis communication: the government was quick to declare it a national disaster and deploy the entire machinery of the disaster management system for it, which meant a clear two-way flow of information from the center to the states and districts. The regular briefings by a duly appointed Joint Secretary from the Ministry of Health and Family Welfare through the Press Information Bureau were another highlight of the information dissemination mechanism. These briefings proved very useful for keeping track of the progress of Covid-19. Besides, it also answered queries from journalists on the issue. The top doctors

from the Apex health institution, All India Institute of Medical Sciences, were regularly addressing concerns about the Covid-19 virus on the public service broadcaster, Doordarshan, and All India Radio, as well as private television channels. In an all-out initiative, the government also reached out to private players to reach to all corners of the country. With a toll-free helpline and an email account where people could write in, the government strove to better community engagement too (Sengupta, 2021).

The government's social media profiles and pages were also being used to disseminate all information about the Covid-19 virus. At the same time though, misinformation was rife on the same social media about the ways to combat the virus, ranging from superstition to the ridiculous. The government's ministers stood behind some Ayurvedic medicine purporting to "cure Corona" which led to a run on the stocks of the concoction, before its claims were proved hollow. Such embarrassments also led to a loss of credibility for the government. The Prime Minister himself, in a bid to boost the morale of a population suffering the effects of isolation during the lockdown imposed in the initial days of Covid-19, put his weight behind clanging of vessels at an appointed time. But the exercise led to circulation of messages on WhatsApp claiming that the clanging would result in an end of the virus because of the sound waves generated at that particular witching hour would kill it. Through the government's Press Information Bureau, an attempt was made to counter such misinformation via PIB Fact Check, but the sheer volume of the misinformation was daunting. Another criticism leveled was the lack of inclusivity in the messaging for a diverse nation such as India (Nankani, 2021). Uncritical acceptance of the global framework of risk communication was another criticism of the Ministry of Health and Family Welfare's risk communication messaging (Sengupta, 2021). Scholars also called for the necessity of having a legal framework for risk communication and crisis management (Mondkar, 2020).

Conclusion

A look at the government information dissemination structures and processes suggests that a permanent system for disaster management is essential so as to have a proactive and holistic approach. Such structures must be constantly extended and updated and must make use of already existing structures. The processes for information dissemination need to be clearly defined and must always be two-way as well as participatory. Public communication in times of disasters rests on three pillars – the telecommunications networks, the channels for information distribution, and the messaging employed. As far as the telecom network (including satellite) is concerned, the goal should be to have real-time, voice, data, and video connectivity which can benefit the community affected. Where the communication channels are concerned, in an age of multimedia, all possible channels need to be employed, tailored to various audiences with inputs from community reference groups and community involvement. While employing digital tools of communication, it is necessary to be aware of the problems of spread of misinformation through them

and public communication must address them. However, a great deal of attention is needed when it comes to the content of the messages which need to be clear, empathetic, honest, and, most importantly, credible. An analysis of the Government of India's response to the Covid-19 pandemic in the early days shows flaws in the messaging, leading to a crisis of credibility and panic among migrant populations, which were avoidable.

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Reinventing Fashion Industry to Sustain Itself During Covid-19

98

Meha Jayaswal

Contents

Introduction	1504
Pandemic Threatened the Existence of Certain Segments	1505
Reinventing Fashion Brands: Altruism Versus Brand Building	1506
Strategy for Survival	1506
The Essentials	1507
From Physical to “Phygital” Fashion Weeks	1510
E-Commerce, Social Commerce, and Digital Stores	1511
Support the Artisans and Craftspersons	1512
Shift to a Seasonless Fashion or Trans-Seasonal Fashion	1512
See Now Buy Now	1513
Collaborations	1514
Conclusion	1514
References	1515

Abstract

The coronavirus pandemic that triggered lockdowns across the world from early 2020 hit the global economy adversely and one of its worst victims was the fashion industry. Lockdowns disrupted normal business activities and barring essentials, and many commercial engagements came to a grinding halt.

Brands had two options – transform or perish. They chose the former. Their common and immediate goal was to accept the new reality, respond to it effectively for survival, and devise strategies to reclaim the lost ground.

The pandemic had pressed the “reset button” for fashion brands. But, it also gave time to introspect to a sector that was always in the rush to beat its own creation. It was the time to reinvent and re-brand. This transformation was inevitable to survive devastations caused by the pandemic that threatened the very existence of the industry.

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It was evident in some of the reactions. Due to lockdowns, businesses in general halted and the first casualty was advertising and PR spend. The advertising budgets were ruthlessly slashed by brands for print media – newspapers and magazines, followed by out-of-home/billboards, radio, and TV, according to industry reports. Therefore, the fashion industry that is based primarily on branding and storytelling struggled to stay visible as the pandemic and imminent lockdowns not only separated people from other people but also brought forced distancing between brands and their audiences. While digital advertising budgets were also slashed, several opportunities for brand communications in digital media emerged such as Instagram Reels, YouTube channels, and SnapChat.

Across the globe, fashion and luxury brands turned their focus toward the manufacture of essential items to protect health professionals and those working to combat the novel coronavirus. The narrative in India was no different from the rest of the world. Fashion designers stood for the cause by communicating through their collections and digital campaigns and by designing products catering to the need of the hour. The fraternity proactively reached out to help and contribute financially to the migrants and craftsmen, from providing shelters to workers and craftspersons to donating percentage of sales to organizations working on the ground.

This chapter will present to readers the “reinvented fashion sector with primary information from the Indian fashion sector” and details on its altruistic contributions, brand building initiatives. It will discuss how fashion brands attempted to stay relevant and how messaging was characterized by humane, ethical, and social overtones.

Keywords

Fashion designers · Reinvent · India · Brand outreach · Altruism · Fashion Communication

Introduction

When clothes leave the factories where they are made, they are merely ‘garments’ or ‘apparel’. Only when marketers get hold of them do they magically become *fashion*. (Tungate, 2005)

Fashion is not just a word that can be described by itself; it has a broad perspective and multiple connotations. The *Fashion Theory: The Journal of Dress, Body & Culture* defines fashion as “the cultural construction of the embodied identity.” It tells stories through clothing and the cultural influence of the embodied. It’s not just a piece of garment that we wear. It’s the image and identity that we wear. It is how we wish to appear before others. This perception or image is created through advertising and brand communication across all its touch points and also through all seasons, festivals, and occasions. The swing tags, catalogues, visual

merchandising, packaging, and invitations – these are all elements that communicate a fashion brand's narrative.

Just like many other sectors, the fashion industry was also hugely hit by the coronavirus pandemic and consequent lockdowns across the world that started from March 2020. Disruptions due to lockdowns caused immense economic uncertainties and the fashion industry was not an exception. Brands had two options – transform or perish. Most chose the former. Their common and immediate goal was to accept the new reality, respond to it effectively by devising strategies beyond survival, and reclaim the lost ground.

The pandemic had pressed the “reset button” for fashion brands. But, it also gave time to introspect to a sector that was always in the rush to beat its own creations. It was the time to reinvent and re-brand. This transformation was inevitable to survive devastations caused by the pandemic that threatened the very existence of the industry.

While speaking about the challenging time in an interaction on this matter, Mr. Sunil Sethi, president, Fashion Design Council of India (FDCI) said, “Economic stunting and inflation, affected small designers, who not only faced cancelled orders, inability to pay rents, salaries, poor infrastructure, but also could not sustain the business as they had no savings. To multiply their woes, there was an exodus of skilled embroiderers due to the lack of work with factories forced to shut down. The interesting part is that as an industry it taught us many lessons that will hold us in good stead about business management, in the future.”

Brands responded proactively with quick action responses toward communities-at-large through improvisation and innovations. These actions were community-centric that had gone into survival mode with uncertain near-term future.

Pandemic Threatened the Existence of Certain Segments

The handloom sector which is the most important element of the fashion and luxury sector value chain was already in perils, and the pandemic only worsened the plight of weavers across the country (Ref. Fig. 7). Founder and director Ramesh Menon, Save the Loom, a nonprofit organization, said:

The first phase of lockdown came weeks before the harvest festivals across India in mid-April and that resulted in huge pile up of stocks, and the resultant cash flow, and work orders getting cancelled, delayed payments and supply chain issues ensured a doom time, and the process continued through the last 24 months with multiple waves, lockdowns, containments etc. In May 2020, West Bengal and Odisha were affected due to Cyclone Amphan, and that also led to damage in certain areas. We at ‘Save The Loom’ with our partners ‘India by Hand’ led a revival of a cooperative with 35 odd looms in Kalna (East Bardhaman district), in Bengal. We devised catalogues of the material and products and circulated to push sales wherever possible. Online sales were explored as well during the festive season to find new avenues of sales. It’s been a learning journey to devise new ways to add value to artisanal products.

Reinventing Fashion Brands: Altruism Versus Brand Building

Strategy for Survival

Disasters are biggest catalysts for change that are increasingly offering opportunities to direct and navigate change toward aspired outcomes, such as sustainable development goals (Brundiers & Eakin, 2018). However, leveraging those opportunities created by disasters to achieve both sustainability and commercial viability objectives has to be community-centered.

Due to lockdowns, the advertising budgets were ruthlessly slashed by brands for print media – newspapers and magazines – followed by out-of-home/billboards, radio, and TV, according to industry reports. While digital advertising budgets were also slashed, several opportunities for brand communications in digital media emerged such as Instagram Reels, YouTube channels, and SnapChat.

Fashion industry that is primarily based on branding and storytelling was getting choked because their outlets were closed, and they had no ready platform to engage with their customers. It needed a new strategy to engage with buyers and recreate relevance. The first major task was to save traditional art forms that live and die with artisan communities. Their survival was a must if fashion had to fight the pandemic and reinvent itself. Most of the fashion brands focused on resilience, rather than vulnerability (Gaillard, 2007).

Fashion brands and designers volunteered and proactively reached out to help and contribute financially to the migrants and craftsmen, from providing shelter to “karigars” and craftpersons to donating a pie from sales to keep the craft alive. The corporate social responsibility (CSR) this time was absolutely voluntary and guided by the principle that survival of the entire ecosystem is a must for all stakeholders – entrepreneurs, designers, workers, and craftsmen. “The FDCI began the very successful Covid Support Fund (CSF) initiative in which we supported many small businesses and helped them sail through a tough time,” shared Mr. Sethi in the interview with the author.

The popular fashion and luxury brands across the globe turned their focus toward the manufacture of essential items to protect health professionals and those working to combat the novel coronavirus. A slew of the world’s luxury brands started from making sanitizers to medical overalls and surgical masks. For example, Donatella Versace, Giorgio Armani, and Miuccia Prada made generous contributions to hospitals in Milan. LVMH™ and Bulgari™ were also among the top fashion and luxury brands donating generously with funds and services (ref Fig. 1). LVMH started manufacturing sanitizer to donate to the French health authorities (Pidgeon, 2020).

The narrative in India was no different from the rest of the world. Fashion designers stood for the cause by communicating through their collections or digital campaigns or by designing products catering to the need of society. For example, during this time of the Covid pandemic, Indian designers came forward to help society with their design solutions (Assomul, 2021; Tewari, 2020).

Designers like Rahul Mishra, Masaba Gupta, Anita Dongre, Payal Jain, Gaurav Gupta, Manish Tripathi, and Shruti Sancheti to name a few famous designers were



Fig. 1 Versace's Instagram post. (Source: @donatella_versace (Instagram))

promoting social distancing and wearing of masks, during this pandemic, through their cotton-based printed face masks and graphics on t-shirts made from their existing collection or by creating new graphics and prints.

The Essentials

As the demand for masks grew and a shortage of masks prevailed, the designers took a lead in providing beautifully illustrated and printed designer masks which gave them a new image and brand outreach at a time when people were not buying designer wear. Realizing the fact that with the number of these masks available in the market being nowhere close to their demand, many designers opened up their factories and began producing reusable, washable cotton masks to supply to slum dwellers, daily wage earners, and others who did not have access to this essential commodity. Going beyond, many designers deployed their teams for the distribution of the masks for those on the streets and migrant laborers (Ref. Fig. 6).

Designer printed masks emerged as a huge trend and a new fashion statement started with a social cause in the disaster (Rabimov, 2020). The amount collected was going to the Fashion Design Council of India (FDCI) fund which was being given out to the needy. *The Times of India*, world's largest circulated English daily, also started the Mask India project and asked fashion designers to voice and demonstrate the usage and importance of masks. The Indian fashion industry took up the challenge to create awareness on Covid through their design solutions and spreading positivity. And, fashion itself became an important medium of communication as compared to the traditional medium of newspapers and television.

Save the Loom, a nonprofit organization, worked with the Khadi institution to support the production unit. This effort not only served the need of the country then

but also gave livelihood to weavers. Those handwoven cotton masks were even exported to the United States.

In an email interview with the author, Mr. Sunil Sethi stated, “The CSF also provided financial assistance to the handloom sector, during the pandemic. In the first tranche, we helped fashion designers to be able to support their staff, the second tranche was open for all non-FDCI designers too. The third tranche of CSF for craftsmen was, buying their unsold stock. The clusters were identified by the DC Handlooms, under the Ministry of Textiles. The FDCI extended financial aid through the NGO MG Gramodyog Sewa Sansthan, which has been working for many years to revive Bengal muslin and cotton.”

It was a special time that influencers, designers, harnessed the power of using their platforms for their community. Designer Anita Dongre, who owns one of the largest homegrown Indian fashion brands, turned her social media pages into a Covid-19 helpline, depicting all vital information related to the crisis, and her social media channels were amplifying every demand, that of hospitals to medical supplies. The brand has 1.6 million followers on Instagram; hence it became a helpful Covid resource guide. Her team was working tirelessly to verify each source and also sharing requests from followers who were in need of medical aid. In similar lines, designer Rahul Mishra also contributed to verifying and amplifying Covid-related posts on Instagram (Ref. Figs. 2, 3, and 4).

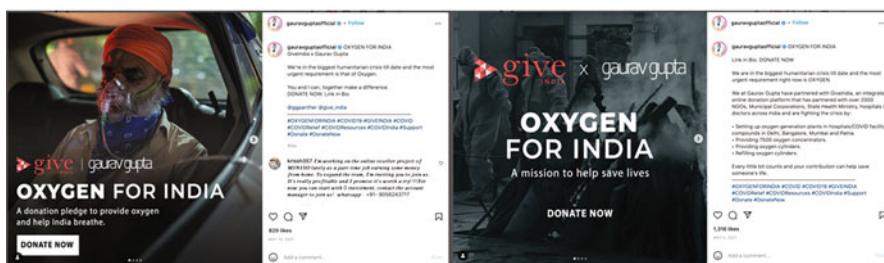


Fig. 2 Indian fashion designer Gaurav Gupta’s Instagram post. (Source: @gauravguptaofficial (Instagram))

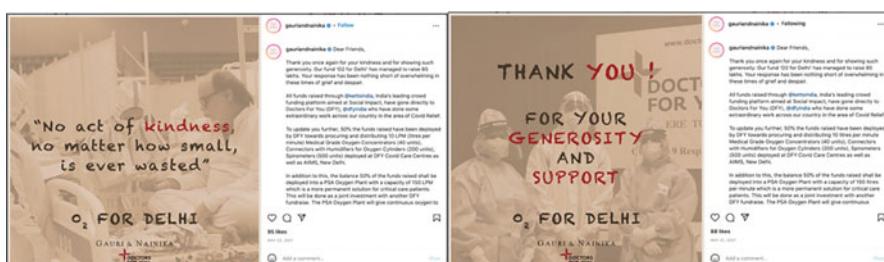


Fig. 3 Indian fashion designer Gauri and Nainika’s Instagram post. (Source: @gauriandnainika (Instagram))

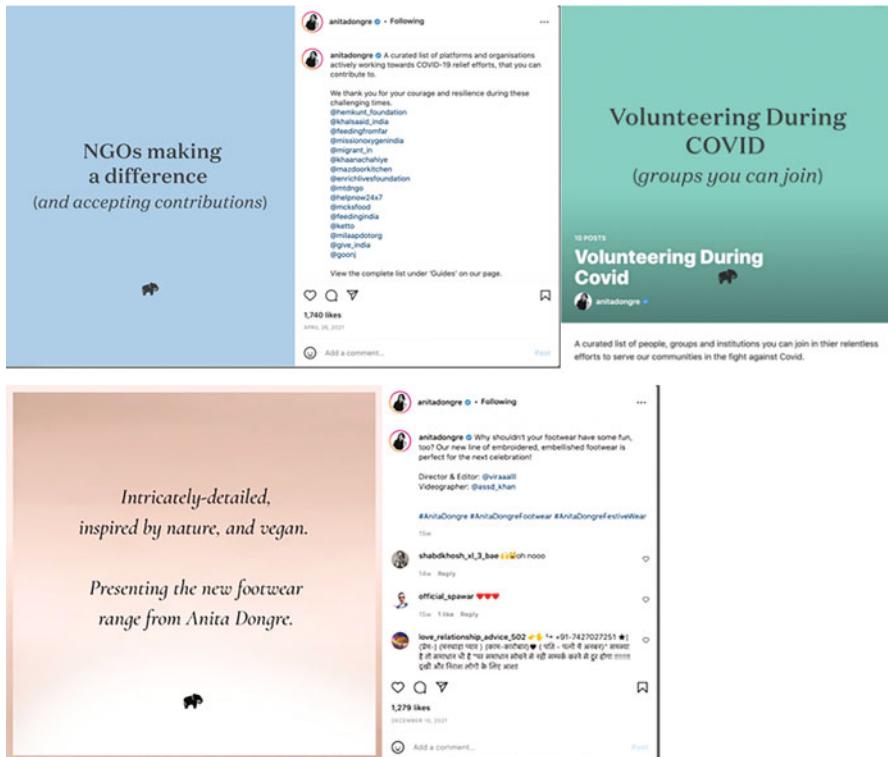


Fig. 4 Indian fashion designer Anita Dongre's Instagram post. (Source: @anitadongre (Instagram))

Another designer Gaurav Gupta partnered with Hemkunt Foundation to save lives. The foundation worked tirelessly to provide oxygen support to thousands across the capital. Couturier JJ Valaya pledged 20% of his label's sales online and offline to support three NGOs, Hemkunt Foundation, Khalsa Aid India, and Give India, that were tirelessly working toward Covid-19 relief.

The Reinvention

"The pandemic in the long run will always be marked as a turning point for most businesses. It brought in a reality check in the fashion business. Non-viable, vision less organisations without strategy for long term survival were put in the spot, to either make a turnaround or perish," said Menon in his interview with the author.

Fashion brands focused on surviving the crisis in the short term by reconfiguring existing resources and initiated long-term recovery by mobilizing efforts for a redesigned business model. They used this pause in the business to digitize their processes and enhance their systems and technology. This allowed them to develop operational efficiencies and provide personalized experiences to the consumers. Many of the former processes that were etched in stone underwent a complete revamp (Ref. Fig. 5).



Fig. 5 How fashion brands contributed? (Source: Self created)

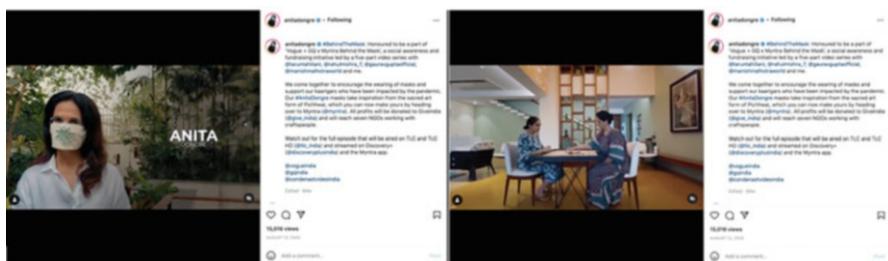


Fig. 6 Indian fashion designer Anita Dongre's Instagram post. (Source: @anitadongre (Instagram))

From Physical to “Phygital” Fashion Weeks

The physical fashion show was substituted by elaborate fashion films and campaigns that went beyond accessible, lavish, and elaborate venues. Mr. Sethi said, “We at the FDCI were the first ones who began the digital fashion week, to make sure that designers retain their will to showcase online through the medium of fashion films. We then went phygital to ensure some shows can be offline too, and we received an overwhelming response even for a niche segment like India Couture Week which is super exclusive.”

The shows were livestreamed for more than 40 designers who participated under the banner of Lotus Make-up India Fashion Week. The Fashion Design Council of India converted parts of its office building into a studio and created a stage, with screens and lighting set up to facilitate shooting of fashion films and videos by the



Fig. 7 Save the Loom craftspersons. (Photography Credit: Maneesh Aggarwal)

designers. Fashion labels/designers who participated in the fashion show included Varun Bahl, Tarun Tahiliani, Suneet Varma, Shivan and Narresh, Shantanu and Nikhil, Rohit Gandhi, Rahul Khanna, Rina Dhaka, Rajesh Pratap Singh, Payal Jain, Nitin Bal Chauhan, Namrata Joshipura, Geisha Designs, Ashish Soni, and Abhishek Gupta.

This led to many Indian fashion designers to explore investments in campaign videos and fashion films with characters, music, and screenplay. This democratized the reach of fashion designers and marked a shift in the way these brands communicated with their audience on social media.

The design council also created an online “designer showroom,” a dedicated space where designers could upload their lookbooks and hold virtual meetings with domestic and international buyers. In order to support designers, Mr. Sethi shared “We deployed technology in our favour by creating a space where designers could interact with buyers virtually creating a market for their products through fashion weeks. The FDCI launched a virtual B2B platform titled ‘Designer Showroom’ and many designers sold their inventory here. This enabled domestic and international buyers to interact with designers virtually and place orders. Designers’ profile page (virtual stall space), had their collection images, line sheets, campaign video and imagery, and they could conduct virtual meetings with their buyers.”

It was observed that during the pandemic, fashion brands all over the world shifted their marketing strategies toward storytelling, experiential, human, conscientious, and fair wages instead of pushing sales through ostentatious showcase.

E-Commerce, Social Commerce, and Digital Stores

Sharing his journey of how he realigned his business strategy during the pandemic, designer David Abraham of *Abraham and Thakore*, said “We immediately put our attention and resources to become strong digitally and on e-commerce sites.” The team realized that being in touch directly with consumers helped the brand.

Most of the fashion brands and labels went silent during the lockdown phases on all posts related to brand and commerce on their social media handles. Many Indian designers and boutiques hadn't built robust online strategies, or it was just a slow work in progress until early 2020. Pandemic turbocharged the online presence for fashion and luxury. Designer Pankaj of the fashion brand Pankaj & Nidhi also shared similar views. According to him, his brand did not have any online presence, and they focused their energies to strengthen their digital sales strategy.

In September 2021, Amazon announced the launch of its Luxury Stores, a new shopping experience offering both established and emerging luxury fashion and beauty brands. Iconic American fashion house, Oscar de la Renta, was the first to unveil its store-in-store featuring its Pre-Fall and Fall/Winter 2020 collections. According to the press release issued by Amazon, "More customers were turning to Mobile Shopping and in the previous year (2020), Amazon customers ordered more than one billion fashion items on mobile devices."

Support the Artisans and Craftspersons

Artisans and craftspersons are integral to the fashion's supply chain. Designer Rahul Mishra shifted his production bases from larger cities to craft clusters in villages and smaller towns. He "decentralized" his "system of production" and "employed artisans in smaller villages that were less impacted by COVID-19."

The co-founder and director, Alpi Boylla, Save the Loom (Savetheloom.org) is a nonprofit community group to revive, restore, and restructure the handloom industry in India) organization, said to the author:

What we encountered on the ground were harsh realities. Initially it was all about retrieving as much material, and fixing their looms and homes. As we went along, we also documented the misery in which weavers thrive – they were earning a measly Rs. 150 a day (~\$ 2.0/day), and that was a shocker – and as we went deeper, we realised it won't make sense if we just fixed their looms and left. Most weavers – 96% are women, and 85% of them are above the age of 45. It's not possible to overhaul a system that has been running to this state for past few decades, or to find immediate solutions. Most importantly, work on the grassroots to bring change where it matters – the processing of the raw materials, the livelihoods of the weavers and associated allied workers, and then make the product relevant (again). We have been working on all the above areas over the past 43 odd months. And have been able to find a way to establish a model space – with our built-in social impact philosophies that revolves around 3 P – People, Process, Planet and 5 E's – Educate, Empower, Employ, Engage, with concern to Environment, followed by 5C's Connect, Collaborate, Create, Culture and Community as part of our Build Better program to provide resource to the Craft sector.

Shift to a Seasonless Fashion or Trans-Seasonal Fashion

On the third of May 2020, Alessandro Michele, creative director of an Italian high-end luxury fashion house based in Florence, Italy, shared on the brand's community

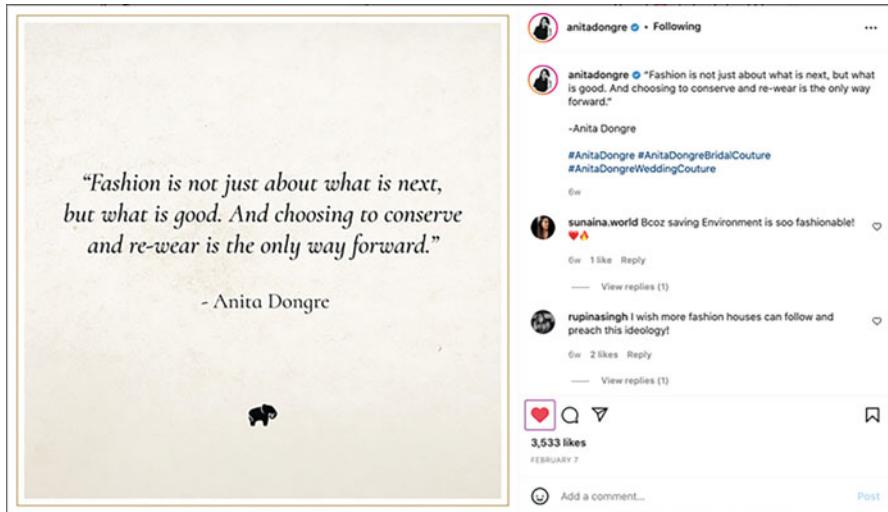


Fig. 8 Designer promoting slow fashion [Source: @anitadongre (Instagram)]

pages from his personal diary written in Rome that the brand will pause multiple season showcases and have only two-season showcases in a year.

With order cancellations from retailers across the world, the stocks piled up with the Indian fashion brands as well. The climate crisis also became an unavoidable issue. And, this movement of seasonless fashion gained momentum and set many to question themselves “Do we really need that many seasons?”

Alyssa Hardy in her article titled “Fashion Year” stated, “...many of the biggest brands like Michael Kors™ and Saint Laurent have removed themselves from the traditional seasonal calendar. Others, like Gucci™ and Prada™ have decided to completely cancel their new collections all together.” Explaining seasonality, she added “Seasonality is a means to sell more products throughout the year. In the fast-fashion realm, where brands like Zara™ and Fashion Nova™ crank out designer knockoffs at lightning speed and at price points that more consumers can access, the cycle has gone up to 52 seasons. Essentially, a new ‘collection’ of clothing gets designed and produced *every single week of the year*.”

Indian designers Rahul Mishra and Anita Dongre agreed that sustainable, seasonless fashion is the new trend and that pandemic has propelled it (Ref Fig. 8).

See Now Buy Now

While the fashion week organizers gave virtual platforms for fashion designer’s B2B showcase, designers were showcasing their current season collection on the ramps at the Lakme Fashion Week 2022. Fashion designer Pankaj in conversation with the author stated, “See Now Buy Now is the trend. Most of my fellow designers are

showcasing current season at the fashion week to reach consumer's directly to drive monetisation."

The India Fashion Week in 2022 tied up with video apps Roposo and Ajio Luxe to support designers in the "see now, buy now" model. In September 2021, Roposo launched live commerce from short videos in India. Similarly, Ajio Luxe also collaborated with designers such as Manish Malhotra at his show for consumers to buy it from the ramp.

Collaborations

In an interview with Asmita Aggarwal, a fashion consultant and official blogger of the Fashion Design Council of India, she said, "The pandemic has initiated collaborations within the sector as well across-industry. Everyone has realised in the fashion circuit that no one will get through this pandemic alone. We saw collaborations earlier but not at this scale. This time in 2022 at the fashion week, we saw designer Varun Bahl with Lakme Salon; Tarun Tahiliani with NEXA, Suneet Verma with Bata, boAt and Huemn, John Jacobs with Shantanu and Nikhil, realme with Shivan & Narresh and few more."

These unique cross-collaborations demonstrate how fashion fraternity has realized the power of collaborations to grow. Collaborations will create newer markets and help designers to optimize resources.

Conclusion

The pandemic disrupted social behavior and that also influenced the business of fashion. Although pandemic was temporary, the transformations it brought are here for good. It has changed the way people perceive fashion and engage with it. Forward-looking multiple fashion trends in a year are now a passe. A seasonless fashion trend is the new mantra.

The last 2 years had been difficult for all. It also hit India. It endured the Covid-19 pandemic, ravaging floods in Kerala, cyclones in West Bengal, shortage of oxygen, deaths, and devastations. These catastrophes did disrupt the entire ecosystem, but could not annihilate it. The difficult situation prompted all stakeholders to adapt to a new ecosystem through a unique blend of technology with creativity. Fashion world went digital and reached the customers without waiting for them to come and knock at the door. The combined strengths of social media and e-commerce not only worked well, but they also paved way for startups – enterprises beyond giants like Amazon, Myntra, and Ajio. In the digitally aided world seasonal, forecasts paved way for instant trends. The new mantra is – create – show and sell, direct-to-consumer through various platforms including social media such as Instagram, Facebook, Twitter, and so on.

This is the power of creativity that works at its best when in crisis. Covid-19 pandemic disrupted the normal – plan and forecast for a forthcoming season, organize fashion or phygital shows to popularize it with the glamour quotient, and encash it. The crisis invented wings for fashion entrepreneurs, designers, and promoters – don't wait for the customer to come, but just fly to them instantly through digital means – now explore the endless possibilities through the virtual reality. However, it is important that the industry works together to protect their crafts and focus on the 3Ps (People, Process, Planet) and 5Es (Educate, Empower, Employ, Engage, with concern to Environment) as stated by founders of Save the Loom.

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Radio for Disaster Management

99

Rajeev Kumar Shukla

Contents

Introduction	1518
Disasters Becoming More Frequent and Fierce	1518
Role of Radio in Disaster Mitigation	1519
All India Radio as the Premier Disaster Management Radio Communicator in India:	
The Kosi Floods of 2008	1521
Good Radio Practices and Future Needs for Disaster Management Radio Communication ...	1522
Radio in the Times of Global Health Emergencies: Lessons from Covid–19	1524
Media as an Equal Partner in Disaster Mitigation	1525
Conclusion	1525
References	1526

Abstract

Although all media platforms are active partners in disaster management communication, radio is the most immediate, intimate, and accessible medium due to its faster and larger reach, affordability, and simpler technology. When a disaster is actually happening, radio is the pivotal medium of choice globally. Media essentially supports the efforts to safeguard lives and livelihoods by creating public awareness and helping rescue, relief, and rehabilitation activities. The components of an effective disaster communication plan are disaster risk prevention/reduction, early forewarning, real-time coverage of rescue and relief, and the post-disaster role of focusing on rehabilitation. As the premier public service radio broadcaster of India, All India Radio (AIR) has continually risen to the occasion in discharging this role through its network reach and employing its bouquet of broadcasts in 23 languages and hundreds of dialects. AIR has its own internal standard operating procedure (SOP), which enables all AIR stations to

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swing into immediate action when a disaster threatens their service areas. Now, besides AIR, private radio channels and community radio stations also contribute significantly in this field working in synergy with various stakeholders. Better real-time information sharing among various nodal agencies and the respective nearest AIR and other radio stations particularly in the disaster vulnerable areas would facilitate faster communication and action thereon. Media should be treated as an active, valuable, responsible, and trusted partner in the realm of disaster management so that it is empowered to do timely, accurate, factual, and responsible reporting and also combat the scourge of misinformation.

Keywords

Disaster · Communication · Media · Radio

Introduction

Accurate, effective, and timely communication is a crucial component of disaster management. All media worldwide participate in disaster communication activities. Due to various reasons, radio has repeatedly proved to be the most potent media tool in disaster communication. However now, many a times, the people handling disaster management activities underestimate the role and potential of radio. They need to be made better aware in this regard. The evolution in radio content creation, presentation, and dissemination due to giant leaps in technology as well as other factors such as changing audience profile, ever-increasing competition, new communication platforms and avenues, etc. also needs to be understood and then used for better efficacy in delivering the message.

Disasters Becoming More Frequent and Fierce

It has been becoming increasingly evident that the incidence of hydro-meteorological and geological disasters is constantly on the rise. And further acceleration of this phenomenon is happening before our very own eyes. Disasters are becoming more and more frequent as well as ferocious. What can no longer be brushed under the carpet and now is almost universally acknowledged, although still grudgingly at times, is the damning fact that a host of increasingly virulent human activities are not just causing but actually hastening the rampant ecological degradation and the resultant climate change patterns have vastly aggravated this situation. The crowning irony is that much of it flows from the “dominate and exploit the nature” development model which has been the gospel truth almost globally since the industrial revolution. In India, the horrifying images of hotels and houses tumbling into an angry swollen river Mandakini during the colossal 2013 Uttarakhand state disaster are still fresh in memory although terrible scenes of

various succeeding disasters have also been superimposed on those. One can see the all-consuming greed encroaching into areas where no human settlements should have been created. Alas, not enough enduring lessons seem to have been learnt from that and many other disasters, which seem to be mushrooming all around us.

Disasters take a very heavy toll in terms of life and property leaving behind tragic tales of utter destruction. Disasters adversely impact local, regional, national, and also global economy, where everything now is so intimately and intricately interconnected. Of course, it is not possible to prevent disasters altogether. Terrible disasters have been occurring through the ages and will keep happening in future too. But, now with the massive advancements in science and technology, steps can definitely be taken to mitigate the damage caused by them. In fact, the heartening fact is that there has been substantial progress in this regard. Thus, to reiterate, disaster prevention may not be possible, but disaster mitigation certainly is. This article intends to look at what media in general and radio in particular have been doing and can further do in this regard.

Role of Radio in Disaster Mitigation

As the frequency and ferocity of natural (and also man-made) disasters go on rising, the increasingly critical role of media, which now seems to be omnipresent if not omnipotent, in mitigating disasters is self-evident. In a disaster situation, media has to **support the efforts to save lives and livelihoods and contribute to the rescue, relief, and rehabilitation activities by creating and nurturing public awareness. This is the core of media's role in disaster management.** Obviously, **well-informed people are a significant asset in disaster mitigation endeavors.** They are generally better prepared to face disaster situations. They can also add vitally to rescue, relief, and rehabilitation efforts and ensure success thereof.

Among all media platforms, radio takes a pivotal and preferred position in disaster management communication due to its faster and larger reach, easy affordability, and simpler technology with continuous innovations. **When a disaster is actually happening, radio is the medium of choice globally.** Mr. Kamal Kishore, member secretary, National Disaster Management Authority, which is the apex body for disaster management in India, has some very relevant observations in this regard. He feels that radio has an unparalleled reach outnumbering the reach of any other broadcast media, and in the far-flung areas such as high Himalayas that are exposed to mountain hazards, radio has the potential to reach every single person. He believes that radio has the ability to deliver messages to remote areas that might be difficult or unsafe for outsiders to access.

The components of an effective disaster communication plan are disaster risk prevention/reduction, early forewarning, real-time coverage of rescue and relief, and the post-disaster role of focusing on rehabilitation.

Disaster risk prevention/reduction aims at educating people at large and particularly those residing in disaster-prone areas to remain prepared at all times targeting

general as well as specific population groups such as farmers, fisher folk, and industrial workers as well as women, children, youth, especially abled persons, etc. This is an activity in which all media – traditional and emerging – should contribute. As this is an ongoing process, all media organs have a role to perform here. However, even in this phase, radio does enjoy some functional advantages including that of effective targeted messaging. **Mr. Kamal Kishore, member secretary, NDMA, underlines these advantages in these words – “Because it is only an audio medium, it does not require listeners to drop other activities. Targeted programmes for different user groups can be developed using this unique strength of Radio as a broadcast media.”** He points out that **different time slots, languages, and dialects can be used for different user groups.** He goes further stating that **radio can provide locally tailored programming that accounts for the specific issues faced by people.**

It will be relevant at this juncture to recall as illustrations of such programming some documentary serials mounted in the past by All India Radio. These were mostly produced in house in collaboration with agencies like Vigyan Prasar. Hindi and English versions were usually created centrally, and then these were reproduced and broadcast by relevant AIR stations across the country in their respective languages. The serial devoted to the concept of sustainable development was entitled “Life must Go on” (Chaltee Rahe Zindagee in Hindi). The one on climate change and global warming was called “Whispers of the Wind” (Badaltee Fizaan in Hindi). Perhaps, the most important from the disaster management communication perspective was the serial “Lest we Lose” (Kaheen Der Na Ho Jaae in Hindi). It must also be reiterated here that these are some examples of centrally originated programs and a huge number of such programs are mounted regularly in different languages and formats by individual radio stations serving their respective areas as a part of the perennial campaign to educate the people thereby preparing them for likely disasters.

However, this process acquires a sense of urgency and is focused on specific information dissemination when the threats of a natural calamity such as cyclones or tsunamis or floods loom large. This is the phase of disaster warning. Disaster warnings are given in two stages – early warnings and emergency warnings. Mr. Kamal Kishore quotes the **United Nations Office for Disaster Risk Reduction (UNDRR) regarding radio’s role in providing early warnings – “When emergencies and disasters strike, radio has a strong and specific role to play in keeping communities up to date with events and advising them on practical steps to take to reduce the impact of a disaster** such as setting food aside for an emergency period.”

When a disaster actually strikes, disaster coverage phase begins usually in the form of “breaking news.” This is quite dramatically evident in disasters of a sudden nature such as earthquakes, landslides, flash floods, etc. The immediate media follow-up activities are primarily directed at lending assistance to rescue and relief operations and keeping affected people as well as people at large fully informed.

The less attention grabbing but vitally important role of media in disaster management relates to a sustained and continued focus on the rehabilitation process of the victims. This is the post-disaster role.

Although all media platforms are active partners in disaster management communication, in disaster situations, radio often comes out as the most immediate, intimate, and available medium. Mr. Kamal Kishore, member secretary, NDMA, emphasizes radio's role as a **friendly, accessible, and relatable interactive platform**. He feels that **there is no other media that is more amenable to an interactive format**. He notes that communities can dial-in to live programs and interact with experts. They can pose relevant queries and also provide vital information and insight from the ground on specific challenges and opportunities for disaster risk management. He underlines that this can be very effective to improve communities' ability to convey ideas from the ground and even raise awareness of their rights. He believes that **radio can also provide basic psychosocial support to communities**. Mr. Kishore is alive to the new trends in the media landscape and notes that convergence with emerging tools such as social media, web-based platforms, podcasts, etc. can further multiply the effectiveness of radio as a medium.

In recent years, amateur or ham radio has played an increasingly important role in disaster communication. This is essentially a hobby but now has evolved into a useful tool. However, it needs to be understood at the outset that communication through ham radio is between individuals equipped with the wherewithal. Thus, it is not a mass media thing. But, often there are situations during disasters when all normal modes of establishing contact between the areas affected and the authorities capable of bringing succor to the people are snapped. Ham radio operators can and do step into such a situation and provide critical communication links. It is a matter of satisfaction that ham radio operators are now getting the recognition they deserve and premier disaster management agencies enlist their support as and when needed.

All India Radio as the Premier Disaster Management Radio Communicator in India: The Kosi Floods of 2008

As the premier public service radio broadcaster of India, All India Radio (AIR), which is also known by its Hindi name "Akashvani," has continually risen to the occasion when disasters like explosions, fires, landslides, bus and train accidents and air crashes, cyclones, tsunami, floods, and earthquakes strike. With almost every disaster in the country, there are stirring sagas of selfless and courageous service provided by the AIR employees, often going beyond the call of duty. As one of the illustrations, it is worthwhile to recall what AIR program and engineering personnel did at the time of the terrible Kosi river floods in Bihar state of India in 2008.

In August, 2008, Bihar was facing the wrath of the river Kosi, which flooded the northern part of Bihar by changing its course. As per reports, this disaster was due to an embankment breach at Kusaha village of Sunsari district in Nepal. The plight of the people in the flooded areas continued for more than a month.

All India Radio stations serving the affected areas swung into continuous action to provide succor to the people by disseminating critical and accurate information round the clock. To supplement their efforts, a specially constituted team from AIR

headquarters at Delhi, comprising officials from program, engineering, and administrative streams, was sent to Bihar by the then director general of All India Radio on eighth September, 2008, to devise additional ways to address the post-flood distress of the victims in Bihar. The IT division of AIR at Delhi had developed a software, which transferred all the messages coming to an earmarked telephone number to a centralized database and loaded it on to a server space to be seen at the AIR stations of Patna, Bhagalpur, Darbhanga, and Purnia. The website biharflood.air.org.in was having the facility to upload information about the missing person and messages. This was the first time in the history of broadcasting in India that a special website was created during a disaster to help the affected people.

It is heartening and inspiring to recall that the members of this team, apart from making major value additions to the programming of the AIR stations in the affected area in tune with the latest norms of disaster management communication, also went to the flood-affected areas and to the relief camps. There were heart-touching moments at every spot. People in groups, with their invaluable radio close to their heart, gathered around the team and poured out their despair as if they had found their most trusted companions. The staff of the concerned AIR stations worked relentlessly and with a great sense of responsibility and dedication.

The team coordinated the implementation of the special helpline module from the AIR stations of Bhagalpur, Patna, Darbhanga, and Purnia. Once the module was publicized, SMSs, messages through message box, and information of missing/ found persons started pouring in, which were broadcast at regular intervals by these stations. Every day the team visited some relief camps and marooned villages. Travelling in wooden boats for many kilometers through the flood waters, the AIR team reached these villages to find out first hand from the villagers their urgent needs for food, clothes, medicines, fodder, and drinking water.

AIR through the live phone-in programs and messages received in the form of mailbox and SMS was able to reunite hundreds of persons with their families. The disaster management authorities also closely monitored the radio programs to send right help to the affected people.

AIR's role in the Kosi floods of 2008 proved the adage – “a friend in need is a friend indeed.”

Good Radio Practices and Future Needs for Disaster Management Radio Communication

Now, besides AIR, private radio channels and community radio stations also contribute significantly in the field of disaster management communication. Thus, the entire radio fraternity can and does unite to discharge the role of disaster management communicators working in synergy, as and when required, with various local (including panchayats and other civic bodies), regional, state, national, and even international agencies such as UNICEF, WHO, UNESCAP, etc. However, the fact remains that private radio channels can devote very limited time chunks as they are

constrained often by commercial considerations. Public service broadcasters such as All India Radio can and do employ long as well as short formats in different languages and dialects. It has to be mentioned here that India has, among other things, a bewildering diversity of languages and dialects. There are 22 languages currently in the Eighth Schedule of the Constitution of India (thereby recognized as premier languages), while many others are jostling for that status. There are thousands of dialects. All India Radio broadcasts programs in all the aforementioned 22 languages enshrined in the Eighth Schedule and also in English besides originating programs in hundreds of dialects, which goes a long way in ensuring the last mile connectivity, the importance of which cannot be overemphasized. Now, the community radio stations (CRS) also provide and in fact reinforce this crucial last mile connectivity. In fact, CRS are going to play an ever-increasing role in reaching the hitherto less or unreacheds.

Some important good practices have to be scrupulously followed in this regard. First reports often tend to be exaggerated and cannot be followed blindly. The sources of information have to be verified and quoted with utmost care. Precise, factual, and responsible reporting is a must to dissuade rampant rumor mongering during and after a disaster, which unfortunately often does happen and more so when true information is not available. It has also to be borne in mind that while, to a large section of the audience, disaster stories are of general interest, these are “life and death” issues to the affected people and also of utmost importance to relatives and friends of such people living elsewhere. The world is increasingly becoming a “global village” and thus interested people can be anywhere. Therefore, timely dissemination of full, factual, and accurate information is crucial. Facts likely to create panic, pandemonium, and chaos have to be very carefully and sensitively handled. Sensationalism is to be totally shunned and eschewed.

For receiving disaster warnings in India, All India Radio and other media entities primarily depend upon information from various concerned departments and institutions such as National Disaster Management Authority (NDMA), State Disaster Management Authorities (SDMAs), India Meteorological Department (IMD), Central Water Commission (CWC), Geological Survey of India (GSI), etc. and respective state governments and district administration officials. The merit of the system being followed is that the information is received after due vetting and verification thus ensuring authenticity.

However, mechanisms for better real-time information sharing among agencies like NDMA, SDMAs, IMD, CWC, GSI, etc. and the respective nearest AIR and other radio stations particularly in the disaster vulnerable areas would facilitate faster communication and action thereon.

With the emergence and growth of local self-government institutions in India and other democracies, the importance of proper coordination and synergy of their efforts with media in general and radio in particular cannot be overemphasized.

All India Radio has its own internal standard operating procedure (SOP) in place, which enables all AIR stations to swing into immediate action on their own in case of a disaster happening in their area thus acting as one of the first responders. This is

updated as per the exigencies of the situation. All media need such a document, and this could be prepared in consultation with the other major stakeholders.

It is pertinent to reiterate here that AIR stations, particularly those located in the disaster-prone areas, carry out campaigns regularly for education of population at large on dos and don'ts in case of various disasters.

To further improve AIR's disaster management communication preparedness and performance, upgradation and fine-tuning of AIR's internal apparatus, in technological as well as programming aspects, are continuous processes. Now, AIR is streaming live on the Internet, and all its channels and stations are available globally through its official app. Its programs are being transmitted from many digital transmitters also, which can be received on digital receivers. These receivers have provision for carrying texts also, and in the case of special programs being put out on an emergency basis during or before a disaster, these receivers have the capacity for such special programs to automatically override other programs being broadcast at that time. What is more, if these are in a standby mode, these can switch themselves on when needed to carry such programming. The disaster management authorities also need to keep themselves abreast of such advances.

AIR's already robust linkages with all concerned agencies such as National Disaster Management Authority (NDMA), India Meteorological Department (IMD), etc. are being further strengthened. This should extend to all radio operators.

AIR participates in many international activities such as training courses, workshops, seminars, etc. geared to this end. AIR has partnered with organizations like Asia-Pacific Broadcasting Union (ABU), Asia-Pacific Institute for Broadcasting Development (AIBD), UNICEF, USAID, BBC, etc.

The key media principles in this scenario continue to be **accuracy**, objectivity, **scientific temperament**, adoption of regional languages and dialects for maximum reach and easy and correct understanding by the audience, empathy, courage, and selfless devotion to duty and to public good while taking necessary care to ensure one's own safety, so that one can continue to be active and useful.

Avoiding dogma, sensationalism, and rumor mongering remains critical.

Radio in the Times of Global Health Emergencies: Lessons from Covid-19

The Covid-19 pandemic, which has been a humongous global public health emergency, underlines the importance of effective communication. There have been unprecedented scientific research and public health activities globally to find effective and safe solutions. Various vaccines have been developed and deployed. New drugs and treatment protocols are being evolved and tried out. India is making a major contribution in this endeavor. But new challenges are also appearing like new strains.

Thus, there is an overwhelming explosion of information, which is not always scientifically true and sometimes contradictory and misleading.

Therefore, application of critical appraisal skills becomes necessary, so that half-baked or incorrect information is not disseminated. Only the authentic sources have to be used to collect and disseminate information.

Another crucial endeavor is fighting stigma and discrimination. Stigma springs from ignorance and can have devastating effects on the stigmatized. Worse, it can lead to suppression of information which may enhance spread of the infection.

Various global functionaries including the United Nations Secretary General as well as top officials of the World Health Organization (WHO) have repeatedly voiced concerns about the “infodemic” in traditional and social media. Digital users have been requested to “pause, take care before you share” under UN’s “verified” initiative. The Ministry of Health and Family Welfare in India has released a tool kit for youth to fight stigma. In this context, media’s role assumes even greater significance.

Media as an Equal Partner in Disaster Mitigation

Authorities handling disaster management need to be sensitive to the enormously positive role that media plays in support of their preparedness, rescue, relief, and rehabilitation activities. They should understand and appreciate media’s dynamics and compulsions also.

Remnants of a colonial mindset sometimes prompt authorities in countries like India to view media with suspicion and mistrust. The impulse then is to look upon it as an adversary or an unwanted companion. But information suppression is always counterproductive. An information vacuum is sure to promote falsehoods and misinformation.

Thus, media should be treated as an active, valuable, responsible, and trusted equal partner in the realm of disaster management. The Covid-19 pandemic is a great example of the generally constructive role of media. This has to be further strengthened.

(I must acknowledge the support of my erstwhile colleagues in All India Radio Mr. Sanjiv Dosajh, Mr. Ashok Kumar Panigrahi, and Mr. Dilip Kumar Jha in writing this chapter.)

Conclusion

The role of radio is always going to be very important in disaster management communication. It is also evolving with the changing times. In India, NDMA has now included on its website <https://ndma.gov.in/> battery-operated radio as a part of the emergency kit in respect of many kinds of disasters such as cyclones, landslides, urban floods, floods and earthquakes. NDMA also includes listening to radio to get local weather news for remaining prepared for the onset of heat waves. This recognition needs to further deepen so that the meaningful cooperation and partnership are further strengthened.

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NDMA Website. https://ndma.gov.in/sites/default/files/inline-images/Heat_Wave_Eng.jpg

Part VIII

Sociology of Disasters



Introduction: Sociology of Disasters

100

Siri Hettige

Contents

Introduction	1530
References	1534

Abstract

The interest that sociologists have taken in natural and human-induced disasters goes back many decades and, therefore, is not a response to increasing frequency and intensity of disaster events in recent decades due to climate change and environmental pollution. Yet, their focus has been quite specific, concentrating on the impact of disasters on the long-established patterns of social and cultural life of people, including aspects of the emergence and short- and long-term consequences of major disaster events in time and space.

In this section of the handbook, we bring together nine chapters dealing with a variety of disaster situations in a number of countries. The disasters concerned are related to diverse situations such as the Covid-19 pandemic, housing development, and a confluence of multiple disasters in one case. The social, economic, and cultural effects of disasters and short-term and long-term mitigation of their impacts have been the focus of authors of the above chapters. Their analyses, conclusions, and recommendations not only contribute to our understanding of the diverse problems that the disasters have given rise to and issues involved in the processes of disaster management but also indicate how governments and relevant institutions can take policy and intervention measures to reduce disaster risks and mitigate diverse adverse impacts on the lives of the affected people. The areas that the authors have investigated are food security, domestic violence, neglect of marginalized groups, Covid-19 pandemic and education, role of indigenous knowledge, community mobilization, and social and cultural

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restoration. Diversity of issues and approaches covered shows the multidisciplinary character of research and interventions.

Keywords

Sociology of disasters · Covid19 pandemic · Social impacts · Vulnerability · Inequality · Recovery process

Introduction

The vast literature on disaster research available today shows that much of the published work is multidisciplinary, drawing from both natural and social sciences. Even a cursory glance at diverse publications over the years shows that many sociologists have also taken an active interest in the study of disasters over many decades, not just when natural disasters became more extreme and frequent in more recent decades due to climate change and environmental degradation and pollution (e.g., Sorokin, 1942; Young, 1954; Prince, 1920; Barton, 1969; Oliver-Smith, 1991; Oliver-Smith & Susanna Hoffman, eds., 1999; Dynes 1970; Turner 1978). This is understandable because any major disaster event would have a significant disruptive impact on social and cultural life of people.

The establishment of a research committee under the International Sociological Association (ISA) dedicated to the promotion of the study of the sociology of disasters and the commencement of the publication of its *International Journal of Mass Emergencies and Disaster* showed the growing interest among many members of the ISA scattered across the world. Today, the conceptual and empirical literature produced by sociologists in different parts of the world is so vast that it is not possible to even have a cursory look at it here for want of space. Yet, their contribution to the vast interdisciplinary literature produced by researchers around the world is highly significant and has provided an important perspective for understanding and responding to disasters occurring in different parts of the world.

Drabek (2017) who did a review of some of the international sociological research literature pointed out that most of this literature has emphasized the social responses to disasters with few exceptions that have focused on their causes. Moreover, the overall focus of the sociologists has also been on the effects of disasters on structural, social, and cultural aspects of communities and societies. The fact that disasters have a dramatic impact on social life and cultural patterns in the communities exposed to major disasters is well established. In more recent decades, sociological studies focused on the disaster as a process rather than an isolated event that unsettles and traumatizes individuals, families, communities, and even an entire society depending on the scale and the intensity of the disaster. This is a widely shared view among researchers with diverse disciplinary orientations and refers to distinct stages in the disaster management process involving hazard mapping, risk assessment, preparedness, response, mitigation, and restoration of long-term resilience of economic, social, and cultural life (Drabek 2005).

As is well-known, disasters emanate from diverse sources, both natural and human-induced, and necessitate multiple responses, depending on their nature, magnitude, and the complexity. This is what we witness today. The expertise needed to manage is complex and diverse, i.e., to identify the potential hazards, study and monitor their development, design measures needed to eliminate or reduce the risks and steps needed to reduce the adverse impacts, and finally mitigate diverse issues and restore normal life of the people and ensure long-term stability of communities.

Sociologists have demonstrated through their work as researchers and policy experts that their contribution has become more and more relevant and significant not only in the research and policy process but in post-disaster interventions such as relief, resettlement, rehabilitation of disaster victims, and restoration of social and cultural life of the people (Hettige & Haigh, 2016).

What is also noteworthy is that researchers have dealt with a variety of disasters including human-induced ones like conflicts and development interventions. In this section of the handbook, there are nine chapters dealing with diverse economic, social, cultural, and psychological aspects of a range of disaster situations. Three of these chapters deal with the effects of the Covid-19 pandemic. Other chapters have focused on diverse aspects of disaster risk reduction and disaster management in several different contexts.

In ► Chap. 101, “Disaster Preparedness, Disability Awareness, and Disability Inequality: A Study of Hong Kong’s Property Management Sector,” Yung Yau examines the issue of marginalization of differently abled persons within the housing development sector in Hong Kong, pointing out that the neglect by the construction industry managers of the need to provide built-in infrastructure to allow speedy evacuation of people with disabilities has exposed this extremely vulnerable segment of the population to hazards emanating from a major natural disaster like floods. This situation has arisen as a result of the failure of relevant regulatory authorities to ensure that housing development sector firms incorporate in the building plans adequate facilities to enable residents with disabilities to be evacuated speedily in the event of a disaster.

Nina Joseph, in her ► Chap. 103, “Combating Domestic Violence During Lockdown of COVID-19 Pandemic,” has explored how the measures taken to contain the pandemic in India, i.e., imposition of lockdowns for extended periods, precipitated domestic violence against women. The study, based on data from numerous sources, was aimed at identifying the root causes of gender-based domestic violence against women. The author claims that the findings of the study provide a guide for policy-makers, administrators, and human rights activists to take measures to deal with the problem in disaster situations in general and in lockdowns in particular.

In his ► Chap. 104, “Food Security in India During the Pandemic: Future Learning for Ensuring Zero Hunger,” Rabindranath Bhattacharya examines the nexus between the Covid-19 pandemic and food insecurity. He, however notes that increasing natural and other disasters on a global level also leads to increasing food insecurity in many parts of the world. In the case of India, he argues that food insecurity is not necessarily the result of a deficit in food availability. The disruption of supply chains due to the pandemic increased food insecurity for vulnerable

groups, resulting in widespread hunger among them. Moreover, excessive centralization of public distribution system has precluded the participation of civil society organizations, making the inclusion of the most vulnerable segments of society in state-sponsored programs more difficult.

The Covid-19 pandemic disrupted the normal functioning of both public and private institutions as well as many public services like education. In many countries, the closure of schools and other educational institutions for extended periods compelled authorities to adopt modern, communication technology-based solutions and conduct teaching and learning activities in a virtual environment as an interim measure and to enable students to engage in their studies. This of course depended on the availability of online facilities at an institutional and household level. This posed a serious problem in poorer countries across the world where digital divide prevented many students from having access to online learning. Despite these ground realities, educational institutions in many countries switched to online teaching and learning in schools, universities, and other educational institutions.

Jayasinghe and Rajapaksha, in their ► [Chap. 105, “Managing Teaching and Learning at Higher Education Institutions During the COVID-19 Pandemic,”](#) examines the experience of a convenient sample of teachers drawn from higher education institutions in a number of Asian countries who began conducting online classes when the pandemic led to the suspension of face-to-face teaching in their institutions. Given the pervasive problems created by the pandemic for educational institutions and students to continue with their educational activities, there are many areas to be examined in terms of both positive and negative outcomes, from the point of view of not only institutions and teachers but also students and their families. The discussion and findings of this research open up a vast array of possibilities for both educational authorities and researchers to prepare for similar situations arising from major disaster events that can disrupt educational processes irrespective of the duration and scale of the disaster in terms of its adverse impacts.

John Morris and Machiko Kamiyama, in their work presented in ► [Chap. 107, “Preserving Cultural Heritage and Psychosocial Support After the Great East Japan Earthquake: An Interdisciplinary Approach to Good Practice,”](#) deal with an important sociocultural dimension of managing the emergent situation following unprecedented, triple disasters in eastern Japan in 2011 when the coastal regions of the country were devastated by a series of three major disaster events. The need to promote social and cultural resilience as part of the management of the aftermath of the disaster and restore and promote psychological and social well-being of the affected people is the main focus of the study. The chapter underlines the value of working across disciplines, namely, psychology and history in this case, to preserve small heritage connected with the day-to-day lives of the people as a strategy to achieve the above objective. It addresses a neglected dimension of people’s lives that is important to bring people together as a community connecting their lives through the restoration of their memories, artifacts, records, and other symbolic aspects of the lives of the disaster-affected people.

Managing public affairs and responding to emerging issues in modern democratic societies usually depend on the long-established formal institutions of governance. This has been true also with respect to managing disasters across the world. Yet, in many countries, the formal institutional structures are not without their shortcomings and limitations, particularly when the institutions are highly centralized and often do not reach out to peripheral areas of the countries. S.M. Pradhan and B. Sharma, in their ► Chap. 106, “[The Role of Traditional Institution of Governance in Disaster Risk Reduction in Eastern Himalayas](#),” identify the limitations of top-down government institutions and make a case in the utilization of informal local institutions to fill the void left by the former. Their main assertion is that the goals of DRR can be better achieved by making full use of local-level institutions that are closer to the lives of the communities.

The term community is widely employed in the sociological and anthropological literature as a unit of observation often assuming that members of a community share a great deal in terms of values, interests, and ideas. Patnaik, in ► Chap. 108, “[Community Participation Strategies in Nepal’s Disaster Management](#),” points out the need to recognize intersectionality of gender, ethnicity, class, and territoriality. The chapter is based on an ethnographic study conducted in three districts of Nepal, namely, Rupandehi, Makwanpur, and Sarlahi. The author asserts that paying attention to intersectionality holds the key to the success of disaster management practices.

As is well-known, modern scientific research in a range of disciplines have immensely contributed to not only to our understanding of all forms of disasters but also to develop strategies and diverse interventions to reduce disaster risks and mitigate their adverse impacts on people and infrastructure, while paying attention to longer-term resilience of disaster-affected communities. Yet, many of the disasters are not new, and, in the past, indigenous knowledge accumulated over a long period of time have helped them to cope with many disasters. Mahifuzul Haque in his chapter in this section on ► Chap. 102, “[Indigenous Knowledge and Practices of the Ethnic and Small Island Communities in Disaster Management](#)” has highlighted the need to recognize the value of such knowledge in DRR based on his observations on the experience of coastal communities in the Asia-Pacific, Southeast Asian, and Indian Ocean region. The author also points out that the scientists need to examine the practical value of indigenous knowledge to make it complementary to current DRR strategies.

As mentioned at the outset of this introduction, sociologists for decades have emphasized that any major disaster, be it natural or human-induced, disrupts the long-established patterns of social, economic, and cultural life of people. Given this reality, any attempt to deal with the aftermath of a disaster needs to address the issue of how to restore the livelihoods and life patterns in the affected communities. In ► Chap. 109, “[Exploring the Social Effects of Disasters: Causes, Consequences, and Mitigation](#),” in this section of the handbook, Siri Hettige emphasizes the need to adopt a chronological and inter-sectoral perspective on disaster risk reduction and mitigation.

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Disaster Preparedness, Disability Awareness, and Disability Inequality: A Study of Hong Kong's Property Management Sector

101

Yung Yau

Contents

Introduction	1536
Disaster Preparedness and Disability	1537
Are PWDs in Property Managers' Minds in Disaster Preparedness?	1538
Lack of Disability Awareness in the Property Management Sector	1539
Organizational, Procedural, and Protocol Inadequacies	1539
Reasons Behind Disability Inequity in Disaster Preparedness	1540
Moving Toward More Inclusive Disaster Planning and Management	1542
Concluding Remarks	1544
References	1545

Abstract

Inclusion of persons with disability (PWDs) to the society is one of the important Sustainable Development Goals advocated by the United Nations. An inclusive built environment facilitates their full participation and enjoyment of equal opportunities. To this end, it is necessary to remove the “manageable” environmental obstacles in our buildings. While many previous studies worked on inclusive design of built environment, little emphasis has been placed on the management issues. In particular, PWDs have often been ignored in the formulation and execution of crisis management or evacuation plan. Against this background, this chapter aims to provide a preliminary inquiry into how PWDs are treated in the context of disaster preparedness. Data were collected in Hong Kong through a survey on 16 residential developments and 8 in-depth interviews with PWDs and property managers. It is found that in none of the 16 residential developments investigated the property management agent had kept a register of residents with disabilities who might help in case of emergency or disaster (like

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flooding, fire, or terrorist attack). There was no clearly written protocol or manual for the property management personnel on how to assist these residents to evacuate from the buildings. No training was offered to the property management personnel to raise their disability awareness. The interviewed PWDs expressed that they were never told what they should do in case of emergency. Drawing on the research findings, this chapter makes a number of recommendations for achieving disability equality in the local property management sector.

Keywords

Disability awareness · Disability discrimination · Disability inequality · Disaster preparedness · Inclusive built environment · Property management

Introduction

According to the World Health Organization (2021), about 15% of the world population (i.e., about a billion people) have one or more forms of disability. In Hong Kong, the number of persons with disability (PWDs) amounted 534,200 in 2021, accounting for approximately 8% of the city's population (Census and Statistics Department, 2021). To the PWDs, enjoyment of equal opportunities and full participation in the community are often challenging due to the inaccessible built environment. The growing number of PWDs throughout the world has made barrier-free built environment a universal goal. The United Nations' (2006) Convention on the Rights of Persons with Disabilities adopted in 2006 stipulates that it is the responsibility of signatory states to identify and eradicate obstacles and barriers to accessibility in the built environment. Following the international trend, Hong Kong had its determination to protect people against discrimination on the ground of disability realized through the enactment of the Disability Discrimination Ordinance (Chap. 487 of the Laws of Hong Kong) in August 1995. Pursuant to the Disability Discrimination Ordinance, owners and managers of premises must provide PWDs means of access to their premises that the public or a section of the public are entitled or allowed to enter or use. It is an offence if these parties fail or refuse to provide appropriate accessible facilities unless unjustifiable hardship is resulted from the provision of these facilities. The Design Manual: Barrier Free Access 1997, which was later replaced by the Design Manual: Barrier Free Access 2008, specified the standards of new construction or alterations and additions to existing buildings that would be deemed to satisfy the legislative requirements (Buildings Department, 1997, 2008, 2021).

While the rights and special needs of PWDs in Hong Kong's built environment have been seemingly protected by the law, the statutory protection is not completed. There are codes of practice specifying the design requirements; little attention has been placed on the unthoughtful management of the built facilities (Yau & Lau, 2016). Equally worse, disaster preparedness for PWDs, which is of particular importance in the high-rise compact development setting in Hong Kong, has not

been accorded much emphasis. As a matter of fact, the impacts of natural and man-made disasters (e.g., flooding, hurricanes, superstorms, and terrorist attacks) on PWDs have been extensively studied. A large volume of literature has been devoted to disaster preparedness of PWDs in the past two decades (McDermott et al., 2016). However, it is not just the PWDs themselves (and their household members) to get prepared. Some other people like property managers need to be well-prepared for the disasters too. This is what has been largely ignored in the literature.

Against this backdrop, this chapter aims to provide a preliminary inquiry into how PWDs in Hong Kong are treated in the context of disaster preparedness from the perspective of property management. The remainder of the chapter is organized as follows. The next section is the literature review which forms the theoretical foundation of the empirical study. What comes next is the description of the research methodology. Afterward, the findings of the empirical study will be presented and discussed. Drawing on the research findings, some recommendations are drawn. The last section presents the conclusion and limitations of the research.

Disaster Preparedness and Disability

Preparedness is one of the critical elements in the holistic disaster management (O'Brien et al., 2010; Sawalha, 2020). Disaster preparedness generally refers to the efforts undertaken by individuals to mitigate their harm in disasters (American Red Cross, 2006; Samsuddin et al., 2018). Diab and Mabrouk (2015: 18) define "disaster preparedness" as "activities and measures taken in advance of an event to ensure effective response to the impact of hazards." From these definitions, one can envisage that the primary objective of disaster preparedness is to ensure appropriate procedures, systems, and resources are in place for assisting those affected by a disaster.

From the angle of urban governance, disaster preparedness is essential at different levels, ranging from the national level, through the city and neighbor levels, to the building levels. To prepare for some known disasters, thoughtful land use planning and building design have vital roles to play (Awotona, 2016). Disaster resilience has become a buzzword in the fields of architecture and urban planning (Allan & Bryant, 2012; Dupre & Bischeri, 2020). Yet, all these are just one of the aspects that can address the issue of disaster preparedness. Careful preparation of an emergency plan and its effective execution in times of disasters are also critical for disaster mitigation (Alexander, 2005). In this regard, personnel involved in disaster management, including police, firefighters, medical practitioners, and property managers, should receive adequate training to facilitate them in performing preparation for disasters (Achora & Kamanyire, 2016; Fung et al., 2008; Nazli et al., 2014).

The impacts of disasters on people with different levels of ability (or disability) vary (Fox et al., 2007; Tomio et al., 2012). In general, in emergencies, PWDs may encounter obstacles to communication, physical barriers, and inaccessibility to essential services (Alexander, 2015). Therefore, PWDs are one of the most vulnerable groups to disasters (Han et al., 2017). Evidence shows that there have been

disparities in the disaster preparedness between PWDs and those without disability (Bethel et al., 2011; Smith & Notaro, 2009, 2015). These disparities can be ascribed to the fact that PWDs tend to be poorly represented or ill-informed in disaster or emergency planning (Fox et al., 2007). For the sake of equality, PWDs should “have the right to participate in the assessment, design, implementation, and monitoring of emergency programmes” (Smith & Notaro, 2015: 415). As pinpointed by Alexander (2015), PWDs have long been ignored in disaster management. Together with the deficiency of involvement of PWDs, the lack of interest in and understanding of the needs of PWDs results in “disabling” emergency or disaster planning.

Obviously, quite a lot of previous efforts have been dedicated to investigation of PWDs’ disaster preparedness at the household or individual level. Nevertheless, the extent to which PWDs can prepare for disasters is contingent on the nature of their disabilities and the level of support received from others (Alexander, 2015). Where personal preparedness is not totally possible (e.g., for persons with limiting disabilities), external assistance is needed for evacuation. One common example is fire evacuation in high-rise building. Lift is generally not considered as means of escape (Koo et al., 2013). Persons with locomotor disabilities cannot use stairs for evacuation without the assistance of the others (Egodge et al., 2020). Therefore, it is necessary to have some rules or guidelines specifying who will and how to assist those PWDs who do not have the ability to evacuate independently to escape from a building in case of emergency. Alexander (2015) advocates that training should be provided to emergency responders so that they know how to deal with PWDs in crisis situations.

Are PWDs in Property Managers’ Minds in Disaster Preparedness?

Professional property managers are regarded as facilitators of building owners’ interests (Kyle, 2005). Their importance is more significant in multi-owned properties like housing in multiple ownership (Yau & Ho, 2019). Apart from daily routine in building management (e.g., cleaning and security), property managers play important roles in disaster preparedness at the building level. They are managing the life safety in buildings under their management (Kyle, 2005). They are responsible for preventing and controlling disasters in the buildings (Shen et al., 2021). Besides, it is critical for property managers to facilitate evacuation of the building occupants and visitors. Disaster recovery is another oft-mentioned responsibility of property managers (Hardy et al., 2009).

Payant (2016) offers detailed guidance on what property managers need to do in disaster management. However, he does not mention how PWDs are dealt with in different stages of disaster management. Moreover, little previous efforts have been made so far to empirically measure property or facility managers’ disaster preparedness for PWDs. The work by Schnitker et al. (2019) is one of these relevant ones, but its focus is placed on special low-rise aged care facilities which are significantly different from the typical multi-owned housing developments in high-rise cities like Hong Kong.

In view of the extant research gap, this research aims to investigate to what extent and how property management practitioners take PWDs into consideration in practicing disaster preparedness in Hong Kong's building management. To achieve this intended aim, a broader understanding of the existing procedures, practices, guidelines, and legislations that are related to disaster or emergency preparedness for PWDs in building management around the world is deemed essential. Therefore, a desk study was carried out through a comprehensive review of the relevant literature including international academic journals, scholarly books, policy documents, and practice notes or guidelines issued by professional bodies (e.g., Bay of Plenty Civil Defence Emergency Management Group, 2009; National Fire Protection Association, 2016). The "best practices" of disaster preparedness for PWDs identified in this stage would form the basis for exploring the gaps in Hong Kong's property management industry in the next stage.

A mixed approach was adopted in primary data collection. Firstly, 50 residential developments throughout the territory of Hong Kong were purposively sampled. In order to ensure diversity, these residential developments varied in terms of scale (i.e., number of residential units), building age, and location. All these residential developments were managed by external property agents (i.e., private property management companies). Property managers of these sampled developments were invited to participate in a structured questionnaire survey. The survey was designed to gauge the level of incorporation of PWDs' needs in the planning and execution of the disaster preparedness practices in each sampled residential development. If necessary, the property managers were requested to provide documentary records (e.g., emergency plans and fire drill records) for verification. Eventually, property managers of 16 sampled residential developments (32.0%) agreed to participate in the survey.

Secondly, in-depth interviews with four PWDs and four property managers were conducted. The four property managers had participated in the questionnaire survey. As for the four PWDs interviewed, they were recruited through the author's personal network. The responses from the interviewees were transcribed. Content analysis with manual coding was performed on the transcribed data collected from the interviews.

Lack of Disability Awareness in the Property Management Sector

Organizational, Procedural, and Protocol Inadequacies

Table 1 summarizes the responses of the 16 property managers who participated in the questionnaire survey. Generally speaking, property management personnel in the 16 residential developments were not well prepared to assist PWDs in disasters. To prepare for assisting PWDs to evacuate from their buildings, disability training was offered to the frontline staff in only four of the residential developments (75.0%). Fourteen residential developments (87.5%) did not have protocols or procedures formulated for assisting residents with special needs (e.g., those with disabilities) in

Table 1 Summary of responses to the questionnaire survey ($n = 16$)

Practice	No. of responses (percentage)	
	Yes	No
Maintaining an emergency contact list of the residents with special needs (e.g., those with disabilities)	0 (0.00%)	16 (100.00%)
Formulating protocols or procedures for assisting residents with special needs (e.g., those with disabilities) in disasters	2 (12.50%)	14 (87.50%)
Creating a support network of property management personnel who are responsible for helping PWDs in a disaster	0 (0.00%)	16 (100.00%)
Providing assisted evacuation devices in the residential development	1 (6.25%)	15 (93.75%)
Performing regular emergency or fire drills for PWDs	0 (0.00%)	16 (100.00%)
Offering training to frontline staff to assist PWDs in emergency evacuation	4 (25.00%)	14 (75.00%)

case of disasters. Only one residential development in the sample (6.3%) had assisted evacuation devices like med sleds or evacuation chairs to facilitate evacuation of PWDs. In all the 16 residential developments, no register of PWDs that need assistance in emergency evacuation was maintained, no support network of property management personnel who would be responsible for helping PWDs in a disaster was set up, and no emergency or fire drill for PWDs was regularly held.

Reasons Behind Disability Inequity in Disaster Preparedness

Lack of Consideration of PWDs' Needs

Most of the interviewees, both property managers and PWDs, opined that PWDs were poorly prepared for disasters and emergencies in Hong Kong's building management. A wheelchair user interviewed said nobody had ever informed her about what to do and where to go in case of emergency:

There is an evacuation plan posted in the communal lift lobby on each floor. Nonetheless, that is for the use of the able people only. The government says it is not safe to use lifts in case of fire. I really don't know how I can get to the ground floor or refuge floor without using a lift. Should I simply wait at home for the firemen to rescue me? (Persons with Disabilities C)

The PWD interviewees criticized that property managers usually devised their disaster or emergency strategies for the residential developments for operational needs only. They added that the property managers were not aware of the needs of PWDs in their daily building management practice. One of the interviewees who was visually impaired shared his experience:

In time of COVID-19 pandemic, the property management company managing my housing development covered the control panels in the lifts of the residential towers with plastic

sheets. I think the purpose was to protect the electronics in the control panels such that they would not be affected by the disinfectant. You know, during the pandemic, the lift buttons have to be disinfected every few hours. However, the plastic sheets were too thick, affecting me to 'read' the braille. (Person with Disabilities A)

Ambiguous Responsibility of Property Managers

The lack of consideration mentioned above could be ascribed to the absence of legislative requirements for disaster planning and management for PWDs. One of the property managers interviewed said:

in Hong Kong, emergency or disaster planning is not mandatory for building management. It is just a kind of value-added service. At the same time, the Disability Discrimination Ordinance does not require the managers of built facilities to have emergency plan for PWDs. (Property Manager B)

However, the PWDs interviewed thought the property managers should have the moral responsibility to provide emergency plans for their built facilities even though it was not mandated by the government. They argued that the formulation of such emergency plans should take the needs of differently abled residents into consideration:

For example, we need to make sure that the emergency can be communicated effectively and timely to some specific groups of PWDs like those hearing impaired. In Hong Kong, visual advisory systems are not mandatory in residential developments. It is hard for those with severe hearing impairment to notice the audio warning signals. (Person with Disabilities B)

Lack of Disability Training and Knowledge

As explained by most property managers interviewed, a low degree of disability awareness in disaster planning and management in building management is a result of the inadequate coverage of the relevant topic in the professional education programs:

In the master programme on housing management I previously took, I was not taught any issue related to disability discrimination and accessibility. Perhaps, that topic was not so important in Hong Kong. (Property Manager D)

Three out of four property managers interviewed had received no disability-related training before. The four property managers interviewed admitted that they did not have enough knowledge and skills to facilitate PWDs' evacuation in case of emergency. It was a general perception by most property managers that planning and organizing disability training is challenging because disability can take a variety of forms:

There lacks a 'one-size-fits-all' approach to disaster planning and management for PWDs. PWDs have a large variety. We have people with visual impairment, hearing impairment or locomotor disability. I think the government or professional institutes should publish some

guidebooks or guidelines on how to cope with the needs of these different groups of PWD for the property management practitioners' reference. (Property Manager D)

Some of the PWDs interviewed thought that the property managers managing their residential developments were not professionally competent enough to help them survive through a disaster happening in their buildings.

No Involvement of PWDs in the Planning and Management of Disaster Preparedness

All the interviewees, including property managers and PWDs, believed that they should have their own roles to play in disaster planning and management in the context of building management. Nevertheless, the four PWDs interviewees expressed that they were not involved in the formulation of any disaster plan or management strategy in their residential developments. They thought they were under-represented in planning stage. There was no channel for their voices to be heard. As explained by one of the interviewed property managers:

disaster or emergency planning in Hong Kong has long been a top-down process dictated by the property management companies. Owners' corporations may have a say on some occasions. We seldom include all residents in the formulation of the emergency plan. It is too difficult have resident involvement in emergency planning because of the large number of residents to be involved in a typical high-rise residential development in Hong Kong. (Property Manager C)

Nevertheless, this view was not received by the PDWs. They argued that the property management companies could perceive the needs and difficulties of PWDs in emergency evacuation:

The emergency plans and procedures are developed from the perspective of 'able' people. They are not workable for us in many scenarios. (Person with Disabilities D)

Moving Toward More Inclusive Disaster Planning and Management

The empirical findings of the research revealed a noticeable gap in the building management practice in relation to the disaster planning and management for differently abled groups of people in Hong Kong. The awareness of PWDs' needs depends on a number of factors including familiarity with PWDs. For example, people with disabled members in their families tend to have a higher level of disability awareness (Han et al., 2017; Yau & Lau, 2016). However, disability training can help most people to gain awareness. Yet, as evident from this study, disability training provided for the property management practitioners was far from enough. The practitioners were deficient in disability awareness, which led to poor preparedness for PWDs in their daily building management practice. The results echo with findings of Fox et al. (2007) that limited staffing and lack of awareness are

obstacles to the accommodation of the needs of SWDs in an organization or community's guidelines of emergency management.

Procedures or protocols for assisting PWDs to evacuate in time of emergency were absent in most of the residential developments under investigation. In this case, when a building needs to be evacuated during an emergency, there will be substantial challenges arising from the special needs of PWDs. All these challenges can be significantly reduced through various steps of disaster preparedness, including formulation of operating procedures, practitioner training, proper equipment staging, drills, and exercises. To this end, it is necessary for the property management practitioners to notice and understand the needs of PWDs in the buildings under their management. Besides, from the practical point of view, the property management practitioners should learn how to safely assist and evacuate PWDs during an emergency.

While it is a general consensus that a stronger commitment from the property and facility management sector is needed to uphold the interests of PWDs in the built environment (Egodage et al., 2020), the research findings suggest that the property management companies might not know how to develop the procedures for assisting disability to evacuate. Perhaps, PWDs should be engaged more in the disability planning and management. That depends on whether the property managers open up more opportunities to be involved in the processes. Moreover, external resources seem to be necessary to help the property management companies and practitioners to develop more "inclusive" disaster or emergency plans. These may come from the government, professional bodies, or disability concern or self-help groups.

Undoubtedly, the lack of legislative requirements and official guidelines to cater to the special needs of PWDs in disaster planning and management in Hong Kong needs to be addressed. The Disability Discrimination Ordinance stipulates the mandatory provisions of accessible facilities in building design and construction. However, its relevance to the resident management in disasters is rather weak. The Buildings Department issued the Code of Practice for Fire Safety in Buildings 2011 (which was later revised in 2015) to set out the minimum acceptable design and construction standards of buildings for fire safety (Buildings Department, 2015). Although the code of practice has a section on means of escape provisions for PWDs, it does not touch upon any issue of emergency planning and management. Similarly, in the field of property management, the Secretary for Home Affairs issued several codes of practice governing the maintenance works in multi-owned properties and procurement of supplies, goods, and services for building management in Hong Kong; there is no guidebook or code of practice for assisting property management practitioners to protect the rights of PWDs in their daily building management practice. Therefore, the coverage of the DDO should be widened to cover emergency planning in building management to prevent and eliminate discriminations against PWDs. In addition, for property management professionals to safeguard the rights of PWDs in disaster planning and management, codes of practice or guidelines are required.

Inadequate disability awareness among property managers is one of the major barriers to inclusive disaster planning and management. This can be ascribed to the

fact that PWDs' rights are not covered in any of the professionally accredited property management programs in Hong Kong. Hence, the curricula of professional training programs in relation to property and facility management, no matter at diploma, undergraduate, and postgraduate levels, should include the topics of anti-discrimination and disability inclusion. While it is generally believed that disability training is important for the fresh entrants to the property and facility management field (i.e., the potential practitioners), continuous professional development (CPD) of existing practitioners, particularly those in senior positions, is equally vital. For their members to be more disability-aware, professional bodies and institutes related to the property and facility management profession (e.g., Hong Kong Institute of Surveyors, Hong Kong Institute of Housing, and Chartered Institute of Housing) should offer enough relevant CPD events. Given that the licensing regime for the property management companies and professionals has been in place in Hong Kong since August 2020, the Property Management Services Authority should specify disability awareness training to be an essential area of CPD. This type of training should include points of view of PDWs and information on the range of needs.

Practice makes perfect. PWDs need to be included in periodical emergency and fire drills (Lee, 2016). This is crucial because François-Xavier Bagnoud Center for Health and Human Rights (2016) reveals that quite many PWDs do not know where to escape in case of contingency. Apart from the PWDs, the property managers should also practice how to use the assisted evacuation devices. Besides, they should know how to lift people in such a way as to avoid harm to both the person being lifted and the lifter (Alexander, 2015). According to the suggestions made by Alexander (2015), property managers should be made aware of the need to preserve the rights and dignity of PWDs and to treat them fairly. In this regard, practice and training provided to the property managers should cover both technical issues and awareness raising, but preferably separately.

Concluding Remarks

It is not enough to design and construct an inclusive, accessible built environment. If it is not managed effectively, a building will quickly become inaccessible. More importantly, accessibility issue is not just for convenience but also for safety. However, disaster planning and management for PWDs, particularly from the perspective of property managers, have been largely ignored in the literature. As a matter of fact, property management practitioners play a pivotal role in ensuring the personal safety of PWDs who use a built facility. PWDs should receive the same level of safety protection as those without disabilities do. This chapter aims to provide an overview of how PDWs in Hong Kong are treated in the context of disaster preparedness. It investigated how property management companies took PWDs' needs into account when formulating and implementing their disaster or emergency plans. Also, the experiences of PWDs were researched.

In this study, it was found that there is a low level of disability awareness among local property management practitioners. Many property management companies

and practitioners did not have specific guidelines or protocols for dealing with residents with disabilities in their emergency plans. Moreover, little provisions were made for facilitating PWDs' evacuation in case of emergency. Disability training was not a norm to the property management practitioners. Overall, the situation is very worrying and not favorable to the promotion of the concept "aging in place" in Hong Kong. Many senior residents have limited levels of mobility so they need assistance in emergency evacuation. Based on the findings of the current baseline study, property managers will be able to track their disaster preparedness for PWDs in the future.

The study has several limitations. First, the empirical study relies on the primary data collected from surveys and interviews. The reliability of the self-reported data may affect the research findings and conclusion. Second, only property management practices in residential properties were covered. Other types of properties such as office buildings and shopping centers were ignored. The level of disaster preparedness for PWDs in these properties may be different from that in the residential properties. Third, the generalizability of the research findings may be limited by the small number of surveyed residential developments and interviewees. A larger number of observations will be warranted in the further studies to confirm the findings of the current research. Besides, future studies should investigate how the degree of accommodation of the PWDs' needs in disaster preparedness varies with property type.

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Indigenous Knowledge and Practices of the Ethnic and Small Island Communities in Disaster Management

102

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Contents

Introduction	1550
Asia-Pacific Islands	1551
Andaman and Nicobar Islands	1553
Bangladesh Coastal Islands and the <i>Haors</i>	1554
Conclusion	1555
References	1556

Abstract

Disaster does know no boundary. Irrespective of people's color and shade, caste and creed, religion and culture, and language and ethnicity, disasters continue to cause havoc on population it traverses. In most cases, the poor, destitute, and the marginal ethnic communities are badly affected. The ethnic communities are doubly affected mainly due to their poverty and living in the periphery. The chapter looked into survival strategies of the coastal communities in the Asia-Pacific, Andaman and Nicobar Islands in the Indian Ocean, and the coastal islands of the Bay of Bengal. Their coping strategies as they face earthquake, tsunami, and hazards like cyclones, floods, and tidal surges were examined in threadbare. Various signs and bizarre symptoms reflected in animal behavior, movement of the celestial bodies, and environmental signs and symptoms; beliefs in local tradition and religion helped the local community to develop a coping mechanism in order to live with the disasters. The chapter observed that these island ethnic communities have been living with floods, tidal surges, cyclones, and tsunamis from time immemorial. Their life and living are intertwined with the sea, forests, hills, volcanoes (often dead), and the surroundings. They are the children of the sea. Many a times, their local knowledge and practices

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transcended on them over the generations were found handy in saving their lives from these periodic disasters.

Keywords

Andaman and Nicobar Islands · Coastal Islands of Bangladesh · Ethnic communities · Indigenous knowledge and practices · Tsunami

Introduction

Amin (2000) and Haque (2013) defined “functional knowledge” of the local community living in a particular ethno-cultural and agroecological condition as their indigenous knowledge. Indigenous knowledge (IK) is developed through sharing of experience, stories, and anecdotes passing from generation to generation orally. The knowledge remains in force in various aspects of community life in unwritten forms. Unwritten knowledge may run the risk of being lost. IK generally sticks around in peoples’ knowledge, folklores, stories and anecdotes, belief, and perceptions, mainly among the rural community (Warner, 1991; Sillitoe et al., 1998). According to Walker et al. (1991), a specific group of people with similar traits living in same geographical setting generally promotes this knowledge collectively. Generally, indigenous knowledge is not “codified or written in formal language” in books or literature. Researchers and policy-makers acknowledge that this knowledge is a resource and it should be promoted and conserved in order to supplement existing scientific knowledge. Sillitoe (2000) observed that opposed to “top-down” planning process, IK has followed a “bottom-up” or “grassroots” process. Such a knowledge is unique and could be separated from that of scientific knowledge based on years of scientific research in laboratories. IK continues to be used by the villagers in the management of natural resource, fisheries conservation, and maintaining healthcare practices of the livestock (Mustafa, 2000; Haque, 2019). Corroborating others, Sillitoe et al. (1998) observed that “contrary knowledge relates to any knowledge held collectively by a population mostly inhabiting in rural areas under similar topographical setting.”

We cannot ignore the importance of local knowledge and practices, and it is neither primitive nor unscientific. It is true that the local community is exposed to modern living conditions and associated knowledge. Despite their access to local technology and knowledge, they continue to cling to their forefathers’ knowledge for survival during a disaster and never disowned their traditional knowledge learned over the generations. With the new ideas and thoughts and rapid spread of new technology, local knowledge is disappearing fast. It is increasingly felt that indigenous knowledge needs to be promoted and documented as it could fast disappear as time passes by. Acknowledging local and indigenous knowledge, UNESCO’s program on Local and Indigenous Knowledge Systems (LINKS) refers to the

“understandings, skills and philosophies developed by societies with long histories of interaction with their natural surroundings” (Hiwasaki et al., 2014). Both the two international conventions, namely, Hyogo Framework for Action 2005–2015 and Sendai Framework for Disaster Risk Reduction 2015–2030, put emphasis on local and indigenous knowledge and practices and stressed that they should be incorporated in national disaster risk reduction strategies.

In line with these two international documents, national disaster risk reduction strategies of the signatory countries are to address local knowledge of the indigenous communities practiced over many generations. One of the five main drivers of “Hyogo Framework” was on strong community engagement for effective disaster risk reduction. Priority actions suggested that the people are to be made aware of indigenous knowledge and practices in order to save themselves from natural disasters. The Sendai Framework, on the other hand, emphasized on “indigenous knowledge and practices and coping strategy of the local community in facing challenges of natural disaster.” The role of the stakeholders is important here. Both the framework conventions wished that the local community would significantly contribute in disaster risk reduction using their local knowledge and practices.

This chapter mainly deals with the hazards caused by floods, earthquakes, cyclones, tidal surges, tsunami, and other hydro-meteorological events. The chapter to start with deliberated on the definitional issues on indigenous knowledge, coping strategies, survival strategies, and resilience of the people in the face of a disaster. The communities chosen for discussion are the coastal and small ethnic groups of people of the islands of Asia-Pacific, Indian Ocean, and the Bay of Bengal.

Asia-Pacific Islands

Hazards caused by irregular hydrological and meteorological events severely affect the communities in Asia-Pacific Island nations. These are the earthquakes, cyclones, tidal surges, heavy rainfall, floods, and landslides. Cyclones originate when mixture of heat and moist air forms a low pressure over the oceans. It is known as cyclone in the Bay of Bengal, hurricane in the Atlantic Ocean, typhoon in the Pacific Ocean, bagyo in the Philippine Sea, and willy-willy in the Pacific countries. In the northern hemisphere, it is counterclockwise, and in the southern hemisphere, it rotates clockwise. Bay of Bengal is the most important cyclone-prone area because of its funnel shape and most cyclones visit in the months of May, October, and November period.

Issues related to climatic changes, warmer days and cooler nights, changes in rainfall patterns, and frequent and stronger cyclonic storms are all intricately observed by the local islanders. High and low tides, rise in sea level, and salinity intrusion affecting their crops are all closely witnessed by these people. Based on their years of observation, they gather a wealth of knowledge and practices on how

to live with them. These communities closely observe and inspect changes of their surrounding environment by looking at the seas, the horizon, shifting of the clouds, and erratic movements of the animals, plants, ants, and insects. Restlessness among the birds and crawling of the frogs, snakes, and lizards announce the advent of an impending disaster. There are also changes of position of various celestial bodies. Color and composition of the clouds and placement of the moon, sun, and the stars also carry meaning for the islanders, who live along the edges of the ocean for ages.

According to Hiwasaki et al. (2014), the island communities envisage heavy rainfall or strong winds by witnessing movement of the clouds, height of the waves, sun, and the stars. Their understanding is based on the “(a) observations of animal behavior, (b) observations of celestial bodies, (c) observations of the environment, (d) material culture, and (e) traditional and faith-based beliefs and practices.”

They understand changes in the texture of clouds, shade of color, location, and movement, including speed and direction. They observe the changes of color of the sky, direction, and height of the waves. Wind direction and temperature fluctuation, location and size of the sun, and visibility of the stars convey messages to the community of an impending disaster. Sometimes, bad smell coming from the sea carries message that a storm or typhoon is approaching.

People watch movement of animals, insects, and plants in some Pacific coastal islands in predicting a hazard. Leaches and caterpillars are seen appearing before typhoons in the islands of Timor-Leste. People in the Philippines, when noticing the leaves of the banana trees falling on the ground without any gusty gale, consider the situation as a bad omen and apprehend the advent of a storm or typhoon (Hiwasaki et al., 2014). Visit by migratory birds is an important sign of changing season. Some bizarre animal and insect behavior also signal approach of a disaster. Erratic movements like the rays leaping repeatedly in the sea in summer, the unnatural activities of sea snakes, and climbing up trees by the hermit crabs signal that a disaster would soon hit the region.

As they predict and apprehend the approach of a storm, the islanders have their own mitigation plans and various ways to guarantee food security during a disaster. As an indigenous way of preserving fish, they use salt and practice sun-drying. During and aftermath of a disaster, people eat locally available fruits, tuber, and roots of plants for survival.

In 2007, an earthquake measuring 8.1 caused death of 52 people of the Solomon Islands (McAdoo et al., 2008). Between the earthquake and tsunami, there were hardly 3–4 min of lull period, and the indigenous peoples of Solomon Islands could sense impending disaster and took refuge for safety. Had the local community not applied their local and traditional knowledge, casualties would have been higher. What did happen on that fateful day was that when the shaking stopped, the coral lagoon was drained uncovering the sea floor. High wave of tsunami advanced within 10 min later and inundated the area with high tides. The local community moved toward the high lands apprehending an impending tsunami. People who died that day in the Solomon Islands were mostly the immigrants with no knowledge of island ecology.

Andaman and Nicobar Islands

Some 1200 km off the eastern coast of India, the Andaman and Nicobar Islands were severely hit by the 26 December 2004 tsunami with epicenter of the earthquake in Aceh province in Sumatra (Singh et al., 2018; Sekhsaria, 2017). The tsunami killed 2,30,000 in 14 countries inundating coastal communities with waves up to 30 m (100 feet) at a magnitude of 9.1–9.3 in Richter scale. Most devastated countries were Indonesia, Sri Lanka, India, and Thailand. There was another tsunami on 27 October 2010 in the coast of Indonesia, although milder though. Islanders of these countries are used to watch these killer waves and have contingency plan for immediate rescue and safety.

The islands of Andaman and Nicobar are inhabited by some 12 distinct aboriginal groups, whose forefathers came all the way from Africa. These primitive people are on the verge of losing their culture and identity due to urbanization, tourism, and modernization. There are only 92 *Ongees*, 43 Great *Andamanese*, 350 *Jarawa*, 100 *Sentinelese*, and over 250 *Shompens* (Reddy, 2018; Chandi, 2010), and they constitute the “particularly vulnerable tribal groups” of the islands. The southern parts of the Nicobar Islands were worst hit by the 2004 tsunami (Reddy, 2013; Sekhsaria, 2014). The earthquake-induced tsunami affected the coastal areas of Malaysia, Myanmar, and Thailand. The giant waves later reached the coast of Bangladesh, India, Maldives, and Sri Lanka killing between 2,50,000 and 3,00,000 people (Shaw, 2006). Due to tsunami, land subsidence took place in some islands with massive devastation. Various parts of the islands were deformed and were reduced in size with death and destruction. Forests of Little Andaman was inhabited by the primitive *Ongees* tribe. It is learned that they could escape to safety during tsunami. Following the earthquake, about 83 *Ongees* gathered their belonging and ran in the midst of the forests to a safer place in the high hills (Pandya, 2005). Their primitive tribal knowledge helped them to have the sagacity that tsunami waves were treacherous. On the morning of tsunami, unlike the settlers, the *Ongees* did not wait to see aftermaths of the earthquake, which to them was an ordinary event. Many lives of the settler communities were lost, because they were looking at the retreating sea in order to catch fishes, unaware of the killer waves trailing behind.

The *Sentinelese* and the *Jarawa* communities are the hunter-gatherer tribes. The *Jarawas* are the forest people and know the forests they live in. They are a group of people of *Negrito* origin, and their ancestors came all the way from Africa some 60,000 years ago (Chandi, 2010). They are familiar with the special use of plants and leaves as they soil their bodies with a paste of leaves that can drive away the bees and help in collecting honey without being attacked (Chandi, 2010; Sekhsaria, 2014). It is also learned that suspecting the looming threat of tsunami in advance, the most isolated and violent primitive tribe living in inaccessible North Sentinel Island, the *Sentinelese* were able to quit their homesteads and escape to the highland forests for safety and security. It is apprehended that the Rs 75,000 crore proposed development project (The Frontline, 22 July, 2022) for construction of a transshipment port, townships, powerplant, and airport by the government of India in tsunami-prone areas of Little Andaman and Great Nicobar Islands could be a disaster not only for

the environment, forests, and wildlife (endemic and endangered) but also for the primitive people of *Shompen*, *Ongee*, and *Nicobarese*, who have been living there for generations.

Bangladesh Coastal Islands and the Haors

The coasts of Bangladesh are one of the disaster-prone areas of the world. The 12 November 1970 cyclone and tidal bore killed around 3,30,000 people in unprotected coastal areas of Bangladesh. Further to that on 29 April 1991, another cyclone and associated water surges killed as many as 1,38,882 people (Haque, 2019; Haque et al., 2011). Bangladesh recently faced bad cyclonic storms with associated tidal surges, named *Sidr* on 15 November 2007, *Aila* on 25 May 2009, and *Mohasen* in 2013 (BMD, 2009). Cyclone warning system helped people to take refuge in cyclone shelters, numbering around 4000 in the coast. Cyclones generally originated in the sea due to low depression and travel toward the landmass, where they get weakened and make eventual landfall. On the other hand, tornado is built up over the land when large masses of cloud converge. The clouds begin to whirl around and make a gigantic twisting funnel. When it touches the ground, it sucks up anything and everything they come across – trees, houses, animal, trains, or people – like a giant vacuum cleaner. Tornado comes sudden with a gusty wind and catches its victims unaware.

Bangladesh has a 710 km coastline (Rasheed, 2008) covering many small and newly emerged *charlands* (shoals). These islands are subjected to tropical cyclones and storm surges incurring loss of lives and property. The area is populated by 35 million people (2005) representing 29% of the total population (Rasheed, 2008) and expected to be 43 million in 2025 (GOB, 2002). Some of the *charlands* are in the process of formation and not yet fully developed. As they live in a hostile land close to the sea, the charland people through a process of community adaptation had developed many strategies concerning disaster. These strategies are based on their indigenous knowledge and practices gathered over many generations. Bangladesh coast was hit by 35 devastating cyclones in the last 150 years (Haque, 2019). The cyclonic months are generally April–May and November with associated tidal surges. The 12 November 1970 cyclone and tidal surges killed around 3,30,000 people in the coast and another 138,882 people died on 29 April 1991 (Haque, 2019; Haque et al., 2011). Some recent cyclones, namely, *Sidr* in 2007, *Aila* in 2009, *Mohasen* in 2013, *Bulbul* in 2019, and *Amphan* in 2020, caused lesser number of deaths and damages, mainly due to a paradigm shift in disaster management from relief and rehabilitation to disaster risk reduction.

A number of researchers did work on the contributions of indigenous knowledge and practices in disaster forecasting, prediction, and disaster risk reduction in the coastal area of Bangladesh. Hassan (2000) has observed that the coastal people could identify and forecast the nature of a cyclone by observing the following signs: (a) direction of wind, (b) temperature and degree of salinity of water, (c) color and form of the clouds, (d) presence of a rainbow, and (e) movement of certain birds and

animal species. It is believed that wind blowing from the southwest would likely to cause a storm. On the other hand, the northeasterly wind has the potential to create a cyclone and not a massive one.

In course of time, the people of the coast have introduced some survival strategies during and after a cyclone. They bind themselves round a tree, mostly a coconut tree and rise and fall with the water level (Haque, 2000). They look for comparatively higher grounds like embankments, polders, and rooftops for a refuge. They cling to floating items such as timber, thatched roof, straw piles, and coconut bunches as the tidal water recedes with enormous speed. People eat stems and roots of edible plants. As cyclones are always followed by rain for several hours, people collect and drink rainwater. In the absence of rainwater, they drink green coconut water to quench thirst. Instead of waiting for external help, the local community treat their minor injuries and recover from diarrhea with herbal medicine. For immediate relief, they depend on herbal medicines for treating minor injuries and diarrheal diseases. They grow vegetable crops in waterlogged area caused by a prolonged flood. Hydroponics or *Baira* is very common in southwestern parts of the country. Vegetables are grown in floating garden made of water hyacinth and mud. This survival strategy during and after a flood helped the coastal community with food security.

Low depression of land in the northeastern parts of Bangladesh, commonly known as the “Haor,” has different ecology. The land is mainly a one-crop land, and the villagers are fully dependent on the harvest from the lone crop. There are various beliefs and taboos surrounding the harvest. People believed that “abundance of mango will bring floods and abundance of jackfruit will increase rice production” (Islam & Bremer, 2016). These “local scientists,” mostly the village elders, could effectively explain and predict the advent of flash floods and rainfall that matter a lot to them. They are able to understand behavior of certain animals, insects, birds, lizards, and even movement of the ants. They believe that visit by snakes during monsoon is a sign of the advent of flash floods. Similarly, if grasshoppers are found flying too high in mid-April and frogs croak in the month of March, this means heavy rainfall would engulf the region. According to them, early return by cattle to their home and birds to their nest symbolizes the advent of a big storm. They consider erratic flight of herons as a sign of northwesterly storm. Similarly, a continuation of southerly wind may herald heavy rainfall. As their agro-based economy is closely linked with crops and harvest and environmental surroundings, the rural folk continues to nurture these signs and symbols in their beliefs and thoughts transcended to them from generation to generation.

Conclusion

Indigenous knowledge and practices are yet to be fully recognized by disaster risk reduction specialists. Vulnerable communities, scientists, policy-makers, and executives have not fully subscribed to the practices. It is to be noted that IKP can play a critical role in addressing hazards and improving disaster preparedness. In order to

operationalize, IKP are to be supported and examined by scientists for their practical value enabling them to be complimentary to disaster risk reduction strategies.

Local and indigenous knowledge is key to survival strategy of coastal and small island communities to hazards, like tsunami, earthquake, and the impacts of climate change. Due to the lack of scientific data and ground truthing, indigenous knowledge and practices suffer limitations. Unfortunately, they remain mostly in oral form and undocumented. A group of scientists and researchers, however, has tried to validate the knowledge with scientific observation. Led by Hiwasaki et al. (2014), they started a process to identify, document, and validate local and indigenous knowledge and integrating this knowledge with science. They coined it as “Local and indigenous knowledge and practices Inventory, Validation, and Establishing scientific knowledge (LIVE).”

Hiwasaki et al. (2014) gave scientific clarifications to local knowledge like (a) observations of animal movements; (b) observations of cosmic and planetary bodies; (c) movements of cloud, direction of the wind; (d) material culture; and (e) traditional and religion-based beliefs and practices. Researchers and academicians are of the opinion that all stakeholders (policy-makers, policy executives, scientists, and the local community) are to be involved for the implementation of the LIVE skill.

It is important that IKP are documented and promoted. They are to be validated with scientific rationale and clarification. Such a validation would help the scientists, policy-makers, and the practitioners in developing an operational country-specific disaster management plan. In line with the recommendations of the Hyogo and Sendai Framework for Disaster Risk Reduction, it is recommended that the local and indigenous knowledge of the community is mainstreamed in national plans and policies before they are lost in time.

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Combating Domestic Violence During Lockdown of COVID-19 Pandemic

103

Neena Joseph

Contents

Introduction	1560
Global Experiences of DV During COVID-19 Lockdown	1561
Prevalence During COVID Lockdown	1561
Vulnerability to Intimate Partner Violence	1562
Triggers for DV During COVID-19	1563
Help-Seeking Behavior of Domestic Violence Victims and New Barriers	1564
Management of the Domestic Violence During Lockdown	1565
Conclusion	1572
References	1572

Abstract

Disasters have a differential impact on vulnerable sections of a society with gender as the crosscutting dimension and violence as the prominent feature. Gender-based violence exacerbates during disasters and most of it is directed against women and girls. The most rampant category is the violence perpetrated by the intimate partner. Though a perpetual global phenomenon, domestic violence has become so frightfully pervasive during COVID-19 that it attracted UN attention. Countries had introduced systems to combat domestic violence during lockdown, because this was a time when women were trapped within homes without access to legal, administrative and social resources and hence victims were conveniently and continuously accessible to the abuser inside the locked house. The objective of this study is to consolidate the learnings from global experiences and to prepare guidelines for action during lockdown situations for containing this scourge and for suggesting long-term strategy toward its elimination. The global scan is done with specific reference to the state of Kerala, India. An attempt is made to examine the deep-rooted causes besides the specific triggers characteristic of lockdown situations. Inputs were collected from UN

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reports, government reports and records, and literature and by interviewing key officials from government, local bodies, and community-based organizations in Kerala. The findings are intended to be a ready reference for policy makers, administrators, and human rights activists to deal with domestic violence during disasters in general and lockdown situations in particular.

Keywords

Domestic violence · Lockdown · Administrators · Guidelines

Introduction

“Gender based violence refers to any act of physical, sexual or economic violence directed against a person or group on the basis of their gender, sex or non-conformity to gender norms and stereotypes It is an expression of unequal power relations, underpinned by social norms and beliefs linked to dominance, power and abuse of authority and formalised through laws policies and regulations of social institutions” (Javed & Chatty, 2021). Going beyond the binaries, gender-based violence includes violence against LGBTQIA++ community as well as violence happening inside and outside domestic spaces. Indian law’s definition of domestic violence (DV) includes emotional, verbal, and economic violence. Respondents can be male relatives by blood, marriage, relationship in the nature of marriage, and adoption in shared households. But the focus of this chapter is DV happening within marriage against women by the husband.

UNDOC study on homicide marks home as the most dangerous place for women (UNODC, 2020). According to the National Family Health Survey-5 (NFHS-5), during 2019–2021, 29.3% of married women in India in the age group 18–49 years had experienced spousal violence at some point in their life. NFHS figures for Kerala reveal that among the victims who had ever experienced physical violence, 90% experienced the same from husbands.

DV is a human rights violation. Unplanned pregnancy, miscarriage, stillbirth, premature child birth (WHO, 2021), chronic diseases, post-traumatic stress disorder, depression, nightmares, social dysfunctions, eating disorders (Das et al., 2020), compromise of self-care and child care, suicidal ideations, deterioration of health, aches, and pains are some fallouts of domestic violence (WHO, 2021). Disruption of peace of the family and neighborhood, decline in productivity, and loss of jobs happen. This is a public health problem which affects the exchequer (UN Women, 2022a, b). It entails intangible and indirect costs such as loss of working days, treatment expenses, decline in the educational attainment of children, time government spend in handling domestic violence, and the transmission of violence into subsequent generations.

“Gender-based violence has been an invisible phenomenon for decades, being one of the clearest manifestations of inequality, subordination and power relations of men over women.” The underlying reason is structural (Donato, 2020). Incidence of

female violence against spouse is very rare and happens due to individual characteristics and not due to structural inequities, whereas the reverse is structural, cultural, and systemic and requires corrections at these levels for its containment and elimination.

Distilled wisdom from recent experiences in handling domestic violence during lockdowns can guide us. A ready set of doables is required to handle DV during lockdowns. Awareness of triggers is crucial. Understanding of the patriarchalized gender dynamics is important for nuanced implementation.

Global Experiences of DV During COVID-19 Lockdown

Prevalence During COVID Lockdown

According to the World Health Organization, globally 30% of women are victims of either physical or sexual violence in their lifetime. Twenty-seven percent of women in the age range 15–49 report such type of violence from their intimate partner (WHO, 2021). Globally, 38% of all murders of women are committed by intimate partners.

Post-COVID period witnessed spike in violence. In Hubei, China, cases tripled (Usta et al., 2021). In the Philippines, it surged to 16% (UN RC Philippines, 2020). In Australia, onset, intensification, severity, and diversification of DV occurred during the first 3 months of the pandemic. “COVID-19 conditions were weaponized to enhance their controlling and coercive behaviour” by the perpetrators (Carrington et al., 2021).

During lockdown, homes became spaces for multiple activities and ended up simultaneously as a home school and workspace besides being spaces for multiple routine domestic engagements including nursing the sick. The “legitimate” care receivers, often healthy men, are always around. Along with the tensions of the pandemic, women’s role overload poses major challenges to them.

A high percentage of women opined that DV has increased in their community: Kenya (92), Bangladesh (81), Nigeria (74), Poland (68), Ukraine (59), Thailand (57), Columbia (43), and Kyrgyzstan (33) (UN Women, 2021).

Overall help calls increased by five times. In South Africa, call centers were overwhelmed (Parry & Gordon, 2020). In Portugal, Spain, Italy, South Africa, and Brazil, immediately after lockdown, reportage decreased (Gama et al., 2020; UNODC, 2020). But, once help services were ramped up, distress calls, messages, and demand for shelters increased sharply: USA and Canada, Brazil (40 to 50%), Argentina (25%), Columbia (12%), Europe (60%), Ireland, the UK, Germany, France (30%), Spain (20%), Belgium and Austria, and Cyprus (30%). The Netherlands and Switzerland did not report any change (Gama et al., 2020; Brink et al., 2021; UN Women, 2022a, b; Usta et al., 2021; Parry & Gordon, 2020). Helpline calls increased by 33% in Singapore (Usta et al., 2021). In South Africa, since the commencement of lockdown on March 26, 2020, call centers were overwhelmed

(Parry & Gordon, 2020). When reporting mechanisms were reinstated, helpline calls hiked up to 111% in some countries (Oxfam, 2021).

In India, the first lockdown was from March 25, 2020, to May 31, 2020. According to the National Commission for Women, the reportage decreased immediately after lockdown and then escalated: 538 (January), 523 (February), 501 (March), 377 (April), 552 (May), and 730 (June) (Oxfam, 2021). Again in 2021, the number of domestic violence complaints received was the highest when compared to the last 12 years.

The worldwide initial decrease could be due to the temporary shutting down of the victim protection centers' mobility curbs and lack of transportation during lockdown. Once restrictions were lifted, complaints surged beyond the capacity of call centers and shelters.

During lockdowns, surge of DV needs to be anticipated and domestic safety services should be ramped up.

Vulnerability to Intimate Partner Violence

Intimate partner violence – physical and /or sexual violence – prevails disproportionately higher in countries which are marked as the “least developed” by SDGs. The contrast is 22% vs the global rate of 13% (UN Women, 2022a, b).

Generally, the major predisposing factors of DV are history of experiencing or witnessing violence and an already impaired marital relationship with little interpersonal communication, tendency to control the female partner, etc. The risk factors also comprise alcoholism, antisocial personality, notions and practice of male privilege, lack of women's access to paid employment, and existence of patriarchally biased social milieu including gender discriminatory laws and absence of protective laws. Sexual violence occurs more in a setup where ideas of male sexual entitlement, family honor, and impunity for sexual crimes prevail. Lower educational level too is another reason mentioned (WHO, 2021). Women underwent lifetime intimate partner violence at the hands of men who cherished patriarchal attitudes and behavior such as controlling women's bodies, autonomy, and social interaction (UN Women, 2022a, b).

Slim Jahan, Director of UNDP HDR Report Office, blogged that violence against women is both cause and consequence of inequality (Thurston et al., 2021). Ageism, disability, LGBTQIA++ status, refugee status, and displacement status all multiply the vulnerability of women to this scourge. When two or more such vulnerable identities intersect, unique problems emerge which are usually invisible and go unrecognized (Vaeza, 2020). COVID-19 restrictions had a disproportionate impact on women who are already working in informal sector and who are already poor. This will “push about 47 million women worldwide into extreme poverty” (UNODC, 2022). Women who are poor are at higher risk of domestic violence (UNODC, 2022).

Multiple and intersectional vulnerabilities to DV exacerbate during lockdowns. These need to be mapped out and at-risk sections can be identified and prioritized for proactive interventions. Disaster risk reduction plans should integrate risk to DV. Measures to reduce inequality (SDG 10) and to challenge patriarchy are required, and for India, this is a formidable challenge considering that Global Gender Gap Report, 2021, places India in the 140th rank vis-à-vis Afghanistan ranked as the last 156th one (World Economic Forum, 2021).

Triggers for DV During COVID-19

In general, during economic crises, adverse impacts on mental health and issues such as “depression, substance abuse, addictions, and suicidal attempts” are to be anticipated (Sochanska, 2020) “Exposure to disasters can increase VAWG (Violence Against Women and Girls) through an increase of stressors that trigger VAWG; an increase of enabling environments for VAWG to occur; and an exacerbation of underlying drivers of VAWG” (Thurston, 2021). During disasters, men could not live up to the patriarchally exaggerated and impossible masculine images as protectors and providers (Parkinson & Zara, 2013). Threatening of breadwinner role of men can severely stress men (Sochanska, 2020). Patriarchally driven compulsions, on incessantly displaying masculine characteristics, roles, and performances, refrain men from expressing emotions other than aggression. Studies corroborate the idea that repressed emotions trigger violent behavior (Anderson et al., 2003). DV is resorted to by some men to ease the tensions generated by the threats and challenges posed by the pandemic (Arora & Jain, 2020).

The USA, Australia, Canada, and New Zealand witnessed incidence of domestic violence during disasters. This was rampant in Australia during the Black Saturday bushfires (Parkinson, 2017). The same rose by 53% in New Zealand after the Canterbury earthquake as reported by the police. After Katrina Hurricane, rise in physical violence on women was 98% (Parkinson & Zara, 2013). Similar experience was witnessed in India and Sri Lanka after the 2004 tsunami (Hines, 2007). During the earthquakes in Churchgate, New Zealand, a rise in DV also was seen (True, 2013).

Regarding the post-COVID scenario, ILO estimates reveal that globally, during the second and third quarters of March 2020, loss of employment hours was 18% and 7.32%, respectively, compared to the same period during the previous year. Loss of jobs for women was 5%, while 3.9% for men (World Economic Forum, 2021). Nonearning status makes women dependent and vulnerable to DV. Nonearning status triggers DV in men.

During COVID, DV was predicted to spike due to anxieties related to health and personal finance, heightened by confinement within homes (UN Women, 2022a, b). Stress disorders, unhealthy sexual behaviors, and substance abuse set in. Stress generated by threat of employment and loss and absence of social interactions can trigger DV (Abramson, 2020). COVID restrictions per se are a stressor. Entrapped condition of helpless victims within homes powered up the triggers. Enclosed within

home, there were more chances of intensification of DV and slippage into substance abuse (Parkinson & Zara, 2013). Intensification and diversification of DV occur (Abujledana et al., 2021). The COVID situation can make an abuser to utilize the social distancing stipulation to further isolate the victim from her networks and lifesaving services (Vaeza, 2020; WHO, 2021).

New cases emerge in this stressed situation (Abramson, 2020).

In short, lockdown generated many stressors – financial (lack of income, debt, loan repayment issues, challenge of meeting daily needs), social (isolation from extended family, networks), psychological (fear of domestic violence, stress related with the upkeep of masculinities, uncertainties regarding employment, availability of services, lack of faith in the governmental systems), and physical (domestic violence, burnout due to role overload, general health issues, COVID infections) (from interviews with local body leaders) stressors which in turn trigger DV.

Various actors dealing with DV need to have a deep understanding of triggers and their deep rootedness and also of the lived experiences of the victims, so that justice can be delivered to victims. Patriarchy-informed gender-sensitive counseling is required. Men should be sensitized and encouraged to use nonhierarchical and nonviolent approaches in cross-gender conflictual relationships.

Help-Seeking Behavior of Domestic Violence Victims and New Barriers

Globally, only 40% of women who experience violence seek help and that too are limited to family, friends, and informal setups.

Only less than 10% of the complainants sought help from police (UN Women, 2022a, b).

Eighty-six percent of Indian women who experienced violence did not seek help and 77% of victims did not even tell anyone. Out of the help seekers, only 7% approached appropriate authorities which means that reported cases constitute only tip of the iceberg, i.e., 0. 98% (NFHS-4 or Hindu 26/01/22).

Non-reportage is due to many reasons including fear of retaliation, lack of primary and secondary support to lodge a complaint, unfamiliarity with the systems, uncertain future looming large especially for women and children who are financially dependent on the husband who is the abuser, notions about losing family honor, trivializing and normalizing violence by victims themselves, fear of social disapproval through victim blaming, and lack of faith in the systems.

COVID restrictions accentuated the barriers to reporting due to blockage of all avenues of support systems – formal and informal – isolation from native family, and inability to make a phone call when the abuser is continuous services such as counseling, police, and courts. Many of the services were shut down during lockdown in some countries. The gender divide in the possession of mobile phones is 24%. This factor further prevents help-seeking behavior of victims during the mobility-restricted lockdown.

There is serious deficit in the already low level of health-seeking behavior. These services need to be declared as essential including the transportation facilities to access such facilities.

Management of the Domestic Violence During Lockdown

António Guterres advised the nations to integrate gender-based violence initiatives to the general COVID management plans. The strategy suggested was “fund, prevent, respond, and collect.” Funding women’s organizations and campaigns and data collection to improve gender-based budgeting were the strategies (Vaeza, 2020).

A Global Scan of the Management of Domestic Violence

Across the world, vulnerabilities compounded during lockdown. Many countries identified the problem of intimate partner violence and had taken concrete steps to overcome it. Local self-governments, NGOs, civil societies, professional bodies, and individual activists by themselves or in collaboration worked to handle the problem. Many governments have taken these entities on board. UN Women, 2021 Report shows that many countries have undertaken prevention and response to gender – based violence and bolstered up their violence response services. One hundred fifty countries had bolstered up their violence response services (UN Women, 2021).

During lockdown, New Zealand listed gender-based violence (GBV) services as essential services. South African government fortified the reporting channels (Oxfam, 2021). In Occupied Palestine Territory, the feminist organizations stretched the services to 24/7 mode. The mental health needs of the counselors themselves were attended to. In Malawi, supported by Oxfam, during lockdown, trained volunteers reached out to the community to intervene in domestic violence cases and to rescue girls from early marriage. In some cases, services had to be shifted to digital mode. (But this resulted in the nonutilization by many in the vulnerable sections such as the unemployed, poor, differently abled, SC/ST, and LGBTQIA++ and also by others who did not have Internet access.) (Oxfam, 2021).

Many countries managed to introduce measures to counter the adverse conditions. In the Philippines, the pandemic worsened the present vulnerabilities arising out of the armed conflicts and climate change issues. Prior to the pandemic, about 17% of girls were married before the age of 18. Even amidst the devastating environment in September 2021, a bill was passed, banning child marriages. It is notable that in Bolivia, in response to the mounting domestic violence, youth from a few cities congregated to discuss the cause for GBV and to analyze the skewed power equations and unjust gender division of labor within households. In Myanmar, there was militarization and the preexisting power structures had scant representation of marginalized ethnic groups and LGBTQIA++. This unrepresentative structure failed the citizens. So, informed citizenry constituted separate networks for mutual support (Oxfam, 2021).

In Spain, campaigns were conducted with the message that gender-based violence was not a private affair but a human rights violation affecting the whole society. The focus of these countries was on spousal violence against women. An easy-to-read

pamphlet was released to guide women to access the variety of services offered, including legal, psychological support, and shelter services. Funds were earmarked and allocated to local authorities and even autonomous communities and cities. Spain undertook massive awareness at institutional level. The entire civil society was taken on board to evolve pertinent policies and practices. The linkages were already strong between civil societies and institutions. WhatsApp call support system was installed with automatic signaling of victim's geolocation to the police. All the services pertaining to GBV was declared essential. Money was allotted for specific services. The President tweeted giving assurance to the victims of GBV. Licenses were issued to hotels for accommodating victims and their children. The government was responsive to the demands of the feminist movements (Oxfam, 2021). Twenty-four-hour helpline was instituted (Brink, 2021). The Pharmacist Association volunteered to notify the police when somebody approached them for assistance. Spain had the advantage of some preexisting conditions: legislation against GBV right from 2004, presence of women in decision-making bodies, and shelters for GBV victims. As an immediate response, campaigns were held. The Minister of Equality extensively used social media to spread anti-violence messages. Television channels too were used. Excellently coordinated participative policy formulation was present. Cutting-edge-level functionaries who had direct contact with victims were trained. Telematic systems to monitor the implementation of the restraining orders were instituted. Due to these factors, there was overwhelming reportage of violence during the 3-month lockdown period. Spain introduced a code word (red mask) which can be used by women who went to the pharmacies to seek help.

On the other hand, Italy stopped distributing pamphlets to pharmacies to inform citizens and did not even create a protocol to report the violence. There was neither multisectoral approach nor institutional-level communication. The existing anti-violence centers were not consulted when response was planned. Dialogues started within the institutions and did not go beyond. Pharmacies were told just to distribute the pamphlets, and even in the distribution of the pamphlets, the already existing services were not planned into the loop. The number of new cases reported dropped from 2018 figures (Donato, 2020). But in Italy, victims could easily reach out to pharmacies. In response to complaints made, violent husbands were issued injunction orders against entering the house (Brink, 2021).

Portugal launched campaigns. In Ireland proactively, the earlier complainants were reached out. In Switzerland, the strength of task force was increased. The Netherlands issued guidelines to health professionals to detect domestic violence cases. Code word system was introduced and victims could lodge complaints at pharmacies. In the UK, 750 million pounds were immediately allotted for handling domestic violence. The Abuse Bill was made stronger. The UK arranged housing for the domestic violence victims who were desperate for shelter (Brink, 2021).

In Pakistan, all the protective services came to a halt in lockdown and such services were declared nonessential. Courts did not function. Psychological counseling services through mobile phones were introduced. But due to the lack of

equipment, many needy women who probably belonged to lower economic strata could not make use of this much needed service (Ashraf et al., 2021).

At this juncture, it would be interesting to take a peek at the gender ranking of some of these countries and to consider their responses to domestic violence during lockdown: New Zealand (4), Ireland (9), Switzerland (10), Spain (14), South Africa (18), Portugal (22), the UK (23), Italy (63), and Pakistan (153) (World Economic Forum, 2021).

Participation of women, girls, and LGBTQIA++ is necessary if their needs and concerns such as domestic violence and invisible work are to be integrated into the policies and programs. But UNDP and UN Women discovered that out of the 137 countries and territories, in task forces, gender profile is skewed with men predominant in 84% of them. Gender parity was present only in 4% of the cases. Surprisingly, women were totally absent in such teams in 24 countries (Oxfam, 2021).

Globally, the percentage of funding for GBV stood at mere 0.0002% of the COVID response funds of \$26.7 trillion (Oxfam, 2021). Fund allocation is necessary. Services of entities outside can be utilized and funded.

Most of the good practices gleaned from all over the globe can be customized and applied across contexts. Banking directly on the organized power of citizens is a possible option worth exploring.

Management of Domestic Violence During Lockdown in India

The National Commission for Women (NCW), India, in their newsletter dated April 2020, acknowledged the fact of exacerbation of domestic violence during lockdown and acknowledged the issue as structural. The role overload of women and the need to share household work were emphasized. Vulnerable sections such as migrant laborers were given specific consideration.

NCW was ever available for women via emails and complaint portals. Complaints were received through messages – directly and through social media platforms. Women were bailed out from distressful situations. WhatsApp number was launched on April 10, 2020. Special team was appointed to handle cases on a fast-track basis. NCW released a short video advising women how to de-stress themselves.

NCW drafted a policy “Women and Children in Disasters: Need for a Policy” and submitted this to the Ministry of Women and Child Development. Telecounseling facilities are created for women utilizing the expertise of doctors and psychologists. Direct Benefit Transfer arrangements to distribute relief packages through aadhaar-linked bank accounts were introduced by government.

When COVID was raging, to decongest jails, prisoners were sent on a 45-day parole. But a few women prisoners stayed back or returned before the expiry of the bail period, since they were not welcomed back (Hindu Daily April 5, 2020). But in the case of men, they enjoyed the full term of the parole and stayed inside their houses with a sense of entitlement, even if they were wife batters, murderers, or child

abusers, and among them were criminals who conveniently utilized this opportunity to indulge in domestic violence including women who complained against them.

Lockdown was declared without any warning. Migrant male laborers and their spouses and female laborers were left in the lurch with sudden loss of employment. Most of them were without savings. They were ousted out of their shelters by the shelter owners. Lack of transportation to native states forced them to traverse long distances, often without food and water. Many mishaps occurred on the way including deaths in childbirth.

Having a policy to meet the needs of vulnerable sections is imitable. Also the system failed the migrant workers, and this reiterates the need to map out vulnerable sections and to reach out to them during lockdown situations. Decongestion of jails has to be done prudently.

Management of Domestic Violence During Lockdown in Kerala

Kerala declared its first lockdown on March 3, 2020, 7 days ahead of the national lockdown. This continued in phases and lasted for 65 days. There were lockdowns in March, July, and August 2021.

The Chief Minister famously declared that the perpetrator would have to go from “lockup to lockdown” if they indulge in domestic violence. He also exhorted the males to share household chores.

In Kerala, there are many preexisting structures already functioning satisfactorily to tackle domestic violence. The Government of India (GOI), Government of Kerala (GOK), local self-governments (the grassroots tier comprising 1000 panchayats and 15,962 wards), government departments such as police and Women and Child Department (WCD), Kudumbashree Mission managed by GOK, wide network of anganwadis managed by SJD, many NGOs, Kerala State Legal Services Authority, etc. are a few examples.

Shelter homes, 24/7 police helplines, district police cells, Mitra Emergency Call Service, free legal counseling, and Snehittha of Kudumbashree Mission (an extensive network of 294,436 neighborhood groups, federated at ward level and gram panchayat level) providing the whole basket of services for victims are already available. Anganwadis one in each ward is a hub where women frequent for services including preschool education; food for preschool children, senior citizens, pregnant, and lactating mothers; and iron tablets for pregnant women and teenage girls, and Bhoomika, the one-stop crisis center in each district government hospitals, provides chance for unobtrusive reporting. Many local bodies at panchayat level have jagratha samithis which are constituted for dealing with violence against women.

Online data compiled from the 14 women protection officers of the WCD (Women and Child Development Dept.) revealed that registered domestic violence cases decreased from 185 to 138 compared to 3 weeks before and after lockdown. This decline indicates the barriers to reporting due to COVID-related restrictions including lack of transportation services. Perpetrators were always around and women were unable to make calls. Messaging services were introduced. WhatsApp call facility was introduced in April 2020. The services were widely publicized.

Ninety calls were received within 19 days out of which 51.6% were DV complaints. Seventy-eight percent of complaints were fresh ones.

Around June 2021 consequent to a series of dowry deaths, Kathorthu services were started to provide online counseling on complaining procedure, legal aspects, and psychological well-being to a victim within 48 h of registering a complaint. GOK immediately started "Aparajitha" under the leadership of a senior lady IPS officer for online reporting.

During lockdown, alcohol addicts displayed withdrawal symptoms and took out their frustrations on their wives though violence. Lockdown facilitated some non-addicted alcoholics to come out of alcoholism. Inaccessibility to contraceptives resulted in unwanted pregnancies. Many medical facilities were converted to COVID wards, and hence reproductive health facilities of women were compromised. Gender advisor, GOK, took up the case of facilitating medical termination of pregnancy.

Transgenders faced the threat of being ousted out of their shelters and government provided four shelters for them.

Immediately after lockdown, Kodakara panchayat in Thrissur district initiated a few women-friendly activities such as starting community kitchens, providing food packets to senior citizens (majority being women) living alone, delivering library books at doors, distributing saplings in grow bags, and producing a short video film to inspire irresponsible men to resume work. Community kitchens were a big relief to women. Creative activities of various panchayats were shared through online meetings arranged by Kerala Institute of Local Administration (KILA), thus facilitating cross learnings. Consequent to the dissemination of a study on domestic violence which was shared by KILA, many panchayats started counseling centers. Snehitha (the one-stop crisis intervention center of Kudumbashree) in Ernakulam district instituted frustration box through which women could ventilate their frustrations through letters, poems, paintings, video clippings, etc. A wide spectrum of frustrations poured into the box from all over the state: domestic violence, withdrawal syndromes of alcoholics, safety of parents living alone, security of wife and children of men who work abroad, anxieties about loss of employment, future of business enterprises, nonavailability of caretakers, problems of children, etc. Literature shows that frustrations can be one trigger for domestic violence. So frustration box might have averted some incidence of domestic violence. Snehitha counselors proactively interacted with early registrants of domestic violence and prevented exacerbation of the same.

In many intervention cases, various agencies worked in tandem to effect redressal. For example, the case of a wife batterer which came to Snehitha was directed to a protection officer who in turn helped the victim to get a protection order from the magistrate. Many abusers were apprised of the legal consequences of violent behavior. The robust network of many entities ramified across the state came in handy while handling complaints which needed cross-district coordination.

Effective management of DV during COVID requires well-coordinated preexisting networked institutions, appreciation of various categories of vulnerable sections, generation

and dissemination of DV data and responsiveness to the findings, understanding the needs of DV victims, handling frustrations of citizens, and invoking creativity of citizens and to make them part of solutions to tackle problems.

Guidelines for Responsible Functionaries to Prevent and Manage Domestic Violence During Lockdowns

1. Declare all the victim protection services as essential.
2. The victim protection services should be provided round the clock.
3. Ramp up victim protection services (facilities, skills, funds, functions, functionaries, etc.) during lockdowns.
4. Declare transportation to such services as essential.
5. Devise diverse mechanisms for reporting – phone, WhatsApp calls and messages, web portals, complaint receiving centers, etc. Due to lockdowns, many services will be shifted to digital platforms.
6. Design systems based on the needs and circumstances of the victims, e.g., accessibility to mobile phones, skill, and freedom to use digital methods. Skill gaps of functionaries and beneficiaries should be closed through coaching and trainings.
7. Ensure that such services can be conveniently accessed by all the vulnerable sections.
8. Make the calls geolocation-enabled so that grievous complaints can be attended to without losing time.
9. Plan to make the calls for help anonymous, if the caller wants it so. Ensure confidentiality.
10. Depending on the local conditions, code words may be devised for women to communicate to the reporting centers.
11. Widely publicize comprehensive structures and systems of victim services (medical, legal, psychological, shelter, etc.) through multiple media – public announcements, pamphlets, radio, TV, newspapers, social media, etc. – and mode of access too.
12. Make proactive follow-ups in the case of already registered pre-lockdown period victims.
13. Decide and plan with the primary complaint collection centers on how to link up with the next node of service depending on the nature of the case.
14. Collect relevant disaggregated (vulnerable group specific) data and use it for planning, budgeting, implementing, and monitoring and evaluating victim protection services. Data-driven responsive policies can be framed for protecting victims with special emphasis on groups such as women and girls, LGBTQIA+, economically backward, unemployed, differently abled, internal migrants, SC, ST, religious minorities, seniors, climate refugees, development refugees, etc. Intersectional vulnerabilities should also be taken into account.
15. Institute and continuously update vulnerability maps so as to enable prompt and customized responses.
16. Evolve robust and practical protocols regarding processing of the complaint and follow-ups.

17. Evolve contingency plans for repurposing buildings as shelters. Also the government needs to be agile enough and adaptable enough to convert facilities such as convention halls, hotels, and even ships to shelters for domestic violence victims.
18. When general campaigns are made about precautions against the pandemic or any disasters, make preventive measures against domestic violence an integral part of such campaigns.
19. Give wide publicity to the legal consequences of perpetrating domestic violence.
20. The government leaders can announce warning against perpetration of violence and publicize this.
21. Maintain continuously all the essential services at a high degree of preparedness and streamline for staffing them adequately when an emergency arises.
22. Provide sufficient funds for all victim service activities. NGOs need to be funded sufficiently. Funding for this should be made a part of the plan for COVID-19 containment.
23. Once notified, make the services fail-free so that the victims will not lose confidence in the systems.
24. Ensure employing gender-sensitized persons or at least give them good briefing on these lines before deployment.
25. Functionaries in victim protection services including doctors, health workers, and helpers should be given mandatory training on gender sensitization and on detecting early signs of domestic violence.
26. When there is unmanageable surge in call centers, the health professionals, workers, and staff could be overwhelmed. Devise methods to de-stress them and to take measures to provide them psychosocial support. Ensure that health professionals get food and other basic amenities so that their energies are sustained.
27. Cutting-edge functionaries need to be trained for gender sensitivity. Besides them, all functionaries, including judiciary, police officials, and high-level bureaucrats, need to be sensitized on the realities of domestic violence.
28. Ensure seamless coordination across various relevant entities responding to DV. On an ongoing basis, maintain the networks strong and ever ready to pitch in, when needed.
29. Sexual violence being the least reported category of violence, counselors need to take special effort to find out if this exists.
30. When each plan or policy is evolved, the impact on women has to be considered. Decongesting the jails by releasing the perpetrators of domestic violence and child abusers is a case in point.
31. Keep participation and inclusion as key components.
32. Ensure uninterrupted availability of contraceptives.
33. In a pandemic situation, when all the medical facilities are customized for, say COVID management, do not neglect the reproductive health needs of women such as facilities for MTPs.
34. Since stress is a driver for domestic violence, models in line with frustration box can be tried out for reducing stress in general.

35. When supply chains are disrupted, the impact of alcohol supply to addicted persons has to be assessed. This can be used as an opportunity to give deaddiction treatment to at least to some of them.
 36. The mental health consequences of pandemic-like situations should be handled by deploying mental health workers and experts and broadcasting their talks and advices through multiple media targeting at both the victims and perpetrators. Temper control problems of the abusers have to be handled. Counseling and if required, treatment should be provided for domestic violence victims.
 37. Since toxic masculinity is one of the not so widely acknowledged drivers of domestic violence, we need to come up with gender-sensitive counseling where men are educated on healthy nonviolent stress management alternatives. Treatment should be provided to abusers who have personality disorder issues and mental health issues. Women should be rescued from dangerous relationships.
 38. The local bodies can take initiatives to make the citizens participate to address lockdown-generated problems. The potential of citizen groups, civil society organizations, and CBOs can be leveraged.
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Conclusion

Domestic violence is structural and systemic, and it exacerbates during any disaster and specifically so during lockdown situations necessitated by pandemics. Long-term solution is eliminating inequality (SDG 19) and addressing vulnerabilities. Preexisting robust well-branched out gender justice-oriented entities which work in well-coordinated manner are the lifeline to victims. Along with policies, grassroots-level creative interventions are crucial. Good governance is significant and so also is the cross learnings of solutions through digital media. Policies, programs, projects, and activities need to be inclusive and participative with all categories of vulnerable sections represented adequately. Multi-stakeholder, multi-sectoral, intersectional, and consultative processes are to become part of governance culture. Well-trained and gender-sensitive individuals are required at all levels who care to have a nuanced understanding of the lived experience of the vulnerable sections. The scourge of domestic violence came into sharp relief during lockdown. This can be used as an opportunity to build back a better violence-free future utilizing the collective wisdom distilled from these global experiences.

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Food Security in India During the Pandemic: Future Learning for Ensuring Zero Hunger

104

Rabindranath Bhattacharyya

Contents

Introduction	1575
Pandemic and Disaster	1576
The Food Supply Chain	1577
Government Initiatives	1578
Disasters and the Right to Food	1579
Critical Role of the Public Distribution System(PDS) in any Disaster	1580
Corruption and the Governance of Natural Disasters	1581
The Lessons for Ensuring Zero Hunger in Future	1582
Conclusion	1583
References	1584

Keywords

Food security · Right to food · Pandemic · Disaster · Public distribution system · Corruption

Introduction

Disasters are increasing globally; so is the food insecurity. “Globally, the frequency of natural disasters increased tenfold since 1960, increasing from 39 incidents in 1960 to 396 in 2019” (Institute for Economics & Peace, 2020, p. 5). Food and Agriculture Organization (FAO) has noted that “In recent decades, disasters averaged more than 360 distinct events per year (in the 2010s) and 440 per year (in the 2000s), compared to just over 100 in the 1980s and a moderate 90 per year in the 1970s” (FAO, 2021, p. 4). On the other hand, “An estimated 2 billion people currently face moderate or severe food insecurity. By 2050, this figure is expected to increase to 3.5 billion people” (Institute for Economics & Peace, 2020, p. 4).

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So food security is one of the major challenges in managing any disaster for today as well as for the future world. In the climate related disasters like floods, droughts, or forest fire, food security is inherently interlinked with climate change and other current global challenges of economy. But the devastating impact of the recent pandemic of COVID-19, leading to an unprecedented recession since the Second World War, has deteriorated the food security and nutrition status of millions of people including children (FAO et al., 2021, p. vi). The Report of FAO, IFAD, UNICEF, WFP, and WHO (2021) observed “Unfortunately, the pandemic continues to expose weaknesses in our food systems, which threaten the lives and livelihoods of people around the world, particularly the most vulnerable and those living in fragile contexts” (p. vi). In fact pandemic has broken food supply chains, devastated food markets and fields, compelled labor shortage and forced *mandi* (where vendors sell their farm products in a wholesale manner) closures. So the issue of linkage between pandemic and food security has become very complex and 720–811 million people in the world face hunger in 2020 (p. vi). Besides “In the developing world, in addition to the millions of chronically undernourished, another 5–10% are at risk of acute food insecurity in times of crisis” (Ashley, 2016, pp. 19–20). Developing countries that have experienced political instability, conflict, or “unprecedented Desert Locust outbreaks in Eastern Africa” (FAO et al., 2020, p. viii) in recent decades are more likely to have sustained significant setbacks in reducing hunger during pandemic or afterwards. This chapter asks some questions in this context: How can the sustainability of feeding Below the Poverty Line People be ensured in terms of availability and accessibility of food grains? What role does the civil society play in the governance of distributive justice, particularly in the context of ensuring food security for the vulnerable sections of the society? What else are required for making the Targeted Public Distribution System (TPDS) more effective in a post-pandemic situation, especially in the context of another disaster? The chapter will be based on secondary data collected from government reports and non-government publications, reports of international organizations, and relevant books and journals.

Pandemic and Disaster

Pandemic has been defined as “an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people” (Kelly, 2011, p. 540). In 2009, Moren, Folkers, and Fauci defined pandemic with certain features of any disease. These are: (i)wide geographic extension, (ii) disease movement via transmission, (iii) high attack rates and explosiveness, (iv) minimal population immunity, (v) novelty (new, or at least associated with novel variants of existing organisms), (vi) infectiousness, (vii) contagiousness, and (viii) severity (Moren et al., 2009). So a pandemic makes the public health systems to confront serious challenges, which cannot be solved by traditional health governance practices and need new legal codes, new standard operative procedures (SOP) in administration as well as a competent leadership in polity. But the pandemic spreads very fast, whereas the administrative and political arrangements do not develop in

that fast manner. So temporarily, and initially, pandemic leads to an administrative disaster, where nobody has any SOP to deal with the configuration of new social risks in the community sphere.

In India, with the onset of pandemic, it was found that the only act that was there to deal with epidemic diseases was the Epidemic Diseases Act, 1897, which was 123 years old. So, after 6 months since the date of lockdown, on 29 September 2020, the Epidemic Diseases (Amendment) Act, 2020 was publicized in the Gazette of India. But the term pandemic was neither mentioned in the Amendment Act nor was the term epidemic defined. More vital question, that remained unanswered, is that – is there any relation between epidemic or pandemic and disaster? The Disaster Management Act 2005 defines disaster in the Section 2d as “Disaster means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man-made causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area.” Later on, the National Disaster Management Authority (NDMA) in India put epidemic and pandemic under biological disaster defining it as “causative of process or phenomenon of organic origin or conveyed by biological vectors, including exposure to pathogenic micro-organisms, toxins and bioactive substances that may cause loss of life, injury, illness or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage” (NDMA website <https://ndma.gov.in/Man-made-Hazards/Biological>. Accessed 4 May 2022). With this interpretation, COVID-19 pandemic came under the Disaster Management Act 2005 in accordance with which lockdown was declared throughout India from 25 March 2020.

The Food Supply Chain

Lockdown for 9 weeks at a stretch was an unprecedented happening in India. Due to this lockdown, initially food supply chain got the shock and “Food arrivals in wholesale markets dropped by 62% in the three weeks following the lockdown” (Lowe et al., 2020, p. 2) although it recovered to 2019 level after 3 weeks. Lowe et al. also have found that wholesale prices initially rose by 8% (2020, p. 2). At the initial phase of lockdown, the movement of goods and services became severely restricted. Even after the declaration by the government of India that trade, agriculture and food related industries were to be exempted from lockdown, confusion and chaos regarding enforcement of rules regarding trade, agriculture and food in different states continued and that led to a major disruption of such activities. United States Department of Agriculture (Foreign Agricultural Service) reported in April 2020 that after the announcement of lockdown, the port of Mumbai did not effectively operate for a week, which led to a huge backlog of shipment. Then, with the start of clearing such backlog, it was observed that there is a shortage of the government of India personnel to conduct cargo inspection and other clearances on the one hand and the shortage of labor for unloading and distributing the cargo

consignment on the other (US Department of Agriculture, Section- Overview; p. 2). Same happened also in rural India, where the *mandis* remained shut off and on and the traders would not come up to buy the products. An International Food Policy Research Institute (IFPRI) survey (Narayanan, 2020) noted that, among around 370 farmers across nine Indian states, 29% were still holding on to the produce they had harvested; whereas 13% had dispensed with their produce at a cheap price and about 7% reported that they had to let the produce go waste. At the urban market the e-commerce companies were facing harassment in delivering food, groceries, or even medicines. At the initial period there was the lack of rules regarding Standard Operating Procedure. Thus police harassment of the e-commerce delivery agents was reported during the starting period of lockdown (Raman, 2020). But during the second wave of COVID-19, lockdowns were declared by different state governments with their own operating rules. During this phase of lockdown, manpower shortage, supply chain constraints, and a surge in demand hampered again the delivery service of e-commerce companies like Big Basket, Flipkart, and Amazon (Shinde, 2021). So it is observed that pandemic as a disaster acted like a tsunami and affected the food supply chain – from the farmers to the *mandis* to the merchants and finally to the customers. Thus, the physical, social, and economic access to sufficient, safe, and nutritious food for all people that meets their dietary needs and food preferences for an active and healthy life, which is considered as the basic pillars of food security was completely violated during pandemic.

Government Initiatives

The central government took many initiatives to overcome these food supply constraints. These initiatives were of three types: (i) cash deposit in the account of the economically marginalized people; (ii) Free feeding mission, and (iii) Strengthening the public distribution system. On 26 March 2020, the Finance Minister announced the Package of 1.70 lakh crore under the Pradhan Mantri Garib Kalyan Yojana (PMGKY) that included free food grains, insurance cover for each healthcare worker and directed cash transfers for affected people including farmers and daily wage laborers. It was also declared that under Pradhan Mantri Kisan Samman Nidhi initiative in which the farmers would receive 6000 Rupees per year which was in force since 1 February 2019, Rs. 2000 to each of 8.69 crore beneficiaries will be deposited (The Economic Times, 26 March 2020). An ex-gratia payment of Rs 1000 to 3 crore poor senior citizen, poor widows, and poor disabled was also declared under PMGKY. Also the Feed India Mission was launched by the Prime Minister on 30 June 2020 under which all poor people would get 5 kg wheat or rice and 1 kg of preferred pulses for free every month initially for 6 months which was extended for another 6 months. One of the reasons of free feeding mission was also “acute shortage of storage space for procurement of rice in ensuing Kharif crop” as was mentioned by the former secretary of the Union ministry of agriculture and farmers’ welfare Siraj Hussain (The Wire, 30 June 2020). The same report also mentioned two significant points: (i)the minister for Consumer Affairs, Food and Public

Distribution, Ram Vilas Paswan, himself pointed out in an interview to *The Wire* shortly before the mentioned report was published that there was no shortage of food grains as around 100 million tons of food grain was in buffer stock whereas the limit for buffer stock on July 1 is 41 million tonnes; (ii) despite this huge buffer stock, free feeding was not extended for the migrant workers although the minister was quoted as informing, “only 11% of the grain that was due to the 8 crore migrant workers has been provided to them.”

For strengthening the public distribution system, on 14 May 2020 the Finance Minister declared the rollout of “One Nation, One Ration Card” (ONORC) system in all states and Union Territories by March 2021. ONORC leads to digitization of the TPDS. But even in June 2021 it was found that in three states, viz., West Bengal, Chhattisgarh, and Assam, the scheme was not implemented. So, on 11 June 2021, the Supreme Court gave its observation that “One Nation, One Ration Card” scheme would have to be compulsorily implemented in all states (Mathur, 2022). As per rule, the beneficiaries of the PMGKY and the Atmanirbhar Bharat – for food distribution under the National Food Safety Act must have ration cards and must be registered for the scheme. The Court noted that despite the sanctioned 314 crore Rupees for development of the National Database for Unorganized Workers in the 2020 budget, “nothing has been done yet” (Mathur, 2022). Plenty of these unorganized workers migrate to other states for work, especially in the lean season. ONORC will allow all these migrant laborers to get rations even if they are away from their native place.

Disasters and the Right to Food

The first two areas where disaster had its impact is on food and drinking water. Disasters challenge the growth and harvesting of crops as well as its distribution to the targeted population. The Constitution of India has enlisted the “Duty of the State to raise the level of nutrition and the standard of living and to improve public health” (Art. 47) in one of the Directive Principles of State Policy. But that principle remained long unheeded until in the People’s Union for Civil Liberties v Union of India (popularly known as the Right to Food case) case in 2002, the Supreme Court upheld the right to food as a significant element of the Right to Life as provided under the purview of Art. 21 of the Indian Constitution. The Right to Food case is a complex one in which many “interim orders” have been issued by the Supreme Court. In all these interim orders, the Supreme Court (i) specified minimum allocations of food grains for the economically vulnerable population, (ii) identified certain government schemes like Antyodaya Anna Yojana and Mid Day Meal Scheme (MDMS) for distributing food grains, (iii) set out the process of distribution, viz., Targeted Public Distribution System by which those schemes would be implemented for the Below the Poverty Line people, (iv) upheld social audit to check the proper implementation of the schemes and (v) observed which government officials would be held responsible, if the schemes are not implemented (Jaishankar & Jean, 2005, Appendix 1: The Supreme Court Orders, pp. 41–67). As a follow up to all these orders, the National Food Security Act (NFS) was passed in 2013. This Act has

been executed in all states and union territories. But the NFSA does not provide any scope for giving priority under TPDS to any specific area or region. Thus, under the NFSA, whenever any natural calamity occurs in a specific area, additional allotment of food grain is made for that area for a period of 3 months (Ministry of Consumer Affairs, Food, & Public Distribution, 9 July 2022).

Despite all the Interim Orders of the Supreme Court and the NFSA 2013, in 2019 a PIL petition was filed by social activists Anun Dhawan, Ishann Singh, and Kunajan Singh seeking direction to the Centre for developing a national food grid through community kitchens in all states “for people falling outside the purview of the public distribution scheme” (India Today, 1 September 2019). On 16 November 2021, while hearing the petition, the Supreme Court directed the Centre to frame a policy and to “Come up with a comprehensive scheme, identify areas where there is an immediate need” within three weeks (The Hindu, 16 November 2021). The Supreme Court also observed that a “welfare state must ensure that nobody dies of hunger,” which was particularly relevant in the context of ongoing COVID- 19 pandemic (Hindustan Times, 17 November 2021).

Critical Role of the Public Distribution System(PDS) in any Disaster

2021 Global Nutrition Report: The state of global nutrition (Development Initiatives, 2021) mentions that “An estimated additional 155 million people are being pushed into extreme poverty globally, as a result of the pandemic” (p. 15) and “While the nutrition crisis pre-dates the pandemic, it is made only more urgent by the potential damage that the loss of resources can inflict on global food security and people’s health” (p. 10). For India the problem of food security is more of distribution than the availability of food grains. India has a solid stock of food grains, which is increasing in a more than proportionate way to the increase in population (Fig. 1). A cursory look into the Food grains Stock in Central Pool for the years 2016–2022 (Opening Balance) in the Stocks page of the Food Corporation of India (FCI) website (<https://fci.gov.in/stocks.php?view=46>. Accessed 12 May 2022) will show the huge buffer

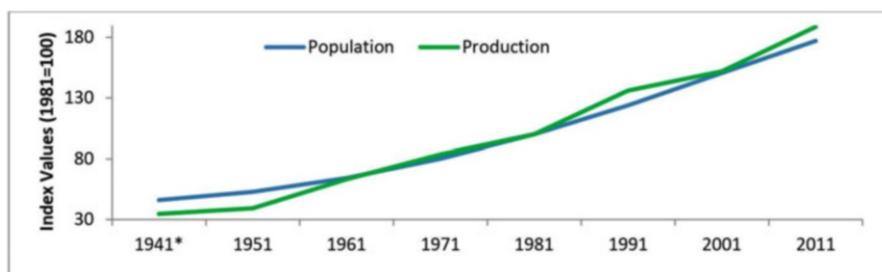


Fig. 1 Trends in Indian population and production indices 1980–81 = 100. (Source: Saini and Kozicka, 2014)

stock of food grains, much more than the quantity mentioned in the “Current Food Grains Stocking Norms” of the FCI since 2016. So, the first pillar of the food security, i.e., availability of food, is not at all a problem in the current situation in India. Still according to the India National Multidimensional Poverty Index Baseline Report (NITI Aayog, 2021, p. 33), the percentage of total population, who are poor and deprived in nutrition indicator is 19.90. So around 260 million people in India, if not more, do not get proper diet. During any disaster, the number goes up. Thus, we find in the initial phase of lockdown during pandemic around 80 million migrant laborers were denied food because of the sudden closure of the means of livelihood on the one hand and stopping of food supply chain on the other.

Taking lesson from the failure of providing free food through the PDS, despite the announcement of the Free Feed Mission by the Prime Minister, ONORC has been introduced. But to what extent that may make the PDS effective is a matter of conjecture. Leakage, exclusion, and outdated distribution system for static population were the basic problems with welfare delivery under the public distribution system in India. On 13 March 2022, Business Standard reported wide spread “leakages” in the PDS which was “about 47% of the total grain” (Business Standard, Noida, 13 March 2022). This leakage means the failure of PDS in providing food security to the most vulnerable people of the country. On 13 May 2020, The Wire reported that Jharkhand’s Garhwa district in Bhandariya block contains 40% SC and ST population among which “8611 families are categorised under the Particularly Vulnerable Tribal Groups (PVTG) who are one of the most marginalized social groups in the state.” The report mentioned that none of these families had a ration card (Kumar, 2020). Thus, the report showed that the hunger situation worsened during pandemic especially among the socio-economically weaker groups like Particularly Vulnerable Tribal Groups, Dalits, Adivasis, daily-wage workers, and nomads.

Reetika Khera and Anmol Somanchi in their study on “COVID-19 and Aadhaar: Why the Union Government’s Relief Package is an Exclusionary Endeavour” have noted that “In the PDS, Aadhaar is an important source of exclusion. It excludes people in three main ways: cancellation of cards (or names on ration cards) if people do not have an Aadhaar number, failure to link or if they fail to link it with their ration card, and failure of the Aadhaar-based biometric authentication (ABBA) at the time of purchasing grain” (EPW, 25 April 2020). During disasters, the exclusion due to these causes increases.

Corruption and the Governance of Natural Disasters

Neha Middela (2017), writing on the Corruption and Food Security in India, observed that “In order to analyze the linkage between corruption and loss of food security, the daily life of rural families, those most affected by a possible loss of food security, as well as the chain of circumstances behind corruption itself must be examined.” Middela observed that the cause of food security in India should be attributed more to the fact the food produced is not being used in a manner that is

transparent and which conforms to its intended purpose than to a singularly attributed factor – lack of available food. According to UNICEF ([n.d.](#)) website, 25 million children are born in India each year. Among them, according to National Family Health Survey (NFHS)-5 ([2019–2021](#)), per 1000 live births, 42 children die under 5 years. Also “The under-five mortality rate is higher in rural areas than in urban areas (46 deaths per 1,000 live births versus 32 deaths per 1,000 live births)” (NFHS-5, March 2022, p. 242). Neeta Lal ([2015](#)) pointed out on the basis of reports that “nearly 60% of the food that is channelled through the public distribution system is either wasted or siphoned off in transit.” Thus, the impressive list of programs in fighting hunger loses its relevance because of the failure in supply and distribution network.

During pandemic, this corruption increased due to the failure in supply and distribution network. The migrant crisis during lockdown showed the extent of hardship that the migrants had to bear just for getting a square meal a day. (For a detailed discussion on migrant laborers and food security during pandemic, please see Bhattacharyya, [2022](#).) Uzmi Athar (The Print, 10 April [2022](#)) reported that “Covid-19 and climate change push many older women into prostitution in Sundarbans,” who, due to the abject poverty that got worse by the pandemic continuing for 2 years, became vulnerable. On the request of Amicus Curiae referring the mentioned report in a plea seeking various benefits for sex workers across the country, the Supreme Court asked the Counsel representing the State of West Bengal to look into this issue and respond when the matter is put up for hearing on 17th May (Chowdhury, 12 May [2022](#), LiveLaw.in). Same type of incident was reported by Mousumi Singh (India Today, 8 July [2020](#)) where tribal minor girls were being sexually abused and exploited day after day by contractors and middlemen of illegal mines “in exchange for a few morsels of food and some money” at Chitrakoot in the Bundelkhand region of Uttar Pradesh. When asked, the mother of a girl narrated that they did not have work for 3 months and consequently they were running from pillar to post to get a square meal a day for the family. These few reported incidents show that despite the availability of food and despite the intention of the government to provide food grains as was expressed through the announcement of Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY) for free distribution of food grains the measures could not ensure zero hunger during pandemic.

The Lessons for Ensuring Zero Hunger in Future

One of the guiding principles (19 d) of Sendai Framework for Disaster Risk Reduction 2015–2030 says “Disaster risk reduction requires an all-of-society engagement and partnership. It also requires empowerment and inclusive, accessible and non-discriminatory participation, paying special attention to people disproportionately affected by disasters, especially the poorest.” Throughout the pandemic, the government policies for the schemes like PMGKAY were implemented through the government network only and the community engagement was never

recommended by the government for implementing social security policies, especially food security programs through the community organizations. In fact, whole food security benefit distribution program is very centralized. This is mainly because social security programs are upheld in the election campaigns as government's good intentions. There may also be an apprehension on the part of government regarding corruption or leakage, especially when government will not have total control over the community organizations. But there are credible and honest civil society organizations like Ramakrishna Mission or Bharat Sevashram Sangha, just to mention a few, who may provide an all-of-society engagement and partnership, if they can be involved with the distribution of food under security programs.

Second important point of course is empowerment and inclusive accommodation of the poorest who are always most affected by any disaster, let alone the pandemic. It should be born in mind that digitization of benefits, especially Aadhaar based Biometric Authentication (ABBA) itself needs considerable money, energy, and time for the poorest since they have to depend on *dalals* or middlemen going to cyber cafe for making biometric linkage. Government should provide adequate centers open day and night for making ABBA linkage free of cost. The lack of an adequate number of such centers will ultimately exclude disaster stricken poor people to get their entitlement.

Third point is bureaucratic bottlenecks, which were highlighted as one of the important causes for the inefficiency of PDS by the NITI Aayog in 2016. Disasters and their after effects make the marginalized more vulnerable than they were before. An accountable government should remove these bottlenecks in the PDS system, so that it becomes more effective and reaches the target group for whom it has been planned.

Finally an all-out effort should be taken to bring down the leakage in the TPDS system as minimum as possible.

Conclusion

India does not have a shortfall in the availability of food. Also, apparently the intention of the government in providing the poor people social security benefits, especially food security is established through a plethora of yojanas. Yet, the fact remains that with a score of 27.5, in Global Hunger Index 2021, India ranks 101 among 116 countries and as per the State of Food Security and Nutrition in the World 2020, the number of undernourished people during 2017–2019 was 189.2 million (p. 182). In such a situation, accessibility of nutritious diet, not just food, remains a big challenge even during a normal situation. A Pandemic, or for that matter any disaster, can make that challenge of reaching the marginalized vulnerable people for ensuring nutritious diet more daunting. A resolute fight can only resist that challenge. For that an effective and accountable administration may focus on the following steps:

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- (i) Community organizations should be engaged more in implementing government schemes, so that an inclusive, accessible, and non-discriminatory participation grows at the community level.
 - (ii) If the Aadhaar Based Biometric Access (ABBA) is not operative due to the onslaught of any disaster, government should have some mechanisms for the inclusion of all marginalized poor people in the food security programs or in the PDS.
 - (iii) Government should take special care centers, in initiating digitization of social security benefits, so that the *dalals* may be kept away from such digitization programs.
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Managing Teaching and Learning at Higher Education Institutions During the COVID-19 Pandemic

105

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Contents

Introduction	1588
Impact of the COVID-19 Pandemic on Higher Education	1589
Challenges to Online Teaching	1590
Effect of Online Teaching on the Workload of Lecturers	1590
Concerns About Online Teaching	1591
What Motivated Online Teaching	1592
Were They Happy Doing It?	1592
Use of Modern Technology in Online Teaching	1592
Did the Employer/Family Supported Them on Online Teaching?	1592
Was Online Teaching Successful?	1593
Advantages and Disadvantages of Online Teaching	1593
Strategies to Enhance the Quality of Online Teaching	1594
Conclusion	1594
References	1595

Abstract

Commonly defined, a pandemic is a global outbreak of a disease which can result in economic as well as social consequences. A disaster can adversely influence physical, human, and environmental aspects of a country. Thus, direct and indirect impact on the education system of a country as a consequence is unavoidable. Disaster management involves implementing a set of policies and procedures needed to support the population of a country in the event of a sudden disaster. In the recent COVID-19 pandemic, severe economic as well as social impacts have been observed. In this environment, this study was aimed at understanding the impact of the pandemic on teaching and learning at higher education institutions across the globe. With the intention of drawing an

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international sample to represent the higher education institutions in the Asian region, we selected 115 respondents from Sri Lanka, Thailand, Indonesia, India, and Bangladesh using a convenient sampling technique. A Google Form was developed to collect data, while qualitative tools were used for analyzing data. The study found that most of the academics were willing and able to manage teaching via online. Respondents mentioned that although their average workload increased, they were satisfied with reaching online as this allows to continue the teaching and learning process even during a world pandemic. Further, they commented that online classroom was the only solution that was available during the pandemic. Thus, it can be concluded that online teaching has contributed toward reducing the impact of the pandemic on higher education.

Keywords

Higher education · Pandemic · Online teaching · Academics

Introduction

The COVID-19 pandemic has affected every aspect of citizens' lives. It has changed the way of living of the population of the world. As defined by the Dictionary.com, an "epidemic" is a widespread occurrence of an infectious disease in a community at a particular time, while a "pandemic" is a disease prevalent over a whole country or the world. COVID-19 first started around December 2019 in China (Wuhan) and later started spreading to other countries in Europe and the USA. When it started in China, neighboring friendly countries like Sri Lanka offered volunteer medical services such as medicine, doctors, and nurses and face masks. Many countries shut their borders to protect their people. When the disease was confined to China, it was called an epidemic.

The World Health Organization (WHO) was very cautious in calling COVID-19 as a pandemic, because for an epidemic to be called as a pandemic, it has to be spread internationally in many countries and solutions to prevent/curb have to be found internationally. In a global pandemic, there are no sidelines, and the disease is everywhere; thus, there is no point in shutting borders; instead, health officials may recommend social distancing which can reduce the spread within a country. Thus, WHO did not declare COVID-19 as a pandemic until March 2020.

To avoid the spread of the virus, many countries closed borders, banned all gatherings, closed schools and other higher education institutions, and imposed curfew. Initially, no business was functioning, and people except for the ones employed in the health services and armed forces and the police were confined to their homes. Banks' function was restricted to few hours per day, and people were encouraged to utilize online services provided by the banks. Many small businesses engaging in the food and beverages and tourism were closed down, and many people lost their jobs. Migrated Asian laborers were to return to their home countries. Gradually, the business places started to function online, and facilities such as Zoom, Google Meet, or Google Classroom were introduced for people to work from home.

Impact of the COVID-19 Pandemic on Higher Education

Higher education institutions and schools were closed to prevent COVID-19 from spreading. The pandemic had confined people to their homes, and people listening to news broadcasted by media were overloaded with fear and worried as to what would be their plight if they get contracted with the disease. If someone gets contracted with the virus, they were taken to separate quarantine centers far away from their loved ones. Those who die from the virus will receive no funeral ceremony nor any religious blessing but will be buried/cremated by the government without the involvement of the relatives. The increasing COVID cases broadcasted by media daily were creating anxiety in the hearts of people. This atmosphere was not at all conducive for a successful teaching and learning experience. No one could expect the teachers to have a mindset for effective teaching nor students to have peace of mind necessary for successful learning. University education consists of not only lectures but workshops, practical sessions, events, projects, seminars, and many extracurricular activities to develop the required levels of knowledge, skills, and attitudes of students so that they will become employable. Thus, the problem faced by the authorities of the higher education institutions was how to provide the same service via a different platform. When considering conducting the courses using an online platform, many things such as the learning environment, mindset of the teacher and the student, facilities available for students and teachers, and minimum level of skills required were to be considered. Most of the higher education institutions (except for the institutions that have been offering online courses) embarked on online teaching on an experimental basis. They were very lenient on the teachers and on the students. Many students were suffering financially due to the lockdown. Some lost their close relatives due to the virus. Many have lost their internships and were even deprived of their daily meals. Most of the students needed counselling. In this background, universities couldn't expect students to purchase laptops/smartphones as preparation for online learning.

As online teaching was a novel experience to most teachers as well as students, there were a lot of discussions about it. During this time, many higher education institutions, both private and public, sought for online teaching as no one could give a proper estimate as to how long it would take for the pandemic to fade away. Most of the universities provided training for the teachers and students free of charge. This study focuses on understanding the effects of the adoption of online teaching on the teaching learning process of higher education institutions across the Asian region.

For this purpose, a Google Form was developed containing 25 questions. Convenience sampling was adopted in selecting respondents from both public and private universities from Bangladesh, Indonesia, Sri Lanka, and Thailand. The questionnaire was sent to the selected academics via email. Table 1 describes the country composition of the sample.

Sixty percent of the respondents were male, and the balance 40% respondents were female. Approximately 53% were in the category of "senior lecturer," 13.5% were professors, and the rest were lecturers and instructors. Approximately 49% of

Table 1 Country composition of the sample

Country	Participants
Bangladesh	05
Indonesia	07
Sri Lanka	59
Thailand	44
Total	115

Source: Authors' calculations

them were between 35 and 45 years of age, 20% below 35, and the rest above 45 years. Forty percent were teaching subjects related to information technology and computer science, and 20% belonged to the social sciences including subjects related to management, another 20% to mathematics, and the rest to languages, photography, and technology. However, 13% of the respondents have not engaged in online teaching; the reason for that was either it was summer vacations or they had completed teaching for the semester before the lockdown.

While analyzing the data collected from the questionnaire, the following information were extracted.

Challenges to Online Teaching

When asked what was the most challenging about changing into online mode, majority of the respondents said that making sure students were following the class from the beginning to the end was the most challenging task. Some others said converting the classroom-based lessons to online teaching was most challenging. Few respondents said that managing time was a challenge. Some others said that students did not have the necessary facilities to participate in the online class was a challenge. However, every respondent thought that getting used to teaching online was a challenge.

When asked about their students' responses on online teaching, almost all the respondents said that their students adapted to the system very fast (faster than the lecturer). Some said that students have learned to be interactive in class, carry out discussions in groups, submit answers to quizzes, and use additional material shared by the lecturer. The main problem with the students was the lack of facilities such as computer, smartphone, and internet connectivity. Some respondents said that final year students were very active during the sessions, while first year students were very unresponsive.

Effect of Online Teaching on the Workload of Lecturers

Commenting about the workload, a majority of respondents said that workload has increased, first because they needed more time to prepare and set cameras, whiteboard, etc. and second because they cover the material that was used for a 3-h class session earlier within half of the duration as there was no interaction with the

students, so they have to prepare additional materials such as videos, academic games, quizzes, etc. to be incorporated into the teaching session. Respondents said that preparation time was more for subjects with calculations (like Accounting as answers were to be prepared in Excel sheets). Teachers of subjects like management said that they hardly experienced a change in the workload. Another young respondent who falls in the age category below 35 said that their seniors assign a lot of work to them without giving any consideration to the fact that they needed a few days at the beginning to familiarize themselves with the new system. At the same time, the respondents said that it was alright to bear an additional burden in terms of workload as they were saving time on travelling to the university. One respondent said that online teaching gives him a different kind of a pressure that cannot be properly explained compared to classroom teaching.

Concerns About Online Teaching

Talking about what they were missing by shifting to online teaching, all the respondents except for a very few said that they miss eye contact, facial expressions of the students, the interactions in the class, student responses to questions asked, attending to weak students individually, and the inability to assess their teaching by making sure students understood the lesson. A few respondents said they were not missing anything by teaching online, and some said they even prefer continuing online even after the pandemic.

Their concerns on having to switch on to online teaching were diverse. Some said their concern was the internet connectivity, additional tools to be used, and quality of the sounds and the microphone. Specially the respondents who were living a little far from the towns have faced the problem of weak internet connectivity and low quality in sounds. Some others said their concern is the effectiveness of the teaching learning process, while some respondents said their concern was how to get the attention of the students; they said that they feel that some students were not following the lesson and they will be far behind the others who are keenly following. A few respondents said that they are concerned about the students not getting a chance to socialize with other students and trapped to computer at a desk in a room. Some respondents who were teaching photography mentioned that it was difficult to cover 100% from an online class. Those respondents who were teaching subjects that involve calculations (e.g., Accounting, Statistics) said teaching online, developing teaching material for online use, and explaining calculations were challenging. Some respondents said that having no office room at home and finding a place free of disturbances from others at home were challenges, and some others said that avoiding sudden power cuts and outside noises was a challenge. Few respondents whose subject was electronics said it was a challenge teaching online. Some respondents complained about the cost of data. All the respondents were concerned about the nature of the student evaluation system that is suitable and available on online basis.

What Motivated Online Teaching

Talking about what motivated them to switch on to online teaching, almost every respondent said that it was the rules and regulations imposed by their employers due to the spread of the COVID-19 pandemic. A minority said that it was the traffic that wasted considerable time going up and down to the university that motivated them to go online. Few others said that it was their enthusiasm to upskill their talents to keep abreast with the changing technology. Every respondent agreed that preventing students idling and wasting time due to the lockdown was also a strong motivator to go online.

Were They Happy Doing It?

When asked about how they feel about online teaching during the pandemic, all the respondents said that they were happy to reach their students even online and cover the syllabuses so that students would not waste their time. Almost every respondent said they were able to successfully adapt to the situation and provide a service successfully and that feeling makes them happy and contented that they did a good job. Some said that they could develop new skills and upgrade themselves to fit them into the newly created situation. Some respondents said as it was the best that was possible during the pandemic, while some others said they were feeling very tired spending many sleepless nights preparing for the sessions.

Use of Modern Technology in Online Teaching

When asked about new technology that was being used in online teaching, all the respondents mentioned that they used only the commonly used platforms for online teaching.

Did the Employer/Family Supported Them on Online Teaching?

Commenting on the support from the employer, a few said that they didn't get any support from the employer, but the majority said that they were provided with software licenses, training workshops, experience sharing sessions among lecturers, help desk facility, rooms with special facilities, supporting staff, released rules and regulations on lecture time schedules, and the place.

About 65% of the respondents said they received good support from their families, for example, some said family member let them spend time confined to their computers, some said family members did help their kids, some were released from house work, some said home people adjusted their schedules to fit the lecture schedules, and they also said it was a good chance for family members to understand

the nature of their job. The balance 35% said they receive no special support except for being quiet and maintaining silence during lectures.

Was Online Teaching Successful?

When evaluating the successfulness of online teaching, almost every respondent said that it is successful but less than 100%. However, they thought as online teaching helped reaching the students during the pandemic, and as a result they were prevented from idling, motivated towards learning and by doing that they could complete the syllabus therefore students enabling students graduating without a delay. However, most pointed out the teacher is not able to make sure that the student really participated in the lecture, due to many reasons such as availability of computer/smartphone and internet facilities and the ability of the student to grasp what is being taught. Due to these constraints, majority of our respondents didn't want to believe that online teaching was 100% successful. Those respondents who were into social sciences said it was convenient and effective, they felt that they were 100% successful, and they expressed their willingness to continue online even after the pandemic.

Advantages and Disadvantages of Online Teaching

Discussing about advantages of online teaching, respondents put forward many points. Being able to reach the students during the pandemic was mentioned by many respondents. The flexibility in time and place at which one does the lecture was the next most popular advantage mentioned by them. The third was the ability to record the online session; thus, the student can listen to it many times to understand the facts clearly. It was the best way to stay safely at home and protect their jobs was the fourth important advantage pointed out by the respondents. Fifth was that all students get the same opportunity to sit in front; some respondents said it is like all the students are sitting in the front row. Sixth was the facilities enabled by online teaching such as automatic attendance check and the duration of participation of student. The seventh in importance was the time saving of the teacher as they do not have to travel to university and instead that time can be used in preparing for the class. Eighth was the opportunity to use modern technology; the training received by the respondents as well as students was considered valuable. Especially the respondents who were language teachers mentioned that it was exciting because they could learn and develop new skills in them related to proper use of information and communications technology in teaching. The possibility of using online teaching successfully even after the pandemic was cited as the ninth advantage.

Among the disadvantages, the most cited disadvantage was the poor interaction between teacher and student, and there is no exact way of making sure that every student could understand the lesson. All students may not have the required devices

and internet connection to follow a lesson uninterrupted was the second important disadvantage pointed out by the respondents. Isolation of both teacher and student was also considered as disadvantageous.

Strategies to Enhance the Quality of Online Teaching

In addition to the advantages and disadvantages that were identified from the survey, respondents have given many suggestions that can be implemented (or they have already implemented) to improve the quality of online teaching during the pandemic.

- Universities/faculties/departments may conduct a survey assessing the accessibility of online lessons by students and then plan the best mode of time and delivery and make the recordings available so those students can have access offline too. (Some respondents said that their employers did it.)
- Handpick the students who are unable to afford a laptop/smartphone and try to provide those with the support of third parties.
- Conduct training sessions for teachers as well as students on online mode of teaching.
- Some respondents mentioned correspondence courses as an alternative (although slow).
- If students can be provided with laptops and internet, almost all the disadvantages will be cleared. (Introduce a loan scheme to purchase required material for online sessions.)
- Some respondents recommended sending hard copies of teaching material by post accepting the fact that they did it.
- Provide online student counselling to students who needed support.

Conclusion

Although respondents were complaining about many aspects of online teaching, all of them seemed to be satisfied with the fact that they could communicate with the students and impart knowledge amidst the pandemic which confined everyone's lives to their homes. Respondents commented positively on the opportunity to work even if it was online which helped protect their jobs and the monthly remuneration. If not for the decision to go online in teaching, many of them would have lost their jobs.

The pandemic has made a huge change in the teaching and learning process implemented by the higher education institutions. The strict timetables were to be relaxed. There are less rules and regulations on the time, place, and duration of lectures. There is no strict rule on compulsory attendance to classes by students. There are no hands-on experience in laboratory sessions, no projects, no activities, and no workshops, but the learning process was confined to what can be done via a

computer. The respondents believed that it will also influence the evaluation process at the end of the course.

Surprisingly, we did not observe any significant difference in the attitudes toward online teaching based on countries except for the fact that few of the respondents have been engaging in online teaching even before the pandemic. Regardless of the Asian country in which the respondent was employed, their problems, perceptions, and attitudes on online teaching seemed to be similar.

Majority of the respondents in the sample had received a training in online teaching before starting the online sessions. All the respondents mentioned that they were very enthusiastic about teaching online and although some have had problems in adapting to the new platform at the beginning, they were able to adjust themselves to the new system fast. Some highlighted the advantages like the ability to record and edit the lesson. Almost all the respondents said that they missed seeing students face to face.

All in all, everyone seemed to be very enthusiastic about the online teaching experience, and the positive point is that they are prepared even to continue online teaching under the normal conditions too. University authorities may use this as a strength in enhancing the quality of the teaching/learning process of their programs.

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The Role of Traditional Institution of Governance in Disaster Risk Reduction in Eastern Himalayas

106

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Contents

Introduction	1598
Formal Institutional Arrangement of Disaster Management in Darjeeling Hills	1598
Samaj	1601
Samaj and Its Role in Disaster Management	1602
Samaj and Covid-19 Pandemic	1604
Conclusion	1606
References	1607

Abstract

The Covid-19 pandemic is a grim reminder of the fact that human society lives on the brink of disasters. Every year, disasters of various forms, magnitudes, and types affect millions of people around the world. Disasters, whether man-made or natural, represent a major threat to human security and development. Given the enormous effect and consequences of disasters on human society, the international community has implemented a number of efforts, starting with the Yokohama Strategy for a Safer World (1994) and continuing with the current Sendai Framework (Sendai, 2015–30). An important component of these initiatives is to encourage and engage the local communities in disaster risk reduction measures. Drawing on the experiences from Darjeeling hills in India, the chapter identifies the lacunae manifest in the formal institutional arrangements for disaster management, and highlights the potential of informal institutions such as *Samaj* in addressing disaster risk reduction concerns.

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Keywords

Samaj · Darjeeling · Landslides · Community · Disaster Management

Introduction

The Covid-19 pandemic has affected almost every aspect of society, viz., health-care, transportation, education, and economy, among others. The enormous hardship experienced by the people in the wake of Covid-19 pandemic has only a few parallels, if any, in the history of human civilization. However, despite its enormity and impact, the Covid-19 pandemic is only the tip of the seemingly gigantic iceberg. Every year, millions of people around the world are affected by disasters of different kinds, types, and magnitudes. Besides causing massive economic loss, it is estimated that in a span of 20 years – between 2000 and 2019 – a close to a million people lost their lives to disasters caused by natural hazards (CRED, 2020). Whether man-made or natural, disasters pose serious challenges to human security and development goals. In order to counter the challenges emanating from disasters, the international community has committed itself to a series of initiatives. Among others, the Yokohama Strategy and Plan of Action for a Safer World (1994), the Hyogo Framework for Action (2005–2015) and the Sendai Framework for Disaster Risk Reduction (2015–2030) constitute important policy landmarks to build a safer and disaster-resilient society. An important component of these efforts is to encourage and engage local communities in disaster risk reduction measures. The Hyogo Framework, for instance, stresses on the need to reorganize the disaster management system by building a people-centric institution at the grassroots that is anchored around disaster risk reduction. The Sendai Framework, similarly, calls for strengthening of the disaster risk governance by empowering local communities and institutions, and entrusting them with decision-making responsibilities. Drawing on the experiences of disaster management in Darjeeling hills in India, including its recent encounter and response to the Covid-19 pandemic, this chapter identifies the lacunae manifest in the formal institutional arrangements, and highlights the potential of informal, community-based organizations such as *Samaj* in addressing disaster risk reduction concerns. In doing so, the chapter seeks to unravel how informal institutions – such as *Samaj* – that are embedded in the social system of a community can address the shortcomings of the formal institutions, and thereby help to build an effective disaster risk reduction regime.

Formal Institutional Arrangement of Disaster Management in Darjeeling Hills

The growing realization that disasters adversely affect human security and development goals has led to a systemic shift in our thinking and approach toward disaster management – there is, hence, a growing thrust on moving from reactive,

relief-based mechanisms to seemingly proactive and mitigation-based measures to prevent and lessen the impacts of disasters. The changed stance is also reflected in India's National Disaster Management Act which was passed in 2005 (Act, hereafter). Besides adopting a holistic perspective of disasters as "arising from natural or manmade causes" (GoI, 2009), the Act envisages the setting up of an institutional structure to deal with hazards and anthropogenic events. Accordingly, the Act established a three-tier disaster management system for the country. At the national level, the National Disaster Management Authority was created and mandated to lead and steer the overall disaster management system. However, given the geographical vastness and diversity of the country and the constraints on the national government – such as limited human resources, logistical challenges and time limitations – the state governments were encouraged to play a proactive role in addressing the concerns related to disasters and their management. Consequently, the Act empowered the state governments to establish State Disaster Management Authority that would coordinate disaster management activities for their respective states. Similarly, the District Disaster Management Authority was proposed to make plans and policies for the districts.

In consonance with the Act, the Government of West Bengal established a Department of Disaster Management and Civil Defense that, among others, seeks to strengthen the disaster management system of the state by delineating the roles and responsibilities of various governmental agencies and departments, and facilitating coordination among them. Darjeeling, the northernmost district of the state of West Bengal, constitutes an integral part and parcel of the Eastern Himalayas, and is acknowledged as a biodiversity hotspot. Famous for its teas and toy train, the place is, however, conspicuous by the high prevalence of disaster risk. A glance at the historical records reveals that the place has been plagued by frequent occurrences of landslides and earthquakes that, over the period of time, have severely undermined the development trajectory of the region. Administratively, the district is divided into four sub-divisions – namely, Darjeeling, Kurseong, Mirik, and Siliguri – and is governed through District Magistrate Office, Municipalities, and Sub-divisional and Block Development Offices. Before its conversion into a district in 2017, Kalimpong was a part of the Darjeeling district, constituting one of its sub-divisions. Of the four sub-divisions within Darjeeling district, Darjeeling, Kurseong, and Mirik are marked by rugged mountain terrains, while the Siliguri is composed of the plain areas. The three hill sub-divisions, along with Kalimpong district, are characterized by a distinct topography, climatic conditions, and population vis-à-vis the rest of the state. In terms of natural hazards, landslides and earthquakes, as noted above, are the most recurrent feature in Kalimpong and hill sub-divisions of Darjeeling that results in loss of lives and property, and greatly paralyses the social and economic system of the hill communities. The Ambootay landslide (1968) in Kurseong, regarded as the biggest landslide in Asia, for instance, disrupted the lives and livelihoods of the people for years, and compelled the disaster-affected families to resettle elsewhere (GoI, 2009). The "Aila" cyclone (2009) and the landslides in the monsoon of 2015, similarly, resulted in massive loss of lives and property, and displaced several families in different places of Darjeeling hills, including Kalimpong.

In order to address the threats and risks of landslides and earthquakes, the Darjeeling District Disaster Management Authority (hereafter, DDDMA) has been appointed as the nodal agency to plan, implement, and coordinate activities related to their management. The DDDMA is led by the District Magistrate who is assisted by other functionaries – such as Chairman of the municipalities and Disaster Management Officers at various levels of administration – in discharge of his responsibilities (GoWB, 2020). Given the vulnerability of Darjeeling hills to landslides and earthquakes along with the imperative need to safeguard the lives and livelihoods of the communities, the DDDMA has adopted a range of disaster risk reduction measures – among others, the building bye-laws, disaster management and development plans, and capacity building constitute important governmental interventions to strengthen the disaster management system (GoWB, 2020). The building bye-laws are important regulatory tools to ensure safe housing in the seismically-fragile landscape of Darjeeling hills that could prevent the risk of earthquakes and landslides, or reduce and lessen the magnitude of harm in case of their occurrence. The Disaster Management Plan, including Development Plan, seeks to encourage the culture of disaster preparedness by mainstreaming disaster management concerns into development practices. The overarching goal of Disaster Management Plan and Development Plan is to develop Darjeeling into a disaster-resilient region where various development projects are oriented toward reducing disaster risks of the communities. Besides, the DDDMA undertakes capacity building of the government personnel and local communities through such measures as training, mock drills, awareness generation and sensitization programs about landslides and earthquakes and their management.

A review of the above measures suggests that DDDMA apparently possesses the required framework to address disaster risk concerns – the building bye-laws, Disaster Management and Development Plans, and capacity building efforts, among others, can facilitate the process of building a robust risk reduction regime that will pave the way for a disaster-resilient society in Darjeeling hills. However, despite the presence of such enabling structures and institutions, the communities have remained susceptible to landslides, enduring greater damages and loss of lives and property in subsequent events of landslides. The land-use pattern, population growth, urbanization, and environmental planning, among others, negate the potentiality of existing mechanisms to reduce landslide risks and losses in Darjeeling hills.

A more serious lacuna that undermines governmental efforts to strengthen disaster risk reduction initiatives, however, emanates from its seemingly technical and managerial approach to disaster risk reduction. The governmental apparatus for disaster planning and management, as noted above, is imbued with a top-down, bureaucratic structure that provides very little in terms of engagement and participation of the local communities. The failure to engage the local communities in the disaster management system has had twofold effects. First, it prevents the sharing of information and indigenous knowledge that communities may possess about their built environment (which may be critical for understanding, preventing and responding to landslides). The exclusion of such vital inputs implies that the hazard

and vulnerability assessment, which remains at the heart of disaster risk reduction project, largely remains an incomplete and fruitless exercise.

Second, a lack of engagement with the community often results in ignoring and overlooking their needs and capacities. This is perhaps best illustrated by the fact that the West Bengal government sent life jackets and *dhoti* – a traditional garment worn largely by the people in plains – as relief provisions in the aftermath of landslides in 1968 (Pradhan, 2010). Furthermore, the absence of community from decision-making structures has crippled governmental interventions to evolve a disaster management system that caters to the needs of the people. The apparent failure of DDDMA to lessen landslide risks and disaster losses has encouraged the communities to look inwards and fall back on their traditional institutions of governance. In this regard, *Samaj* has assumed a central place, acting not only as one of the first responders in the events of landslides but more importantly in helping and assisting the communities in rebuilding their lives.

Samaj

Samaj is a traditional, self-organized, community-based organization that features local governance in Darjeeling. The *Samaj* operates at the grassroots level and functions with the participation of households. The member households can subscribe to the *Samaj* membership on payment of nominal fees. Although the subscription remains open to all, the individuals or households within a certain geographical boundary usually take the membership. The *Samaj* selects functionaries such as the president, vice president, general secretary and treasurer, from among its members, and are responsible for managing the affairs of the *Samaj*. Though these portfolios are conventionally held by the elder members of the community, there are recent instances of young members taking these positions. The *Samaj* holds regular meetings to discuss and deliberate over issues and concerns that are of common concern such as access to water, sanitation, and waste management, among others. While the participation in meetings is voluntary, the member households are encouraged to participate in deliberations. The *Samaj* also extends financial and logistic support to member families during weddings, funerals and other such ceremonies. Besides, *Samaj* also acts as a conflict resolution body in such cases as disputes between households or intra-family feuds, although it does not intervene in formal judicial matters concerning its members. The role, support and assistance rendered by *Samaj* create a strong sense of solidarity among the households who view *Samaj* as their support-base and a partner in their social life.

Given its role and overwhelming presence in the lives of the people, *Samaj* has become an integral part of the local governance structure in Darjeeling hills. The agencies engaged in social and welfare services, particularly Non-Governmental Organizations (NGOs, hereafter), often collaborate with *Samaj* in the administration of their programs, especially community-based, such as tree plantation, awareness generation, capacity building, and so on. As *Samaj* has better outreach and understanding of the locality, and the needs and constraints of its members, it possesses the

capacity to address the concerns and challenges of the community. Given such a position, *Samaj* has proven to be both cost- and time-effective institution of governance. While *Samaj* has emerged as a trusted conduit between people and agencies, particularly during rescue and relief interventions but also in disaster preparedness, it has become an important aspect of the disaster management system of Darjeeling hills.

Samaj and Its Role in Disaster Management

Samaj occupies an important place in disaster governance of Darjeeling hills, playing an active role in various phases of disaster management cycle. In the aftermath of landslides, *Samaj* is the first responder to help and assist disaster-affected families. As households are usually the members of one or the other *Samaj*, it becomes imperative for *Samaj* to render its assistance in times of crises such as landslides. Depending on the magnitude of disasters and the necessity of its action, the *Samaj* engage in various search and rescue interventions, along with government agencies such as National Disaster Response Force (NDRF). In fact, in the absence of external support, including the government, and in the urgency to save lives, *Samaj* becomes a forerunner in search and rescue efforts. The imperative role of the *Samaj* reflects in the spontaneity of its action in response to any disaster event – they are prompt in rescuing the victims and providing them with immediate relief provisions in form of food, shelter, and medicine. In the aftermath of rain-triggered landslides in 2009 and 2015, *Samaj* emerged as a lifesaver on several instances in Darjeeling, Mirik, and Kalimpong, rescuing people from the debris of shattered houses and mudslides, and assisting NDRF in the search and recovery of dead bodies later on (Indian Express [July 2, 2015] reported that around 38 people lost their lives dead, while 23 people went missing across Darjeeling hills, including Kalimpong, during 2015 landslides.).

As the immediate deployment of government rescue teams, including NDRF, is constrained by time limitations and their availability, the members of *Samaj* proactively participate in rescue missions, providing first-aid and arranging support for individuals with special needs such as old-age people and pregnant women. The information possessed and shared by *Samaj* regarding landslides-affected places plays a vital role in saving the lives of the people as the (rescue) logistics of the government are based on them. In cases where the *Samaj* lacks resources and capacity to effectively organize rescue interventions, their counterparts from nearby localities contribute and assist in their efforts. In the far-flung villages of Kalimpong such as Lingsaykha, Todey, and Tangta, the *Samaj*, during the 2015 landslides, also arranged shelter for disaster-affected families until alternative arrangements were made by the government. As several families lost their homes and savings, *Samaj*, in collaboration with other organizations, organized community kitchens to provide food and other necessities. The overarching role played by *Samaj* in the aftermath of landslides has turned it into a major relief provider, and an indispensable partner in rescue interventions.

Samaj's role, however, is not only limited to rescuing and providing relief provisions to disaster-affected families. There are several instances of *Samaj* assisting and rehabilitating their members. While housing reconstruction is funded from the government exchequer, there is an apparent delay in disbursement of funds owing to red-tapism and a cumbersome process of funding that is based on identification of the beneficiaries, scrutiny of their claims, inspection of housing sites, authentication, and so on. *Samaj*, in such cases, often intervene on behalf of their members to ensure the timely release of housing funds, thereby helping them to negotiate an apparently complex process of housing reconstruction. Besides, as the funds provided by the government are often insufficient for housing construction, *Samaj* also provide monetary assistance to those in need through voluntary contributions from other members. The *Samaj*, furthermore, assist the households during the housing construction process by offering their labor, logistics, and resources (for example, woods and stones). Such assistance provided by *Samaj* constitutes an important component of rehabilitation interventions that has become a benchmark for other organizations, including the government.

While *Samaj's* role during rescue and rehabilitation interventions becomes paramount, it plays an equally important role during other times, acting as a facilitator and supporting the disaster preparedness efforts of the government and NGOs. In this regard, *Samaj* acts as a bridge between the people and other agencies. The government agencies such as Civil Defense and NGOs working on disaster management collaborate with *Samaj* in conducting awareness and training programs. The *Samaj* helps in mobilizing and sensitizing the members about disaster risks and their role in addressing them. The members are also encouraged to participate in mock drills and training programs that promote and enhance disaster preparedness of the community. The *Samaj* coordinates with the DDDMA and encourages its members to volunteer for Civil Defense team that assists disaster-affected families in the aftermath of landslides and other disasters.

Apart from capacity building and disaster preparedness, *Samaj* assists NGOs in planning and executing various disaster risk reduction interventions that normally take the shape of Community Based Disaster Management (CBDM, hereafter) programs. As CBDM revolves around community, *Samaj*, as the representative of the community, plays a critical role in every phase of CBDM. First, as a repository of local information and knowledge, *Samaj* provides vital leads in Hazard, Risk and Vulnerability assessment (HRV, hereafter). The *Samaj* helps in identifying hazard-prone locations of a place along with the capacities and vulnerabilities of the households. Such assessments help the *Samaj* and NGOs to understand disaster risks and to plan and develop appropriate mitigation measures, including identifying shelter points and resources required during disasters. Second, the *Samaj* mobilizes its members to participate and contribute to CBDM. The members, through awareness programs, are sensitized about various disaster risks, and their role in mitigating and preventing them. The household members are encouraged to participate in meetings and deliberations that are aimed at improving the prospects and efficacies of CBDM. A visible outcome of such meetings is behavioral change among the participants who recognize the importance of disaster preparedness and disaster risk

reduction measures in mitigating landslides. Third, *Samaj* trains its members with such necessary skills as first-aid, search and rescue, and so on, and motivates them to join the disaster management team that would work during crises. Such measures help the *Samaj* to enhance the capacity of its members to respond, cope and deal with landslides when they occur. Fourth, *Samaj* provides critical inputs in the evaluation and assessments of CBDM. As *Samaj* possess insights and experience about the working of CBDM, it helps in divulging the challenges and lacunae of CBDM and the ways to improve it.

Samaj and Covid-19 Pandemic

The Covid-19 pandemic has proven to be a devastating phenomenon, having massive ramifications in India, including the Darjeeling Himalayan Region. Across the country, the epidemic prompted a wide range of reactions, the bulk of which were characterized by underlying anxiety, isolation, and discrimination against those who tested positive for the Corona virus. Individuals and families were, either directly or otherwise, cut off from the traditional social structure, leaving them to fend for themselves in the fear of contracting the Corona virus. In many cases, the affected families were seen to be left with a sense of abandonment under such circumstances. Following the outbreak, the call for vigilance and caution took on a new shape, resulting in several incidents of violence, discrimination, and stigmatization.

Darjeeling hills, however, witnessed a different stance toward the Covid-19 patients and those under precautionary quarantine. A unique approach to the handling of the crisis came afloat under the aegis of *Samaj*, who worked zealously to fill in the gaps in crisis management that arose due to the inability and inefficiency of the formal institutions of governance in functioning effectively at the grass-root levels, given the degree of crises that prevailed. The *Samaj*, under such circumstances, acted as an informal agency for vigilance and management of the Covid-19 pandemic. The *Samaj* across Darjeeling hills assumed responsibility of their respective areas and laid a foundation for preparedness, management and prevention of the pandemic. The role of the *Samaj* became indispensable in disseminating information, spreading awareness, sensitizing community and administering (Covid-19) protocols – such as physical distancing, use of face masks, hand washing or sanitizing, among others – at the local level.

The makeshift quarantine centers with provisions of separate toilets and bathrooms that were constructed by the *Samaj* for isolation and quarantine of the suspected cases of Covid-19 infection or those travelling from other places, stands to be a prominent feature of disaster response in the Darjeeling hills during the Covid-19 period. Those suspected of the viral infection were encouraged to undergo Covid-19 test by the members of the *Samaj*. Besides, the *Samaj* acted as a medium to sensitize people about the importance of observing the Covid-19 protocols and worked effectively to ensure their enforcement at the grassroots level.

During the escalation of Covid-19 crisis, when the households, particularly in the rural regions, were socially ostracized and left to fend for themselves, the villages

displayed a unique resolution and an exemplary case of crisis management under the leadership of *Samaj*. A prime example of such effort came forth from Kothidhura, a village located in the Phuguri region of Mirik – a basic model of operation that was adopted and followed by other Samaj across Darjeeling hills. Kothidhura had gone to raise concerns when 30 villagers tested positive for Corona virus. Contrary to the prevailing practice of isolating the Covid-19 infected people and subjecting them to a different behavior, the *Samaj*, stood by them and supported them all through their hardship of pandemic. Instead of panicking and abandoning the infected households and individuals, the *Samaj* encouraged the people come to together and respond sensibly.

After a series of meeting with the members, the *Samaj* decided that the Covid-19 infected individuals would be quarantined at their respective houses instead of sending them off to government quarantine centers which normally was the practice. In order to contain the spread of Corona virus, the *Samaj* urged its members to observe a strict lockdown throughout the village, thereby reducing physical interaction significantly. All the necessary items, including groceries, medicines and water, were provided at the doorsteps of the affected individuals by the members of the *Samaj*. The senior members, with the help of the youths, conducted sanitation drives through the village, while also monitoring the health and requirements of the infected people on a daily basis.

The *Samaj* collaborated with Health Department of the government to conduct testing and vaccination programs within the premises of the village, thereby controlling the interaction and movement of the people to nearby towns such as Mirik which had witnessed a sharp rise in Covid-19 cases. The *Samaj*, with the help of health department staff, also provided counselling about the treatment, sanitation, and hygiene requirements to the members and the affected individuals. In the absence of *Samaj*, it would have been difficult, if not impossible, for the government to organize such programs on account of lack of human resource and limited outreach in the grassroots. While being in isolation through the infection, the *Samaj* ensured that the Covid-19 infected households and individuals were supported in all respects for which a collective fund was started to provide necessary provisions, including medicines and grocery.

The *Samaj* sought to spread awareness about the Covid19 pandemic by encouraging symptomatic individuals to test for the Corona virus instead of concealing or suppressing the symptoms. Such an approach proved immensely effective in curbing the spread of the infections in the locality. Despite the fact that the government recommended stringent standards for Covid-19 proper behavior – with lockout and other “social” distancing measures in place – it would not have been possible to implement them uniformly, particularly in remote regions, due to a shortage of volunteers and staff. The *Samaj*’s grassroots presence and the villagers’ faith in it guaranteed that government rules and regulations on the Covid-19 pandemic were followed without fail, thus aiding in the containment of the Corona virus. Community competency is frequently cited as one of the most critical characteristics and aspects of disaster resilience. The *Samaj*’s prompt response and deployment of

resources not only prevented the Corona virus from spreading, but also assisted in the treatment of Covid-19 affected persons.

Conclusion

The *Samaj* works as a catalyst for disaster risk reduction in Darjeeling hills. Apart from its role in rescue and relief interventions, which constitutes one of its most notable contributions in the immediate aftermath of landslides, the *Samaj*, in partnership with government agencies and NGOs, is engaged in disaster preparedness and mitigation efforts through such measures as hazard and vulnerability assessment, sensitization, and awareness generation and capacity building, among others. In the aftermath of Covid-19 pandemic, *Samaj* emerged as an effective mechanism to address the crisis and played an important role in its containment. In the absence of governmental machinery, particularly in remote places where accessibility is difficult and challenging, *Samaj* led the crisis management, saving the lives of the people by extending medical care and support, and by invoking Covid-appropriate behavior. The *Samaj* also complimented the government's effort by supporting and volunteering during vaccination and awareness generation drives.

Despite the fact that they play such crucial roles in disaster management landscape of Darjeeling hills, *Samaj*'s potential, however, largely remains untapped. First, as *Samaj* is a self-organized and self-sustaining institution with majority of its members coming from economically poor backgrounds, the *Samaj* lacks necessary resources - finance, disaster-combating equipment and materials, and contingency plans - to engage in long-term disaster preparedness. In the absence of external support, *Samaj*'s capacity to engage in disaster management activities, including rescue and relief missions and disaster risk reduction, is severely constrained. Second, the formal governance structure around disaster management, laden with top-down framework, provides little scope to *Samaj*, if any, to effectively intervene in disaster risk reduction efforts. The *Samaj*, at best, plays supportive role in capacity building programs, with no voice or participation in the decision-making processes on disaster management. Such exclusion of *Samaj* not only undermines the growth of appropriate institutional structure for crisis management but also deny an able and efficient partner to the government and NGOs. Third, the growing trends of urbanization, modern lifestyle, and erosion of social values, among others, often challenge and undermine the existence and relevance of traditional institution of *Samaj*. There are numerous evidences of households withdrawing from *Samaj*'s membership because they do not consider it as an essential aspect of their social life anymore, with its role seen largely in terms of assistance during social ceremonies. Such attitudinal changes often discourage *Samaj* to participate in societal matters, including disaster management.

To revitalize the institution of *Samaj* and maximize its potential, it is critical to reconfigure the existing institutional arrangement – from top-down intervention to bottom-up initiative – by making *Samaj* an equal partner in the disaster management system of Darjeeling hills. In order to ensure and sustain its participation in the

decision-making bodies on landslides management, *Samaj*'s role must be formalized and clearly defined. As capacity building and disaster preparedness of the community depend upon *Samaj*, the government must explore ways to assist them through provisions of financial support, information- and knowledge-sharing, and organizing training programs. The government should also encourage *Samaj* to play a proactive role in disaster mitigation measures by motivating and supporting their disaster risk reduction activities. Such stances of the government could go a long way in realizing the dream of a disaster resilient society.

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Preserving Cultural Heritage and Psychosocial Support After the Great East Japan Earthquake: An Interdisciplinary Approach to Good Practice 107

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Contents

Introduction	1610
Key Terms: Psychosocial Support, Resilience, and Heritage Preservation	1611
“Big” Heritage, “Small” Heritage: Which Is Important?	1612
Salvaging “Small” Heritage and Psychosocial Support: The Case of Miyagi Prefecture	1612
Activating “Small” Heritage as Psychosocial Support	1613
Activating “Small” Heritage: Collaboration with Psychologists	1613
Activating “Small” Heritage: Building Wide-Ranging Social Capital	1616
Activating “Small” Heritage: A Town Confronts Diaspora and Negative Heritage	1617
Conclusion	1618
References	1619

Abstract

In articles 29 and 30(d) of the Sendai Framework for Disaster Risk Reduction 2015–2030, cultural resilience is listed, alongside of economic, social, and health resilience, as one of the factors necessary for disaster risk prevention and reduction (UN General Assembly). However, heritage workers generally lack a theoretical understanding of resilience, and there is a dearth of case studies providing objective evidence and examples of good practice in this field.

This chapter argues that an interdisciplinary approach to resilience enables heritage workers to reframe heritage in the larger framework of disaster risk prevention and promoting resilience. It provides an outline of three key terms which form the theoretical basis for this reframing and argues that undesignated heritage recording people’s daily lives (“small heritage”) can play a powerful role in building resilience. It next introduces three case studies from the Japanese triple disaster of 2011 to demonstrate how “small heritage” can promote resilience. The first two examples are cases of psychologists collaborating with

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historians to provide an appraisal of the psychosocial effects of salvaging “small heritage.” This project not only yields objective evidence that preserving “small heritage” can provide a powerful form of psychosocial support, but it also demonstrates that interdisciplinary collaboration can yield results beyond those possible by either historians or psychologists acting alone. The third case is an example of how the administration of a town affected by the nuclear reactor accident in Fukushima is using salvaging “small heritage” to help the town survive as a community in the face of total evacuation, dispersal of its residents, and discriminatory backlash.

Keywords

Preserving cultural heritage · Psychosocial support · Disaster psychology · Resilience · Social capital · Great East Japan Earthquake · Fukushima disaster

Introduction

Can it be demonstrated that preserving cultural heritage provides an effective form of psychosocial support for individuals and communities after a disaster?

In the “Sendai Framework for Disaster Risk Reduction 2015–2030,” cultural heritage was elevated from being a passive factor to be protected to the status of forming an important component of the complicated process of promoting disaster reduction and social resilience (UN General Assembly paragraphs 5, 29).

The booklet *First Aid to Cultural Heritage in Times of Crisis* published by the International Centre for the Study of the Preservation and Restoration of Cultural Property (Tandon, 2018) made an important contribution to implementing this new emphasis on the significance of cultural heritage. It lays out a systematic framework for salvaging cultural heritage at risk, incorporating the 2007 *IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings* and subsequent World Health Organization (WHO) *Psychological First Aid: A Guide for Field Workers* (WHO, 2011), which form an important part of the theoretical basis for the Sendai Framework. However, despite the prominence assigned to culture/heritage in the Sendai Framework, the reality is that there is an overwhelming lack of understanding among national and international disaster management planners on how cultural heritage can contribute to the realities of promoting resilience, saving lives, and ensuring effective recovery.

To bridge this gap in communication, cultural preservation specialists need to learn from and cooperate with other disciplines in order to explain and demonstrate the effectiveness of heritage preservation in providing psychosocial support for disaster survivors. This chapter introduces two data-informed theoretical frameworks which help explain why salvaging cultural heritage is important and draw attention to the potential of overlooked forms of heritage. It then provides three examples from after the triple disaster of 2011 in northeastern Japan as case studies of novel but effective approaches to applying these theoretical models in practice and

to highlight the need for an interdisciplinary approach to heritage preservation as psychosocial support.

Key Terms: Psychosocial Support, Resilience, and Heritage Preservation

In an emergency, for the majority of people, receiving timely humanitarian aid and regaining or building new social connections are in itself the most effective forms of psychological support. This recognition of the interconnectivity of psychological and social well-being is expressed in the term “psychosocial support.” Providing timely and appropriate aid to support people’s basic needs (food, water, shelter, safety) and paying attention to people’s social connections form the basis of improving people’s resilience and thus expediting the recovery process. Psychosocial support is directed at a wide range of people and is not something separate from other forms of aid. It is most effective when it is imbedded in the overall aid process or in people’s daily routines. If aid workers, including heritage workers, review their work and consciously incorporate the principles of psychosocial support, then any form of aid can actively contribute to promoting the overall well-being of disaster areas. Conversely, aid conducted in ignorance of these principles can cause psychological harm and impede or damage resilience (IASC, WHO, International Centre for the Study of the Preservation and Restoration of Cultural Property).

Resilience is not a trait, nor is it an innate ability. In psychology, resilience is defined in terms of interlocking systems. In this definition, people exhibit resilience when they succeed in adapting to disturbances in their environment which threaten their stability or well-being. Whether any person succeeds or otherwise in adapting depends on the various systems within which she/he is imbedded, including social networks, or the lack thereof (Masten, 2014).

Moving to the level of community resilience, social science also points to the primacy of social networks in the form of social capital. In his analysis of building disaster resilience, Aldrich defines social capital as “the resources available through bonding, bridging and linking social networks along with the norms and information transmitted through those connections” (Aldrich, 2012, p. 33). Bonding social capital is the kind of horizontal link between people who are similar to each other and are typically joined together as friends or by kinship (family) or geographical proximity (neighbors). Bridging social capital links horizontally different groups, sometimes crossing borders such as ethnicity, race, or religion, to bring in assets lacking in one’s own group. Linking social capital joins together vertically different groups working for a common goal across a social, economic, or political/administrative gradient between the groups (*ibid.*, pp. 31–33). Aldrich uses a robust analysis of data from four historical disasters to demonstrate that a balanced mix of these three kinds of networks (social capital) was the primary driving force behind the recovery in communities which achieved an effective recovery, while communities which lacked a well-balanced mix of social capital struggled to recover.

The process of salvaging and preserving heritage often activates existing or generates new social networks. Understanding the multilayered nature of these networks and social capital enables heritage workers to identify the underlying mechanisms embedded in the salvage process which can serve to promote people's resilience and therefore to explain how this process interlocks with the overall disaster response. When viewed in the light of the amount and variety of social capital that is generated not only by cultural heritage but also by the process of salvaging cultural heritage, it becomes possible to explain to people with no experience nor understanding of the power of heritage to promote resilience how and why preserving cultural heritage can promote the psychosocial well-being of people exposed to disasters.

"Big" Heritage, "Small" Heritage: Which Is Important?

One of the first questions that face heritage specialists faced with a disaster is how should they distinguish between "heritage" and "debris/garbage" (Izumita, 2020). There is no single correct answer to this question. However, experience shows that heritage designated as such by UNESCO or a governmental body is not the only kind of heritage worth preserving. Items held in private hands recording the history of a locality or community may be more relevant to the task of supporting local people's memory and sense of identity than the "big" heritage more commonly associated with "preservation." The experience of Miyagi Shiryo Network (MSN) conducting salvage operations for collections of private documents at risk after the Great East Japan Earthquake of 2011 shows that if one focuses not only on the role "small" heritage can play in providing effective psychosocial support but also on the nature of this process, this kind of activity can produce resilience-building results at multiple levels in a disaster-affected region.

Salvaging "Small" Heritage and Psychosocial Support: The Case of Miyagi Prefecture

MSN is a volunteer NPO located in Miyagi Prefecture, northeastern Japan. Miyagi Prefecture suffered the heaviest tsunami damage both economically and in terms of loss of life in the disaster of 2011. The core membership is comprised mostly of academic historians, but MSN depends on the participation of citizen volunteers, local government, and other public bodies in order to function. By December of 2013, MSN had conducted 105 salvage operations in tsunami and earthquake-damaged areas of Miyagi Prefecture. Most of these operations were for collections of privately owned heritage (documents). Some 88 collections were removed into primary holding for cleaning and restoration work, mostly after being exposed to prolonged submersion in polluted seawater. The contents of the collections varied widely, covering areas such as local administration, commercial dealings, private letters, diaries, and other numerous records of many facets of the workings of local

society and the lives of private individuals and families within society. The contents of each collection can span time from several centuries ago up until the present day. In general, MSN salvaged what the family members themselves had set aside; photographs and other records of recent memories can be as powerful form of support as ancient documents (Satō, 2020).

Activating “Small” Heritage as Psychosocial Support

However, in order to make local “small” heritage function as a source of individual and community identity and resilience, it is necessary to use the contents of salvaged collections to reconstruct the history of a locality/community. Where feasible, MSN gave feedback to communities through publishing booklets and holding public symposiums and lecture series and also workshops to teach citizens how to read and understand their documents (Takahashi, 2020). However, important as this kind of activity is in its own right, the potential of salvaging “small” heritage to promote resilience can be extended even further beyond its immediate parameters by collaboration with other disciplines or simply by paying attention to the social significance of the salvage process itself.

Activating “Small” Heritage: Collaboration with Psychologists

Members of MSN are collaborating in an ongoing project with a team of three clinical psychologists (PT) led by Kamiyama to appraise the historians’ work as a form of psychosocial support. The first step in this process was an appraisal of the effects/effectiveness of MSN’s salvage activities for owners of collections of heritage. A key aspect of this appraisal was that it also served as a nonintrusive form of psychological therapy for the owners, so that the appraisal process itself acted as a reinforcement of the psychosocial value of MSN’s activities. An outline of the appraisal process is as follows.

Method. PT conducted a series of semi-structured individual interviews with people owning collections of historical heritage salvaged by MSN. PT interviewed 21 subjects, 20 of whom were over 60 years old, and 3 were females. Twenty of the subjects were the heads of families with lineages dating back 100 to 500 years. Of the subjects, 11 had suffered total damage to their homes and 10 partial damage. MSN had contacted and conducted salvage operations for all the subjects who had suffered total damage of their houses within 1 year after the disaster, whereas MSN was able to reach only four of the subjects who had suffered only partial damage to their home within 1 year, and the remaining six had to wait for over a year before MSN was able to reach them.

Each subject was interviewed three times, generally spaced over a period of about 3 weeks. The interviews used personal attitude construct (PAC) analysis to analyze each subject’s attitudes toward their historical heritage and self-identity (PAC Analysis Society). The first interview was a familiarizing session where the PT explained

the purpose and outline of the study and asked whether the subject would agree to participating in the study. At this stage, three potential subjects declined for personal reasons, and the interviews proceeded no further. When the subject agreed to participate in the study, PT elicited free description of the subject's recollections of the MSN salvage experience. In the second interview, the PT presented the stimulus sentence "What words, ideas, images come to mind when you remember your experiences with MSN?" to elicit free word association from the subject. The subject wrote her/his choice of associated words each on a card. The PT entered the associated words into a random sorting program on a computer which was used to present the subject with a random pairing of all the possible combinations of the words chosen. PT asked each subject to scale the distance between each pair of words presented by the computer on a distance matrix of 7 points and to give each word a valency of positive, negative, or neutral. Before the third interview, the subject's assessment data for each associated word was entered into SPSS software using Ward's method to produce cluster groupings of the associated words as dendrograms. In the third interview, the subject was presented with the cluster dendrograms produced by the SPSS software and asked to assess the validity of the computer grouping and to revise and regroup the clusters as she/he thought appropriate. The subject was then asked to explain their rationale for their regrouping of the clusters and to give a name or title to each cluster grouping that they produced and what she/he feels on looking at the clusters and cluster groupings. To conclude the session, Kamiyama then gave the subject a supportive interpretation of the meaning of the subject's cluster groupings and answers.

Results. The responses given by the subjects can be subsumed into the following eight groupings: (i) positive impressions expressed in the associated words, (ii) feelings of gratitude to MSN, (iii) dissatisfaction with MSN, (iv) a recognition of their place in the family line/history, (v) pride in one's ancestors, (vi) passing on the family history to the next generation, (vii) a sense of devastation and loss, and (viii) disposing of garbage/cleanup. Subjects' answers in each of these groupings showed differing tendencies according to the degree of damage suffered. Overall, respondents (group 1) who suffered total damage to their houses showed a strong tendency to give positive replies, while respondents who suffered only partial damage to their homes (group 2) tended to give more negative answers compared to group 1. The results for each grouping are as follows:

- (i) Over half the respondents in both groups showed mostly positive attitudes in their choice of associated words, but the ratio was higher in group 1 than 2.
- (ii) Most respondents in group 1 expressed gratitude to MSN in their answers, but less than half the respondents in group 2 expressed gratitude.
- (iii) No members of group 1 expressed any dissatisfaction with MSN, but a small number from group 2 openly expressed dissatisfaction.
- (iv) A high proportion of group 1 expressed a positive recognition of their place in carrying on their family's line and history; over half of group 2 also expressed this wish, but the proportion was lower than in group 1.

- (v) This tendency became much clearer in the next word grouping of expressing pride in one's ancestors; over half of group 1 expressed a sense of pride in their ancestors, whereas the ratio was very low in group 2.
- (vi) Similarly, just over half of the respondents in group 1 had taken action to pass on information about and a sense of pride in their family line/history to their grandchildren and other family members, whereas this ratio was markedly low in group 2.
- (vii) The sense of devastation and loss was lower than half in each group but was considerably higher in group 2 when compared to group 1. This was in stark contrast to the reality that the group 1 members had suffered greater loss to property, family, and community than the members of group 2.
- (viii) No members of group 1 made any mention to their inherited documents and other heritage as being "garbage" or an imposition: a small number of members of group 2 made such references explicitly.

Subjects whose homes were totally damaged tended to show more positive attitudes and expressed more explicit thanks toward the work of historians than subjects whose houses were only partially damaged. This group showed a stronger sense of pride in their heritage and positive engagement with their immediate family to pass on awareness of and pride in their heritage and tended to actively engage in using their historical heritage to help revitalize their communities. This difference was directly reflected in the subjects' social behavior after the disaster: over half of group 1 became active in local history study groups and similar activities after the disaster, whereas this proportion was markedly low in group 2. Historians were quicker to react to calls for help from families whose houses were totally destroyed than those where the damage was lower, and this time difference may account for the observed differences in attitudes of subjects in the two groups.

Despite the differences between group 1 and 2, except for a small number of subjects exhibiting extreme stress, the answers given by the majority of subjects demonstrate that their experiences with MSN were positive. When viewed as individual cases, many of the subjects had taken steps to pass on the psychosocial benefits of MSN's support to their family and community, and to pass on their heritage and the meaning bound up in this to future generations. The PT assessment demonstrates that the salvage and follow-up operations of MSN achieved more than just preserving heritage objects; combined these operations served as a form of psychosocial support helping disaster-affected people recover their identity and mental and physical well-being.

This example of heritage workers collaborating with psychologists is significant in two ways. Firstly, the appraisal by the psychologists provides an objective, external measure of the effectiveness of preserving "small" heritage in helping disaster survivors recover a healthy mental attitude after a disaster. This kind of external appraisal based on strict methodology is crucial in explaining the significance of heritage preservation. Secondly, the PAC analysis methodology used by the PT was designed to also serve as an unintrusive form of psychological support for the participants while evaluating their psychological well-being. Two examples

illustrate this significance. One subject who gave markedly negative replies throughout the interview process resumed participating in a local history study group after the interview process. Prior to the disaster, this subject had been very active in participating in preserving local history and making recommendations to local government on heritage policy matters but had withdrawn from all these activities after the disaster. This sudden change in behavior suggests that the interview process motivated the subject to overcome his/her withdrawal and seek active participation in the community again. The second case is the exceptional case of one subject who originally was expressing a death wish. During the evaluation process, this subject came to recover the will to live and to rebuild links to his/her community. In this case, MSN's heritage salvage activities alone were not sufficient support to help this subject recover; however, the basis laid by MSN became a foundation for the subject's recovery through the PT's interview process. The results of this pilot study demonstrate that there is further potential for salvaging heritage to promote the overall well-being of disaster survivors by integrating heritage salvage with other forms of psychosocial support. Conversely, this particular example of collaboration between historians and clinical psychologists also demonstrates that applying appropriate methodology from clinical psychology in collaboration with other psychosocial support efforts can enable psychologists to provide effective support to people who can benefit from such support but would be overlooked by conventional clinical approaches (Kamiyama et al., 2021).

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Activating “Small” Heritage: Building Wide-Ranging Social Capital

Another important aspect of salvaging and preserving “small” cultural heritage is that MSN's activities generally involve or generate complicated social networks. Independent of the restorative effects of preserving cultural heritage, these networks add to a community's pool of social capital and thereby increase its capacity to adapt to challenges or adversity, in other words, to exhibit resilience. Moreover, this social capital extends beyond the areas directly affected by the tsunami.

The task of cleaning, restoring, digitally recording, and cataloguing the collections MSN has in temporary keeping before returning them to their owners in the disaster-affected areas is still continuing 10 years after the tsunami. MSN relies on citizen volunteers, many of whom are retired, elderly people, to carry on this task. These volunteers live in the disaster hinterland; while they themselves suffered little direct damage from the tsunami, because of their proximity, they feel a strong psychological connection to the disaster areas. In interviews, these volunteers describe how their volunteer work enables them to find an active role in the process of supporting the disaster-affected communities and that volunteering serves as a form of support for themselves. In advanced industrial societies like Japan which

have a high proportion of people aged over 65 years old, finding ways for active elderly people, and other people not physically suited to working in disaster-affected areas, to volunteer in tasks such as restoring salvaged cultural heritage can provide a continuing form of psychosocial support for people who feel alienated from mainstream society in a post-disaster situation (Satō, pp. 5–6).

The PT's next project was to have an investigation and appraisal of the psychosocial effects for volunteers involved in preserving cultural heritage, but this project has been interrupted by the current Covid-19 pandemic.

Activating “Small” Heritage: A Town Confronts Diaspora and Negative Heritage

A different example of good practice involves a town’s government adopting the practice of salvaging and disseminating the contents of “small heritage” in order to maintain a sense of community and identity in the face of extreme adversity. The township of Tomioka, Fukushima Prefecture, lies 15 kilometers from the nuclear power plants which exploded in the disaster of 2011. The whole town suffered total evacuation, and residents were scattered in temporary housing, mostly in other cities in Fukushima Prefecture. As a result of this helter-skelter exodus, communities and even families were sundered. Refugees from Tomioka were exposed to discrimination in their new surroundings, and many became ashamed of their origins and hid their identity. As a means of combatting this crisis both for the town as an entity and for its individual members, the town adopted a policy of salvaging “small” heritage into its overall disaster recovery plan. Before the disaster, townspeople believed that their town’s history was totally nondescript and had nothing worth mentioning. Using the salvaged material, the town aims to objectify the town’s history and change its focus from famous people and events to relocate the negative heritage of the decision to accept nuclear plants in the larger history of the region’s struggle for economic survival, as a way of healing the psychosocial wounds of the nuclear accident and subsequent diaspora. Momma (2020), a key person in the town’s decision to undertake this project, provides a richly detailed personal narrative of the inception of this project and how salvaging “small” heritage and utilizing it through exhibitions to enable townspeople to see the complexity of their region’s history can be used to face up to the powerfully negative legacy of the nuclear disaster and help the scattered townspeople regain their bonds to their hometown and each other. Tomioka not only provides a textbook case model of how a town administration is using the process of recovering its history as psychosocial support for its members in the face of severe adversity; it also provides a model for how a community can use the process of objectifying its heritage to overcome the social schisms produced by the town’s recent history.

Conclusion

Preserving cultural heritage can help promote disaster resilience, but learning from the activities of historians collaborating with psychologists and local governmental bodies after the triple disaster in Japan in 2011, it is clear that not only heritage officially designated as such by a public authority but also the undesignated “small heritage” of personal documents and photographs, the records and ledgers recording the vicissitudes of local economy and business, records kept by local institutions such as religious or social organizations, and items which are too often disposed of as “garbage” in the cleanup after a disaster can be used to provide a powerful form of personal and community support. In many cases, salvaging this “small heritage” in itself can serve as a form of psychosocial support for disaster survivors, by restoring their links to their past and, thereby, to their futures (Erikson, 1950, 1959). However, the impact of preserving heritage can be amplified beyond the primary parameters of preserving heritage itself if the following measures for good practice are observed:

1. The potential of undesignated, privately owned “small heritage” for building individual and community resilience can be increased when its meaning and contents are made accessible to the affected communities by historians and other specialists analyzing and publicizing the contents of this heritage.
2. Salvaging “small heritage” usually involves direct face-to-face interaction with its owners or custodians. Heritage workers should familiarize themselves with the principles of good practice in humanitarian aid (especially as outlined in the WHO booklet) and incorporate these into their planning and practice in order to ensure that the heritage salvage process itself does not inadvertently cause psychosocial harm and, more positively, to maximize its benefits as a form of psychosocial aid for all actors involved in the aid process and to ensure the heritage aid process interconnects with other humanitarian aid to contribute to the overall recovery and rehabilitation process.
3. Heritage workers should understand the principles of psychological resilience and social capital and apply these to their planning and practice. The process of preserving “small heritage” provides multiple opportunities for building social capital and promoting resilience. Being conscious of these opportunities enables heritage workers to maximize the subsidiary benefits and ripple effects of their interactions with heritage owners, communities, and other actors involved.
4. Heritage workers should seek ways of collaborating with other aid workers, for example, psychologists or social workers, in order to further and widen the results for all fields of aid involved.
5. Conversely, other actors in humanitarian aid should consider how collaborating with heritage preservation workers can provide mutually complementary avenues for providing appropriate support in unobtrusive forms as a way to augment the effectiveness of the overall psychosocial support effort.
6. Depending on the circumstances, incorporating salvaging and preserving a community’s “small heritage” can provide a powerful tool for healing social

divisions and problems resulting from disasters when incorporated into the disaster recovery plans of local and regional governmental bodies (Momma).

Preserving cultural heritage can help societies use traditional methods to adjust to disasters and emergencies, and reading old documents can help scholars glean information about past disasters to help them better predict the frequency and degree of possible future disasters. Nonetheless, no matter how important these aspects of heritage may be in contributing to disaster preparedness, the types of heritage that can yield this kind of result are only a very small part of the overall body of heritage contained in any society. The significance of the kind of psychosocial support that can be gained from heritage, especially the “small” heritage of ordinary people’s very ordinary lives, should be viewed in terms of the longer-term cycle of rebuilding and rehabilitating society after a disaster, where multiple levels and forms of psychosocial support need to be generated or mobilized to maintain the overall well-being of affected populations and therefore prevent the slow but remorseless attrition of disaster-related deaths caused by people being left to feel alienated from the recovery process.

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Community Participation Strategies in Nepal's Disaster Management

108

Soumendra Mohan Patnaik

Contents

Introduction	1622
Disaster Policy and Governance	1623
Disaster, Liminality, and Communitas	1624
Field and Methodology	1625
Spatial and Cultural Diversities	1626
Revisiting Community Participation	1628
Gender Concerns	1630
Challenges of Disaster Management	1632
Concluding Observations	1634
References	1635

Abstract

The Himalayan state of Nepal is at high risk of natural disasters caused by earthquakes, flash floods, landslides, and snow avalanches. People's vulnerability during disaster acquires alarming proportion due to chronic poverty, involuntary migration, unplanned settlement, and conflict situations. In the last two decades, attention of the state and INGOs has been drawn toward planning for disaster prevention and preparing local communities in developing capacities for its mitigation.

Based on an ethnographic study in three districts of Nepal – Rupandehi, Makwanpur, and Sarlahi – this chapter assesses the state policy and the programs that aim to strengthen community resilience to disaster through good practices in disaster risk reduction. It explores some of the operational challenges of adopting a top-down approach for understanding issues related to the notion of community, participation of indigenous people, resource sharing, gender concerns, and issues

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of communication. Issues of migration leading to de-territorialization and loss of indigenous knowledge are important challenges for disaster management. A community-centric approach to disaster management in the cultural and political context of Nepal points toward the necessity of revisiting the concept of community questioning its centrality in the disaster mitigation process. The intersectionality of gender, ethnicity, class, and territoriality holds the key to the success of disaster management practices.

Keywords

Disaster management · State policy · Community participation · Capacity building · Nepal

Introduction

Nepal's disaster management practices are governed by its constitution adopted in 2015 and the subsequent Disaster Risk Reduction and Management Act 2017. The constitutional spirit of disaster governance is that the local government should manage the disaster situation on its own. However, if needed, the provincial and federal governments shall provide the backup and lead the initiative. Thus, the role of the local bodies at the village and community level acquires significance in disaster management. The decentralization of development initiatives is a product of a long transition from a previous unitary system to a new federal one aiming at effective and accountable service delivery. Nepal, a landlocked and mountainous country, shares border with India and the People's Republic of China. The majority of the Nepalis are Hindus (81%) followed by the Buddhists (9%) and other indigenous communities speaking different languages having distinct race, ethnicity, and culture. The diversity poses a major challenge for the strategies visualized by a unitary policy at a national level.

The changing policies of the federal government in local self-governance have created new ways of administrative groupings without considering the cultural or territorial principles of everyday life that have contributed to the ambiguities of formation, maintenance, and continuities of community ties and solidarities. This has affected community participation in disaster management practices in the local context. It is argued here that the development discourses in Nepal revolves around the idea of community participation making it almost like a fetish to be engaged with. The chapter attempts to find out ways in which multiple solidarities and voices contained in a community living are important parameters for understanding the efficacy of disaster management strategies. Using the framework of liminality and communitas which surface during any disaster, the present study attempts to examine the manner in which communitarian relationships intercepted with ethnicity, kinship, and gender play an important role in disaster management and mitigation.

Disaster Policy and Governance

Nepal's new constitution adopted a federal system enshrining people's sovereign right and right to autonomy and self-rule. Article 56 spells out Nepal as the Federal Democratic Republic of Nepal consisting of three levels of governance, federation, state, and local level. Disaster risk reduction and management is included in Schedule 7, Schedule 8, and Schedule 9 of the constitution which provides the sole authority to the local government along with shared responsibility at the provincial and federal levels. The local government can formulate laws on matters pertaining to disaster mitigation and management. However, such laws should not be inconsistent with provincial or federal laws. Article 235 stipulates that efficient coordination is to be maintained by the federal parliament through legislation and administrative mechanism. Article 273 empowers the president to deploy Nepal Army on the recommendation of the federal government, and under 273(2), the provincial government can request the federal government to declare an emergency during a disaster. Article 51 (G-9) enables the provincial government to formulate and implement policies related to advance warning, preparedness, rescue relief, and rehabilitation, some of which are also there in the shared responsibility.

Thus, the constitution of Nepal contains provisions in which a disaster situation can be handled at different levels of authority depending on its magnitude and severity. Disasters have been classified into four categories from level zero to level three following the international protocol. While for the first two levels of disaster the local government is responsible for its management and mitigation, for the disasters of level two and level three category, the provincial and federal governments take the lead in managing it. Nepal's National Emergency Operation Center's Standard Operating Procedure 2015 classifies the disasters into four categories on the basis of the degree of severity in terms of economic damage, human injury, or loss of life. The "minor" ones have an impact on human injury or missing individuals with economic damage, but no loss of life. The "major" disaster occurs when the loss of life goes up to 10, and when it goes beyond that but remains less than 100, it is classified as a "severe" disaster. Disasters with a death toll of more than 100 are known as "catastrophic" ones. The Ministry of Home Affairs has also adopted this classification since 2015.

Subsequently, the Disaster Risk Reduction and Management/DRRM Act 2017 was formed stipulating various roles and responsibilities of different stakeholders for smooth and well-coordinated disaster management in the country. Nepal came up with a National Disaster Risk Reduction and Management Policy 2018 for an empirically grounded yet futuristic national vision to mitigate and manage the disaster. A long-term initiative, the Disaster Risk Reduction National Strategic Action Plan was formulated in 2018 to meet all targets by 2030. This developed a comprehensive planning framework for disaster risk reduction and management identifying priority areas of intervention and focus areas for government and other stakeholders. The National Disaster Response Framework was developed in 2019 for dealing with emergency situations.

The local government reserves the right to call for external support from any agency. The decentralization of planning and decision-making as entrusted to the local government is generally not coupled with their preparedness for a big disaster. The local governments' expertise in using nationally endorsed tools and methods for streamlining the disaster relief distribution process always remains questionable. Further, they have not been able to generate or have meaningful access to the robust database on the vulnerable population, vulnerability profiles, and disaster risk profiles so important for managing the disaster (Karna & Bhandari, 2019; Oyen, 2019; Sujakhu et al., 2019). The constitution of Nepal bestows the responsibility on the provincial and federal government for handling disasters of greater magnitude; no clear-cut guidelines are available on the sharing of roles and responsibilities among local, provincial, and federal governments in such a situation (Bhandari et al., 2020).

Disaster, Liminality, and Communitas

Research on disaster studies reveals that their field is theory light, characterized by a paucity of theory leading to a considerable focus on case studies and practical solutions (Matthewman & Uekusa, 2021). Thus, they have remained marginal in comparison to other areas of social science research leading to some kind of "institutionalized marginality" (Stallings, 2006). The United Nations treats disaster as an event that critically disturbs the functioning of a society. According to United Nations' International Strategy for Disaster Reduction (2009), disaster can cause human, material, and environmental damage making it difficult for societies to go back to normal conditions on their own. To explain this phenomenon of destruction and devastation, this chapter adopts the framework of liminality and communitas to examine the dynamics of community resilience in dealing with disaster risk reduction and management in three districts of Nepal.

The concept of liminality refers here to Turner's (1969, 1979) idea of a "stage in transition" where society is viewed not as a "thing" but rather as a dynamic and dialectic process. Liminality is a stage in the process of change, a threshold or limen that holds promises for a new stage or return to the previous one. According to Turner, the presence of opposite processes and notions in a single representation characterizes the unique unity of the liminal, which is neither this nor that yet both (1969:95). Such states or entities falling "betwixt and between" past and future categories are marked with suspended statuses and roles where individual actors behave in a self-contradictory manner. Disaster situations can be productively analyzed using the framework of liminality in the sense that the disaster has devastated the society affecting every aspect posing a threat to its continuity; it is on the threshold of losing everything, even facing the fear of extinction, but it still exists (Hoffman & Oliver-Smith, 2002). Such an existence is filled with despair and hope and can be best regarded as a "moment in and out of time" (Turner, 1969) and "matter out of place" (Douglas, 1966). The formulation of Turner and Douglas developed from the analysis of a ritual context. However, it has been successfully applied to examine the dilemmas of migrant refugees and displaced communities

encountering a great sense of loss of home, habitat, and health (Marris, 1974; Malkki, 1995; Gronseth, 2001; Gaur & Patnaik, 2011).

In Turner's formulation, liminality brings out a state called "communitas" referring to a relatively structureless society based on relations of equality and solidarity, though communitas as opposed to the normative social structure is structurally defined, limited, and temporary and therefore dialectically serves to reaffirm the existing social order (Haney, 2018; Kapferer, 2019). Derived from the Latin roots conveying the idea of unstructured communities based on shared experience, the concept of communitas is also being used in disaster research (Jencson, 2001). Communitas refers to a modality of social relationship which emerges during a liminal stage, while the community is always viewed as an area of common living. There is also an element of utopia to building a bright and fulfilling future through collective action. Communitas is also known as prosocial and innovative behavior (Knowles, 2011; Rodriguez et al., 2006), emergency togetherness (Drury et al., 2009), extraordinary community (Solnit, 2009), and post-disaster solidarity and brotherhood of pain (Oliver-Smith, 1999). Thus, the idea of communitas, in a disaster situation, can help us examine the sense of common suffering with a utopian impulse of imagining the outline of a brighter future based on the idea of equality (Turner 2012).

Field and Methodology

Fieldwork was conducted in eight locations, out of which four are village development councils (VDCs), two are parts of rural municipalities, and two are from urban municipalities out of which one is a small town. The field locations of (i) Devdaha, (ii) Makrahar, and (iii) Kerwani are located in Rupandehi district, (iv) Basamadi and (v) Handikhola are from Makwanpur district, and (vi) Sundarpur, (vii) Lakshmipur, and (viii) Phulparasi are situated in Sarlahi district. The locations are marked with distinct topography, geographical elevations, different climatic conditions, and population density.

In Rupandehi district Devdaha constitutes a rural municipality, believed to be the home of queen Mayadevi, mother of Gautama Buddha; it was also the ancient capital of the Koliya Kingdom. Because of its historical importance, heritage and cultural tourism have come up in the area providing an important source of livelihood to local people in the nonfarm sector. Makrahar is a town in Tilottama urban municipality, and Kerwani is a village development council in the district. Basamadi in Makwanpur district constitutes a part of an urban municipality of Hetauda sub-metropolitan city. Handikhola is a village in Manahari rural municipality. Sundarpur is a part of an urban municipality in the Sarlahi district of the Janakpur zone in the central development region. Lakshmipur and Phulparasi are village development councils in the Sarlahi district inhabited by different ethnic groups.

Besides the abovementioned sites, visits were made to two major towns and business centers and sub-metropolitan cities, Hetauda in Makwanpur district and Butwal in Rupandehi district. While Hetauda was awarded the title of "cleanest city"

in 2016, Butwal has earned the title of “green city” of Nepal in 2019. The presence of great scenic spots in the surrounding natural environment and several historical monuments has made these cities places of tourist attraction. Several industries in the fields of cement, chemicals, paints, and other manufacturing units have come up in Hetauda Industrial Estate. Interviews were taken with entrepreneurs and businessmen on the philanthropic role of the private sector during disaster situations.

In-depth ethnographic fieldwork was conducted in these three districts in different locations in 2007–2008 and a brief visit in 2014 followed by a few online interviews in 2020. The primary data collection through fieldwork was done through the participatory ethnographic method (PEM) where the ethnographic insights were validated through people’s participation in the interpretation of social and cultural data. Checklists for conducting interviews and focused group discussions (FGDs) with district officers, project staff, and different office bearers and members of village development councils (VDCs) were prepared before the commencement of the fieldwork. Semi-structured or unstructured interviews were conducted to collect data from the villagers and other members of the neighboring local communities.

The main focus of the fieldwork was to have firsthand information from the communities which was done primarily through focused group discussion. Sometimes data from individual respondents were collected using the semi-structured interview technique. Whenever required, depending on the feasibility, interviews were conducted with men and women separately. Efforts were also made to interact with the field mobilizers and field staff of different civil society organizations. A diverse category of stakeholders were contacted and interviewed to ensure that the data and associated information came from a variety of sources. This included the District Administration Office, secretary of village development council, and other line agency staff such as people from the District Education Office, District Soil Office, school teachers, and media personnel. Validity and reliability of data were ensured through triangulation and corroboration. Observation visits, using consistent criteria to assess disaster mitigation measures and service utilization, were made to various project sites.

Spatial and Cultural Diversities

The study was conducted in three districts of Nepal, Rupandehi in the west, Makwanpur in the south, and Sarlahi in the east, each having its distinct geographical and cultural features. Rupandehi comes under the Western Development Region of the country in Lumbini province. With mountains of the Chure range and Palpa on the north, Nawalparasi and Kapilvastu districts on the east and west, respectively, and Terai plains on the south, the district has a well-developed communication system in terms of two national highways, Mahendra and Siddhartha highway passing through the district which is emerging as an important center of trade, business, and banking. Most of its area is flat and formed by alluvial deposits with small portions of low-rising mountains and rocky cliffs intercepted by rivers of Tinau, Kothi, Rohini, and a few others. The climate is that of a lower tropical type

with the elevation ranging from 394 ft. to 490 ft. (120 m to 150 m) approximately. Some of the ethnic groups inhabiting the Rupandehi district are Tharu, Magar, Newari, and Gurung along with Nepalis and Madhesis who speak Bhojpuri and Awadhi. The economy is mainly agriculture followed by off-farm activities like service, cottage industry, petty business, and trade.

Makwanpur district is a part of Bagmati province in the Southern Development Region of Nepal. The topography is marked by the presence of several hills and mountainous ranges. Out of 12 prominent hills, the Chandragiri Hills is the highest one with an elevation up to 8369 ft. (2551 m). Mahabharat mountainous range is also extending through this district which is intercepted by several rivers including the famous Rapti and Bagmati Rivers. The climate is that of tropical and subtropical type. Makwanpur is the home to several indigenous ethnic groups such as the Tamang, Chepang, Newari, Magar, etc., in addition to the local Nepalis. Agricultural land and forest constitute the two important traditional sources of livelihood.

Sarlahi district is situated in Madhesh province in the Eastern Development Region. With river Bagmati on its west, Mahottari district on the east, and the Sivalik Hills on the north, the district of Sarlahi is connected to the plains of Bihar of India in the southern part. Much of its geographical area comes in the Terai plains with less of hills and rocky cliffs. Sarlahi is one of the small districts with a high population density. The climate is that of a lower tropical type with elevations around 334 ft. to 452 ft. (102 m to 138 m). Agriculture and horticulture are the main sources of livelihood. However, service sector, business and trade, banking, and armed forces are also important sources of employment and income generation. The tourism industry has come up in the district around some of the famous shrines such as Mukteshwar Nath, Sitalmai, and Pathankot temple which attract lots of domestic tourists. Bajiika or Tirthutiya, a version of western Maithili and Maithili speakers, constitutes more than 70% of the total population of the district. Among other ethnic groups, the Tamang, Tharu, and Magar inhabit the district in addition to Muslims and Nepalis.

The three districts exhibit different geographical and cultural characteristics. While Makwanpur district has mountainous and hill ranges, Sarlahi has more plain land or Terai land. While the former has more risk from landslides, cloud bursts, and sudden flash floods, the latter has the danger of floods and heavy rains including lightning and thunder. Rupandehi district on the other hand exhibits an environment that is a kind of mixed one of the above two types.

Nepal society is broadly divided into three major categories: (i) hill caste groups, (ii) the Adivasi or Janjati, and (iii) the Madhesi. The hill caste groups are also known as hill Aryans which include Chettri, Bahun, Thakuri, and Dashnami comprising 39.37% of the total population of Nepal. The Adivasi and Janjatis, which include Sherpa, Tamang, Magar, Gurung, Rai, Tharus, etc., constitute 30.81% of the total population of the country. While 22.28% inhabit hill and mountainous regions, 8.53% live in the plains of Terai. The Madhesi and Newars comprise 22.53 and 5.5% of Makwanpur, respectively. The district of Makwanpur has nearly 56% of Adivasi and Janjatis. The Tamang, Newari, Chepang, Magar, and Rai are found along with the caste communities. In Rupandehi district nearly 80% of the

population belongs to hill and Terai caste groups. Besides them, the Tharu, Magar, Newari, and Gurung comprising nearly 13% of the total population of the district are also found in the field locations. In the district of Sarlahi, nearly 8.8% belong to the Adivasi and Janjati categories who share the territory with different caste groups of Madhesi category.

Except for the Tharus and Newars, who speak both Indo-Aryan and Sino-Tibetan languages, all other Adivasi and Janjatis speak Sino-Tibetan language only. The hill caste groups and Madhesis are Indo-Aryan speakers. The hill caste groups enjoy higher status than the Madhesis inhabiting the Terai regions. The Adivasis and Janjatis lie outside the caste system, but the strong influence of the idea of purity and pollution and social hierarchy is noticed among them.

The Tharus are agriculturalists and live on the bank of the river near the forest. Most of them are landless and work as sharecroppers or *kamaiya*. Animal husbandry and fishing are alternative sources of livelihood. The Magar are Nepal's largest minority group, the majority of them being Buddhists; however, the practice of animism and influence of Hinduism are also observed. They are known as Gorkha soldiers in Royal and Indian Army. Among the Tamangs, nearly 90% are Buddhists. The Gurungs do not follow the caste rules but are regarded as a caste of considerable ritual purity by Bahun and Chettri. They are gifted craftsmen and follow either Hinduism or Buddhism or animism in different areas. The Newars or Newa, the original inhabitants of Nepal, practice agriculture and trade as their main occupations. Built on the later Vedic varna model, they are divided into various endogamous groups and provide ritual services to other castes. The Rais have been a warrior community who have provided stiff resistance to the invasion of Gorkhas in the past. One of the dominant sections of the Kirati group, they practice animist shamanism but are also influenced by Buddhism and Hinduism. Agriculture is their main occupation, and they cultivate wheat, maize, millet, and mustard on dry terraces. Animal husbandry and small trade are also what the Rai engages with. The Chepangs of the Mahabharat mountain range are the most marginal and excluded group. Shifting cultivation has been the traditional occupation of these forest dwellers leading a seminomadic life. As per the census of Nepal (2011), the Chepangs numbered 70,000, out of which 65% are Hindus, 25% are Christians, and 10% are animists. Because of their political subjugation, they are also called the Praja or the political subjects.

Revisiting Community Participation

The idea of community in Nepal is understood differently by planners on one hand and people on the other. VDC is the smallest functional unit for development initiatives. Each VDC is divided into many wards that send elected representatives to VDC. While the VDC and its wards constitute the administrative units of local governance where the government has decided to constitute the disaster management committees (DMCs), the people, in reality, live in small dispersed settlements locally called *tol* which is the space for everyday interaction providing the basis for

group cohesion and solidarity that play an important role in combating disaster and emergency situation (Wood et al., 2013). Members of a *tol* are united by bonds of direct cooperation and reciprocity, while the relationship among ward members cut across the ties of caste, ethnicity, and territoriality (Bolin, 2007). Each ward may have several *tols* separated from each other by the stretches of deep forest, mountainous streams, and even flash flood divides. In Makwanpur it was found out that, in the case of both the DMCs, the members do not come from all the nine wards. In Handikhola the Chepang or Vankariyas settlements are distributed in four wards, and not a single representative of this ethnic group is found in the said DMC. In Basamadi the Tamangs live in four different *tols* in the hilltops of the Mahabharat range, but the DMC comprises members belonging only to Bahun and Chettri caste. The Tamang settlements are scattered in the mountains, and the dominant Bahun and Chettri believe that the soil erosion and the landslides are primarily due to the indiscriminate cutting of trees by the Tamang for shifting cultivation. Integration of the indigenous communities with the disaster management strategies initiated by the local administration through VDCs and DMCs remains a challenge.

During a disaster, it was the local communities or the *tols* which became the operative units for executing the immediate disaster rescue, relief, and rehabilitation and not the ones officially conceived at the level of DMC or VDCs. Ahupathi, one of the young men of Laxmipur VDC in Sarlahi, recalls "when the flash floods devasted the houses in two *tols* in 2010, the government assistance came much late, the neighbours were the first ones to rescue my family, nobody from the other wards came to help us." The members of the *tols* are readily available during emergency for instant intervention ensuring safety. At this level, the communitas surface in which people identify with the suffering other as if it is happening to them or their immediate family. The idea of *tol* incorporates the idea of a family writ large where the residents share the same space, aspirations, and sufferings. The members are united by the bonds of cooperation and reciprocity on an everyday basis, a phenomenon so important in handling emergency situations during natural disasters. A conceptualization of the community based on the principle of territoriality and sharing of resources and space in everyday interaction would enable us to look into the gaps which may not be perceptible if the whole VDC is taken as the unit for instilling and facilitating disaster preparedness leading to mitigation. Taking VDCs as the basis for the formation of DMCs reflects a top-down approach to classifying the local communities in a decontextualized manner without any regard to cultural sensibilities.

Further, the composition of DMC is less inclusive in terms of caste, ethnicity, gender, and territoriality. Ethnic groups like Tamang, Chepang, Vankariya, and Tharu remain marginalized in terms of management and decision-making at the level of DMCs. The dominant Bahun and Chettris of the region feel that due to extreme economic poverty members of these communities are not interested in activities pertaining to disaster preparedness training which requires long gestation. With great difficulty, the president of Basamadi DMC could convince an acculturated nonresident Chepang to be a member of DMC because of the insistence of an international donor agency funding a disaster mitigation initiative. In Siddhakali, one

of the Chepang *tol*s, the local administration, constituted a *Basti Bachao* subcommittee or save the village drive to facilitate mitigation work through gabion boxes made up of barbed wire to protect the soil erosion landslide on the river bank. Ironically the chairperson of this subcommittee working for the indigenous group is none other than a Bahun belonging to the locally dominant group.

In Twangra *tol* of Handikhola VDC, a massive landslide destroyed seven Chepang houses rendering these families homeless in 2015. The *tol* was inhabited mainly by Bahun and Chettris who did not display the needed sensitivity to the Chepang's precarious and vulnerable condition. The Chepangs also did not seek any external assistance as they considered that their plea may not be heard by the higher caste decision-makers. It was only among the affected seven families that the bonds of cooperation and reciprocal help were observed.

In Rupandehi, the Tharus have land, but instead of cultivating their own land which requires initial capital investment, they prefer to work as agricultural laborers in fields owned by higher castes. Tharu women also work in stone quarries as wage labor. They stay far off and generally remain cutoff from the other caste communities. In the Sunawali *tol*, it was recently observed that most of the Tharus are selling their agricultural and homestead land to local immigrants, mainly from Bahun and Chettri castes, and migrating out to the interior areas on the Indo-Nepal border. Many of the families have crossed the international border and settled down in Indian territory. In case of natural disasters and other emergency situations, they depend on themselves rather than on neighboring caste communities who may be living in the neighborhood.

Gender Concerns

It was observed that many of the training programs for disaster risk reduction conducted by the local government connected more to young boys than girls. These training programs were conducted in the schools involving both the categories of stakeholders, the students, and the local youth. Bipna, a young Chettri girl of Sundarpur VDC, says: "the young women of the village who had never gone to school were given the training for first aid and disaster rescue operations along with students of 10th standard. Like many others I could not follow few points, but was shy of asking to the trainer." Most women felt that separate training programs for them would have been more effective. The young women of the *tol* could hardly attend these training programs as the timings were not suitable for them to take time off from the everyday routine of the household chores and they cannot afford to be absent from the household at that point of time (Bradley et al., 2021; Gaillard et al., 2017).

The headmaster of Mahendra Jyoti School in Handikhola VDC, with more than 32 years of service in the area, is of the opinion that "we have to walk few extra miles to bring the girls from the marginalized communities so that they get interested in disaster mitigation training." He went out of his way to identify Chepang children not going to school and convinced them to come for the classes. In his entire service

career, he has never witnessed the enthusiasm that the Chepangs have demonstrated. Recently one of the Chepang girls has completed 10th standard and is now in 11th standard. She has received first aid training organized for local women in 2018 and subsequently received training under the Community-Based Disaster Risk Reduction (CBDRR) program initiated by the government of Nepal together with major development partners including INGOs. She is definitely a role model inspiring other village girls who have started thinking that they can also do it if they receive the right kind of training.

Needless to mention that, in the given cultural context, disaster preparedness and mitigation rely on the prevailing social structure that carries deep-rooted seeds of patriarchy. Men and women have different vulnerabilities in facing disaster as they have differential access to resources, social networks, information, and skills including literacy (Bradshaw, 2015). Men deal with public spaces and use cell phones; therefore they are well connected to information flow in comparison to women counterparts. With virtually no access to decision-making or control over family assets, women have restricted personal mobility and autonomy. Thus, the ability to cope with the crisis and recover from it depends on men and women's everyday life and unequal power relationship. Women-specific needs and concerns are perceptibly missing from the disaster management strategies. Saree, the common traditional attire for Nepali women, slows down the movement causing greater vulnerability during emergency. The local women of Sarlahi remember that, when the trainers from Bangladesh came to teach them the skills of rescue operations, they have demonstrated with a women's traditional trousers and shirt (*salwar kameez*) or with a sports tracksuit. During the flood in 2021, the local women in Rupandehi who had received training were shy to wear the sports outfit in front of patrilineal kins, and when they tried to rescue other women, when they were in sarees, it was not very effective. Male in-laws hesitate to touch a drowning woman in Sarlahi due to avoidance relationship.

Further, women's reproductive and sexual health is at more risk during a disaster. In most cases, the shelter homes do not contain the provision for separate spaces for pregnant women and lactating mothers. The challenges of menstruating women during the monthly cycle have not been addressed in terms of infrastructural requirements in the shelter homes. In the post-disaster situation, women continue to do routine domestic chores such as cooking, serving, cleaning, washing, and minding children which further reduces freedom and mobility. It was also observed that during the flash floods that occurred in 2012 severely damaging the settlements in Handikhola VDC, the relief from the local government did not reach instantly. Reenu, a 38-year-old widow from the village, recalls that when the government aid reached her village, it was first given to those who were known to the president of DMC or had political connections outside. She along with her young daughter and infant son had to wait for 5 more days to receive the aid after the whole village had received it. Baijanthi, a 32-year-old women separated from her husband, living with her 4-year-old daughter also had to wait for a nearly a week before she received any aid from the local government. In fact, gender-based violence increases in post-disaster scenarios in multiple ways. One of the strategies thought of by the local

government is to include gender budgeting in disaster planning and management, but it remains only a thought-out strategy for disaster risk reduction for women. It existed only on paper and has yet to gain momentum in practice.

Challenges of Disaster Management

At the local level, disaster management strategies face many challenges, ranging from the issue of integrating the indigenous communities, youth, and women to the local competition for sharing the resources that the federal and state governments provide to the local administration (Matthewman, 2015). The manner in which disaster management committees (DMCs) are formed is not free from the challenges of exclusion and marginalization. The DMCs are key structures playing an important role in emergency and everyday situations. Ideally, they are to be formed at the level of VDC with a president and secretary and nine members from the wards so that the training, capacity building, and dissemination of strategic learnings can be effectively distributed among all residents. It was also observed that if a member quits the post, there are no clear-cut guidelines available for filling such vacancies. In Rupandehi district, the Kerwani DMC co-opted a new member in place of the vacancy created due to the moving out of a member to a nearby town, Butwal in search of a better livelihood. The Makrahar DMC of the same district preferred to keep one post of member vacant after the sitting member migrated to Qatar in the middle east for better job opportunities.

The role of the VDC secretary is to coordinate the plans, programs, and strategies agreed upon at the level of DMC with other bodies of local government in the district. However, it was observed that the involvement of the VDC secretary, who is ideally the ex officio member of DMC, has been minimal. Different DMCs have involved the VDC secretary in a different manner. While in Makwanpur and Sarlahi districts the DMC has the VDC secretary as an ex officio member, the DMCs in Rupandehi do not have a VDC secretary as their member. Instead, the DMCs in Rupandehi have an advisory committee where the VDC secretary is a member. This has led to a weakening of the linkages of DMC with other government bodies creating bottlenecks in mainstreaming the theme of disaster management with other government agencies and programs. In this context, the role of VDC secretary assumes significance as he is the only contact between the local government and the community.

Under the disaster mitigation initiative of the local government, shelter homes and community halls were constructed in every VDC. Instead of choosing the construction site close to areas that are more vulnerable to disasters like flash floods, such structures were built in the *tol* belonging to the leader. These structures are important resources for community members who use them for hosting marriage ceremonies, community feasts, and even at times political meetings. However, managing such shelters and sharing the revenue accruing from them have become challenging for the community members. In Sarlahi district one of the community shelters was being used by a school teacher who was taking private tuition for school

children. The other side of the *verandah* was being used by a tailor who has kept the sewing machine. The DMC president was charging some rent from them, but the norms pertaining to its access and utilization are still emerging. Such processes await streamlining so that they can lead to institutionalization. Since the members of the *tol* where the community halls are located take the responsibility for everyday cleaning and maintenance of the structure, some of the DMCs do not charge anything from the *tol* members. Thus, the membership of the *tol* or *samudaya* where the community shelter is located carries greater privilege. However, there has been competition among various subgroups and village factions for having control over such attractive and visible structures.

Mobilizing the youth and connecting them to the DMC initiatives have been a challenging task. Many youth clubs existed in these districts much before the formation of the DMCs. In Devdaha VDC of Rupandehi, the Moon Light youth club was already taking local initiatives to face the disaster situation. The local youth organize themselves cutting across the lines of caste and gender with participation from both boys and girls in considerably equal numbers. In Phulparasi VDC of Sarlahi, the youth organized a *shram daan* campaign urging the people to contribute voluntary labor for the construction of a community shelter. In some cases, high fee structure and method of payment have excluded the poor and marginalized youth to participate. The Adarsh youth club of Devdaha VDC which started functioning after the formation of DMCs has kept the fees very high. A monthly fee of Rs 50 has to be paid for a period of 6 months in advance along with one-time processing fee of Rs 200. Youth from poor and marginalized groups found it difficult to participate in group activities.

In Twangra *tol* of Handikhola VDC, the youth club existed many years before the disaster preparedness initiatives were taken up by the DMCs. The youth club has been organizing sports events for boys and girls. After the initiatives are taken up by the local government, the youth club was renamed as youth group and got actively involved in building the community shelter and participating in training for disaster preparedness to such an extent that they could not pay much attention to game and sports. Ojita, a young girl, would fondly recall how they used to meet every Saturday to play different games. Many of the local youth felt that disaster preparedness programs were too tightly packed, almost in a continuous manner, one coming up immediately after another virtually giving them no time to breathe and play. The multiplicity of training and preparedness programs in a routinized manner often leads to too much pressure on the local community.

On the other hand, the office-bearers of Basamadi DMC find it difficult to mobilize youth in their activities. The president of DMC says that the youth of the area are migrating out in search of jobs leading to a decline in the youth population in the village. Even the youth club of Basamadi finds it difficult to have membership in spite of a very nominal fee of Rs 10 per month. Indradu, a 26-year-old upcoming entrepreneur from Basamadi, has recently started a shop in the village. He is of the opinion that, during the massive landslide and flash flood in 2018, most of the reconstruction work was done by contractors from outside with their own supply chain and workers from outside the region. Thus, management strategies adopted by

the local government did not give priority to local aspirations. Members of the affected and neighboring communities were neither engaged nor consulted.

Concluding Observations

As reflected in the foregoing pages of this chapter, the decentralized planning and decision-making as entrusted with local government are not coupled with their preparedness for a disaster of greater magnitude, where the provincial and federal government pitch in. However, no clear-cut guidelines are available for sharing of role and responsibilities among these three either in the constitution or in the policy. The narratives and verbatim of local people clearly point toward the inefficacy of government aid and reconstruction initiatives. The fellow citizens residing in the same *tol* are the first responders who do the heavy lifting when the disaster strikes (Tierney, 2003). People realize that official assistance is never adequate and seldom reaches the right people at the right time. This not only gives the civil society a boost and creates a situation where *communitas* surfaces. It is argued here that disasters do not remain restricted to the natural environment because devastation, damage, and threats are public and widely experienced. In this sense, disasters are also social phenomena. A sense of suffering together connects the survivors leading to an emergent shared social identity. Mutual aid from within the “society of equals” is the important resource available (Haney, 2018, P106; Wood et al., 2013, P145). In *communitas* social relations are horizontal bonds, where empathetic and altruistic acts are more pronounced. It differs from social capital in the sense that it is short-lived, context specific, experientially based, inclusive, and transformational (Aldrich, 2012; Aldrich & Meyer, 2015). The local narratives corroborate that, when the initiatives of federal agencies become ineffective in reaching out the people at the right time, the *communitas* provide the relief effectively.

These findings point toward two important observations. Firstly, the command-and-control model of disaster recovery is extremely questionable. On the other hand, the presence of *communitas* has a significant impact on community’s recovery process following disaster. Secondly, in an ordinary situation, planners and policy-makers focus on “physical lifeline infrastructure,” i.e., hard technological system that sustains life like electricity, communication, energy, transportation, and water supply, rather than the “social infrastructure,” the ultimate driver of resilience (Klinenberg, 2018). The realization that by building social infrastructure we build resilience and create an effective strategy for disaster recovery especially in small communities may help the planners and administrators responsible for disaster mitigation.

Finally, this chapter has demonstrated how *communitas*, though appear temporarily (Casagrande et al., 2015), can be instrumental in making disaster-hit lives better. As reflected from the field, this is based on the idea of expanded sense of self and community. According to Turner, liminality is “optimal setting *communitas*” in which individuals are stripped of attributes of structure, i.e., the identities and status that mediate their relations in ordinary situations, and therefore they are in a position

to comfort one another directly and equally in a situation of antistucture (1979). His conceptualization of human existence through liminality, communitas, and structure-antistucture dynamics had challenged the static and structured nature of social reality which is affected by the phenomenon of disaster.

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Exploring the Social Effects of Disasters: Causes, Consequences, and Mitigation 109

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Contents

Introduction	1638
Mitigation of Adverse Social Effects of Disasters: A Chronological Perspective	1639
Learning from the Past Disasters to Prepare for the Future	1640
Disasters and Settlement Planning	1641
Conclusion	1644
References	1644

Abstract

Disasters, both natural and human induced, have received greater attention in recent decades from scientists, policy makers, and the wider public, partly due to their increasing frequency and intensity and the growing human toll across the world and partly due to the urgent need to take diverse measures to reduce disaster risks emanating from different sources. With increasing disaster risks, social effects of disasters are also more than likely to intensify, leading to the disruption of long-established patterns of social, economic, and cultural life of people resulting from displacement, relocation, and resettlement. In this regard, the disruption of social networks, livelihoods, and social infrastructure can be critical factors. In this chapter, an attempt is made to discuss what measures are necessary to reduce and mitigate the adverse social effects of disasters resulting in the displacement of people. It is widely recognized today that disaster mitigation is a wide-ranging process that unfolds much before the onset of a major disaster and continues far beyond the immediate management of an actual disaster that has occurred. This perspective is particularly relevant in dealing with adverse social effects of disasters as these can be significantly reduced if an integrated, long-term perspective is adopted in identifying measures necessary to reduce disaster risks to families and communities, in particular, to vulnerable segments of a

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population such as children, the poor, and the elderly. The analysis in this chapter is largely based on the recent research experiences of the author and co-workers in investigating and documenting the impacts of several major disasters in the recent past.

Keywords

Vulnerability · Displacement · Social effects · Relocation · Social infrastructure · Social well-being

Introduction

Disasters have diverse effects, namely, physical, economic, social, and psychological. These effects are often intertwined and cannot be easily disentangled. Moreover, the understanding of the causes and consequences of social effects of disasters is important from the point of view of prevention, management, and mitigation of disaster risks. In this chapter, the focus is on the nexus between disasters and society.

Natural disasters like earthquakes, tsunamis, droughts, and storms are not new. Yet, with ongoing, human-induced climate change, what we witness today is a clear increase in extreme weather events across the world. Human interventions by way of unsustainable and destructive development and consumption patterns in many countries have clearly contributed to environmental pollution and degradation, biodiversity loss, depletion of natural resources, and the spread of many related diseases (Hettige, 2017). These trends need to be arrested in order to reduce their adverse effects. On the other hand, climate change is a much bigger global challenge to the planet and humanity. There is an emerging global consensus on the need to act fast to overcome the above challenge before it is too late.

Meanwhile the countries across the world have no choice but respond to disasters when they occur, to protect communities, save lives, meet the needs of the affected people, and restore their habitats, vital services, and livelihoods that are disrupted or destroyed. Given the increasing frequency and intensity of natural and human-induced disasters, it is increasingly realized today that disaster risk reduction (DRR) is a far more meaningful and effective approach in responding to disasters. This of course demands us to revisit the disaster cycle in order to treat disaster mitigation as a residual category. In other words, all measures need to be taken to prevent or reduce disaster risks so that when disasters strike, their impacts are less damaging or costly. The measures of DRR can be diverse, continuing, and long term involving a multitude of disciplines, actors, and institutions.

Looking at disasters from a sociological perspective, it is important to look at the nexus between disasters and society from a chronological angle to cover the three stages, namely, before, during, and after disasters. What should happen at each of these three stages can be very different but remain interconnected. In the first stage, what happens should be guided by a holistic and long-term perspective. This is where economic, social, and physical planning comes in with a focus on DRR. Yet,

disasters occur, and, therefore, disaster preparedness is critically important to minimize their adverse impacts. On the other hand, the aftermath of a disaster can be complex and extends beyond the mopping up operations to include long-term measures of rehabilitation, restoration, and resettlement.

Disasters, by their very nature, are disruptive of long-established social arrangements and cultural practices. If a major disaster precludes the restoration of pre-existing habitats and social infrastructure, establishment of new settlements elsewhere to accommodate the displaced needs careful planning and considerable new public investment. This is a complex process that involves addressing a whole range of economic, environmental, social, and cultural issues. Reintegration of new communities into a host environment is a complex process with political, economic, social, and cultural implications. A critical component of the entire process is the nature of social solidarity, both pre-existing and emerging. Integration of a new settlement in a new social, cultural, and economic environment can be a complex and at times a challenging process that needs to be carefully managed to ensure that there do not emerge misunderstandings, tensions, and conflicts between the resettled community and the host communities. Restoration of social and community life following a heavily disruptive disaster, particularly when the displaced people are resettled in a new environment, can be a major challenge for all stakeholders involved in the process (Hettige, 2007; Haigh, 2016).

Mitigation of Adverse Social Effects of Disasters: A Chronological Perspective

Disaster risk reduction (DRR) perspective embedded in the Sendai Framework persuades us to go beyond conventional disaster management practices that usually concentrate on disaster mitigation. In other words, disaster risk reduction entails what we do to reduce risks before a disaster strikes, what we do at the onset of a disaster to minimize adverse impacts on people and infrastructure, and the interventions following a disaster to restore social and cultural life, habitats, social infrastructure, and livelihoods of affected communities. What this means is that policies, institutions, and professionals need to be adapted to engage in a much wider range of interventions in the three stages mentioned above.

As is well known, disasters vary widely in terms of their types and intensities depending on a range of factors. Moreover, the risks they pose to individuals and communities also vary accordingly. The disaster risk mapping at a country level can identify key disaster risks that people in different parts of the country face. For instance, people living in Sri Lanka face many disaster risks, often depending on where they live and under what social and economic conditions. These include floods, landslides, droughts, coastal hazards like coastal erosion, sea level rise and tsunamis, storms, lightning, and cyclones and hazards caused by unsafe disposal of waste such as air, soil, and water pollution. Then, there are also human-induced risks posed by violent conflicts (Haigh et al., 2016).

It is obvious that all of the disaster risks mentioned above cannot be eliminated. If at all, some of these might even be intensified due to such factors as climate change, sea level rise, increasing population density, haphazard development interventions, and unplanned human settlements in vulnerable areas. So, what is needed is to identify vulnerabilities and take measures to reduce risks to people's lives, livelihoods, habitats, and social and physical infrastructure (Birkmann, 2013). This demands the development of policies; enactment of necessary legislation, revamping of existing institutions; establishment of even new institutions where necessary; development and mobilization of diverse expertise and other resources; preparation of vulnerability maps at different levels and in different sectors; increase in disaster preparedness at community, region, and country levels; and development of detailed mitigation plans to deal with the economic, social, and psychological effects of a significant disaster, either natural or human induced.

What is indicated in the above paragraph needs detailed discussion, but the space available here does not permit such a detailed analysis. Therefore, in the remainder of the present chapter, what is presented is an analysis of the institutional responses needed to address highly significant social effects of disasters from a DRR perspective, in the light of the research experience of the author and co-workers in recent years in dealing with the social effects of several disasters in Sri Lanka.

Learning from the Past Disasters to Prepare for the Future

As mentioned before, disasters of some type or another, large or small, have been the common experience of most adults living in any part of the world today. When a disaster occurs in any country today, people expect the government authorities, either local or national or both, to come forward to provide various forms of assistance through diverse interventions to reduce the likely harms caused by it. These interventions include pre-disaster measures like vulnerability mapping; identifying and relocating families and communities vulnerable to significant adverse effects of disasters such as coastal erosion, flooding, and landslides; providing early warnings and evacuation of the vulnerable people in actual disaster situations such as rising flood waters and tsunamis and cyclones; and providing immediate relief to affected people by way of temporary shelters, food, and medical support. This is usually followed by restoration of settlements, livelihoods, and basic services. In some situations, the affected people and communities require resettlement, either in the vicinity or away from the earlier habitats.

What is outlined above is what usually follows a major disaster that leads to displacement of people. But, as mentioned earlier in the chapter, our approach to disaster mitigation has changed in recent years. This is based on the new knowledge that has been generated by research across the world and the new policies that have been developed based on evidence. Countries are expected today to draw from this continually growing body of research and policy analysis (Haigh & Hettige, 2016; Hettige, 2006; Hettige & Haigh, 2016; Hettige et al., 2004; Weerasena et al., 2018).

Increasing population pressure on natural resources due to population growth, the growing public desire a higher standard of living, and haphazard government interventions to create livelihood opportunities for people have often encouraged governments to allow people to encroach on available public land, at times even in ecologically sensitive areas, often ignoring disaster risks such as floods and landslides. In other words, often there has not been systematic settlement planning to ensure the safety of newly settled people. This has also been true in coastal areas exposed to diverse disaster risks. This is clearly evident from makeshift dwelling units scattered in coastal areas where many migratory fishing communities can be found. When the 2004 Indian Ocean Tsunami struck the coastlines of many countries in the region, there were many victims in all countries affected resulting in many deaths in affected communities besides mass displacement of hundreds of thousands of families.

Rapid population growth has also led to internal migration of people from densely populated to sparsely populated regions. Recognizing the problems of poverty, landlessness, and other related issues, governments have also facilitated the process by providing access roads and other social infrastructure like schools and health facilities. Yet, the lack of any assessment of disaster risks in the areas that the new settlers move into, no effort has been made to provide any guidance to them regarding possible vulnerabilities involved in their search for a better life in a new area.

Governments often regularize irregular immigrant settlements but rarely evict them even if the habitats are found to be vulnerable to adverse effects of natural disasters. This has been true for many rural, urban, and coastal settlements. Yet, in more recent years, after many years of exposure and hardships suffered by people in such communities, researchers and state officials, under the influence of new DRR initiatives, have taken an active interest in investigation, documentation, and identifying ways to address disaster risks faced by vulnerable communities. Moreover, global discourses on DRR, SDGs, and climate change have influenced governments, relevant national institutions, and state functionaries, and there has been greater recognition of the need to revisit old practices (Hettige, 2017). So, it is possible today to plan human settlements in secure areas to resettle people who are displaced by disasters and violent conflicts, but national and local authorities find it difficult to find suitable alternative resettlement sites in many situations due to diverse constraints. On the other hand, there is a greater realization today that there is no choice but relocate such communities to reduce their risks and vulnerabilities to future disaster events.

Disasters and Settlement Planning

What is evident from the above is that human settlements have cropped up in areas vulnerable to disaster risks, but, today, such haphazard developments can be avoided as responsible institutions are expected to possess the knowledge and tools needed to determine the suitability or otherwise of the possible settlement sites. Yet, in densely

populated countries and regions, the choices are not easy, and relocation and resettlement need to be done carefully to minimize risks while making every effort to optimize benefits to the resettled. For instance, finding alternative livelihoods is a key consideration in selecting a resettlement site, for livelihoods are critical to sustain people who move into new settlements. In fact, this is as important as minimizing disaster risks at the new site. When this aspect is neglected in the planning stage and the new settlers do not have access to employment and other sources of income, many families are likely to fall into abject poverty, encouraging adversely affected families and individuals to return to their old habitats under very difficult social and economic conditions.

As mentioned earlier in this chapter, moving families or even entire communities following a devastating natural disaster or a major violent conflict needs careful planning, taking diverse needs and concerns of the people concerned into consideration. This is usually done while the displaced are accommodated in a temporary shelter pending relocation. On the other hand, those responsible for managing the resettlement process usually come under great pressure to expedite the resettlement process as entire families living in often congested temporary shelters with minimal facilities for an extended period create many social, health, and psychological problems. Yet, rushing into careless decisions to save time can have long-term adverse consequences that can make life difficult for settlers who move into a not so well-planned new settlement.

Based on the experience in the recent past relating to relocating communities displaced by major disasters in Sri Lanka, several key considerations seem to stand out. These are selection of new settlement sites, selection of settlers for a particular location, prospects for livelihoods in and around the settlement, nature of dwelling units, relationship to host communities, and the provision of social infrastructure.

Each one of the above aspects needs careful consideration, but, for lack of space, these are only discussed in brief here. It is important to emphasize at the outset that the future prospects of the settlers, their health, and well-being depend a great deal on how carefully the above are considered in the planning and implementation process.

Moving people displaced by a disaster, away from their familiar habitats and related living circumstances such as livelihoods, social networks, social and cultural spaces, etc., is difficult for them, particularly when the new location is far away from the old one. Yet, given the highly disruptive and destructive impact of a major disaster on the living environment, livelihoods, etc., the displaced people often do not have much of a choice but move out from there. But, it is also necessary for them to compare the likely living and working environment at the new location with what they were used to at the old location. Moreover, in view of the idea of “build back better,” the conditions in the new location are expected to be better.

Depending on the extent of destruction caused by the disaster, a site affected by it might be partly or wholly damaged. But, it is the government authorities who determine whether to relocate people or rebuild the affected site. Moreover, often no pre-disaster settlement is homogenous in terms of the composition of the pre-disaster community, unless it was a housing scheme with identical housing units. This pre-existing diversity cannot be ignored when relocation of the displaced

is being considered. For instance, unequal property ownership is an important issue as much as unequal livelihoods and employment. Given this diversity, settlers might want a choice with respect to relocation. In other words, random selection of new settlers to be moved into a new settlement might not be to the liking of some of the displaced due to their particular personal circumstances.

As much as livelihoods are a key consideration in relocation, ability to adapt and fit in to livelihood opportunities available in the vicinity of the new location might be challenging to some prospective new settlers. In fact, moving people with certain established livelihoods to a new settlement located far away from the old location can be rather unsettling. For instance, moving fishermen from a coastal fishing community to a new settlement far away from the coast can be problematic unless the persons concerned are ready to change their occupations.

Housing units and social infrastructure are two critically important areas that many new settlers are concerned about. So, prior consultation with prospective new settlers can elicit many useful information and insights that can be critically important to design housing units and determine the nature of social infrastructure needed or desired by new settlers. It is the diversity of the community that is formed around a new settlement that determines the variety of social infrastructure required by different segments of the population in terms of age, gender, education, cultural practices, etc. Location of social infrastructure facilities such as health, leisure, education, transport, meeting places, skill training, child care, elderly care, etc. within and in the vicinity of the settlement can play a vital role in ensuring health and well-being of community members. It is critically important to ensure that the needs of diverse segments of the local population are taken care of by various social infrastructure facilities, ranging from small children to elderly senior citizens. These can best be determined through a detailed community consultation process involving potential beneficiaries with community volunteers playing a catalytic role.

Another important aspect of a relocated community is its relationship to host communities in the vicinity. This is a complex issue depending on how the relationships develop between the new settlement and other communities. In this regard, mutual understanding of each other and the inter-community relationships that evolve are highly significant. At times, hostile relationships emerge due to diverse circumstances. But, what is desirable is a mutually beneficial relationship based on mutual understanding, exchanges, and social solidarity. This may not happen automatically, and some measures might be necessary to facilitate throughout the process of settlement planning, to ensure the host communities remain alienated till the new settlers begin to move in. What needs to be avoided are possible tensions and conflicts between the relocated community and the host communities in the vicinity. Integration of communities through shared social infrastructure facilities can be one way of doing this, while engagement of community members in collective inter-community social and cultural activities can be another.

The above inter-community issues can arise in relocated communities following major natural disasters as well as in new settlements established after a major violent conflict. There are many countries that have faced both major natural disasters and long drawn-out internal conflicts in recent years resulting in mass displacement of

people requiring planned resettlement. Since victims of conflicts have experienced inter-community problems even prior to resettlement, special care needs to be taken to prevent recurrence of inter-community tensions and conflicts in the new setting. Here, certain well-thought-out measures might be necessary to prevent such conditions from emerging in the new environment.

Conclusion

In this chapter, we have focused attention on social aspects of major disasters, displacement, and the management of the mitigation processes following a major disaster, natural or human induced. Special attention is focused on the issues of relocation and resettlement of the displaced with a view to highlighting the need to mitigate the adverse social effects of displacement in order to not only avoid possible negative consequences of relocation and resettlement but also to ensure that the conditions of life in the new setting are better, rather than worse than the conditions obtained in the previous habitat. This is not only to fall in line with the principle of “build back better” but also to fit into the widely shared global concerns regarding climate change, sustainable development, and social justice.

With increasing attention being paid to disasters today, by scientists, global institutions, researchers, policy makers, and the wider public, there is a growing demand for evidence-based decision-making relating to DRR, disaster mitigation-and securing a safer and just future for people adversely affected by disasters. Evidence-based management of the mitigation processes following a major disaster, therefore, has become critically important. Extensive research evidence emanating from the field observations on how processes of resettlement of the displaced have unfolded in many real-life situations provides guidance for decision-making in the above regard. If such guidance is followed, people who are affected and displaced by disasters, both natural and human induced, can look forward to living in a secure environment free from wants.

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Part IX

Disaster Law



Theoretical Foundations of Disaster Law: 110 The Pillars and the Building

Amita Singh

Contents

Introduction: The Idea of Disaster Law	1650
History of the Growth of DL	1651
Transition of DL from Supernatural Origin to Origin in Governance Decisions	1652
Five Pillars of Disaster Law	1656
Doctrine of Public Trust and Vicarious Liability	1656
Equity Brought Public Trust as Fly Wheels of DL	1658
Principle of Subsidiarity	1659
Transdisciplinarity	1661
International Humanitarian Law (IHL)	1662
Conclusions	1664
References	1664

Abstract

Disaster law (DL) is a new and emerging area of law provoked by a specific need of governance to prevent, mitigate, and manage emergencies which damage and destroy life and property. Various other branches of law, i.e., for contracts, company, business, competition, property, women, children, criminals, technology, international law, etc., have started from a specific felt need for justice due to silence or incompleteness of law. These areas of law have seen progressive advancement and inclusivity only when they were interpreted on grounds of equity which is justice and fairness to supplement shortcomings and the silence of laws. In short, it is a correction of law as Aristotle defined it which has enlarged areas of legal studies. A latest entrant to legal discourse is disaster law which is

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growing in proportion to quantum of governance deficits to manage nature's fury against living creatures. Much depends on how one perceives a disaster. A primitive understanding treated a disaster as an "act of God," but growth of science and subsequently a stronger analytical rigor of democratization of governance found them preventable if attended to in time. Modern science, skepticism in policy enforcement, and growth of democracy have helped in the development of disaster law in areas of accountability, transparency, participatory governance, global humanitarian principles, and rule of law. Global approach to disasters changed post-tsunami in 2004 which triggered a golden phase for developing a holistic framework for disaster law. Starting with a UN initiative in Hyogo Declaration (2005–2015), member states came up with their nation-specific laws to manage disasters. After the completion of Hyogo mandate in 2015, the Sendai Framework for Disaster Risk Reduction (2015–2030) set the stage for a merger of disaster law to technology development, tortious liability of decision-makers, administrative coordination, and international-regional partnerships. The present paper addresses the issue of formative and developmental journey of disaster law, its defining pillars, and future directions.

Keywords

Equity · Subsidiarity · Compliance · Accountability

Introduction: The Idea of Disaster Law

Disaster law (DL) finds a key place in disaster management as understanding of disasters deepens to human causation from its erstwhile origin in supernatural forces. Thus, to save lives trapped in a calamity is not anymore a charitable act of the state but a mandatory responsibility. Consequently, disaster management comes closer to state governance in contrast to state philanthropy. As it became fairly clearer that timely, efficient, and knowledge-based preemptive action could prevent, mitigate, or reduce impact of many disasters, a need for legal deterrence against authorities appeared necessary. Administrative accountability for actions starting much before an actual disaster event in the form of risk assessment, strategic planning, enforcement, and implementation defined and demonstrated quantum of negligence, lack of integrity, and extent of vicarious, tortious, and contributory negligence. Three perceptual changes as mentioned below catalyzed the need for adoption of "disaster law" (DL) in mainstream state policy framework, that is:

1. Disasters are a result of political and administrative failures rather than an "act of God." Therefore, accountability and tortious liability of offenders need to be worked out effectively and clearly through their framework of governance, workability of institutions, governmentality (Foucault to Agamben) (Agamben, 1998, 2011; Jessen & von Eggers, 2020; Biebricher & Vogelmann, 2012), and implementation.

2. Disasters know no boundaries and give no time; therefore, no country can handle it alone. There is need for international collaboration, cooperation, and agreements to address them immediately through preemptive risk reduction strategies. This suggests reinvigoration of international humanitarian law from its “war focus” to “disaster focus” as disasters have wiped out communities faster than wars.
3. Disasters can be mitigated and are preventable with the state anchored on the top as a public trustee of all natural resources including all flora and fauna. Acting according to the doctrine of public trust, the state has a mandate to oversee carrying capacity of planet Earth and stop overextraction and overkilling. Consumption should draw limits and be proscribed till it is in sync with sustainable development.

From the above three realizations, disaster studies and research moved out from its shrunken existence as a supernatural outburst or an “act of God” to a calamity or a devastatingly forceful event caused by human action which has directly or indirectly brought immense damage and loss to its surrounding.

History of the Growth of DL

Disaster law has found wisdom from failures of developmental policies irrespective of being or not being a cause for it. Failed development causes immense misery, suffering, unemployment, and even wars. So, the objective of disaster law is to reduce vulnerability and enhance resilience or in other words generate a stronger possibility of bouncing back when struck by wars or disasters. Somewhere, disaster law becomes indispensable to sustainable development and inclusive human progress. History of economic advancement of the world reveals the nature of vulnerability that was later dropped into the field of disaster law to address.

The period of the 1960s was a period of immense philosophical discourse in political and economic theory which questioned state and institutional failures leading to some of the key economic and decisional disasters, i.e., UK economic failures (English & Kenny, 1999; Ringe & Rollings, 2000; Tomlinson, n.d.), USA’s (Moffatt, 2020) explosive unemployment and industrial crisis, and South Asia’s particularly India’s repeated collapse of Five Year Plans of holistic development. United Nations felt that a more holistic addressing of economic challenges was needed. On December 19, 1961, resolution 1710 (XVI) proclaimed the 1960s as the “United Nations Development Decade.” Besides economic restructuring, increasing growth rate, and eliminating hunger, these newly admitted 19 countries from the developing world were directing world politics toward responsible and accountable role of the state to eliminate illiteracy, hunger, and disease. It started a phase of international collaboration and international responsibility toward world’s problems. *Lack of unanimity and partnership increased vulnerability of both humanity and nature.*

An Argentinian economist Raúl Prebisch, who was at that time secretary-general of UN Council for Trade and Development (UNCTAD), worked on a plan to let the world know that *they share a common future*. He suggested a plan for financial resource transfers to developing countries in the form of official development assistance (ODA). The United Nations adopted resolution 2626 (XXV) and proclaimed the 1970s as the Second United Nations Development Decade. As the world severely plunged into one of the gravest economic crises aggravated by the Vietnam war and then the Yom Kippur war between Israel and the Arab states in 1973, oil prices shot up due to oil embargo imposed by the Organization of Petroleum Exporting Countries (OPEC) and destroyed whatever remained from the first development decade. While this phase was laying the foundation for principles coming 20 years later as the Millennium Development Goals (MDG) and then the Sustainable Development Goals (SDG), world powers lost an opportunity of realizing a common future.

Disasters have never been in any discourse of environmental or humanitarian law despite some of the world's worst disasters causing immense vulnerability, death, and damage. Governments bypassed norms of sustainable development, i.e., need to sync carrying capacity in development, managing scarcity without overextraction and overkill, and lastly a visionary passion for intergenerational and intragenerational equity and justice. Climate change is one such outcome of failed governance. The focus of disaster law is at sources of disasters. Its strength depends on an independent and experienced judiciary which has to provide solutions to damage, losses, and reduced resilience on grounds of equity. It banks upon a state which acts as a public trustee, not an authoritarian top-down enforcer. The idea of development was succinctly revisited by the UN secretary-general in his report on Proposals for Action (E/3631, pv): *At the opening of the United Nations development decade, we are beginning to understand the real aims of development and the nature of the development process. We are learning that development concerns not only man's material needs, but also the improvement of the social conditions of his life and his broad human aspirations. Development is not just economic growth, it is growth plus change.*

Transition of DL from Supernatural Origin to Origin in Governance Decisions

Despite its religious connotations, act of God is repeatedly used in statutory and case laws on disasters. Why were disasters treated as an “act of God”? God is a metaphor used for an all-encompassing, all-knowing, and most powerful supernatural being, but since it is subjectively defined, it inhibits any action on ground to identify, prosecute, and punish the offenders. This proved beneficial to prevent accountability of an apathetic, corrupt, and negligent government in contributing to disasters. The concept was approached for the first time in *Forward v. Pittard* (1785) (1 TR

27, 33.82017, English citation 99 E.R. 953, p. 33) when a carrier caught fire and damaged goods. The question raised by Lord Mansfield was “whether a carrier is liable for the loss of goods occasioned by fire, without any negligence in him or his servants.” He further pointed that there is doubt on the construction of the words “the act of God.” It is something immediate, without interposition of any human cause. He cited examples of a ship lost to tempest or burned by lighting as acts of God but a house burning my negligence or mischance is not an Act of God. In *Fish v. Chapman* (1847), Justice Nisbet carried this forward to identify human act from an act of God and refused to exonerate the transporter from liability for his own negligence or the negligence of agents whom he employs to perform the transportation. The learned judge distinguished the much used “inevitable” in courts in place of seldom used “unavoidable.” The semantic difference between the two words is rarely seen in that the “inevitable” being an act of God. J. Nisbet found that the two phrases mean the same thing. In the case of *Tennent v. Earl of Glasgow* (1864) in which Lord Westbury defined an “act of God” as an event or occurrence born of natural causes without human intervention and described with clarity as the accident occurs “in circumstances which no human foresight can provide against and of which human prudence is not bound to recognize the possibility.” The parameters of act of God could be stretched wider in interpretation therefore in a case *Greenock Corporation v. Caledonia Railways* (1917); Lord Shaw of Dunfermline expressed his dissatisfaction with a definition given in the case to the expression (damnum fatale) or an “act of God.” Some act of God circumstances were mentioned as lightning, storms, perils of the sea, earthquakes, inundations, sudden death, illness, etc. An act of God excludes every bit of human agency and subsequently any liability on the part of a negligent. So the judges expressed that the exception of unavoidable accidents excludes all other exceptions in this case, “*expressio unius est exclusio alterius.*”

In a famous 1868 case of *Rylands v. Fletcher* (LR3HL330), J. Blackburn laid down an important proposition of law, “The true rule of law is that the person, who for his own purposes brings on his lands and collects and keeps there anything likely to do mischief, if it escapes, must keep it at his peril and if he does not do so, is *prima facie* answerable for all damages which is the natural consequence of its escape.” Yet in a court verdict in 1876, a turning point in defining an “act of God” came in *Nichols v. Marsland*. In 1875 case of *Nicholes v. Marshland* (L.R.10 Ex.255), the defendant had a series of artificial lakes on his land in the construction of which he claimed no negligence when heavy rains washed off many country bridges. Since it was reasonably unanticipated, the defendant escaped liability by treating the disaster as an act of God. It became clearer that an occurrence could be classified as an “act of God” only “if it could not be reasonably anticipated or guarded against.” In a follow-up later case of *R. v. Commissioner of Sewers for Essex* (1889), this was explained as being extraordinarily unprecedented and unexpected.

Black’s Law Dictionary defines the act of God as an “An act occasioned exclusively by violence of nature without the interference of any human agency.” “Vis major,” another metaphor for an act of God, is defined as “A greater or superior force; an irresistible force. A loss that results immediately from a natural cause

without the intervention of man, and could not have been prevented by the exercise of prudence, diligence, and care." Fearful of unprecedented calamities, most contracts have a "force majeure" clause to avoid any eventuality of nonperformance due to an act of God. The High Court of Orissa however rejected the act of God argument in an Indian case of Saraswati Parabai v. Grid Corp. of Orissa (2000, AIR). It imposed responsibility upon the Grid Corporation authorities for the death due to falling of an electric pole. Similarly, the Kerala High Court in Ramalinga Nadar v. Narayana Redilier (AIR 1971, Kerala 197) held that criminal activities of an unruly mob cannot be considered as an act of God. In 1997, While elaborating on the act of God, the Orissa High Court in 1997 said that an event which happens not only without the concurrence of the will of man but in spite of all efforts on his part to prevent it. In the case of 2018 floods in Kerala, the High Court of Kerala ensured that procedures, plans, and strategies were followed in management of rains and dams. Interestingly, while business has always wished to hide behind the act of God argument, insurance contracts claim not to provide coverage and indemnification for acts of God such as was seen in contracts during the recent pandemic. So this term becomes relevant in drafting contracts in contemporary times when use of advanced scientific technology such as the artificial intelligence (AI), drones, and databases has high predictive ability about natural disasters. The pandemic has no doubt revived this defense as in the 2020 case of JN Contemporary Art v. Phillips Auctioneers LLC and many others.

Three expressions are strongly providing pillars to the act of God argument to defend causality of disasters, i.e., unexpected, unprecedented, and unanticipated by any human skill or science. Finally, in the case of Transco PLC v. Stockport Metropolitan Borough council (2003) (UHKL 61), the act of God criteria was prescribed as:

- No involvement of human agency
- Which is not realistically possible to guard against
- Which is due exclusively and directly to natural causes
- Which could not have been prevented by any amount of foresight, plans, and care

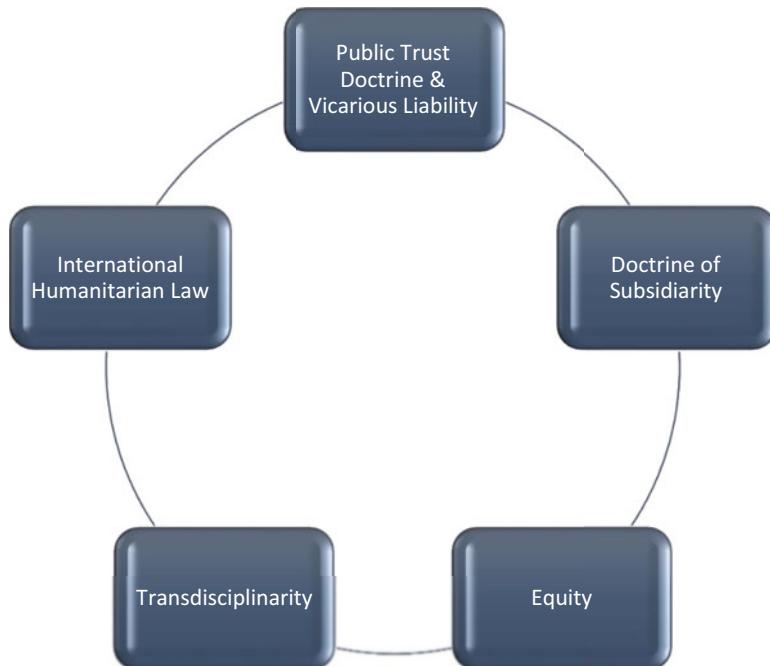
Policy makers have been using an anachronistic framework of decision-making which belied any relief and respect to affected lives and property. DL, as it stands today, is a product of an enlightening intellectual revival at United Nations after the deadly and devastating tsunami of 2004. The United Nations called the World Conference on Disaster Reduction at Hyogo's capital city Kobe in January 2005. The discourse which ensued at this aspiring congregation of nation states revisited often used policy terms such as disasters, vulnerabilities, and hazards which set important levels of action required from governments, people, and technology regimes. Finally, the Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters was adopted to provide for focused

and inclusive strategies which reduced vulnerabilities, mitigated hazards, and prevented death and damage in disasters. A new democratic term from ecosystem sciences “resilience” which was somewhat reminiscent of “carrying capacity” used in environmental law to indicate strength and “re-bouncing limits” of environment entered into disaster epistemology. This phrase soon became a plea for sustainable development as perceived in the Sustainable Developmental Goals (SDGs, 2015–2030).

Law arrives when equity and justice are threatened. The way disasters were conceived prevented any progress in the direction of law. Disasters were treated as sudden occurrences beyond human capacity to control (Salmond, 1907), manage, or explain so an “act of God” explanation satisfied most people. Courts have carried forward this narrative woven around the belief that disasters are an act of God. The era of the 1960s was a turbulent phase in social sciences when the UN declared first developmental decade collapsed and the world over movements against government failures in managing economy were rising. The 1968 First Minnowbrook Conference was an indicator that the state could not hide behind a veil of altruism anymore and was being watched for its self-aggrandizing and corrupt practices in public policy decisions. In political economy, a parallel movement was picking up in Virginia School of Economics where James Buchanan and Gordon Tullock wrote *The Calculus of Consent* in 1962 which was to become a seminal text for governance theory which not only brought down curtains over Pigou’s school of thought representing “state as altruistic and public spirited” but also pulled carpets under those who saw state as a saintly relief provider when Gods bring disasters on Earth. What becomes important here is to see that Buchanan and Tullock were the front-runners, in fact initiators, of analysis of law and constitutions on the basis of economics. Thus, the sarcasm that came into writings on disaster management in the phase that followed vociferously attacked state agencies which flew as administrators as angels flew to disaster-affected regions for relief action but in turn immensely benefitted from unaccountable funds received as aid for suffering people in the form of “emergency funding.” (Sainath, 1996).

As natural sciences and life sciences advanced, many erstwhile beliefs in supernatural and divine powers crashed, and simultaneously disasters emerged as a product of negligent, greedy, and corrupt governments. Most disasters such as hurricanes, floods, glacier burst, earthquakes or tsunami were found to be grounded in governance deficits. The “act of God” belief appeared as a shield to protect all those responsible for disasters once science took over disaster studies. It took some time for law to shape up into a clear direction expected of it, and this came up when Hyogo Declaration of 2005 identified “sources” of disaster not beyond administrative action for being sacrosanct and divine but formed the prime area that sought mitigation and preventive action against a likelihood of disaster. Governance deficits and not “divine cause” became the focus of addressing disasters and subsequently a passage to a worldwide demand for legal imperatives against human frailties causing avoidable disasters, death, and damage.

Five Pillars of Disaster Law



Doctrine of Public Trust and Vicarious Liability

Vicarious liability is a concept which is much adored, respected, and recommended to strengthen accountability of administrators for decisions which bring disasters. The "Principal is liable for the acts of his agent, master for the servant and State for its administrators." However, it is yet to become a norm in disaster law for the fuzziness in governance that prevents fixing up responsibility upon decision-makers. This concept is a clear direction to justice dispensation systems in every country to identify those large numbers of disasters which are clearly man-made due to greed, corruption, or desire for political capital and are linked to illegal clearances for use of land, water bodies, river bed, hills, or other public spaces. Some major disasters like floods, landslides, fire, dam burst, oil spill, and subsidence repeatedly strike human and nonhuman habitats, while the decision-maker who caused this calamity goes unscathed. Vicarious liability holds that the person responsible for omission of another person is accountable before law. Under a general tort law, one is held responsible for one's own act but under vicarious liability a person is held responsible for the negligent actions of a third party. This makes the decision makers issuing unworthy orders to ground level implementers accountable for their act

which increases vulnerability to disasters anywhere ie; coasts, forests, mountains and cities. Such decision-makers must be held liable for the acts of others who are their subordinates or their field employees or contractual or outsourced workforce. In an era of globalization and liberalization of government activities, vicarious liability is an indispensable source of fair justice in offshoring and outsourcing of projects. In summary, it is explained in the phrase, *qui facit per se per allum facit per se*, suggesting that “he who does an act through another is deemed in law to do it himself.” This is presumptively and logically established in law as a maxim of “respondent superior” or letting the “principal be liable,” thereby making both the commanding superior and the compliant and obedient junior equally liable for a harmful decision leading to calamitous situations.

Vicarious liability in disaster law is primarily about man-made injury to public goods found free in nature for use by anyone irrespective of class, caste, race, or species such as “the air, the water, the forest and the sea which are all common to the public.” This is the law of nature which takes a doctrinal form in the case of M. C. Mehta v. Kamal Nath and Ors [(1997) 1 SCC 388]. The encroachment of Himalayan River Beas by a tourist company Span Motels Pvt Ltd. belonging to the environment minister was decided on public trust doctrine. This and the polluter pays principle were applied to question and penalize wrongful state decisions which destroy these resources despite being its public trustee. Generally, those many offices which have participated in a combined approval of an otherwise environmentally prohibitive project designs, equipment, and machines tend to go scot-free with impunity. The Apex Court had noted in its judgment that behind the rampant rise of unauthorized constructions in urban areas, there prevailed an “unholy nexus between builders and planners (administrators).” When it subsequently ordered demolition of 40-story Emerald Court project of Supertech Ltd. (*Supertech Ltd v Emerald Court Owner Resident Welfare Association; CA 5041 of 2021, LL 2021 SC 407*) in NOIDA, it also sanctioned prosecution of officials under *Section 49 of the Uttar Pradesh Urban Development Act 1973 and under Section 12 of the Uttar Pradesh Industrial Area Development Act 1976 and UP Apartments Act 2010 for violations*. In the approval of Maradu Apartments (State of Kerala, 2019) in Kochi’s coastal zone area, more than seven government offices worked as a nexus to grant all approvals from land, water, electricity, design, etc., in defiance of the Coastal Regulatory Zone Notifications (CRZ). Law provides for a combined action against several persons joining hands in committing a wrong. Winfield (Rogers, 1984) and Jolowicz (1984) clarify that “persons are said to be Joint Tortfeasors when their respective shares in the commission of the tort are done in furtherance of a common design and there must be a concerted action to a common end.” In *Khenyei v. New India Assurance Co. Ltd. and Ors*, (Civil Appeal No.4244 of 2015) the Apex Court held that the affected party is entitled to sue both or any one of the joint tortfeasors to seek joint action against them. The principle of joint tortfeasors has been well laid out since the Petrie v. Lamont (1841) (*Petrie v. Lamont* (1841) Car & M 93, 96; 174 ER 424, 426). All persons who aid or counsel or direct or join in the commission of a wrongful act are “joint tortfeasors.”

Equity Brought Public Trust as Fly Wheels of DL

In legal philosophy and in the jurisprudential history of law, equity has been the basis of making law more humane, just, and fair and therefore more acceptable and accommodative of diversity and differences. It is embedded in the fairness principle of law standing as pillars of constitutional guarantees for fundamental rights, division of powers and property, etc., so that these rights do not become a plea for injustices, loss of opportunity for others, and unaccountable accumulation. In the absence of equity, any legitimate right may turn into a self-gratifying and acquisitive action. In that sense, equity brings to disaster management inclusiveness principles which reject caste, racism, speciesism, and sexually differentiated people. Equity prevents marginalization of persons with disability, gender, language, regions, and positions. In disaster management, Hyogo Declaration (2005–2010) was the first comprehensive and visible adoption of the principle of equity when it considered preparedness as a greater priority than rescue and rehabilitation. A sensitization toward social exclusion, cultural diversity, and geographical vulnerabilities besides inclusive and efficient governance continued to improve disaster risk reduction. This further advanced in the Sendai Framework which followed the Hyogo Declaration. Equity was like a growing light within disaster management operations and entailed a process of self-realization against systems of oppression which inhibit advancement of inclusive disaster management policies. It also joins hands with natural law to establish a more equitable regime of governance as in other branches of law. Many principles and doctrines which grew within disaster studies came from a sensitized judiciary rather than administration performing a lopsided task of rescue and supplies after a disaster occurred.

Many instances can be given here. In the case of Saraswati Parabhai v. Grid Corp. of Orissa and Others (AIR 2000 Orissa 13), when an electric pole was uprooted and fell on a live wire to cause death, the judge rejected the act of God defense and invoked tortious liability of administrative authorities responsible for the accident. So the change that had transformed since the Crown Proceedings Act of 1947 the dictum of English law that the “King can do no wrong” strengthened and re-invigorated Art 300 of the constitution dealing with the liability of the state in which it could not only sue but also be sued. The Supreme Court had categorically established in the case of Saheli Women Resource Centre v. Commr of Police Delhi (AIR 1990 SC 513) that a sovereign immunity is not available when the state or its officers infringe a person’s fundamental right given under Art 21. Subsequently, a stream of Public Interest Litigation brought out concerns of state dysfunctionalities, corruption, and criminality besides negligence and oversight causing disasters. The case of M.C. Mehta v. Kamal Nath and Ors 1996 brought such embeddedness of governance simply by taking note of the newspaper caption in Indian Express (Feb. 25, 1996) that “Kamal Nath dares the mighty Beas to keep his dreams afloat.” It brought to light the politico-administrative-contractor nexus which brought to light how a private company, Span Motels Private Limited, administration gives approvals for heavy earth movers encroached upon 27.12 bighas of land and a large forest area. The high-powered effort made to divert the course of a mighty

Beas river using crores of public money and power caused a disaster. The Apex Court invoked “public trust” to restrain such surreptitious activities, and validation of this invocation was well brought out through several international judgments and writings.

The “Doctrine of the Public Trust” was forcefully developed by the ancient Roman law about “resources were either owned by no one (res Nullius) or by every one in common (Res Communis)” (Span Motels case 1996). English law accepted only a limited ownership of nature as resources used by all being free in nature deemed to be held in trust by the Crown. This was further explained by referring to an important path-breaking article by a law professor, Joseph L. Sax (1970), from the University of Michigan who is considered one of the chief proponents of public trust doctrine. His defense of this doctrine was in an act of state understanding, “Public trust problems are found whenever governmental regulation comes into question, and they occur in a wide range of situations in which diffuse public interests need protection against tightly organized groups with clear and immediate goals.”

Several issues emerged in the M.C. Mehta v. Kamal Nath and Ors 1996 (Span Motels) Apex Court judgment which highlighted that the state needs to be bound by this doctrine in managing water bodies (in Sacco vs. Development of Public Works 352 MASS 670, the Massachusetts Court restrained the Department of Public Works from filling a great pond as part of its plan to relocate part of State Highway), wet lands (in Robbins vs. Department of Public Works 244 N.E. 2d 577), and protection of recreational natural spaces (National Audubon Society vs. Superior Court of Alpine County 33 CAL. 3d 41). Over the years, respect for equity, fairness, and justice prevailing with the judiciary has transformed an erstwhile nuts and bolts discipline of disaster management into a mission driven, principled, and beyond the call for duty platform to prevent disasters.

Principle of Subsidiarity

The manner in which authority is divided in the management of disaster and risk undertaking forms a crucial point of governing emergencies. Disasters are now a regular feature as climate change, sea level rise, exploding population, and poverty has increased vulnerable communities across the world. The governments have more or less failed to prevent disasters except where local communities were heard in time and action was taken. It is repeatedly being established that an important part of efficient prevention is to stay in communion with local communities, improve local governance to a more participatory and understanding partner, and to synthesize local knowledge into strategic planning.

The principle of subsidiarity may be explained as a devolution to the lowest level of governing structure. It is a kind of percolation of initiatives and precipitation of power to where it should logically be. Just as in science, laws of gravitation cannot be reversed, so in governance power needs to percolate and precipitate downward, not from bottom upward. Authors have repeatedly written about this principle and

have found it of utmost importance in disaster management. The administrative principle of “arm’s length” whereby the party to a transaction is kept at an equal footing of accountability is part of the principle of subsidiarity. This principle has been meaningfully used in contract law to bring greater clarity within the agreement so that it would stand up to legal scrutiny.

This principle is different from decentralization per se as it emphasizes that power should rest at the lowest level and also that the lowest governance level be vested with decision-making unlike the federal or central government as the case is made out to be in most constitutions (Zurita et al., 2015).

This concept of subsidiarity is a fallout of democratization of governance and media when there were more open analyses available in public about disasters in remotest areas. In most cases, it was evident that the local communities had been voicing their concerns about highway constructions, bridge structures, city high rise buildings, dam management, natural waterways, and riverbed cementing. A closed and authoritative government was either evasive of grassroots voices or was treating them as troublemakers protesting unconstitutionally. It is established across the continents that there can be no disaster management if decision-making on disaster prevention are not devolved to the lowest level. This would involve local control over local resources and eventually affect political positions of contesting governments in an election. Therefore, most governments refuse to devolve to this level (Handmer & Dovers, 2013).

The principle of subsidiarity insists on the following requirements as given:

1. Initiatives and power of decision-making should percolate to the lowest level of community governance.
2. Local structures should be the center of constitutional democracy, and effort to make these structures increasingly participatory should be the mandate of disaster management.
3. Local knowledge and heritage resources should be conserved, and local teams of elders should be formed to carry the culture of local knowledge and solutions forward.
4. Capacity building through involvement of nongovernment groups and organizations ought to be working on a sustainable and continuous manner.
5. Appropriate ecological education should be made part of school syllabus.

Many other authors have considered the lowest level of governance in a country as the most optimal level as it leads to appropriate solutions which are cost-effective and easily implementable (Evans & Zimmermann, 2014). However, if this effort lacks even one of the above requirements, this whole effort may get wasted as it happened in India when the epochal legal initiative was launched by the government in the Panchayats Extension to Scheduled Areas (PESA) Act, 1996, which gave the lowest unit of community governance called “Gram Sabha” in areas inhabited by tribal communities special powers and the right to manage their natural resources. Over the years, for lack of other requirements mentioned above, the powerful groups of developers and contractors took over controls to promote central government

agendas. The natural areas shrunk, water bodies leveled, and highways were constructed through protected zones with much more ease than before. Devolution and percolation means that power which the lowest level holds is “weighty” or knowledge laden. This suggests that capacity-building programs, eco-education, and judicial scrutiny by environmental courts (i.e., Green Tribunal in India) on the structural gaps become a mandatory exercise prior to imposition of projects by any upper-level government in that area. Failure of central/federal government to be a good governance Samaritan is a major cause of disasters. Legal remedies demand a synthesis and rationalization of appropriate controls in disaster governance as laid out in Disaster Management Acts of most countries.

Transdisciplinarity

Transdisciplinarity would mean “hand-holding” in ground activities, based upon a belief that when you sink together, no one solution helps but each one ought to use their sectional expertise to save the ship and its passengers. Ironically, this concept has found little attention in emergency governance required during disasters, leading the universe of disasters still under lopsided and limping control of science spewing civil engineers, GIS experts, and environmental scientists. Lately, one can see a stampede of professionals from IT companies, machine learning, and artificial intelligence into disaster management.

“Transdisciplinarity” was first found in the cognitive analysis conducted by the Swiss psychologist Jean Piaget in 1972. Human intelligence is about the nature of knowledge itself which could build capacity and direction to obtain social harmony, community resilience, and base knowledge for larger human welfare. Many other researchers such as Rene Berger (Berger, 1990) and Edgar Morin (Edgar Morin explained transdisciplinarity through constructivist epistemology where social movements lock horns with models and jargons. The reality deconstructs and helps in reconciliation with other branches of knowledge) in the early 1990s reflected on constructivist epistemology to liberate scientific phenomenon from the complex models constructed by scientists and experts. It was the German philosopher Jurgen Mittelstrass who set up university centers on transdisciplinary studies and got the academia and educationists start a dialogue on the need for this approach. Many unanswered questions on legal ethics were aptly undertaken in many ancient works in the Indian subcontinent prior to 1500 BCE (This is a period in which knowledge of the Vedas was compiled within a system’s framework, more as a transdisciplinary literature as Samhitas, the Brahmanas, the Aranyakas, and the Upanishads). Transdisciplinary knowledge was passed on as “words” and “dialogues” [Veda (Veda is a compilation of four books (Rig-Veda, Yajur-Veda, Sama-Veda, and Atharva-Veda), which date back to pre-5000 BCE, the most ancient text from India passed on from generation to generation through talking, reciting, and discussion. Vāda (वाद) refers to “discussion” or “oral words.”)] from generation to generation. The *Vedas*, (Vedas have a transdisciplinary domain in which they answer questions of life and state governance) *Shantiparva* (*Shantiparva*, The Mahabharata

12th Book, translated by Dutta, Manmatha Nath., Elysium Press, Calcutta), *Upanishads*, and the *Samhita (Charak)* found that the source of all knowledge is just one single idea. A work worth mentioning here is the *Mundaka Upanishads* which indicates that access to “dispassionate analysis of a problem” can only come once older load or baggage of information is shed such as a process “that shaves or liberates one of errors and ignorance” (Eduard Roer (1856) *The Brihadaranyaka Upanishad and the Commentary of Shankaracharya on its First Chapter*, translated from original Sanskrit by Dr. Eduardo Roer, Published in *Biblioethica Indica* by East India Company and The Asiatic Society of Bengal, Vol. II, Part III, Nos. 27, 38 & 135, Printed J. Thomas, Baptist Mission Press).

Disaster management advances through new transdisciplinary knowledge such as microdata on pollution, air quality, riverbed and coastal erosion, phytoplankton and coastal vegetation, wild life and green areas, etc. Experts are expected to walk through domains of various knowledge areas without trespassing in vengeance but in a manner of hand-holding. Many best initiatives of governance have come through with courts appointing expert committees to study and present findings. These findings in the form of status of health of natural resources and communities and wild life could bring laws to protect and conserve them in a scientific manner. The compressed natural gas (CNG) that replaced lead-based petrol as fuel in Delhi (M.C. Mehta vs Union Of India And Ors on 5 April, 2002, Writ Petition (civil) 13029 of 1985) or recent laws which banned firecrackers during festive times are an outcome of expert findings on air quality index being highly toxic for human and animal health.

Transdisciplinarity is a continuous discovery of experts and those who are experienced in local knowledge and culture. If governance structures are open and intentions of government are ethically clean, this discovery can act as a firewall against disasters by making preemptive action possible. Law ought to achieve an inclusive and participatory direction of managing disasters.

International Humanitarian Law (IHL)

International humanitarian law protects victims of armed conflicts who become weak, sick, and tortured in confinement due to belligerent party behavior. It restricts the use of violence during war. Therefore, technically, it may not be applicable to disaster victims. However, the main object of IHL is avoidance and prevention of human sufferings, barbarism, brutalities, and inhuman activities. The Hague Convention of 1899 and 1907 paved the way for IHL, but it was the Geneva Convention of 1949 which strengthened a fair humanitarian treatment of victims of war, whether a declared one or an ongoing undeclared warfare.

The international disaster response law (IDRL) is an emerging new area of international law which fills the gaps which are much needed in IHL. An increasing frequency of natural disasters and an increasing number of casualties due to

man-made disasters have drawn the attention of the International Federation of Red Cross and Red Crescent Societies (IFRC) on existing laws, rules, principles, and cultures of different countries to produce a better oversight, regulation, and accountability mechanisms for managing disasters, relief operations, and risk identification through the help of local authorities.

Since international law does not establish any legal protection to victims of disasters and much of it is still based in local laws, it is generally used by national governments to ill-treat minorities and socially excluded caste communities and temporarily suspend many human rights. IHL ought to generate international collaboration and flexibility in international trade and aid provisions during emergencies and relief operations. IFRC has brought forth three key international agreements, i.e., Sendai Framework, Sustainable Development Goals, and the Paris Agreement, to deal with new and emerging crisis linked to climate change and the pandemic.

IDRL is neither comprehensive nor a mature law to be easily handled by national governments. It is also not substantiated by core treaties such as Geneva Conventions and Protocols. However, custom plays an important role in which bilateral expressions on technical and medical assistance, humanitarian relief, and relief distribution between nations play important roles. Regional treaties such as the SAARC Rapid Relief in Natural Disasters (SARRND) of 2011 for South Asia can play a major role in disaster operations toward mitigation. Many regulatory barriers to trade, movement, relief, and rescue and for aid workers to holistically operate on foreign land are the needed requirements of present times. The Tampere Convention of 1998 commits parties to reduce regulatory on export of telecommunications equipment for disaster relief (Bannon, 2008). Besides these bilateral approaches, a need for today is to apply globally binding agreements as well. The UN operations and dominance should provide greater space to international nongovernment actors in humanitarian rescue and relief operations.

IDRL could be a great force if some of the soft laws in the form of declarations and guidelines could be enforceable, i.e., the “Measures to Expedite International Relief,” which was brought about in 1977 by the UN General Assembly and the Red Cross in 1977 and following that the 1981 Resolution 36/225 which called for strengthening the UN’s capacity to respond to disasters and subsequently the 1992 Resolution 46/182 focusing upon “coordination of emergency humanitarian assistance” of UN operations. These efforts gave rise to the Office for the Coordination of Humanitarian Affairs (OCHA) endorsed by the General Assembly in 2002 when it adopted the Resolution 57/150. A new leaf was turned in IDRL toward international urban search and rescue assistance soon after the UN Resolution (GSDRC, 2013).

The international humanitarian law has much to explore in managing oceans, oil operations, international rivers, mountains, and flight operations, most of which work beyond boundaries for causing immense destruction during disasters to all sides of international boundaries. As world closes down with common threats for survival, IDRL needs much strengthening and support from legal scholars and governments.

Conclusions

Disaster law is an indispensable need for managing disasters which are growing in rising quantum of destructive ability as well as in their frequency of occurrences, yet anti-environmental human operations have not yet paused. The focus on DL is to reclaim for the State its primordial role of “a public trustee.” This discipline is increasingly transdisciplinary and judiciary has to rise up to adapt to these changing times. Lastly, scholars in law and social sciences should broaden the reach of international humanitarian law from its current focus of dealing only with “victims of war” to incorporating “victims of disasters.” War, is no doubt a man-made disaster as much as other disasters rooted in greed, pride and politics.

The world can achieve this only by collaboration and knowledge exchange within regions and in international forums. The handbook section on DL aims to bring together legal scholars to help fill these unidentified gaps in DL.

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The Pandemic and Its Effect on the Power Sector in India

111

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Contents

The COVID-19 Disaster and the Scenario of Green Energy in India	1669
Problems Faced by the Energy Sector During Covid-19	1671
Possible Actions Taken by the Government	1674
Response of the Power Sector Regulators to the Pandemic Disaster	1675
Rise in the Renewable Energy Sector During Covid-19	1677
Conclusion	1679
Suggestions	1681
References	1683

Abstract

Regulators across the world are entrusted with the task of formulating regulations to help governments in improving economic growth, promoting social welfare and protecting the environment. Regulations can range from legal restrictions, contracts, co-regulation to certifications or accreditation and social regulations such as norm-setting. A disaster of any kind may affect the direct or indirect functioning of a regulator. In times of a disaster, the regulators are faced with unique challenges to ensure free play in the market with its limitations due to the extraneous circumstances.

In the wake of the current pandemic situation, Indian regulators have reacted and modified their approach in unique ways. For e.g., the Securities and Exchange Board of India (SEBI) immediately posted the outbreak of the COVID 19 pandemic, took early cognizance of the volatile markets and initiated measures in forms of relaxations for almost all kinds of markets, market participants and intermediaries. IBBI has suspended initiation of insolvency operations

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for a whole year with special focus on MSMEs. Post disaster challenge lies in designing clear, coherent, and efficient regulations, to effectively implement them continually and evaluate them for their appropriateness, relevance and impact. This chapter strives to delve into the space of regulators' response in stabilizing the economic markets and other aspects in times of a disaster. In analyzing the issue at hand, the chapter puts a spotlight on the power sector and analyses the possibility of creating a shift to create more sustainable and environment friendly practices. The synergies between current practices and adoption of green energy that are fast tracked in the pandemic era are also examined in the chapter.

Keywords

Disaster · Regulators · Pandemic · Market · Regulations · Green energy

India's power sector is one of the world's largest and most complicated. And it has seen a dramatic transformation during the last several decades. Almost all citizens now have access to energy and electricity generated through power. Installed renewable energy capacity now accounts for a third of overall capacity and the country's power shortage has been considerably decreased. The power sector played an exceptional role in the pandemic world when the need for household electricity was at its peak and all and sundry were using electrical means to communicate. The electricity sector in India is heavily regulated. Electricity is a concurrent list subject i.e., both the Centre and the States regulate the various aspects of electricity. Being a concurrent subject there is a federal dimension to the sharing of power and responsibility between Centre and States. This is reflected in the structure of electricity regulation in India. The Central Electricity Commission regulates tariffs for generating companies owned or controlled by the Central Government, those with an inter-State dimension, and those concerned with inter-State transmission of electricity. The State Electricity Regulatory Commissions (SERCs) regulate tariffs for generation, supply, transmission and wheeling of electricity within the States.

The alacrity of the pandemic caught all sectoral regulators by surprise and threw the regulatory spaces into a completely new arena where instant resolutions were required even on policy related matters. The Covid-19 Pandemic disrupted the growth and development of the electricity sector at several stages. The pandemic led disaster pushed governments all around the world to impose a state of emergency & lockdowns. The Indian government also followed suit and imposed a complete lockdown across the country. All commercial activities were halted (OECD, 2020). As a result of the lockdown and other limitations imposed by the government, many people were unable to leave their homes, resulting in a significant reduction in energy usage from the national grid (Elavarasan et al., 2020). In such scenario, new electricity patterns emerged and many new issues arose in the electricity sector that were never thought of earlier and needed to be handled in a unique and previously unimagined way. During the pandemic, there were unprecedented changes in the patterns of power demands from both domestic and commercial users. With the exception of some essential

commercial activities, everything else was shut across the nation. As a result, energy demand from industrial and commercial consumers decreased dramatically. On the other hand, there was an increase in the household demand, particularly during the lockdown's early stages, since work-from-home was getting adopted as the new normal. It was hence observed that, a sudden shift in lifestyle has drastically boosted household power consumption while simultaneously reducing its demand in commercial activities, affecting the national energy demand profile. For example - Roads and airports were almost vacant, stores and restaurants were shut, and industrial activity was essentially halted globally as a result of these regulations. In the initial days, from March 25 to May 20, 2020, a rigorous lockdown was implemented across India too, resulting in a huge reduction in power demand, ranging from almost 20% to 40% (Aruga et al., 2020). The impact of this consumption gap on India's power sector comes in the form of financial obstacles for majority of electricity distribution companies (discoms) as the Electricity Regulatory Authority of India assures that household consumers are charged a lower price than commercial consumers, which is sometimes even below the average cost of supply (Electricity Act, 2003). A huge gap was created in the power generation side due to the lack of demand for electricity. In the aftermath of the same, there has been much thought and deliberation on effective ways of reducing the distress of the power sector. The pandemic has given an impetus to thought and deliberation in this field.

The financial burden on discoms in India is a pressing issue and it needs to be addressed urgently. The most effective solution to this intense problem is transition of energy from non-renewable sources to renewable sources. The silver lining that the COVID-19 pandemic brought with itself was that it pushed and encouraged the government to look beyond their current energy production sources (which heavily depend on coal) and shift to renewable energy sources. The focus on diversifying energy resources and promoting renewable has put renewable energy in the momentum of replacing coal, which dominates more than half of India's energy sector (Parajiyia, 2021). As a result, despite the current crisis, India remains dedicated to its objective of becoming a greener nation, with the energy sector playing a significant role. This is in sync with the United Nations sustainable development goals which are an environmental parameter for all countries. While the Covid-19 crisis has been the most devastating disaster that humanity has faced in recent years, this lockdown has impacted India's energy sector both negatively and positively. The possible change in energy transition to renewable and supply has resulted in a number of scenarios that may be efficiently utilized and provide significant insight to regulators and stakeholders. In effect, in the wake of the pandemic, the future roadmap for the India's growth trajectory has been mapped and set.

The COVID-19 Disaster and the Scenario of Green Energy in India

India is the world's third-largest energy consumer. Global energy consumption also has increased since 2000, with the majority of demand being met by coal, oil and solid biomass (Outlook, 2021). It is estimated that India would overtake China as the

world's most populated nation in the coming years and as a result, it is expected that India's energy consumption will grow at a rate faster than the country's overall energy production. To fulfill this demand-consumption gap, it will become necessary to add an energy system to its current system to fulfill the future energy demand which will rise over the next 20 years. Another key issue that will be addressed by this adding on of new energy system is that the pandemic and its aftermath may temporarily reduce emissions due to reduction in the demand for coal and oil, but that does not get India much nearer to its long-term sustainable development agenda and vision of a greener nation.

Several aspects of India's energy system are highlighted by the coexistence of shortage and excess. Despite having the world's fifth largest coal reserves, it is still one of the world's largest coal importers. However, the coal sector's grip on India's power industry seems to be decreasing, particularly in the wake of the Covid-19 pandemic, and the latest coal crisis has turned the attention to renewables. The energy sector has encouraged a significant spike of renewable energy sources with solar power leading the way (Sharma, 2021). During the Covid-19 lockdown, which began on March 25, India saw its energy consumption drop by about 30% (Covid, I. E.A, 2019), with coal generators facing the brunt of the impact. The pandemic induced lockdown had imposed significant hurdles to the energy sector's supply and value chain. For example – Inadequate and costly power plants were requested to either stop generating and remain on hold, or limit their production, due to lower energy demand levels. The adoption of renewable sources of power generation was strengthened during the lockdown (Pyper, 2021). At this juncture, it is important to mention the remarks of Sunil Dahiya, an expert at the Centre for Research on Energy and Clean Air who stated that "*before pandemic, there was a strong indication that coal will not drive future energy development, and it will be pretty much driven by renewable.*" The pandemic gave the world and energy generating bodies to pause and take stock of the possibilities of power generation through cleaner sources other than coal. In this context, India has a good chance to accelerate the shift from coal and more toward renewable energy sources (Pathi, 2021).

This acceleration can be seen by the fact that despite the numerous obstacles brought on by the pandemic, the renewable energy sector had tremendous growth in 2020. While the world was battling a rapidly declining economy during the crisis, global renewable energy capacity addition increased by 45% in 2020, the biggest growth in a decade and has been steadily doing well even in 2021 (Parajiya, 2021). According to the International Energy Agency's (IEA) report, it was predicted that India might develop twice as much green energy capacity in 2021 as it did in 2020. Additionally, even when the worldwide energy consumption was predicted to fall by 5%, renewable power generation was expected to increase by 7% (due to long-term contracts, priority access to the grid and continuous installation of new plants) (Renewables – Fuels & Technologies – IEA, 2020).

However, while the use of renewable energy sources and consumption has increased significantly, so has the use of fossil fuels. According to the report (Global Status Report, REN21; Murdock et al. 2021), even a small rise in renewable capacity over 2009 levels would significantly raise the sector's overall challenging task to

adopt renewable in terms of a tremendous upfront cost, subsidies of fossil fuels, a lesser supportive framework, available resources, and technological solutions. As a result, the development of Solar PV has been amazing; the resource potential is immense, the expectations are lofty, and governmental backing as well as technical cost reductions has quickly made it the most cost-effective solution for new power generation (International Energy Agency (IEA), 2020). The Jawaharlal Nehru National Solar Mission (JNNSM), sometimes known as the National Solar Mission (NSM), was launched in India in 2010. It was the first time that the Indian government has focused on promoting and developing solar power. By 2022, the plan aims to have installed a total of 20 GW of capacity. On August 20, 2019, the government announced that it would aim for a total of 300 GW of solar power by 2030. A compound annual growth rate (CAGR) of roughly 59% has been recorded in India's solar sector from 2011, increasing from 0.5 gigawatts in 2011 to 55 gigawatts in 2021 (Garg & Gulia, 2022). According to the latest data, India is presently ranked fifth in the world in terms of installed solar power capacity, following China, the United States, Japan and Germany. Further, in order to achieve ultimate leading position, the government should implement steps to address internal difficulties such as safeguarding of duty, tax management, and so on, in addition to attaining raw material independence. Moreover, for the past several years, renewable energy initiatives in many parts of the world have driven new power generation capacity expansions and have progressively outperformed fossil fuels. So, when it comes to the integration of renewables into the grid, India has always been a forward-thinking country. The economic consequences of the pandemic are widespread, and the renewable energy sector in India is no exception. Furthermore, it is also no longer associated with high-cost solar energy. Small-scale renewable energy power plants have become more affordable, stable, and efficient in recent years. Renewable energy is therefore considered as the way of the future, and it can provide India with what it requires.

Problems Faced by the Energy Sector During Covid-19

The Covid-19 situation has thrown a twist into attempts when it comes to addressing several crucial problems in the power sector. Such as, there has been a shortage of consistent power for many users; a continuous dependence on solid biomass, mostly firewood and poor air quality, which has put Indian cities among the world's most polluted. Many things have changed in India and in the world of energy, but the Covid-19 epidemic has created more damage to the industry than any other event in recent history. For years to come, the consequences will be experienced in India and around the globe. India's energy consumption was set to rise by roughly 50% between 2019 and 2030 before the pandemic, but it is now closer to 35%, or even estimated as 25%¹¹.

Moreover, India was suffering from the severe effects of rising health, economic, and social issues during the second phase of Covid-19. Meanwhile, India's power system was being put to the test as the nation confronted with the extraordinary

health and economic crises brought on by Covid-19. Hospitals and citizens relied on steady power, therefore the power sector's resilience became crucial. Simultaneously, India had one of the highest energy consumption reductions in the world, with Covid-19 causing power demand to drop by 28%¹¹ by the end of March 2020 (IEA, 2020). Power consumption from hospitals, critical services, and residential sector increased during the extreme lockdown and growing Covid-19 cases whereas industrial demand and commercial activity decreased significantly.

Remarkably, India's energy sector has shown exceptional resilience in the face of global financial and commodities market turmoil, with supply holding up remarkably. This has, however, come at a price. As roughly a third of the world's population remained at home, energy consumption fell substantially. According to estimates from KPMG India, demand for energy commodities fell by 25–30% during the lockdown (De, 2020).

When most states in the country cut power supplies due to lower demand, The Ministry of New and Renewable Energy (MNRE) had already assigned renewable energy projects as must-run energy sources (Parikh, 2020) (meaning that power generated from renewable sources must be prioritized over others), dramatically increasing renewable energy's market share. During the crisis, the government identified power generation, particularly from renewable sources, as an important commodity. Public utilities like transmission, and distribution were also classed as important services, ensuring that services were not disrupted. If the benefits of the lockdown are continued throughout, the landscape of the Indian energy sector might be fundamentally transformed (Verma, 2020).

As a result of the Covid-19 epidemic, India's energy sector players have put their institutional capabilities and financial resources under considerable strain. Many of the state-owned utilities relied on government aid and subsidies to run their businesses. In addition, there's the matter of who owns what. Public ownership of the energy sector puts it at risk for political sensitivity because the government plays multiple functions, including owner, operator, and regulator. Institutions that lack self-determination and adaptability are more likely to be undermined in times of crisis. Attempts to withdraw the government from these operations have been made in the past, but they have been inconsistent and ultimately unsuccessful. Hence, in the case of India it can be said that the Covid-19 crisis hit the nation at a time when transition to green and sustainable energy was becoming increasingly urgent and necessary.

Nevertheless, some of the current reforms could have had a positive influence on the energy system and lead to a cleaner energy shift. India needs to fulfill its energy demand for a green energy transition and be financially and infrastructurally strong in order to obtain capital. Though the Covid-19 might have worsened the sector's current financial and infrastructural existing problems, this crisis along with the government's response, seems to have the potential to contribute to energy sector reforms in over a decade. Moreover, the energy sector has perhaps the most crucial infrastructural constraint, if not supply-side, that the Indian economy faces. India has made significant efforts in developing the renewable energy scenario, particularly since the Paris Agreement.¹¹ Despite this, considerable obstacles exist, such as a lack

of infrastructure and an inadequate knowledge of the sector. The Covid-19 situation has only contributed to emphasize India's deteriorating infrastructure, which is in dire need of renovation, and while it is doing so, it may benefit from a green boost too.

The impact on the regulators can also be seen from the key cases that were taken up by the tribunals/courts to solve pandemic related issues. One such key case is ***Sprng Renewable Energy Private Limited v. Central Transmission Utility of India Limited (CTUIL)*** (Sprng Renewable Energy Private Limited v. Central Transmission Utility of India Limited (CTUIL), 525/MP/2020 dated May 23, 2022.). In this case Sprng Renewable Energy Pvt. Ltd., a wholly-owned subsidiary of Sprng Energy Pvt. Ltd. (SEPL), had requested that the Central Electricity Regulatory Commission (CERC) deny a request by Sprng Renewable Energy Pvt. Ltd. to waive its transmission fees, open a letter of credit (LC) for PoC charges, and reject a default notice sent by Sprng Transmission Utilities (CTU) due to a force majeure and change in law event that occurred.

The facts of the case are that on 05.02.2018, Sprng Energy Pvt. Ltd. (SEPL) allotted 300 MW of wind capacity under SECI's 2000 MW RFS. Letter of award (LoA) for the project was issued on 01.06.2018. Subsequently power purchase agreement (PPA) was signed with an effective date from 30.08.2018. Accordingly, the initial scheduled commissioning date (SCOD) turned out to be 29.02.2020 after 18 months from the effective date of PPA. Further petitioner applied to CTU for ISTS connectivity and long-term access (LTA) for evacuation of 300 MW wind power. Stage-I & Stage-II connectivity at Pugalur (existing) ISTS substation was granted by CTU from effective date of 12.07.2018 and 31.10.2019 respectively. Subsequently transmission service agreement (TSA) was signed between petitioner and CTU. Long Term Access (LTA) was granted by CTU to the petitioner from 30.11.2019 till 29.11. 2044. Petitioner submitted a bank guarantee of Rs 5Cr for transmission agreement. Sprng Energy Pvt. Ltd. (SEPL) requested repeated extension of scheduled commissioning date (SCOD) on account of various challenges and impediments which were out of responsible control of the petitioner.

The commission identified three issues and resolved the same. They are:

A. What shall be the date of commencement of LTA of the petitioner?

As per the signed LTA agreement, CTU opened LTA for 300 MW wind capacity from 30.11.2019. Commission noted that LTA agreement has no clause with respect to date from which supply under PPA is anticipated or alignment of such date with LTA start date. The Commission further observed that PPA & LTA agreements are entirely different and distant agreements. Thus, petitioner's prayer for requirement of LTA start date with extended SCOD is rejected.

B. Whether the Petitioner can claim any relief on account of Force Majeure and Change in law events faced by the Project as claimed by the Petitioner?

Commission observed petitioner did not claim any of the time extension based on change in law or force majeure event in terms of signed PPA clauses. SECI allowed time extension of commissioning date based on different government of India & MNRE notification. Thus, in view of the fact that the petitioner never

invoked the provision of Force Majeure or Change in law event, petitioner cannot claim any relief on account of Force Majeure event.

- C. What shall be the liability of the petitioner for payment of transmission charges for the period before COD of its Project?

Commission observed that as per this Regulation, waiver from payment of transmission charges and losses is available for generation based on solar and wind power resources for a period of 25 years from the date of commercial commissioning date. There is no provision for exemption from transmission charges and losses for generation based on solar or wind power resources before the date of commercial operation of such generation projects. Therefore the regulation clearly states that till the generating station has achieved commercial operation, the responsibility to pay transmission charges shall be of the generator. Accordingly, petitioner shall be liable to pay transmission charges for the delay of its project in terms of the 2010 Sharing regulations and the 2020 Sharing regulations for the respective applicable period.

Further commission observed that as the petitioner has already achieved the COD of its project for the full capacity and is availing the waiver of transmission charges, any specific direction on opening of LC is not required.

Therefore, the electricity sector has been battling with financial management and due to payment delays by the State Discoms it has been witnessing bankruptcy of big generation capabilities. Pandemic and lockdown issues have been unique and destructive and are threatening to push an already moribund sector over the top. **In light of the lockdown's precipitous escalation**, the industry has demanded financial assistance in order to alleviate its current restrictions.

Possible Actions Taken by the Government

As elaborated in the previously, how over-production, low consumption and fluctuations were directly impacting the power sector as a whole and this indirectly raised questions upon the regulators as they are the ones who are primarily responsible for the smooth management and stability of the sector in disruptive times or extreme situations.

It is pertinent to note that any real endeavor to reform the energy sector must focus on four priorities: (a) boosting fuel availability by closing the demand-supply gap; (b) addressing energy price through periodic tariff revisions; (c) introducing regulatory reforms; and (d) assuring improvements such as lowering distribution losses, among others. To make headway on any of these, the concerned authorities must go beyond policy and regulatory changes and must also seek to address the challenge of political collective action too (Necoechea-Porras et al., 2021). As a result, deregulation and private engagement in electricity generation and distribution, fuel exploration, as well as advancements in public utility efficiency have been advocated as standard solutions to the problems arising in the sector. Several technical evaluations, on the other hand, oversimplify the problem and do little to address it effectively. Further, as this sector seeks to double India's renewable energy capacity by 2030 the clean energy shift

should also emphasize numerous variables, including clean air, resilience, and economic and social justice, now more than ever, while getting the economy back on track (India can increase, 2021). These obstacles are anticipated to have an impact on demand for clean and renewable energy, making the transition in India's energy sectors more difficult. Transforming each issue into a potential driving force, can help India's economy recover and become more robust by leveraging renewable energy.

Response of the Power Sector Regulators to the Pandemic Disaster

Ministry of Power (MoP)

On March 25, 2020, the MoP released a notification:

- Designating the operation of power generation utilities as a vital service and granting them authorization to move any supplies they would require during the nationwide lockdown. On designating electrical power transmission as an essential service and mandating the continuity and availability of the transmission network for maintaining service during the nationwide lockdown. .
- The MoP issued an Order on March 27, 2020 saying that power may be scheduled even if the PSM is formed for just 50% of the amount for which it must normally be contractually established. On March 28, 2020, the Ministry of Power (MoP) issued instructions to the Central Electricity Regulatory Commission (CERC) to:
 - (a) grant Discoms a 3-month moratorium before making payments to generating companies and transmission licensees; and (b) specify lower Late Payment Surcharge rates (LPSC). Additionally, the MoP asked the state governments to give the state electricity regulatory commissions similar directives (SERCs). On April 6, 2020, MoP made the following clarifications:
 - The requirement to pay for electricity within 45 days of the bill's presentation or in accordance with the terms of Power Purchase Agreements (PPA) remains in effect.
 - The LPSC will only apply at a reduced rate from 24 March 2020 to 30 June 2020, and after that date, it will be payable at the rate specified in the PPA/Regulations. This only applies to payments that become past due between 24 March 2020 and 30 June 2020; it does not apply to payments that were past due prior to 24 March 2020.
 - The responsibility to pay capacity charges and transmission fees in accordance with the PPA will continue.

Ministry of New and Renewable Energy (MNRE)

- On March 20, 2020, MNRE instructed all agencies responsible for carrying out RE projects to treat any delay resulting from a disruption in supply chains brought on by the coronavirus's spread in China or any other country as an FM event and, as a result, to grant suitable extensions for the scheduled commissioning dates (Time extension in Scheduled Commissioning of RE Projects. Grid Solar Power Division (2020, March 20). *Ministry of New and Renewable Energy (MNRE).*).

- The MNRE published a notification on March 26, 2020, identifying the operation of RE power generation utilities as vital services and granting authorization for the movement of materials required by them during the nationwide shutdown (Essential operation of renewable power generation utilities. Grid Solar Power Division (2020, March 26). *Ministry of New and Renewable Energy (MNRE)*.).
- ‘Must Run’ status for RE generating stations:
 - On April 1, 2020, MNRE published an Office Memorandum (O.M.) confirming that the ‘Must Run’ status of renewable energy (RE) generating stations remains intact and that RE generators should be paid on a regular basis, as was the case previous to the nationwide lockdown (Clarification regarding payment to Renewable Energy Generating Stations (REGS). Grid Solar Power Division (2020, April 1). *Ministry of New and Renewable Energy (MNRE)*.)
 - On 04 April 2020, MNRE published an O.M. in continuation of its O.M. dated 01 April 2020, clarifying that the ‘Must Run’ classification of RE generators remains unaltered and that any curtailment for reasons other than grid safety would be considered deemed generation (‘MUST-RUN’ for Renewable Energy Generating Stations. Grid Solar Power Division (2020, April 4). *Ministry of New and Renewable Energy (MNRE)*.).
- On 01 April 2020, MNRE decided that the billing/invoicing for RE generating stations shall continue as follows (Invoice for Renewable Energy (RE) supplied: instructions regarding. Grid Solar Power Division (2020, April 1). *Ministry of New and Renewable Energy (MNRE)*.):
 - Invoices may be accepted through email where billing is handled by a Regional Energy Account or a State Energy Account, and the due date must be determined in accordance with the PPA; Invoices may be accepted by email in cases where billing is handled via Joint Meter Reading (JMR) and JMR is available. In cases where lockdown prevents JMR from being signed, an invoice produced by a RE generator using a meter reading may be approved. For newly commissioned operations, Discoms may opt to pay on the basis of the invoice from the previous month, if it is lower, or, in the alternative, on the base of the invoice for same month of the prior year, if it is lower;
 - Within 15 working days on the date the lock down is lifted, all RE developers must produce hard copies of invoices for any necessary adjustments, if any, from the following bill.

Clearly, the regulators took a pro-active role during the pandemic and tried to anticipate all the de-tracks and control them by issuing timely notifications and orders. Despite the regulators’ efforts, the lockdown continues to be a severe problem for the power industry in India and around the world. The power sector was impacted by changes in the industry’s financial models. It is typical for producing companies in the thermal power sector to pay upfront for inputs like coal and then wait 60–90 days to get the money back from Discom, the distribution utilities.

Therefore, renewable energy is already a major part of the global energy mix, and utility companies are taking steps to incorporate or enhance their use.

Rise in the Renewable Energy Sector During Covid-19

Ernst and Young's Renewable Energy Country Attractiveness Index (RECAI) measures the attractiveness of the world's top 40 countries for renewable energy investments and implementation. Focusing on the energy revolution's primary driver, renewable sources of power, India was rated fourth among the top 40 nations in the RECAI 2020 version. In comparison to the previous editions of the rankings, India has moved up to fourth place from seventh (as of Nov, 2020) (Renewable Energy Country Attractiveness Index (RECAI), 2021).

Similarly, The Covid-19 shutdowns in India temporarily switched the power mix to renewables, and the sector as a whole is now looking at alternatives to achieve a long-term net-zero foreseeable future. When the Covid-19 pandemic restrictions were eased, there was a glimpse of the future, especially of what the energy market would look like in the future, with lower electricity consumption and the operation of solar PV and wind power plants, as well as lower tariffs. Covid-19 related supply chain issues and project shutdowns, as well as increasing major risks, contributed to a 70% decline in New PV capacity installations during the very first half of 2020 as compared with the preceding 3 years (Solar PV – Renewables 2020 – Analysis - IEA). Nevertheless, the percentage values have steadily increased over time. Furthermore, the recovery from the Covid-19 outbreak offered a chance for the Renewable energy sector to improve. There are undoubtedly obstacles in the near future, but renewables have shown to be strong, adaptable, and are well prepared to embrace the opportunity and meet the difficulties that may arise in the future.

Power generation capacity from renewable energy (RE) has grown by more than five times since 2010, with the total installed capacity now at 90.39 GW (as of November 2020). 38 GW and 37 GW of installed wind and solar photovoltaic power production capacity are now available. More than 80% of the capacity for renewable energy-based power generation comes from these two sources (Kumar, 2021a). In their recent renewables market update (2020)¹³, the International Energy Agency (IEA) predicted that India would be one of the biggest contributors to the renewables uplift in 2021, with annual installations almost doubling since 2020. And, as of October, 2021, in the 57th EY Renewable Energy Country Attractiveness Index (RECAI), India has climbed one position to third place. The same can be found in the figures below (Figs. 1 and 2).

In addition, following the Covid-19 outbreak, India's solar sector is predicted to grow significantly, with solar PV generation expected to surpass coal before 2040 (Singh & Gupta, 2019). The Indian government's policy aspirations have accelerated this remarkable shift, resulting in solar PV becoming the region's most cost-competitive power source, which is only becoming better with time. According to research by IEEFA (Garg & Trivedi, 2021), renewable energy investment in India is increasing again after a pause in the previous financial year due to the Covid-19 crisis. Increased investment within India's renewable energy infrastructure is being boosted by recovering energy demand and a rise in bank and financial institutions pledges to quit fossil fuel financing (Vibhuti, IEEFA 2021).

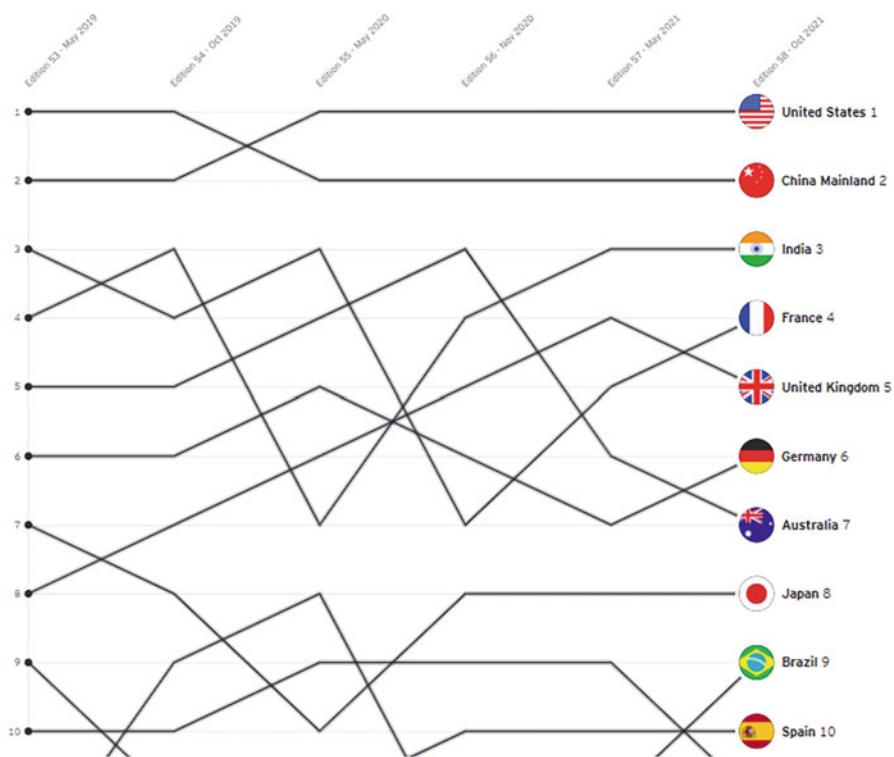


Fig. 1 EY Interactive Chart - Top 10 Ranking & Index score¹⁹

Rank	Previous rank	Movement on previous Index	Country/region	Technology-specific scores (0-100)							
				Onshore wind	Offshore wind	Solar PV	Solar CSP	Biomass	Geothermal	Hydro	
1	1	●	US	72.8	58.3	59.8	57.9	46.3	43.3	46.3	39.9
2	2	●	China Mainland	70.7	54.8	56.8	60.2	53.9	50.8	28.3	54.3
3	3	●	India	70.2	54.3	28.8	62.4	49.6	45.1	25.1	46.2
4	5	▲	France	67.4	54.8	51.9	53.1	22.7	45.9	39.0	40.6
5	4	▼	UK	67.3	57.1	61.4	46.5	14.8	54.1	28.7	38.7

Fig. 2 RECAI - Renewable Energy Country Attractiveness Index, EY¹⁹

Power from wind and solar generators is becoming more affordable at an alarming rate, which is helping to propel the worldwide clean energy revolution. International firms have also increased involvement in renewable energy auctions, allowing for more efficient and competitive tariff discovery. Other policy concerns include priority grid connections, transmission support required for wind and solar power providers, and renewable purchasing responsibilities. India is also moving away from pure solar and wind tenders and toward hybrid RE auctions that comprise solar PV, wind, storage and stranded assets for thermal power generation. This shift is taking place over time. Covid-19 did not stop India from selling an additional 8.2 GW²⁰ of PV capacity by the end of September 2020, broke the previous year's total

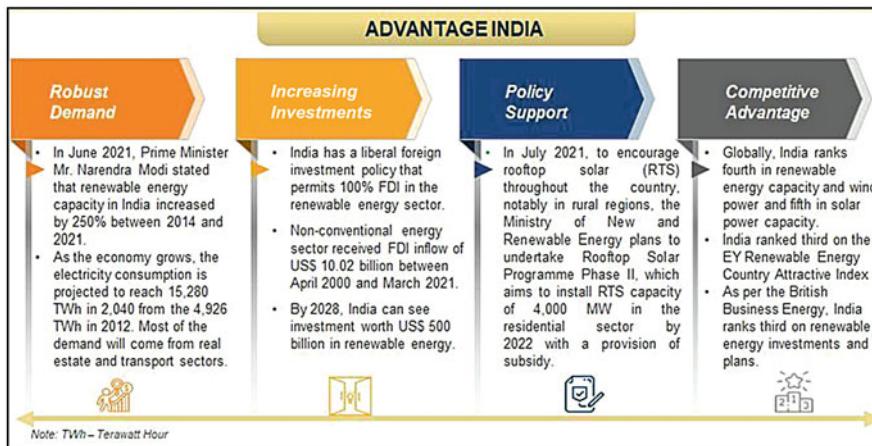


Fig. 3 Growth of Renewable Energy Industry in India: Infographic, IBEF (2021, December 16) (IBEF Infographic. <https://www.ibef.org/industry/renewable-energy/infographic>)

and resulting in continuous tariff reductions. In spite of this, pricing reductions will continue (Fig. 3).

The Solar Energy Corporation of India (SECI) and the Indian Renewable Energy Development Agency Limited (IREDA) will be given enhanced funding as mentioned in the Union Budget 2021, allowing for a greater emphasis on renewable energy (Highlights - Budget 2021–22 Provisions for Renewable Energy (RE) Sector. (n.d.). mnre.gov.in). In addition, the budget highlighted the launching of a comprehensive National Hydrogen Mission to produce hydrogen from renewable sources, which is a positive step. Several infrastructure-related efforts, such as the establishment of a Development Financial Institution for debt financing and the establishment of a central asset management organization to take over distressed assets, will have a significant impact on the electricity and renewables sectors. When considering India's renewable energy sector in the near future, policymakers should also take note that climate change issues are a much greater threat to the country's economic growth ambitions than the present pandemic's shocks.

Conclusion

The implication of Covid-19 crisis on the energy sector and shift to renewable energy transition is complicated, and it will remain so in the foreseeable future. While India's greenhouse gas emissions have decreased for the first time in four decades as a result of lower fossil fuel usage due to lower demand in the energy, industrial, and several sectors, coal continues to hold a large portion of India's energy demands. As a result, India should design a policy framework to address the increasing issues of economic growth and fulfilling energy demands while also

ensuring environmental sustainability for a smoother green transition. In addition, as pollution levels have decreased in many locations, post-Covid 19 India may see an increase in environmental awareness (Kumar, 2021b). Thus, the pandemic pushed India to improve its capacity to keep security of supply, increase system flexibility, and integrate better its energy software and hardware for effective readiness in the face of imminent threats to energy security, as stated above.

India is re-entering a very dynamic period of energy expansion while attempting to recover from the Covid-induced depression of 2020. When it comes to climate change, the mounting intensity that is pushing the global reaction has become a key issue of discussion currently. As a result of India's relatively minor contribution to global greenhouse gas emissions, a change in strategy from the country is much needed (Narain, 2021). Hence, energy-intensive sectors are implementing energy-saving strategies to reduce carbon emissions. As more nations adopt net-zero goals, the renewable sector's future appears optimistic. This might lead to market revolution and cut the cost of renewable technologies even further.

It was estimated that it will take at least 5–6 months for energy consumption to return to pre-pandemic standards. Hence, creating demand during pandemic times was also one of the government's primary priorities during this recovery phase. A lot of steps were taken in this direction and this has not only helped the sector to recover more quickly, but it has also assisted India in its long-term energy demand rise and transition (India's power consumption, 2021). Aside from the level of demands, the sector's financial inadequacies have been exposed during this pandemic. Distribution Companies, or Discoms, the weakest link in the value chain, have been experiencing growing financial difficulties and funds shortages. As a result, the power sector's financial issues are expected to have a substantial influence on the industry's situation of investment in the future. There will be an increasing amount of renewable energy generated by generators as well as by consumers, which will put further strain on electricity distribution companies (Aggarwal et al., 2021).

Likewise, there are several important issues that must be addressed as India attempts to restore its economy which raises the question, Can India continue to grow/expand in the same carbon-intensive, and unsustainable manner, or will it be feasible to shift to a low-carbon, and renewable economy? Hence, it will be desirable for a country aspiring for a \$5 trillion economy (How embracing renewable, 2020) to integrate its policy and expenditure with social, economic, and environmental components of sustainable development for such energy transition.

The following are some of the significant policy possibilities for transition of India's energy mix toward greater renewable energy adoption:

- (a) It would be crucial to incentivize renewable energy generation through subsidies or rate reduction while also limiting the use of fossil fuels.
- (b) Financial resources and instruments such as Green bonds would be appealing to investors, as governments have started emphasizing a green recovery from the Covid-19 crisis.
- (c) For the energy transition to renewables, the government might also encourage investment in cleaner energy sources and implement necessary institutional reforms.

Although these transitions are tough under any conditions, they are especially complex in India's energy sector because of its specific dysfunctions and complicated energy sector. Stronger reform on the other hand seem to be a distant reality unlikely, given the country's politically influenced power sector and its current struggles. Deeper changes in India's energy sector are thus required to assure the energy sector's long-term prosperity. India's history for energy reforms demonstrates that the country is far too huge and varied for a one-size-fits-all strategy (Turning Around the Power Distribution Sector – NITI Aayog (2021)). External insights, institutional frameworks, and new technologies would be needed, however they will not be enough to achieve India's energy sector's transformation. Both the central government and the state government would have to participate and work together. The government of India's support for the Atma Nirbhar Bharat project to promote renewable energy production demonstrates that India is prepared for a greener and sustainable future. Clearly, a decade of adjustment and development awaits the Indian electricity sector. A decade ago, India's renewable energy development was exciting, and Prime Minister Narendra Modi's steadfast goal of 450GW has kept the pace going. Since the release of the Peripheral Services Market regulation and Market-Based Economic Dispatch (MBED), there have been encouraging developments. A market-based approach to procuring power will allow new assets like batteries and demand response to contribute in delivering grid services, and it will enable the least expensive, clean energy to be procured.

These achievements show the Indian government's determination to upgrade the network and improve the sector's operational and financial performance by embracing new business opportunities and clean energy portfolios.

During this shift, India's distribution businesses (discoms) may play a pivotal role to the sector's future. The Indian cabinet's recent approval of a Rs. 3,00,000 crore electricity discom reform scheme demonstrates the significance of discom transformation efforts. Indians have a chance to benefit financially, operationally and environmentally by adopting renewable energy portfolios. The long-term dividends of a discom recovery powered by clean renewable energy portfolios will be realized in the sector's journey toward a clean energy transition.

Discoms are generally considered as a tool to increase overall sector efficiency, however privatization is not always a panacea for increasing performance. As of recently, the central government has stated that it intends to delicense distribution networks and enhance competitiveness among distribution companies so that businesses can contend to supply power through same grid infrastructure and consumers could choose the supplier who offers them the finest quality combination (Singh, 2021).

Suggestions

India's power sector, which is at the heart of the country's economy, is in dire need of more comprehensive reforms to the country's power market.

There are numerous benefits to tighter cooperation between all key parties, including the discoms, the system and grid operators, as well as the regulators through the Central Electricity Regulatory Commission, as demonstrated by the Covid-19 issue. Important power market reforms will not be successful without increased cooperation at the national, regional, and state levels.

Therefore, keeping the same in mind a few key areas to work upon has been suggested which is consonance with the IEA's India 2020- Energy Policy Review. They are:

I. BANKING ON COVID-19 ACTING AS A CATALYST TO BOOST THE POWER SECTOR RESILIENCE: The pandemic has pushed India's power market reforms forward, which have been in the works for some time. Discoms are at the vanguard of change, especially in the struggle against the pandemic, in electricity grids, and in the inclusion of variable renewables. Government must guarantee that distribution sector management is adequate to handle these issues and safeguard the industry's financial and physical resilience so that this can be accomplished efficiently. Despite the necessity of a recovery package, structural reforms are just as critical. Electricity tariff modifications can be an effective economic stimulus. As part of the Make in India initiative, they plan to boost industrial demand while also supporting small and medium-sized firms and manufacturing in the country as a whole. Using the UDAY program as a foundation, a recovery program for the electrical sector currently includes tasks for discoms to continue to cut their losses, ensure high-quality and dependable power, improve invoicing, and support digital payment options. As part of a recovery package, additional procedures must be established to guarantee that any rescues promote long term investment and an economically beneficial future.

II. REFORMING THE ELECTRICITY TARIFF SYSTEM:

A cost-reflective tariff and direct subsidy system are among the improvements praised by the IEA. The electricity industry, on the other hand, has yet to put these principles into action. Even little changes can have an impact: Instead of paying discoms price subsidies for residential customers, India's governments should look at two options: limiting cross-subsidization from industrial demand and providing direct transfers from state budgets for needy consumers.

Because of the high cross-subsidy surcharges, industry has already let go of the grid in many situations and instead has resorted to autonomy and market pricing. A lack of infrastructure and inadequate market reforms imply that development with a view to competitive electricity supply from exchanges is still restricted in India. As part of the recovery package announced in May 2020, the central government requested large public firms to give discoms with cost rebates that will be handed on to industrial consumers.. Energy prices can also help to assess the possibilities for India's energy efficiency, competitiveness and leadership in exporting.

Discoms in India have enormous and diverse customer bases, as well as significant financial obstacles, because of the country's unique demographics. State budgets do not lose money by making direct grants to the most

disadvantaged households and by simplifying power pricing for everyone. As a starting point for state governments and regulators, the government should issue new recommendations for tariff systems across the country.

III. DEVELOPING A MECHANISM OF PAN-INDIA WHOLESALE ELECTRICITY MARKET TO EASE OUT THE BURDEN OF DISCOMS:

The national grid of India is a collection of regional grids. This is reflected in the market and system operations. POSOCO utilizes a multi-tiered system, with one national dispatch center, five regional dispatch centers, and 33 state load dispatch centers. With the exception of renewable energy, the most of India's power generation occurs at the regional and national levels. Although interstate trade and liquidity have improved, power purchase costs have not. The primary goal of power trading is to exchange auxiliary services in order to keep the coordinated system stable (deviation settlement mechanism). Today, wholesale electricity transactions account for just 3% of all electricity sales.

India's power exchange is widely expected to improve trade efficiency, but liquidity is dispersed across a variety of goods and platforms. To diminish state market domination, international experience from the United States and the European Union suggests that regional trading over wider market areas can be facilitated by transmission and system operators. To meet demand in the most efficient and cost-effective way possible, a wholesale energy market based on standard criteria for dispatch and transmission capacity would be ideal.

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Local Community Leaders Operating in Disaster Recovery

112

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Contents

Introduction	1688
Disaster Management in Australia	1689
The Role of Neighborhood Centers in Disaster Management	1690
Shared Responsibility	1691
Personal Preparation Guide for Community Leaders	1693
Community Disaster Fatigue	1698
Discussion	1701
Conclusion	1702
References	1702

Abstract

This chapter is designed to assist community leaders with what to expect when operating in the disaster recovery space. Local place-based community organizations, such as not-for-profits and non-governmental organizations, are pivotal to building the resilience of their communities. Although not established specifically for disaster response, the day-to-day activities of these community organizations have provided them with an unmatched understanding of their community and its needs. Following a disaster, they do not require lead-in time to familiarize themselves with the community due to already delivering essential services and the local presence of their existing operations. Frequently, they already managed

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groups of trained volunteers. As such, these leaders have high levels of expectations placed upon them to assist in disaster recovery. Despite these expectations, their organizations typically remain underfunded and there is little recognition by government authorities of the actual and potential contributions they are able to make. In 2013, fires swept through the Blue Mountains NSW, destroying over 200 homes and damaging many others. Local community leaders found themselves operating in the recovery space without being linked into the official emergency management processes. When the Black Summer bushfires swept through Australia's eastern states in 2019/20, these community leaders knew what to expect, had developed various approaches to previously identified issues, and could capitalize on networks made with emergency services. Our research has informed the development of two generic guides to assist community leaders to prepare for working in the disaster recovery space. Informed by lessons learned and presented in an easy-to-adapt format, these guides are designed for uptake by local community leaders in any region.

Keywords

Local community organizations · Community leaders · Preparation · Disaster fatigue · Resilience · Guide · Emergency

Introduction

Over recent decades, Australia has experienced a series of significant disasters in the form of droughts, flooding, bushfires, and pandemic. These crises have impacted individuals and whole communities, as well as the community organizations that serve them. These recent disasters have taken a heavy toll on community leaders because they are affected at multiple levels: as individuals living in a disaster-affected community and as leaders of their community service organization. As individuals, people in community leadership positions may find themselves and their families in life-threatening situations. At the same time, these leaders are responsible for keeping their service operational, collaborating with other community services, other communities, and emergency responders. Community leaders in the context of this chapter refer to individuals who are responsible for the oversight of an organization or a section of an organization in either a volunteer or paid capacity. They generally have oversight of other workers and/or programs. Thus, this chapter focuses on community leaders and their responsibilities concerning their personal and professional engagement in disaster management and, in particular, in disaster recovery.

Disaster literature includes knowledge about the resilience of individuals and how they deal with preparing for and recovering from a disaster. In addition, it is known that planning for service continuity is a core activity for leaders of local community organizations. However, there is very little by way of kits, guides, or advice for local community leaders to inform them of what to expect, personally, in terms of

demands for knowledge, time, and capacity, in the event of a disaster. Furthermore, at a more collective level, the phenomenon of communities experiencing collective fatigue after having experienced an overlapping series of crises has just begun to be acknowledged and addressed (Ingham et al., *in press*). Recognizing disaster fatigue as a phenomenon that affects how people perceive, react, adapt, and make (or do not make) decisions is paramount for people in leadership positions operating in a disaster-affected community.

The purpose of this chapter is to draw attention to the development of two distinct guides. One guide assists community leaders to prepare themselves as individuals for working in the disaster recovery space. The other guide helps community leaders identify collective disaster fatigue. Together, these guides are intended to be understood against the background of the institutional development and responsibilities of disaster management in Australia. We consider anyone who manages five or more people, in either a volunteer or career capacity, to be a community leader.

Disaster Management in Australia

In Australia, politics, decision-making, and operational tasks are regulated by law at various levels of government. The overarching Commonwealth Government is the peak policy body. In the context of disaster, the Australian Commonwealth Government provides support to the states and territories when requested, usually in the form of financial assistance. Beneath the Commonwealth Government sit the State and Territory governments. Each takes responsibility for a wide range of disaster-related activities, including the “primary responsibility for the protection of life, property and the environment within the bounds of their jurisdiction” (Elphick, 2020, p. 3). Subsidiary to the State governments, there is a multitude of local governments whose role in disaster management is to manage local disaster operations; this includes planning for local natural hazards, bridging communications between emergency services and the community, and overseeing and financing the various socioeconomic costs of recovery at a local level.

The 2003 Canberra bushfires and Cyclone Larry in Queensland in 2006 highlighted the importance of community-based facilities for recovery management, which includes both emergency services and local government agencies (Eyre, 2004; Gordon, 2004). The concept of “shared responsibility” (Council of Australian Governments, 2011; McLennan & Handmer, 2014) and joint involvement of the community sector and emergency services in emergency management have been favorably commented upon in several reports, including the Victorian Bushfires Royal Commission (Parliament of Victoria, 2009), the Queensland Floods Commission of Inquiry (2012), and the Keelty (2011) Report on the Perth Bushfires 2011. Despite this affirmation, Australia’s three levels of government lead to an unclear distribution of responsibility and unwieldy rules and regulations. In a large-scale disaster, this can be detrimental, particularly at the community level. This situation is also observable in countries with a similar sociocultural context, such as in New Zealand, where, after the earthquakes of 2010–2011 in Christchurch, many

residents felt personally disempowered. In contrast, community-led reconstruction measures were viewed more positively (Redshaw & Ingham, 2015). Firmly anchored in the community, community organizations were able to set up activities with other community organizations and manage local projects. These kinds of community connections create social support networks and participation opportunities that are demonstrated to increase the morale of the community.

In Australia, despite what one could regard as an excessive level of government, there are many community needs that no level of government takes full, if any, responsibility for. To address this gap, many volunteer, private, and not-for-profit organizations have arisen to take up the challenge of meeting community needs not fully addressed by government bodies. These organizations, while frequently having a national governance structure or a loose affiliation across regions and other organizations, are largely focused on small local communities both in terms of recruitment of volunteer and funded staff and in terms of the people whose needs they serve. Their funding is uncertain and largely community-based, and their leadership is comprised of selfless individuals of remarkable spirit and capacity. Because these groups are in contact with the most vulnerable members of the community on a day-to-day basis through the provision of services and assistance, they are well-positioned to be called upon by official recovery operations to provide essential assistance when the community is threatened by and recovering from disaster.

The Role of Neighborhood Centers in Disaster Management

Community groups include neighborhood centers and other organizations that provide a wide range of family and community services. From a historical perspective, local community services had their origins in the 1960s and 1970s. Various movements influenced the rise in community development, such as the second wave of feminism and other social reforms (Australian Neighbourhood Houses and Centres Association, 2011; Lyons, 2001; Rooney, 2011; West End Community House, 2011). Before 1970, most social services and health and leisure facilities were in the hands of religious or charitable organizations (Lyons, 2001; Rooney, 2011). Rooney (2011) emphasized the difference between local community services and previous models of service. Local community organizations were compared to religious institutions in the community and included community development and self-determination aimed at social justice. Local community organizations continue to pursue similar goals today. The Local Community Services Association (2009) and the Australian Neighbourhood Houses and Centres Association (2011) identify with shared values, such as social inclusion, community development, local participation, community management from the bottom-up, and grassroots work with the most disadvantaged and socially isolated community members. These neighborhood organizations are a crucial part of the social infrastructure at the local level as centers that can be quickly adapted to meet new requirements (Izmir et al., 2009). Despite their importance, many local community organizations are limited in their sources of

income to provide services; nearly 60% of neighborhood centers have an annual income of less than \$250,000 and 52% do not employ full-time staff (Australian Neighbourhood Houses and Centres Association, 2011). Also, most of the funding for local community organizations comes from government sources, much of it through competitive funding processes (Australian Bureau of Statistics, 2015).

Neighborhood centers have in-depth knowledge of their community, often foster well-trained networks of volunteers, and employ people from the community where they can. Neighborhood centers are regarded as taking care of the “neighborhood” as a small parochial physical locality, as well as the “community,” which comprises a larger number of neighborhoods (Redshaw & Ingham, 2017). In particular, neighborhood centers in NSW are commissioned by the Department of Family and Community Services to build networks within communities that enhance community welfare. While some of these community organizations have associations with emergency services, they are unfortunately often overlooked in the official local disaster planning mechanisms and processes. However, effective participation in emergency planning is an important contribution to strengthening the well-being of a community (Redshaw et al., 2017).

In the Australian context, neighborhood centers play a central role. Their overriding task is to reduce social and financial disadvantage, and to increase the capacity of the community (Ingham & Redshaw, 2017a). Some claim that neighborhoods have declined in importance because people are often away from home due to employment and other activities, which take advantage of increasing mobility. As a result, it is suggested that neighborly contact is less important and has been replaced by social networking via electronic media (Beck, 1997; Crow et al., 2002; Sennett, 1998). This is an important consideration as disasters generally require a place-based response and recovery effort.

Shared Responsibility

At the time of the 2013 fires in the Blue Mountains, there were no formal links between the local community and the local emergency services. The Blue Mountains are a peri-urban regional area to the west of Sydney, NSW. It includes 27 villages, has a population of 80,000, is heavily forested, and depends on tourism. The villages span a 100 km mountain ridge. There is one main traffic axis through the Blue Mountains, creating a particular challenge in the event of a disaster. Risks include road closures and power outages, which are usually the result of bushfires or severe storms (Ingham & Redshaw, 2017b). In 2013, fires in the Blue Mountains destroyed over 200 homes. Local community leaders initially worked in the recovery arena without being included in the official emergency management response and recovery operations. In contrast, during the 2019/20 Black Summer bushfires that swept through the eastern states of Australia, the local community leaders knew what to expect and had plans in place for their client group and liaising with emergency services.

The 2013 recovery experience illustrates how the two sectors of emergency management and community services can find a common operating procedure for working in disaster planning and recovery. Before the 2013 fires, the two groups had very little awareness and understanding of each other, and the move toward cooperation constituted a major paradigm shift. Ingham and Redshaw (2017a) examined possible difficulties in connecting the local community and emergency services and issues that required resolving to re-envision the role of emergency services in the community. This is a challenge in Australia because emergency management activities are not uniformly regulated and there is still great potential for improvement. Part of the paradigm shift is, for example, getting away from the perception of an emergency service organization as a rescue service and the local community as a passive entity awaiting "rescue." To change this situation, the National Strategy for Disaster Resilience (Council of Australian Governments, 2011) was developed. It mandates that communities as a whole should work toward "shared responsibility." Such a paradigm shift is difficult to make since rescue services have paramilitary origins and adopt a hierarchical structure for decision-making. This is in direct contrast to the participatory and collaborative approach of the community sector, which, based on their collective beginnings, tends to make decisions based on collegial principles of cooperation and service.

Furthermore, it has been shown that the flow of information plays a central role in managing emergencies. Information sharing is the most effective when all community members receive the same message (Schraagen & van de Ven, 2011). People in the community sector commit a lot of time to discussing and reaching a consensus on issues of importance. On the other hand, the emergency service representatives found such consultation to be an excruciating time-taking process. In addition, differences in organizational priorities made collaboration difficult; some focused on physical and structural issues associated with the restoration of properties while others concentrated on psychosocial aspects of recovery. Hence, it took time to develop a common operating approach.

The National Strategy for Disaster Resilience (Council of Australian Governments, 2011) and the Emergency management Australia handbook 6: Community engagement framework (AIDR, 2013) address the central question of who is responsible for the disaster resilience of the community. Both documents argue for "shared responsibility" and encourage local communities and emergency services to work together in building local disaster resilience. Such a shift, which ostensibly aims at building more disaster-resistant communities, can be explained against the background of the increasing frequency of major catastrophic events. Furthermore, there is potential for cost reduction if the resilience of communities can be increased through the use of unused social resources (Islam et al., 2012). Transferring responsibility for well-being and resilience to individual local communities is expected to result in improved recovery after disasters (Gil-Rivas & Kilmer, 2016; Madsen & O'Mullan, 2016). This involves activating local organizations and volunteers from different walks of life and can lead to public savings (Oliva & Lazzeretti, 2018).

Within Australia's national policy, volunteers are expected to play an increasingly important role in disaster management and recovery. Activating local volunteers,

however, means engaging in volunteer recruitment, training, and management at the community level. In the case of disasters and emergencies, a large number of volunteers are usually required very quickly, either through formal agencies or informal spontaneous undertakings. Traditionally, volunteering is an ongoing commitment to a particular community. The reality of recent disaster events has shown that volunteering tends to shift toward short-term commitments based on existing community skills and networks. In Australia, it is also noticeable that in times of crisis individuals with strong local networks and local knowledge, such as community leaders, are very effective in arranging volunteering (Ingham et al., 2021).

The next section elaborates on what personal preparations community leaders should consider before a disaster occurs.

Personal Preparation Guide for Community Leaders

People in community leadership roles are involved in disasters at both the individual and the community level; therefore, they need to make personal as well as professional preparations. During the 2013 fires, community leaders were called on to engage in disaster recovery without prior incorporation into the local formal disaster management processes. Some community leaders involved in the 2013 fire incidents in the Blue Mountains had to cope with personal family trauma and disruption at home, and then uncertainty at work, whilst daily driving through devastation and destruction to get to their workplace. At work, they spent all day with disaster-affected people before traveling home again through burnt-out streets. This constant exposure substantially increased their trauma.

To learn from this experience, the research examined the practice of these community leaders (Ingham et al., 2021). In general, community leaders are perceived as strong, reliable people who know what to expect in an emergency. After all, their services target people in distress, facing homelessness, domestic violence, and so on. However, very little research concentrates on the personal resilience of community leaders suddenly thrust into the disaster recovery arena. Additionally, very few arrangements are put in place to enable the community leaders to meet the additional demands that they are called upon to address, even though working in disaster recovery raises not only their workloads but also increases their stress levels. For this reason, ongoing research is directed at establishing what local community leaders need to increase their preparedness and ultimately enhance their human capital for working in disaster recovery (Ingham et al., *in press*).

Table 1 presents a guide designed to assist local leaders who want to prepare strategies for themselves so that when disaster strikes they are in a position to take care of their well-being as well as that of the community. The guide is intended to be “workshopped” individually or with a group of local leaders. The list is not exhaustive and within different cultural settings the issues raised may vary in level of relevance. Community leaders are encouraged to use the guide as a basis for identifying the issues and challenges, including additions to this list, that are most relevant to them. Once the issues within a given context are identified, the suggested

Table 1 Guide for the personal preparation of local community leaders (Ingham et al., 2021, p. 506)

Issue to prepare for	Challenges and contributing factors	Personal preparation strategies	Outcomes
Personal well-being	<p>Challenges</p> <ul style="list-style-type: none"> Blurring of personal and professional boundaries for workers living and working in the same locality Dealing with uncertainty at work and having to cope with your own family trauma and disruption Failure to allocate personal and family time because of ongoing community needs <p>Contributing factors</p> <ul style="list-style-type: none"> Frustration caused by issues such as the need to seek permission for actions; inappropriate policy or inappropriate application of policy and undue bureaucratic processes Mounting demands from clients and staff as the impact of disaster proceeds 	<p>Develop your own strategies to</p> <ul style="list-style-type: none"> Distinguishing between personal and professional obligations Quarantining family time Establish a modus operandi for unscheduled events 	A workable strategy to manage the various dimensions of your personal and professional life
Personal access to required knowledge	<p>Challenges</p> <ul style="list-style-type: none"> Increased and excessive community demand for information <p>Contributing factors</p> <ul style="list-style-type: none"> A community belief that you know the answers to the questions they ask A community belief that you have unique access to all of the information they need A community belief that you will be responsible for 	<p>Take time to</p> <ul style="list-style-type: none"> Establish a list of personal priorities for the nature of the information that you are going to take responsibility to provide Establish a list of data sources and a means of accessing those data sources under the pressures of a disaster event Establish strategies for disseminating information during a disaster event 	Enhancement of your personal capability to provide others with advice, guidance, and service direction related to seeking disaster assistance

(continued)

Table 1 (continued)

Issue to prepare for	Challenges and contributing factors	Personal preparation strategies	Outcomes
	disseminating all necessary information	Establish a list of alternative data sources for information that you are not able to take responsibility for	
Personal networking relationships	<p>Challenges</p> <p>Failure to receive timely emergency communications during an event</p> <p>Failure to achieve a collaborative decision-making relationship with emergency services</p> <p>Exclusion from official recovery briefing sessions</p> <p>Knowledge of local vulnerable people not sought by local authorities</p> <p>Contributing factors</p> <p>Little or no relationship with emergency services prior to an event</p> <p>Clash of the emergency services culture of “command and control” with the community service culture of collaborative decision-making</p> <p>Differences in recovery objectives – for example, the emergency service desire to “mop up” in the direct aftermath, compared with the community service desire to ensure psychosocial well-being</p>	<p>Ensure that, prior to an event, you</p> <p>Inform yourself about operating in a command and control environment (i.e., be prepared to adapt to the culture of the emergency service responders)</p> <p>Build a connection between the emergency services and local community groups</p> <p>Establish your responsibilities with the emergency service bodies</p> <p>Have the courage to break with organizational bureaucracy and invent recovery processes as you go</p>	<p>Development of community and emergency service collaboration evidenced through collaborative activities such as</p> <p>Combined disaster and preparedness expos</p> <p>Collaborative delivery of household preparedness programs</p> <p>Combined calendar to display each organization’s proposed activities</p> <p>Inclusion of local community groups representative on the Local Emergency Management Committee</p>

(continued)

Table 1 (continued)

Issue to prepare for	Challenges and contributing factors	Personal preparation strategies	Outcomes
Personal communication strategy	<p>Challenges</p> <p>Exclusion from formal media activities</p> <p>Important messages for the community may be ignored by the appointed emergency services media officer</p> <p>Contributing factors</p> <p>Misreporting by the mainstream media</p>	<p>Be prepared to</p> <p>Undertake professional development for engaging with the media</p> <p>Develop alternative means of communicating with staff, clients and your family</p> <p>Publish your own communications vehicle</p> <p>Access existing multimedia sites or establish your own platform</p>	<p>Success in Reducing misinformation and misunderstanding for staff, clients, and the community in general</p> <p>Establishing a connected recovery space where everyone aims for the same goals</p>
Personal interaction with workers	<p>Challenges</p> <p>Stressed working relationships</p> <p>Absenteeism</p> <p>Loss of existing volunteers</p> <p>Influx of untrained volunteers</p> <p>Contributing factors</p> <p>Committed and hardworking staff are themselves victims of the disaster</p> <p>A need by workers for support and encouragement in difficult times</p>	<p>It is essential that you</p> <p>Trust your workers</p> <p>Establish a working culture of watching out for signs of worker distress</p> <p>Prepare to respond to distressed workers</p> <p>Facilitate access to counselors both within and outside of the community</p>	<p>The establishment of a workforce that is</p> <ul style="list-style-type: none"> Relatively safe Reliable Stable Committed
Personal interaction with community members	<p>Challenges</p> <p>Communities impacted by disaster will exhibit a marked increase in a range of issues that community services are called upon to address, including family domestic violence, alcoholism, relationship breakdowns, and job losses</p>	<p>Familiarize yourself with</p> <p>Alternative individuals, groups, or programs within the community that can be called upon for assistance</p> <p>Individuals, groups, and programs from outside of the community that could be called upon for assistance or to whom</p>	<p>Timely implementation of, or access to, appropriate programs</p>

(continued)

Table 1 (continued)

Issue to prepare for	Challenges and contributing factors	Personal preparation strategies	Outcomes
	Contributing factors Normally available community intervention and assistance to deal with trauma is also disrupted by the disaster	those in need could be referred	
Back-up to sustain normal activities	Challenges Leaders are frequently called away from their normal tasks to meet the needs that arise in an emergency and subsequent recovery Contributing factors Emergencies give rise to many additional meetings and the need to set up recovery-related programs	Plan to Fill your substantive position through determining how to fund a replacement Train existing staff to undertake your normal duties Establish individual and community resilience as part of your organizations core business/mission statement	Ensure a combined effort to make backfilling of community leader positions a reality

strategies can be adapted, or alternate strategies devised concerning the particulars of a specific situation. The overriding goal is to have community leaders begin to think about the personal challenges that they will be confronted with in the event of a disaster and to assist them to prepare so that their effectiveness in working on behalf of a community under stress will not be diminished.

The guide (Table 1) consists of seven issues presented in the left-hand column. The guide provides for each issue a list of challenges, preparation strategies, and outcomes, and is intended to be adapted and extrapolated by everyone who uses it. For example, in terms of personal well-being, the challenges for community leaders may consist in maintaining an adequate balance between personal and family time and community needs. The strategy of “establishing a modus operandi for unscheduled events” can be effective to deal with the challenge. This may lead to a workable strategy to manage the various dimensions of personal and professional life.

To complement the importance of community leader readiness at the individual and professional level, the phenomenon of disaster fatigue at a community level is presented in the next section. Informed by community leader experience in the Blue Mountains, this section looks at an affected community after a disaster from the perspective of the community as a whole and considers Community Disaster Fatigue criteria. These criteria are presented to assist community leaders to identify the onset of disaster fatigue at their worker and client group level.

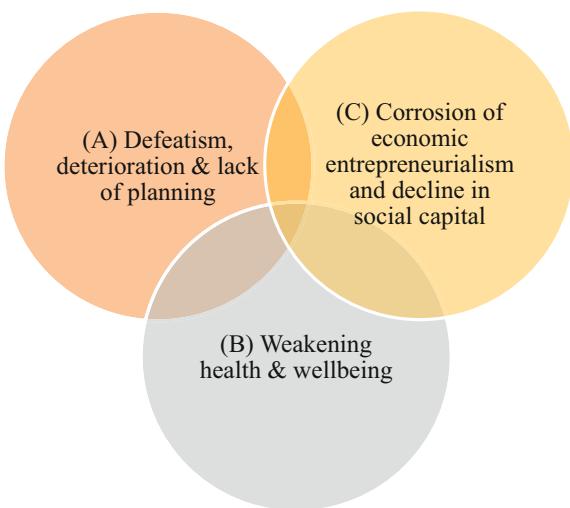
Community Disaster Fatigue

Disaster fatigue in a community affects how the community perceives, reacts, and adapts to risk and makes (or does not make) decisions and the quality of the decisions themselves. Complex disasters, for example, often lead to conflict in decision-making. In general, it can be said that household preparedness and evacuation planning is the priority of most official communications from the emergency services and increasingly, from community organizations. This messaging prioritizes a focus on physical property preparation and evacuation planning for household members. Very little attention is paid to psychosocial preparedness for disaster. The phenomenon of community disaster fatigue is introduced as an explanatory factor for the failure of a community to recover and move forward following a disaster or series of disaster events. It encompasses not only the community's ability to establish and maintain a resilience to adversity through appropriate disaster management structures, but also an apparent numbing of both its social (including health) and economic (or business) activities that can see all aspects of community atrophy and result in community stagnation.

When investigating a community that has experienced a disaster, one has to go beyond an individualized viewpoint focusing on people who experience fatigue or post-traumatic stress disorder (PTSD). Such an individualistic understanding falls short when diagnosing a crisis-affected community because a community as a whole is more than the sum of its residents. Disaster fatigue at the community level is a macro-phenomenon that manifests itself at the community or region level and must be formally defined as such, and not at the individual level (Ingham et al., [in press](#)). Hence, this is about community disaster fatigue on a collective level. Failures at this collective level due to the unresolved state of complex disasters can have long-term negative effects on the community and its ability to plan constructively for its health, economic, and social needs. For example, disaster fatigue in a community can slow down its potential redevelopment or even prevent changes in health, economic, and social practices that would be necessary to move forward from a crisis event.

Investigating the nature of a community and its organizations under “normal” circumstances, communities are usually dynamic structures and constantly adapt to changes and new issues. Thus, a healthy community strives to continuously improve and grow its standard of living. In this way, a healthy community builds its capacities by striving for social goals and the integration of different groups to achieve positive growth and adequately deal with failures (Zautra et al., [2008](#)). This natural process can be interrupted or even reversed by catastrophic events. Most of the time, communities can respond to such disturbances, defend themselves, and continue on a constructive path. To be able to deal better with disasters, it is necessary to move away from seeing disaster and resilience as something event-centered and instead to use a process-centered approach. Such a process-oriented approach makes it possible to understand resilience as something that improves the quality of life in a community, as people are connected, and thus social capital can grow (Elliott et al., [2010](#)). The challenge for a community going through a series of catastrophic events is that it must deal with preparing for the next catastrophe before it has sufficiently recovered

Fig. 1 Components of community disaster fatigue in community (Ingham et al., *in press*, p. 4)



from the previous one. In addition, disaster events can differ greatly from one another and therefore require very different responses from a community (Ingham et al., *in press*). Hence, crisis-affected communities can show signs of community disaster fatigue. Defining and investigating the signs of stress and fatigue in a community has significant implications for national, state, and local government officials and emergency services personnel tasked with dealing with a new disaster. When people in a community whose houses have not yet been restored from the previous catastrophe, whose businesses or livelihoods have not yet recovered and whose neighbors are still in need, where children are only just going back to school, and social life is still blocked or is severely disturbed, dealing with a new disaster becomes difficult and one can speak of collective disaster fatigue.

Figure 1 depicts the concept of community disaster fatigue. The three issues identified of (A) defeatism, deterioration, and lack of planning; (B) weakening health and well-being; and (C) corrosion of economic entrepreneurialism and decline in social capital, are components of community disaster fatigue. Each is an issue that, when present, the community must address, targeted solutions are usually available for each. However, the presence of two of these components increases the complexity of recovery as the solution for one problem may not be appropriate for the other and, indeed, practical solutions for any one problem may be ineffective when the problem is found in combination with one of the others. When all three issues combine, the community may simply abandon any effort at recovery as it lacks the resources to deal with this level of complexity. Overall, a community's disaster fatigue manifests itself on a collective level through the collapse of resilience. While a healthy community exhibits collective strength in mental health, well-being, and socioeconomic strengths, a complex disaster can disrupt the cohesion of a community and weaken its resilience. As a consequence, domestic violence can rise after a

Table 2 Collective indicators of disaster fatigue (Ingham et al., *in press*)

Lens through which disaster fatigue was viewed	Collective indicators of disaster fatigue
<i>Defeatism, deterioration, and lack of planning (A)</i>	<p>Dissatisfaction with disaster risk governance in terms of recovery progress, resulting in group protest causing disruption</p> <p>Lack of response by the community</p> <p>Increasing levels of unemployment</p> <p>Communities lacking focus or purpose</p> <p>Declining ability and opportunities for community-based initiatives; reduced participation in regional and state-level decision making</p> <p>Increased demands on police and other public officials</p>
<i>Weakening mental health and well-being (B)</i>	<p>On a collective scale known as public health</p> <p>Increased demand for various mental health and community support services</p> <p>Mistrust of other communities fed by social distancing, e.g., not wanting tourists to visit as they may bring COVID-19</p> <p>Reduction (either temporary or permanent) in organized social activities</p> <p>Widespread nonparticipation in organized activities</p> <p>Collective trauma and helplessness (Chang 2017; McFarland and Norris, 2006)</p> <p>Collective complicated grief</p> <p>Extra burden on social and community support services</p>
<i>Corrosion of economic entrepreneurship and decline in social capital (C)</i>	<p>Waning production in local businesses</p> <p>Dissolution or a prolonged hiatus of previously active community groups</p> <p>Lack of safe housing (Gearhart et al., 2018)</p> <p>Lack of community networks and social support (Gearhart et al., 2018)</p> <p>Suboptimal decision-making due to poor information flow and time pressure</p> <p>Increased political polarization</p>

disaster (Gearhart et al., 2018). Individual needs arising from the breakdown of social relationships then place an additional burden on community support services. In this respect, the increasing demand for social services can serve as an indicator of disaster fatigue in the community.

Research on the fires in the Blue Mountains in October 2013 led to the creation of a Community Disaster Fatigue Guide. The study of leaders involved in the fires in the Blue Mountains informed the list of collective indicators of disaster fatigue displayed in Table 2 (Ingham et al., *in press*, p. 13). These indicators can be used to determine whether a community is in a state of disaster fatigue. Table 2 is intended to provide an initial checklist for community leaders and people involved in community decision-making so that they can recognize signs of disaster fatigue in their

community at an early stage and take steps for its management before it becomes unmanageable.

Currently, many community organizations within the Blue Mountains include building individual and community resilience as a part of their core business. They do this in the knowledge that a community that is resilient in daily life is also more resilient during and after a disaster. Consequently, community services deliver disaster preparedness programs and consider them integral to core business instead of it being “an ‘add-on’ activity” (Ingham & Redshaw, 2017a, p. 59).

Discussion

Research demonstrates that in disaster management individuals, community services, including volunteer organizations, and the community as a whole are strongly interconnected (Ingham et al., *in press*). Community leaders are particularly challenged because they are affected by a disaster at all levels: in their personal lives as an individual community member, as the head of a crisis-affected community organization, and in their collaborations and networking with other communities and state and federal agencies. On the individual level, people in a complex disaster situation are looking for guidance to get through the crisis. At the same time, community leaders and their organizations face high expectations to help their communities with disaster recovery. Such community organizations, however, tend to remain underfunded and the real and potential contribution they make is poorly recognized by the government agencies. On a community level, a disaster remains in the collective memory of a community for a long time in the form of “memories, the memorials and the evidence of burned houses, blackened landscapes and empty cleared blocks” (Ingham & Redshaw, 2017a, p. 62).

It has been recognized that building resilience in daily life as a complement to building resilience for disasters requires an integrated approach. However, the “current climate of rather short contracts and funding limited to recovery processes with an ‘end date’ fails to recognise the integrated nature of such connections in building resilience during daily living and the flow-on effect into disaster resilience” (Ingham & Redshaw, 2017a, p. 61). Therefore, the concept of recovery as an endpoint needs to be questioned as recovery should be something that is continually evolving with the constantly developing community.

So far, the important differences between the ways community organizations and emergency services operate have been discussed in terms of hierarchy and decision-making. As a result, it is suggested that a common operating picture needs to be established before a disaster, as heralded in Australia’s National Strategy for Disaster Resilience (Council of Australian Governments, 2011). A recommendation, therefore, consists in the integration of disaster risk reduction into the “core business” of community organizations through the establishment of partnerships and a working relationship with local emergency services organizations in-between disasters. Such joint local disaster planning initiatives on the community level strengthen the connection and commitment of the various stakeholders. To capitalize on the local

knowledge of community leaders, community leaders require recognition from their emergency service partners and the provision of appropriate training and funding from the government.

Conclusion

Both the Personal Preparation Guide and the Community Disaster Fatigue Guide have been developed from research with one community; however, they are intended to be applied to other communities. These other communities can be both within Australia, and indeed in an international context, as the issues confronting community leaders when facing devastating events may bear many similarities. However, even in situations where the community context may be very different, each guide presents a methodology to be adopted and applied, taking account of the local context, to ensure that the universal issues of leader vulnerability and community fatigue are addressed and dealt with so that the impact of a disaster can be, to that extent, limited.

Resilient community leaders are integral to the recovery of their community; thus, the implications of the Personal Preparation Guide and the Community Disaster Fatigue Guide are far-reaching in terms of preparing and retaining community leaders for the long-haul task of community recovery. Implementing these guides will help ensure that the impact of a disaster on them personally is minimized, thereby increasing their efficiency to continue operating efficiently and effectively on behalf of a community in need.

Learnings for investigations about the past show that there is a need to clarify the roles and responsibilities of community organizations and emergency services in times of disaster. In addition, a community preparing for, responding to, and recovering from a disaster should be recognized as a fully involved entity, not something that recovery operations and emergency services “work on” and then disappear from. And finally, the financial and human cost to the community services sector should be taken into account when they are called upon to assist with government-provisioned surge capacity demands involving community organizations.

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Post-Disaster Dispute Resolution: A New Zealand Case Study

113

Toni Collins and W. John Hopkins

Contents

Introduction	1706
The Aotearoa New Zealand Insurance Context	1706
Why Efficient and Effective Insurance Dispute Resolution in Post-Earthquake Canterbury Failed	1707
Dispute Resolution Framework not set up for Disasters	1708
Delay	1708
Addressing the Issues: Too Little Too Late?	1709
Residential Advisory Service	1709
Greater Christchurch Claims Resolution Service	1710
Canterbury Earthquakes Insurance Tribunal	1710
High Court Earthquake List	1711
Conclusion: Learning from Aotearoa New Zealand's Mistakes	1711
References	1712

Abstract

Disasters expose underlying weaknesses in systems and processes. When the dispute resolution framework is not set up to be robust in “normal times,” it is inevitable that the entities tasked with dispute resolution will fail to cope with the enormous increase in disputes after a disaster. Lengthy delays in resolving disputes leave a trail of destruction and exacerbate the suffering of the victims. At worst, the failure of the dispute resolution system may “become the disaster” affecting the physical and mental health of claimants on top of their economic loss. This has broader implications for the community and society as a whole. This chapter briefly explores some of the problems that arise when post-disaster disputes are not resolved effectively and efficiently, drawing on lessons learned from New Zealand’s 2010/2011 Canterbury earthquake sequence.

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Introduction

Efficient and effective dispute resolution in the aftermath of a disaster is a key factor in the resilience of a society and its recovery. The specific context for such dispute resolution varies across jurisdictions, but the key problems remain the same: delays in economic recovery, uncertainty about long-term plans for victims, and the psychological inability to “move on” (see, e.g., the many longitudinal studies around the long-term impact of Hurricane Katrina; Galea et al. 2008). It is notable in particular that although medical evidence seems to suggest that the psychological impacts of a disaster can fade swiftly (Rubonis & Bickman, 1991), when the economic and social consequences linger, so do the psychological impacts (Lima et al., 1987). Delayed dispute resolution is therefore a serious impediment to disaster recovery.

For this reason, the experiences of Aotearoa New Zealand provide both lessons for this jurisdiction and for the wider world. Eleven years on from the Canterbury earthquake sequence of 2010/2011 and 7 years after the “Kaikoura earthquake” of 2016, for many victims of the disaster the event has not concluded. A significant number of disputes, particularly relating to insurance claims, are still ongoing which impacts on recovery. Clearly, the existing framework for resolving these disputes has not worked well. This is not a controversial point. One of the key findings of the Royal Commission into how the main earthquake insurer dealt with disputes was that “dispute resolution was ineffective which had a significant detrimental impact on claimants and the region’s recovery as a whole” (Public Inquiry into the Earthquake Commission, 2020, part 6, pp. 186–194).

This chapter briefly explores these issues with a focus on insurance and the responses developed in Aotearoa New Zealand, before placing them in the context of disaster law and recovery more generally.

The Aotearoa New Zealand Insurance Context

The Canterbury earthquake sequence, which began in September 2010 and continued for over 18 months, was to become the largest disaster in post-war New Zealand history. As such, it provided the biggest test for New Zealand’s unique post-war approach to disaster insurance. In response to several significant earthquakes during the period 1929–1942 (the 7.8 magnitude Murchison earthquake in 1929, the 7.8 magnitude Napier earthquake in 1931, and the Wairarapa earthquakes – two of greater than magnitude 7 – in 1942), a National Disaster Fund, financed by levies paid by New Zealand residents as part of their home insurance policies, was established in 1945 (EQC, n.d.-a). The fund continues to this day and is managed by the Earthquake Commission (EQC), a Crown entity (a public body, independent

of government but part of the state sector), which provides insurance to residential property owners affected by natural disasters (of any sort) for the first NZD 150,000 of their claim. At the time of the earthquakes, EQC paid the first NZD 100,000 of the claim and the balance was covered by the private insurer. That amount was increased in 2019 to NZD 150,000 by the Earthquake Commission Amendment Act 2019, and in October 2022 it is set to rise again to NZD 300,000 (see Clark, 2021). The fund was established to encourage private insurers to remain in the New Zealand market, an aim that has been largely achieved. For this reason, despite the fact that New Zealand has significant hazard risk, it retains a high level of insurance cover in the event of “natural” disasters. Up until 2010, the fund had not experienced large claims and had a healthy balance of NZD 6.1 billion. This situation changed dramatically as a consequence of the Canterbury earthquake sequence, after which the fund was entirely depleted. EQC now aims to rebuild the fund to NZD 1.75 billion by 2030 (EQC has reinsurance, but it must meet the cost of all claims up to NZD 1.75 billion before it can call on its reinsurance cover; EQC, n.d.-b). Although this high level of insurance has generally been seen as a way of mitigating the impact of disasters in New Zealand, as the seismic events over the last 11 years have shown, this advantage came at a significant cost.

Prior to the Canterbury earthquake sequence, the framework for resolving insurance disputes was by way of standard dispute resolution processes, including private mediation and generalist financial service provider dispute resolution schemes (any insurer who provides services to consumers must belong to an approved dispute resolution scheme under the Financial Service Providers (Registration and Dispute Resolution) Act 2008; see Insurance Council of New Zealand, n.d.). Complaints arising from these dispute resolution mechanisms could be taken to the (industry-funded) Insurance and Financial Services Ombudsman or to the (public) New Zealand Ombudsman, in the case of EQC. In addition, the less formal Disputes Tribunal (a division of the District Court) could be utilized for claims up to NZD 30,000, with the formal courts available for larger and more complex claims (the District Court for claims at the time up to NZD 200,000 and the High Court for larger or more complex disputes).

In “normal times” this framework for dispute resolution seemed to work adequately. However, prior to the earthquakes there were already warning signs that the courts were coming under increasing pressure with their workloads. The mounting delays in hearing cases were occurring without the added burden of a monumental increase of claims arising from a disaster (Controller and Auditor General, 2009).

Why Efficient and Effective Insurance Dispute Resolution in Post-Earthquake Canterbury Failed

It is well established that system weaknesses are highlighted and exacerbated in any disaster. In fact, disasters do not occur naturally. To use the words of Ilan Kelman, societies “choose” to allow them to happen, by their policy decisions (Kelman, 2020). This was clearly borne out in the experience of claimants engaging in dispute

resolution in the aftermath of the Canterbury earthquakes. Quite simply, Aotearoa New Zealand was unprepared for the volume and complexity of the disputes that arose. The main barriers to the efficient resolution of post-disaster disputes were a lack of options for dispute resolution and severe delay in getting disputes resolved.

Dispute Resolution Framework not set up for Disasters

The existing dispute resolution framework was not conducive to resolving large numbers of disputes in an efficient and effective way. Many of the earthquake-related issues that arose could have been resolved through mediation as they were simply not suited to an adversarial court system, yet initially there was no choice. The majority of issues were in respect of property and business and therefore fell outside the financial limits of the speedy, inexpensive, and informal Disputes Tribunal and the less costly District Court. Consequently, the High Court suddenly became the “go-to” for dispute resolution, which made the process expensive, resource intensive, formal, and slow (Finn & Toomey, 2022).

Delay

A range of factors caused delays in the resolution of disputes. The complexity of the issues, a lack of technical experts, and vulnerable claimants were common problems. Substantial damage to residential houses and commercial buildings meant assessments could only be carried out by experts. These experts did not have capacity for the volume of claims which arise in a disaster situation, and they struggled to meet the huge demand. This meant there were significant delays in obtaining expert reports, with anecdotal evidence of one report taking 11 months to be completed (Little, 2018). These reports were crucial to the mediation or court process. There were also issues with experts disagreeing on the damage and the strategy for remediation, which increased the time that it took to resolve the dispute.

Other complex issues arose too. Many claimants had grievances with their insurance companies around whether the loss was covered by their specific insurance contracts, in addition to the time taken to process and pay claims. Furthermore, issues arose from the fact that the earthquakes were large and the sequence prolonged. The September 2010 earthquake was a major event followed by 18 months of aftershocks, including some significant and damaging events in February, June, and December 2011. Buildings and homes damaged in the first earthquake were then further damaged in subsequent aftershocks, which led to multiple claims over several events. This created confusion around the liability of insurers for multiple events and the interplay between the two insurers (EQC and the private insurance company) for the claims. All of these complex issues were significant barriers to the efficient and effective resolution of disputes.

Tactical approaches used by insurance companies added to the difficulties in resolving disputes and prolonged them. Many cases were also delayed by the

perceived need for court decisions to clarify the law although, in the event, many of such cases were settled just before trial (usually by the insurance providers), to avoid the creation of any precedent (Finn & Toomey, 2015).

Delays in resolving disputes were also caused by the sheer volume of claims coming before the High Court, which it struggled to manage. In addition, there were disruptions to hearings because the court buildings in the central city were inaccessible and court staff had to find alternative venues at various places around the city, which were not necessarily fit for purpose.

Addressing the Issues: Too Little Too Late?

The framework for dispute resolution in existence at the time of the earthquakes had systemic problems that needed to be addressed. It is therefore not surprising to find that, when the Canterbury earthquake sequence hit, the dispute resolution mechanisms were ill prepared to cope with the onslaught of claims that had to be resolved. The courts recognized this early on and took action immediately. The government was not as quick to act. This hesitant approach added to the delay in resolving disputes and is most likely one of the reasons why there are still earthquake-related claims being processed today (over 10 years after the event).

The new initiatives established in response to the disaster seem to have worked well and lessons can be learned from them for future events. Advisory services for claimants were established in the form of the Residential Advisory Service and the Greater Christchurch Claims Resolution Service. A specialist tribunal was established to specifically deal with earthquake-related disputes. The judiciary created a unique system for managing the huge numbers of earthquake-related cases filed in the High Court. These initiatives are explored briefly below.

Residential Advisory Service

In 2013, an independent specialist service called the Residential Advisory Service (RAS) was established by the Canterbury Earthquake Recovery Authority together with support from insurers, the Christchurch City Council and EQC, to assist property owners of earthquake-damaged homes. In 2015, the government took over the operation and funding of this entity. The RAS offers a free and independent advisory service with its purpose being to assist homeowners with the progression of their claims with EQC and their insurer. It provides the services of a broker who assists by arranging meetings with all parties involved in the claim. The service provides access to legal support through Community Law (a legal aid service with charitable status and significant public funding) and technical assistance for engineering issues. It has been perceived as a successful initiative for dispute resolution and has generally been positively received by its users (Stevenson, 2018; Public Inquiry into the Earthquake Commission 2020, p. 190; RAS, n.d.). Since the establishment of the Greater Christchurch Claims Resolution Service (discussed

below), the RAS now deals with claims relating to disasters other than the Canterbury earthquake sequence.

Greater Christchurch Claims Resolution Service

Eight years after the earthquakes, in 2019, the government established the Greater Christchurch Claims Resolution Service (GCCRS) to specifically assist with earthquake-related dispute resolution. It was one of a number of initiatives carried out in response to the 2018 Independent Ministerial Advisor's Report to speed up the resolution of outstanding insurance claims to EQC. It is operated by the Ministry of Business, Innovation and Employment (MBIE), together with support from Treasury, EQC, private insurers, Community Law, and Engineering New Zealand. The GCCRS is another service that fills the gap in dispute resolution between the RAS and the tribunal/court system. It provides homeowners with free facilitation and determination services including engineering and legal advice as well as well-being support. It leads the claim process by coordinating with all agencies involved to work through the issues. If the dispute cannot be resolved by negotiation, the GCCRS provides an internal dispute resolution service involving mediation, determination by arbitration, or a combination of both. User exit surveys have recorded that as at 2020, 86% of homeowners said they would recommend the GCCRS to others and 74% reported their well-being had improved as a result of the support they received from GCCRS (MBIE, 2020, p. 47).

Canterbury Earthquakes Insurance Tribunal

The government's response to the huge increase in court cases was very slow. It did recognize that claimants needed options for dispute resolution outside the court system, yet it was not until 2019, some 8 years after the earthquakes, that a specialist tribunal was established – the Canterbury Earthquakes Insurance Tribunal (Canterbury Earthquakes Insurance Tribunal Act 2019; Khouri, 2017). This tribunal was created to provide a fair, speedy, flexible, and cost-effective way to resolve disputes. Unfortunately, the government may have underestimated the demand for this service, and in its first year of operation the tribunal experienced delays in hearing cases, which added to the frustration of claimants.

Nevertheless, the tribunal has been a successful initiative in resolving earthquake-related disputes (Canterbury Earthquakes Insurance Tribunal, 2021). It has provided an alternative service for claimants than costly court proceedings and has additionally provided important rulings on legal issues where called upon to do so.

The one major limitation of the tribunal is that it was set up in the aftermath of, and in response to, a specific disaster. It has been set up for the special and limited purpose of resolving disputes over insurance claims arising from the Canterbury earthquakes between the specific dates of 2010 and 31 December 2011. Any claims relating to the later Kaikōura earthquake in 2016 or to do with properties where

earthquake-related damage has been discovered after a property has been “on sold,” for example, are outside its jurisdiction.

High Court Earthquake List

Very soon after the Canterbury earthquake sequence occurred, it became apparent that the courts were becoming overwhelmed with the volume of disputes. The judiciary recognized that a better system of managing the claims needed to be implemented to ensure a more streamlined process in operation. This recognition, combined with the Chief High Court Judge’s commitment to ensuring earthquake cases would be dealt with as swiftly as the court’s resources would permit, paved the way for the creation of the first High Court Earthquake List in 2012 (the year following the earthquakes). The purpose of this list was to ensure earthquake-related cases received fast-track case management by expeditious processing at the early stages of the cases, through to trial, and to ensure that priority be given to urgent cases or those with precedential value. The list is still operational today and provides an example of an innovative response to disaster-related dispute resolution that worked and continues to work relatively well (Kos, 2016; New Zealand High Court, 2020).

Despite the success of the Earthquake List, resolving disputes in the courts also came with problems. One glaring issue was the significant power imbalance between the insured and insurers. Large insurance companies being repeat players in the litigation scene (to use Galanter’s classic typology) were often pitted against inexperienced first-time litigants (Galanter, 1974). Many disputes were long, drawn out and expensive and often affected the mental and physical health of the claimants.

It did not end there. To add to the stress of the earthquake-affected community, there emerged another group of cases involving defective earthquake repairs, which further exacerbated the existing problems.

Conclusion: Learning from Aotearoa New Zealand’s Mistakes

The framework that existed in Aotearoa New Zealand for resolving insurance disputes did not provide efficient and effective dispute resolution for victims of the Canterbury earthquake sequence. The fact that there are still claims before the courts and tribunal over 10 years after the event is clear evidence that New Zealand did not get this right. To build a dispute resolution system resilient to future disasters requires reflection, change, and preparation. The following are suggestions, building upon the Canterbury experience, to achieve this end goal.

First, it is important to get it right from the start. This means that the dispute resolution framework should be planned in advance to ensure it can address the needs of its community in a time of disaster. Unnecessary disputes should be avoided by considering and clarifying in advance those issues that are likely to be problematic in a disaster. In essence, it is important to reduce the need for disputes in normal

times where possible because the need will be significantly worse in a time of crisis. However, as part of a disaster preparedness strategy, it is essential to ensure there are dispute resolution mechanisms able to cater to the different types of disputes that will emerge and that the dispute resolution mechanisms available are resourced to cope with the inevitable large influx of claims in the aftermath of a disaster.

Second, the dispute resolution framework should aim to enable disputes to be resolved quickly and cost-effectively in “normal” times and then be able to “step it up” when needed in a disaster. The formal court process struggles to cope as the main dispute resolution mechanism. It is not set up to provide the quick, informal, and cost-effective resolutions to disputes claimants may seek. Instead, claimants should be empowered to be in control of their dispute by the provision of free impartial, independent advice and support services including legal and technical expertise. This helps to address the power imbalance between the parties and places the claimant squarely in the forefront of the process, although is still only a solution that addresses the symptoms of the problem, not the cure for it.

Third, avoid creating new processes and mechanisms for resolving disputes midway through the disaster and in the years following. Hastily introducing new models during a time of crisis takes too long to implement and risks creating confusion unless they have been part of pre-planning. In the Aotearoa New Zealand situation, with the exception of the High Court Earthquake List, the response was too late.

Disasters expose underlying weaknesses in systems and processes. It is therefore essential that fundamental issues in dispute resolution mechanisms are addressed before disaster strikes. These issues include the fact the system clearly favors large players, allows game playing and tactics that preserve the power imbalance between parties, and, most significantly, creates delay in the resolution of disputes. Ensuring that lessons are learned from past experiences and applied in advance to make dispute resolution mechanisms fit for purpose in “normal times” is easier than trying to make a flawed system work in a crisis. If the mechanisms do not work in a disaster, the consequences of the hazard are exacerbated, as are its effects on the affected community and, potentially, far more widely. In worst case scenarios if the dispute resolution mechanisms fail, they, themselves, can “become the disaster” in a situation where there is already a huge amount of suffering. Either way, if states do not resolve these issues before a disaster strikes, they once again “choose” to inflict a further disaster upon the victims of nature’s hazards, causing more harm, stress, and suffering to those who have suffered enough.

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The Need for Health Emergency Law in India

114

Manika Kamthan

Contents

Introduction	1716
What Is Right to Health?	1717
Right to Health in India	1718
Right to Health During COVID-19 in India	1719
Conclusion	1722
References	1723

Abstract

COVID-19 has uncovered cracks in the Indian legal system and the public healthcare system. The Government of India, on March 24, 2020, imposed a lockdown across the entire country to contain the outbreak of the virus. Interestingly, this lockdown was imposed by invoking not only Section 2 of the Epidemic Diseases Act of 1897 but also the Disaster Management Act of 2005 to handle the pandemic. In the present chapter, it is argued that the Indian legal system has proved insufficient to handle the situation created by the pandemic and totally ignores the right to health of citizens. A pandemic like this not only affects the health of people but also leaves the economy in shambles. The sudden lockdown of the nation took the unorganized sector by surprise. Thousands of migrant workers and domestic workers were left to the mercy of their employers. In the chapter, we try to argue that an appropriate health emergency law could accommodate many demands which emerge during a pandemic.

Keywords

Health emergency · Right to health · COVID-19 · Pandemic

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Introduction

COVID-19 is an infectious disease caused by a virus called coronavirus. China announced an outbreak of COVID-19 on January 7, 2020, and on March 11, 2020, the World Health Organization declared COVID-19 a pandemic. The World Health Organization issued simple guidelines relating to sanitizing and washing hands frequently and social distancing as preventive measures. These were followed by all countries. To contain the outbreak of the virus, the Government of India followed suit and imposed a countrywide lockdown. This lockdown was imposed by invoking Section 2 of the Epidemic Diseases Act of 1897. The Epidemic Diseases Act of 1897 was enacted by the British for dealing with the bubonic plague in Bombay in 1896. It is one of the shortest pieces of legislation. Section 3 of the Act empowers both central and state governments to do anything in order to control the spread of epidemics. Any person who disobeys government orders will be penalized under Section 188 of the Indian Penal Code (IPC). No public officer will be charged for doing anything in good faith under the Act. Recently, the parliament amended the Act by an ordinance which was passed in the context of attacks on health workers. The Epidemics Diseases Amendment Act of 2020 defines healthcare service personnel and includes measures for the prevention of violence against them. It also expands the power of the central government to prevent and contain the spread of epidemic diseases. It made such violent acts against healthcare service personnel and property as non-bailable and a cognizable offense punishable with a fine between 50,000 and 2,00,000 and imprisonment of 3–5 years. The healthcare service personnel are also entitled to compensation for injury or damage of property. It is very fascinating to note that even in the backdrop of a grave health emergency, the government chose to keep the “epidemic” undefined. This leads to lack of clarity and objectivity and enables the government to misuse it in situations it deems fit. The law empowers the government to take all necessary actions which it deems fit for containing and preventing the outbreak of epidemic diseases. The government has interpreted this as then power to order lockdowns and quarantine rules. However, the functions of the government are not enumerated. It neither imposes any obligation on the government to impose lockdown within a stipulated time frame nor does it contain any kind of checks and balances to ensure accountability of the authorities. Also, the law recognizes only land and sea routes and does not consider air routes because at the time of its enactment in 1897, air travel was not very prevalent.

The Indian Penal Code (IPC) acts as ancillary to the powers of the government under the Epidemics Diseases Amendment Act. Section 188 of IPC makes willful disobedience to the orders issued by a public officer an offence punishable with 1 month imprisonment or a fine amounting to 200 rupees. If the disobedience endangers the life, safety, and health of another human or it causes affray or riot, the punishment for the same would be a fine of 1000 rupees or a jail term for a duration of 6 months or both. Sections 269 and 270 of the IPC also empower the state to punish any malignant or negligent act which spreads an infectious disease endangering the life of others with a fine or imprisonment of 6 months to a maximum duration of 2 years or both. Section 271 empowers the state to punish willful

disobedience to orders for quarantining vessels to prevent the spread of infectious diseases.

For the purpose of containing the spread of COVID-19, the Government of India apart from invoking the Epidemics Diseases Amendment Act, the National Disaster Management Authority (NDMA) also invoked its powers under Section 6 of the Disaster Management Act of 2005. Section 6 of the Act empowers the NDMA to formulate policies and plans and lay down guidelines for managing a disaster so as to ensure a timely and effective response to disasters. On March 24, 2020, NDMA directed ministries, departments of the Government of India, state governments, and state authorities to take measures for ensuring social distancing for containing the spread of COVID-19 in the country.

The legal framework for containing epidemics and disaster management in India is largely punitive in nature and lacks human rights approach. It largely comprises powers of the authorities to penalize people who violate the orders passed by them. A legal framework serves three-dimensional purposes, i.e., risk reduction, preparedness, and how to respond. A good law serves all three purposes. It has to be both preventive and punitive in nature. In this chapter, it is argued that COVID-19 aggravated existing vulnerabilities and exposed the inadequacies of the legal framework which failed to address the human rights of people. The chapter focuses on the right to health during COVID-19 and makes a case for a special health emergency law to prevent violation of the right to health during pandemics.

What Is Right to Health?

The right to health is part of the grand narrative of global justice which focuses on the individual as opposed to the country, community, or culture. WHO defines health as “A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (Saracci, 1997). Article 25 of UDHR has a very holistic view of the right to health and provides that, everyone *has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing, and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age, or other lack of livelihood in circumstances beyond his control*. It can be noticed that good health is the outcome of a well-fitting comprehensive policy on different aspects of life and thus need all-around state initiatives in all related fields. Article 12 of the ICESCR also provides that the states shall try to attain the highest standards of physical and mental health for their citizens. Section 12(2)(c) states that “The steps to be taken by the States Parties to the present Covenant to achieve the full realization of this right shall include those necessary for the prevention, treatment, and control of epidemic, endemic, occupational and other diseases.” The CESCR General Comment No. 14: The Right to the Highest Attainable Standard of Health (Art. 12) provides that health is an essential human right that is indispensable for the realization of every other human right. It highlighted the four facets of the right to health which lay down the pathway for the states to work on:

1. Availability.
2. Accessibility.
3. Acceptability.
4. Quality.

In the context of health emergencies, these are the four deliverables that become the essence of the right to health. The four aspects consider both individual's preconditions, for example, socioeconomic and biological, and the capacity of the state to fulfill its obligations.

Right to Health in India

COVID-19 has once again fueled the right to health debate all over the world. Article 25 of UDHR entails the right to a decent standard of living must be enjoyed by everyone. The state should provide basic necessities like clothing and food, other utilities like medical care and housing, and a social security network to people who cannot provide for themselves. Article 12 of the International Covenant on Economic, Social and Cultural Rights says that all state parties shall identify and provide for the right to the physical and mental health of its citizens. India is a founding member of the United Nations and has also signed and rectified ICESCR. However, there is no explicit provision in the Constitution of India for the right to health. However, there are several judicial decisions that have interpreted the right to health as an integral part of the right to life under Article 21 of the Indian Constitution. In *Bandhua Mukti Morcha V UOI (1984)*, the Supreme Court held that the right to dignity and health fall under the ambit of the right to life under Article 21. In *Parmanand Katara V UOI (1989)*, it was held by the Supreme Court that no doctor of any hospital employed at a private or government hospital can reject treatment to a patient. The Court further widened the scope of the right to health by observing in *Paschim Banga Khet Mazdoor Samiti V State of West Bengal (Paschim Banga Khet Mazdoor Samiti V State of West Bengal, 1996)* that the Government is responsible for ensuring that every person gets appropriate medical assistance aiming to provide public welfare at large. In *State of Punjab V Mohinder Singh Chawla (1997)*, it was held by the apex court that the right to life encompasses the right to health which is an integral part of the right to life and the government is under a constitutional mandate to provide for healthcare facilities. The failure of authorities to provide appropriate healthcare can be considered a violation of the right to life.

Apart from judicial decisions, the Directive Principles of State Policy also indirectly manifest the right to health. Although non-justifiable by the force of law, Directive Principles are important for the good governance of the country (Article 37). The idea behind Directive Principles of State Policy is that of the "welfare state." The Principles concerning right to health are the following:

Article 38: The State shall promote the welfare of its people.

Article 39: The State shall ensure the health and strength of workers, men and women, and the tender age of children are not abused and that citizens are not forced by economic necessity to enter avocations unsuited to their age or strength.

Article 47: The State shall strive to raise level of nutrition and the standard of living of its people and the improvement of public health as among its primary duties and, in particular, the State shall endeavor to bring about prohibition of the consumption except for medicinal purposes of intoxicating drinks and of drugs which are injurious to health.

We find the reflection of these Directive Principles of state policy in several legislations. For example, the Mental Healthcare Act of 2017 created a justiciable right to mental healthcare. The Act ensures affordable mental healthcare and easy access to services. The Act protects people from inhuman and degrading treatment and provides for free legal services. Similarly, the National Food Security Act of 2013 showcases the paradigm shift from a welfare approach to one based on rights. Under the Act, 75% of the rural population and 50% of the urban population can obtain food grains at a subsidized cost under the Targeted Public Distribution System ([GOI](#)).

Recent welfare schemes like *Ayushman Bharat* also focus on the right-based approach toward health. It envisages establishing as many as 150,000 primary healthcare and wellness centers for providing good healthcare. It also seeks to implement Pradhan Mantri Suraksha Bima Yojana which provides health insurance coverage to the tune of Rs. 5 lakhs per year to more than 10 crores impoverished families in India. However, it must be noted that the right to health is not an exclusive fundamental right under the Constitutional scheme.

Right to Health During COVID-19 in India

A disease which affects a huge number of persons in a region, community, or population is called an epidemic. An epidemic becomes a pandemic when it is spread over multiple countries. According to Nelson et al. ([2007](#)), a health emergency is characterized by both its consequences and causes along with the precipitating events. An outbreak of a disease or a situation can become an emergency when its consequences have an overwhelming impact on the capabilities of the existing infrastructure to address them. Article 12 of the International Covenant on Economic, Social and Cultural Rights requires the states to take actions for *prevention, treatment, and control of epidemic, endemic, and occupational and other diseases*. During COVID-19, most of the states struggled to provide medical care and healthcare equipment like oxygen cylinders, ventilators, etc. As far as the right to health, it can be understood that healthcare is provided to everyone equally and no one must be subjected to any discrimination on economic condition, disability, class, gender, caste, economic condition, etc. ([Pūras et al., 2020](#)). A rights-based response

to COVID-19 must also ensure access to correct information about the virus, availability of facilities, and vaccination drives (Human Rights Watch, 2021).

The first response to COVID-19 was to impose lockdown. The impact of lockdown on the lives of people raises serious questions on its impact on human rights. COVID-19 and human rights can be looked into from three dimensions, i.e., (1) restricting individual rights to protect public health; (2) impact of lockdown on sociopolitical rights like right to housing, employment opportunities, food, water, and social security; and (3) international assistance and collaboration (Sekalala et al., 2020). But as discussed above, the legal framework does not address the issue of human rights while addressing and managing pandemics.

Being prepared for a public health emergency is not just the betterment of the existing capabilities but should also focus on four key aspects: mitigation, preparedness, response, and recovery. There are two kinds of measures: structural and nonstructural. Guidelines, policies, and laws are nonstructural measures, and strengthening human resources and good infrastructure are considered structural measures (Sahoo et al., 2020). Public health legislations play important role in the containment of the diseases.

As discussed above, the quarantine rules were enforced in order to curb the spread of COVID-19. However, it is argued that the Indian legal response to COVID-19 has ignored the philosophical understanding of the term “public health.” Public Health is “the science and art of preventing disease, prolonging life and promoting health through the organized efforts and informed choices of society, organizations, public and private, communities and individuals” (Winslow, 1920). So this prevention of disease and promotion of health in “public health law” terms is considered to be the duty of the state. As the definition provides, it requires organized efforts from various players in the society, and with that collaboration, the state can exercise its powers and duties (Gostin Lawrence & Wiley, 2008: 4). The purpose of public health law is to create an “infrastructure” wherein the legal authorities created will exercise their power to promote health. This can be done through agencies established for the maintenance of data, an inspection of patients for diseases, granting of licenses to public health officials and clinics, carrying out educational activities for spreading awareness regarding a disease, etc. It can also be an “interventional” purpose wherein efforts are taken to restrict a particular disease, i.e., maintaining the proper quality of water in waterborne diseases, social distancing, or quarantine of people in case there is a spread of communicable disease, etc.

If we specifically look at India and how it deals with public health, the obfuscation starts with the power to make law itself. In our scheme of things, the parliament has limited power to legislate on the state list. The state list has enumerated entries on which the states have exclusive jurisdiction to legislate which includes public health, hospitals and dispensaries, and water and sanitation. Now the issue arises as to how can the parliament legislate on a state list subject that is of our concern, public health. The Constitution of India has a provision that provides if there is a need for legislation to be made on the state list in “necessary or expedient in the national interest,” the Rajya Sabha may by a two-thirds majority allow the parliament to pass legislation on the state list.

The only legislation we have in India to tackle such epidemics directly is the pre-independence Epidemic Diseases Act (EDA) of 1987 (hereinafter “the Act”), which has been used for a century to deal with diseases such as malaria and cholera in India. Enacted after the bubonic plague in Mumbai which later spread to other parts of India, it has not undergone any substantial amendment. Moreover, no rules or regulations have been made under the Act. Certain rudimentary elements to deal with epidemics have been mentioned in the Act such as restrictions on travel, inspection and quarantine, and separate accommodation for those infected. For violations of the provisions of this law, the penalty is pari passu read with Section 188 of the Indian Penal Code dealing with disobedience of government order.

Apart from it being a century-old law, it has other limitations. Firstly, it does not define essential terms such as “infectious,” “dangerous,” “contagious diseases,” etc. let alone “epidemic.” This creates an ambiguity as to which category the disease can be put so as to choose the degree of restrictions or measures required to arrest or suppress it. Secondly, it provides no procedure as to how the essential services or vaccine (if available) can be supplied to the general public in order to maintain a lockdown or effective quarantine in cases of communicable diseases. Thirdly, there is no protection of human rights for people who are working in these situations for the betterment of public health. Among all, the major drawback of the Act is that it describes only the “powers” of state and central government, failing to enumerate the duty of the government to prevent or control the epidemic.

A limitation of this Act that cannot be independently accorded to the Act itself is that if District Magistrate passes an order under Section 144 of the Criminal Procedure Code, and the state or central government promulgates an order under the Act, which order will have primacy. There is a fundamental administrative flaw that needs to be addressed so that it does not touch upon the ever-sensitive federalism nerve but promotes cooperative federalism.

To address the issue of attacks on healthcare personnel and certain quarantine and travel restrictions, the president amended the Act through an ordinance (Ordinance, 2020). It provides stricter punishment of jail term for a minimum duration of 6 months and a fine which may extend to 5,00,000 rupees for committing an act of violence to or grievously hurting any healthcare professional who is serving the people. It defines what healthcare service personnel means, hence eliminating the ambiguity that may be caused. Though this can be considered a progressive step, there are major flaws in the Act which require a complete overhaul. Now, as all states have their healthcare setup and hierarchy already in operation, amending the Act to suit the system will make less sense. The Disaster Management Act of 2005 was also invoked to manage COVID-19. Interestingly, the DMA (2005) was never conceptualized to deal with health emergencies. But it was invoked to enforce lockdown to contain the outbreak of COVID-19.

In the absence of a strong legal framework to protect rights during COVID-19, the Indian judiciary responded to varied matters having impact on human rights. In Shashank Deo Sudhi V UOI (2020), the Supreme Court directed that all citizens eligible under the Ayushman Bharat Pradhan Mantri Jan Arogya Yojana and other

economically weaker sections as notified by the government to conduct COVID-19 test of people free of cost. Andhra Pradesh High Court also directed the state government to ensure the availability of personal protective equipment (PPE) to doctors, nurses, and other healthcare staff working in government and private hospitals ([Corona Virus-COVID-19 Pandemic v. Government of Andhra Pradesh, 2020](#)).

Conclusion

Several federal countries like Canada, Australia, the USA, and England have exclusive laws to deal with health emergencies ([Tewari, 2020](#)). India is also in urgent need of an exclusive and comprehensive law to address health emergencies that can avoid regional disparities and enforce the right to health of its citizens in its truest sense. It is imperative to view the management of health emergencies from the “rights-based” approach. The present Indian legal framework as discussed can only impose restrictions in terms of managing health emergencies. It fails to create a framework that can ensure better expenditure on healthcare infrastructure, rights of patients, and duties of the government during a health emergency.

In 2017, the Union Government drafted the Public Health (Prevention, Control, and Management of epidemics, bioterrorism, and disasters) Bill of 2017. It aimed to empower local government bodies for recognizing the right to health. It was expected to repeal the Epidemic Diseases Act. However, the Bill was never tabled in the parliament. Since health is a “state” subject, many states like Gujarat and Karnataka have drafted their own health legislations. The National Health Bill of 2009 also aimed at providing a legal framework for the essential public health services by recognizing the fundamental right to health. It also outlined collaborative federal machinery to provide healthcare during health emergencies, but this Bill also never saw the light of the day because states saw it as an encroachment on their sacrosanct domains. The biggest hurdle in drafting a public health emergency law is the nonrecognition of the right to health as an exclusive fundamental right. The recommendation to recognize the right to life as a fundamental right was made by a High-Level Group on the Health Sector constituted under the 15th Finance Commission in September 2019. It also suggested shifting “health” from the “state” list to the “concurrent” list. It will strengthen people’s access to healthcare.

The National Human Rights Commission, in the wake of COVID-19, constituted a committee on the impact of the COVID-19 pandemic on human rights and future responses. On the basis of the assessment done by the committee, NHRC issued an advisory on the “right to health in the context of COVID-19.” It recognized the fact that even before the outbreak of COVID-19, the Indian healthcare system had been struggling to meet the healthcare requirements of the population. COVID-19 has further worsened the situation. The outbreak of an epidemic shifts the attention from other health emergencies and all resources are diverted to contain the epidemic which creates havoc. Emergency trauma care also gets affected due to a shortage of staff and diversion of resources. The advisory is quite comprehensive and focuses

on the most important aspect of the right to health, i.e., access to healthcare. It provides for the right to treatment without discrimination, access to vaccination, access to healthcare in public health facilities, the need to ensure confidentiality and human dignity, and the right to privacy of patients among several other important advisories (NHRC, 2020). The advisory is worthy of being converted into law on the subject of the public health emergency. COVID-19 has given the Indian government an opportunity to do away with the archaic colonial law and draft a special health emergency law that is rooted in the right to health of its citizens.

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Making Those Accountable for Man-Made Natural Disasters: A Critical Appraisal of the Law with Special Reference to Sri Lanka

115

Kokila Konasinghe and Akalanka Thilakarathna

Contents

Introduction	1726
Human Activities and Their Adverse Impact on the Environment	1727
Human Activities and Man-Made Disasters	1728
Liability Regime Under Environmental Law	1729
“Polluter Pays” Principle and Liability for Environmental Harm	1730
Possibility of Using the “Polluter Pays” Principle Concerning Man-Made Natural Disasters	1731
Suggestions at Holding Those Accountable for Man-Made Natural Disasters	1732
Conclusion	1733
References	1734

Abstract

Sri Lanka is hailed for its richness in environmental beauty and abundant biodiversity. As a country, it is one of the safest places to live in with its geographical location, climate patterns, and the lack of potential for some natural disasters such as volcanoes and earthquakes. However, it has recently been devastated by several natural disasters such as floods and droughts which have taken a heavy toll on the livelihoods of the people living in affected areas. While these disasters could be termed as “natural” in some sense, when one considers the broader picture, human activities have had a profound impact on the occurrence and the frequency of these natural disasters which goes unnoticed at times. Therefore, this research is focused on discussing the liability of those who contribute to creating natural disasters through their own activities by causing harm to the natural environment. Using a doctrinal approach embedded in qualitative methodology, this chapter attempts to design a liability regime for

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those who either directly or indirectly contribute to the creation of natural disasters. The results reveal that the existing legal system fails to impose pecuniary liability upon those who either directly or indirectly contribute to the creation of natural disasters and that the use of the “polluter pays” principle is inadequate at times since all harm that is caused to the environment cannot be rectified with compensation. Therefore, it is suggested that awarding exemplary damages, shifting the burden of proof upon the exploiters of natural resources to prove that such exploitation does not cause or aid in the creation of natural disasters, and environmental taxation should be better utilized in making this novel concept a reality which is nonetheless a sine qua non for environmental protection and governance.

Keywords

Environmental protection · Man-made disasters · Liability for environmental harm · Sri Lanka

Introduction

The environment, as simple as it may sound, has had a really challenging time in the recent past due to the activities of mankind which have caused a great deal of destruction to it. In the discourse of the environment, environmental degradation and its destruction take a central place in the grand scheme of things. So profound is this adverse impact on the environment, that it has changed from the common heritage of mankind to the common concern of mankind (Thilakarathna, 2019). Much of this environmental degradation has been caused by many human activities that have gone out of proportion. Environmental degradation can be identified as “the deterioration of the environment through depletion of resources which includes all the biotic and abiotic elements that form our surrounding that is air, water, soil, plant animals, and all other living and non-living element of the planet of the earth” (Maurya, 2020). The alarming nature of the problem was realized in the 1960s when many countries had solely focused on rebuilding their countries after the devastations caused by the effects of the second world war. While countries were less conscious about the damage that they were causing to the environment in the race to rebuild their nations, soon it became evident that what they were doing was causing harm to the environment at unprecedented levels which led the world leaders to come together and do something about it, resulting in the United Nations Conference on the Human Environment of 1972, commonly known as the Stockholm Declaration which focused on the environmental issues and discussed such issues as international concerns. This initiative marked the start of a dialogue between the developed and developing countries on the link between economic growth and the protection of the environment, thus allowing for a discourse on sustainable development. While it has continued the pursuit with the Rio Declaration of 1992,

Johannesburg Accord of 2002, and the 2012 Accord of Rio-De Janeiro, many environmental issues have remained unsolved and much of it can be attributed to the uncontrolled, overwhelming, and unsustainable activities of mankind. One of the main reasons for the inability to put an end to this destruction can be attributed to the fact that much of what has been caused by mankind to the environment goes without being properly punished. This in turn would deter others from causing such devastation to the environment. Environmental harm has remained a crime without a perpetrator. Unlike the crimes that we encounter regarding property and body, environmental crimes (and environmental harms) are much more versatile, and they leave long-lasting and irreversible effects upon the environment which are often incapable of being resurrected through compensation (Nurse, 2022). To this end, one must find a proper way of making those accountable for causing environmental harm, especially those who are responsible for man-made natural disasters, which has become a growing concern in the discourse related to environmental protection. In this respect, the present chapter aims at discussing the possibility of making those responsible liable for man-made natural disasters. It argues that there are certain human activities that might, as a single occurrence, not warrant any interventions, but may nevertheless be responsible for man-made disasters. As such, perpetrators of such activities should be held liable and accountable for their actions as well as their omissions.

Human Activities and Their Adverse Impact on the Environment

The adverse effects caused by human activities have been well documented. When one compares the growth of the human population with the environmental degradation, there is a strong positive correlation between the two, meaning that, with the expansion of human population, the environment has also had to face the wrath of the struggle of the mankind in utilizing limited resources offered by the environment. While it is accepted that exploitation of the environment itself would not be possible without causing any harm to the environment, the extent to which the environment has been overexploited and polluted does bring serious concerns for mankind. While concepts such as inter and intragenerational equity have put emphasis on the need for utilizing the environmental resources in a sustainable manner, they have not yielded the expected results. Much of this can be attributed to the fact that more than the direct impact caused on the environment by human activities, the indirect effect which is caused is more significant. For example, effects on soil and water quality are indirect and complex, and subsequent impacts on natural, ecological, and socioeconomic conditions are intricate. While it might be easy to measure the direct effects of human activities on the environment, such as the amount of carbon dioxide emission through the utilization of fossil fuels, the indirect effects may cause incidents like global warming. Moreover, the depletion of the ozone layer might be difficult to precisely calculate, as there are other causes which would also be responsible for such environmental harms (Royall, 2013).

Human Activities and Man-Made Disasters

Many human activities are directed at profit maximization, and as such, the cost-benefit analysis of most activities would be based more on anthropocentric considerations than on ecocentric ones. Even the judiciaries have hinted that most of the laws that are man-made tend to utilize an anthropocentric approach (T.N. Godavarman Thirumulpad vs Union Of India & Ors, 2012). However, even with such a cost-benefit analysis that utilizes an anthropocentric approach in deciding to go ahead with a certain activity that may have serious repercussions on the environment, it should not go unpunished if it results in or does cause a considerable amount of environmental harm, whether such harm is caused immediately or if it is caused because of accumulation. Evidence have shown that there are numerous human activities that have led to man-made natural disasters.

The term “manmade natural disasters” connotes that, while the disaster is caused by natural events such as a flood or a drought, the real culprit is not nature itself but the human being who has acted or failed to act in a certain manner which has forced nature to behave in a manner which has caused such a disaster. Not all natural catastrophes are the work of fate – some are man-made. However, the distinction is not always straightforward, particularly in the case of floods, landslides, or wildfires. Human activities that cause natural disasters such as floods, landslides, and droughts are difficult to directly connect with such incidents, as there are several other factors which would cause such disasters. For example, floods can be attributed to human activities such as deforestation, overexploitation of natural resources, and even some natural causes such as soil erosion. When there is a combination of effects, it becomes difficult to directly hold liable those who have acted to the detriment of the environment. However, that is not to say that those who have acted or failed to act in a particular manner and have indirectly contributed to man-made natural disasters should be allowed to be free from any form of liability whatsoever. A recent study conducted by the UN University has found that for many of the natural disasters that occurred in the period of 2020–2021, much of it was to be blamed on human activities which have had a cumulative effect on these natural disasters. For example, the recent heatwave in the Arctic and the cold wave in Texas that occurred in 2021 are two incidents that have occurred thousands of miles apart, but are related to one another, and can have consequences for people living in distant places. The study has also found that there are three root causes that affected most of the events in the analysis: human-induced greenhouse gas emissions, insufficient disaster risk management, and undervaluing environmental costs and benefits in decision-making (UN, 2021).

The above analysis indicates that human activities, regardless of having been committed in a distant place, could have consequences in distant places or places that might not have been on the radar of those who have done or failed to do certain activities which have caused damage and destruction to the environment. In this regard, it would become imperative to hold those accountable for causing such natural disasters which are a result of such human actions or omissions.

Liability Regime Under Environmental Law

The liability for causing harm to the environment can be implemented as both criminal and civil liability. In considering the criminal liability, for acts such as killing or smuggling of protected species and plants, the authorities impose both physical and financial punishments and fines on the perpetrators. On the other hand, when considering the civil liability for environmental harm, it primarily focuses on imposing financial liability on those who either directly or indirectly cause harm to the environment. However, one of the more significant issues in the liability regime concerning environmental damage lies in the quantification of damages, as many of the legal instruments try to give a threshold for imposing liability for environmental harm. For example, the National Environment Act No. 47 of 1980, with its regulations and directives, prescribes certain ceilings that must be met to require an applicant to obtain an Environmental Protection License (EPL), while activities falling below such a threshold – though it may have adverse impacts upon the environment – do not require such a license.

Another issue to be considered is the basis for imposing liability upon those who cause harm to the environment which may lead to man-made natural disasters. If one were to insist on a fault-based liability regime for environmental harm and man-made natural disasters, it would be too difficult to hold the perpetrators responsible for their actions or omissions which would cause environmental damage eventually leading to a man-made natural disaster, since proving fault and causation would be difficult (UNEP, 2003). This must be also considered with the fact that much of the environmental harm which would eventually have the capability of resulting in a man-made natural disaster would be created not by individuals acting in an isolated manner, but by major industries and multinational corporations which would be able to spend big in claiming their innocence. On the other hand, if one were to argue for a liability regime based on strict liability in imposing liability upon those who cause environmental damage or destruction which could lead to man-made natural disasters, such would be more viable than a fault-based regime, wherefore strict liability would only require the proof of the action irrespective of the intention, and especially in cases of environmental damage, that should be the approach as it would also help to take out the inequality of the power between the perpetrator and those who are affected by their actions.

Even if one were to agree upon a basis for imposing liability, the need for proving the nexus between the cause and effect would remain. In simple terms, this would mean that anyone claiming to hold those liable for causing environmental harm that leads to man-made natural disasters would have to prove that the natural disaster occurred due to the activities or the omissions of the perpetrators and that there is a direct link between the two. To prove such a contention, it would be paramount to have scientific evidence with absolute precision as there would be no room for speculation, and once speculation begins, the benefit of the doubt will always favor the perpetrators (Cane, 2001). However, it is to be noted that if there is a lack of scientific evidence which could conclusively prove that the actions or the omissions of the perpetrators have had a direct effect on the environmental damage which has

resulted in a man-made natural disaster, it should not always be in the benefit of the perpetrators, as pointed out under principle 15 of the Rio Declaration of 1992 which states that “[w]here there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.” This principle could be used to argue that where there is a lack of scientific evidence to sustain a claim for imposing liability upon those who have contributed to man-made natural disasters should not be a bar for imposing liability on them merely due to a lack of scientific evidence which links their actions or omissions to the harm that they have caused. Under the existing regime governing responsibility of those who have caused damage to the environment, it is somewhat difficult to hold them liable for the harm that they have caused to the environment which could lead to a man-made natural disaster as it is very challenging to prove the nexus between their actions or omissions with the harm caused to the environment.

“Polluter Pays” Principle and Liability for Environmental Harm

In attributing liability to those who cause environmental harm, the “polluter pays” principle has gained acceptance in the international arena, and some argue that it is considered a principle of customary international law (Dupuy, 2019). The “polluter pays” principle simply denotes that they who cause harm must also take action/ compensate for restoring the environment to its original status. However, this the principle is used in a broader sense in the environmental context within the ambit of externalities. When one compares the gains or profits made by manufacturers through production which creates negative externalities, they only bear a small portion of the negative externalities that they generate in proportion to their gains or profits. However, when it comes to others who do not make any gain or profit through such production would nonetheless have to bear the brunt of the negative externalities that are caused to the environment. In essence, the “polluter pays” principle tries to internalize the negative externalities (Alam, 2013). The “polluter pays” principle first emerged explicitly in 1972 in a Council Recommendations of the Organization for Economic Co-operation and Development (OECD) (Gaur et al., 2022). The same Organization in 1992 according to this principle declared that “the polluter should bear the expenses of carrying out the . . . measures decided by public authorities to ensure that the environment is in an acceptable state. In other words, the cost of these measures should be reflected in the cost of goods and services which cause pollution in production and/or consumption.” Such measures should not be accompanied by subsidies that would create significant distortions in international trade and investment (OECD, 1992). The main point to be emphasized here is the fact that the “polluter pays” principle should only be utilized where it is possible to rectify the harm caused to the environment through compensation. In a broader sense, it means that internalization of negative externalities should only be allowed if it is economically possible from the perspective of the environment, and where a certain threshold is to be exceeded where it becomes not possible of compensating

the damages caused, one should not be able to buy the harm that they are going to cause to the environment. In such an instance, it is best to prevent the harm from occurring rather than imposing liabilities upon the polluters as compensation would not become adequate to rectify the harm caused to the environment.

The “polluter pays” principle has been utilized by the Sri Lankan judiciary on numerous occasions (Edirisinghe & Wijesooriya, 2019; Wijesooriya, 2019), including the celebrated case of (Bulankulama and Others v. Secretary, Ministry of Industrial Development and Others, 2000) where Justice Amarasinghe held that “the costs of environmental damage should be borne by the party that causes such harm rather than being allowed to fall on the general community to be paid through reduced environmental quality or increased taxation in order to mitigate the environmentally degrading effects of a project.” In the *Chunnakam* case (Ravindra Gunawardene Kariyawasam v Central Environmental Authority and Others, 2019), the court held that the “polluter pays” principle has been recognized in many parts of the world, including many cases in India and the Rio Declaration of 1992 under Principle 16 refers to the said principle and that there is no issue with utilizing the said principle in the present case. In the more recent case of *Wilpattu* (Centre for Environmental Justice V Anura Satharasinghe and Others, 2020), the issue was related to a resettlement plan for settling internally displaced people in the north. The minister in charge of industry and commerce has taken steps to relocate the IDP’s in a forest land which was protected under the Forest Ordinance No. 16 of 1907 (as amended). The Court found that the minister had acted ultra vires in respect of the powers granted to him under the statute and that he should be held personally liable to replant the trees that were either cut down or destroyed because of the resettlement plan and that this should be done within 2 months from the judgment. The Court extensively referred to the “polluter pays” principle in arriving at its decision. However, even at the beginning of 2022 there is no report as to whether the Court order has been complied with.

Possibility of Using the “Polluter Pays” Principle Concerning Man-Made Natural Disasters

As discussed above, the polluter pays principle, in general, is a remedial method rather than a cure. When it comes to environmental matters, and especially conservation of the environment, preventive methods are always to be encouraged rather than remedial methods which seek to compensate for the losses generated, which on most occasions will become futile when it comes to the environment. This fact was nicely elaborated in the Indian case of (M.Velu vs The State Of Tamil Nadu, 2010) where the Court held that taking preventive measures is always better than taking curative measures and the judiciary sitting as a Green Bench has a social duty to intervene in cases concerning development projects that adversely affect the environment and to prevent environmental harm if such developments projects were to be allowed. Poulopoulos has also shown the importance of prevention as a principle of environmental law whereby it is always considered more appropriate to prevent

environmental harm than to rectify it through compensation (Poulopoulos, 2016). In addition, to apply the “polluter pays” principle, the polluter would have to be clearly identified and the fault of the polluter would also have to be established. Further, there would be a need for precise calculation as to how much harm has the polluter caused to the environment to appraise their liability. The matters would be further complicated with the fact that, when it comes to proving that human actions or omissions to cause harm to the environment are one of the main reasons for the occurrence of a man-made natural disaster, where the involvement of human beings in the creation of the natural disaster would have to be established to apply the “polluter pays” principle would become still more difficult to prove.

Though it is conceded that the “polluter pays” principle might not be best suited to hold those liable for creating man-made natural disasters, it does not take away the requirement or the necessity for holding those who are responsible for causing such harm to the environment which could lead to man-made natural disasters since it would create a crime without an offender. It emphasizes the fact that there should be new principles and policies developed to tackle this matter since the involvement of human activities and omissions cannot be disregarded when it comes to the occurrence of man-made natural disasters. The following section focuses on some of the suggestions for building a regime that could be utilized to make those accountable for creating man-made natural disasters.

Suggestions at Holding Those Accountable for Man-Made Natural Disasters

It must be noted that defining exactly what is a man-made natural disaster might not be something easy, or even easier said than done. However, the proven fact that there are many human activities that would become the root cause of many natural disasters such as floods, wildfires, and droughts cannot be disregarded. Therefore, it becomes imperative that there should be a regime to hold those accountable for causing such harm to the environment which would result in such man-made natural disasters. For instance, in the abovementioned Wilpattu judgment, the Court only focused on restoring the trees that were cut down to make premises to resettle the IDPs. It failed to appreciate the broader implications that could result from such acts of deforestation which could eventually lead to droughts and floods. The suggestion is that, in such kind of cases where there is sufficient scientific data to prove cause and effect, the damages that are to be ordered should be exemplary meaning that they should go beyond the immediately foreseeable damages that are caused to the environment. Therefore, it is suggested that a modified principle derived from the “polluter pays” principle should be utilized in holding those accountable for man-made natural disasters. The lack of scientific data connecting the causes with effects of man-made natural disasters is another area to be discussed.

As discussed above, the mere lack of scientific evidence in proving that such harmful activities would not result in the creation of man-made natural disasters should not be required to be proved by those who allege the existence of such a

nexus, but it should be something which would have to be proven by those who are in the process of exploiting the environment for a gain. Therefore, the burden of proof must be shifted from the plaintiffs to the dependents in the case of environmental harm. If we are to see some results in such an instance, it would be up to the party exploiting the environment and provoking man-made natural disasters who would have to ultimately prove that their actions are not a cause whether direct or indirect to the creation of such catastrophes. A related issue in connection is the thresholds that are used at allowing for environmental exploitation.

The threshold approach in environmental law requires the exploiters of the environment to adhere to certain limits when they are exploiting the environmental resources. The threshold approach is also linked with the inter- and intragenerational equity which requires the current generations to utilize the environmental resources without hampering the ability of other generations to enjoy a same kind of utilization regarding the environmental resources. However, it is suggested that the threshold approach should always be taken from the perspective of the environment and not from the perspective of gain or advantages that are purely calculated from a human perspective. Therefore, it is suggested that the threshold approach should be strictly utilized with an ecocentric mindset, wherefore any activity which has a greater potential in the creation of man-made natural disasters should be prevented rather than allowed to be carried out with a threshold limit. Environmental taxation should also be examined in the reduction and deterring of environmental activities which have the potential of causing man-made natural disasters.

Environmental taxation could be utilized as a method of reducing and deterring exploration activities of the environment that has the potential of creating man-made natural disasters. As a suggestion, it can be argued that if there is an activity with a high possibility of creating a man-made natural disaster, such activity should be heavily taxed to discourage its future practices.

It is to be noted that while some of the suggestions made in this section may seem one-sided only concerning the environmental aspect without the others, the damages caused to the environment are so extensive that there is a need for taking affirmative actions for restoration and the protection of the environment to the detriment of other rights, which have been so far utilized at the destruction of the environment by such activities which profit some and cause harm to all including those who have profited. Therefore, ideas such as making those accountable for creating man-made natural disasters should be developed and sustained to protect and advance the riches of the environment.

Conclusion

The idea of making liable those who contribute to creating man-made natural disasters could be taken as a novel idea. However, there are many examples that could be shown to prove that there are certain human activities and omissions which could eventually contribute to creating man-made natural disasters, and there is a need for making those accountable who have contributed to creating such disasters.

The “polluter pays” principle can be identified as a principle of international environmental law that seeks to internalize the negative externalities caused by humans to the environment through a variety of actions or omissions. However, the “polluter pays” principle lacks the ability to extend itself to cover incidents of such activities or omissions of individuals which could contribute to the creation of man-made natural disasters. Therefore, it was suggested that an extended version of the “polluter pays” principle should be utilized in awarding exemplary damages to those who contribute to create man-made natural disasters. In addition to this, shifting the burden of proof upon those exploiting the environmental resources to prove that their activities would not be a reason for man-made natural disasters and implementing a more coherent system of environmental taxation have been suggested as alternatives. While this chapter is written from a legal perspective which is a limitation of the study, a true analysis would require a collaborative effort inculcating different perspectives including environmental, scientific, and management-related fields for providing a workable solution to the issue of finding an appropriate mechanism for holding those accountable for man-made natural disasters. In conclusion, it can be said that the idea of making those accountable for man-made natural disasters is a project that needs to be collaborated on and advanced for the greater betterment of environmental protection which is to be considered through different perspectives at finding an optimal solution.

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The Use of Earth Jurisprudence Against Anthropogenic Marine Environmental Disasters in Sri Lanka

116

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Contents

Introduction	1738
Earth Jurisprudence: Philosophical and Theoretical Origins and Development	1739
Elements of Earth Jurisprudence and Their Relevance for the Protection of Oceans	1740
Legal Personhood and Rights of Nature	1740
Great Jurisprudence	1741
Community Ecological Governance	1741
Restorative Justice	1742
The MV X-Press Pearl Disaster and Earth Jurisprudence	1743
The Role of the Contemporary Marine Environmental Protection Laws in Sri Lanka in the Protection of Intrinsic and Relational Values of the Oceans	1744
The Constitution	1744
Marine Pollution Prevention Act, No. 35 of 2008	1746
Fisheries and Aquatic Resources Act, No. 02 of 1996	1746
Earth Jurisprudence in Other Jurisdictions	1747
Constitutional Recognition: Ecuador	1747
Legislative Recognition: New Zealand	1748
Judicial Recognition: India	1749
Recommendations	1750
Judicial Recognition	1750
Legislative Recognition	1751
Constitutional Recognition	1751
Conclusion	1752
References	1752

Abstract

Earth jurisprudence is a philosophy of law and governance that perceives human beings only as a part of the wider Earth community. It emphasizes the necessity of deviating from the legal frameworks which keep the protection of human interests

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as its core objective. Today, more than nine jurisdictions around the world have embraced Earth jurisprudential principles through various constitutional, legislative, judicial, and institutional means. In May 2021, Sri Lanka faced one of the worst maritime environmental disasters in its history as “MV X-Press Pearl,” a Singaporean containership, burnt for several days just outside the port of Colombo with tons of hazardous and highly reactive chemicals, bunker oil, and containers carrying plastic pellets aboard. The incident which occurred in shallow waters endowed with high biodiversity caused unprecedented and irreversible damage to the marine environment, species, and resources. It reiterated that environmental disasters affect not only human beings but all other living and nonliving species who share the planet with them. Therefore, it is unequivocal that these nonhuman beings shall be empowered to protect themselves against anthropogenic environmental disasters. This chapter ascertains how Earth jurisprudence can be used to protect the oceans and ocean species in Sri Lanka from anthropogenic maritime disasters and to remedy the damage that they have already sustained. The author utilized the black letter approach to research and international and comparative research methodology to carry out the research. The chapter mainly focuses on Sri Lanka and refers to Ecuador, New Zealand, and India in drawing lessons for law reform. The chapter will provide guidance to protect the Sri Lankan oceans for more than the instrumental values that they hold.

Keywords

Earth jurisprudence · MV X-Press Pearl · Marine environmental disasters · Protection of oceans

Introduction

Since the late 1990s, there has been an effort among a set of legal scholars to develop a new jurisprudence or a legal philosophy that recognizes human beings as an inextricable strand in the larger community of the Earth. This ideology termed “Earth jurisprudence” was initially proposed in *The Great Work* authored by Thomas Berry (1999) and, subsequently, developed mainly in the scholarly works of Cormac Cullinan and Peter Burdon. Earth jurisprudence fundamentally upholds that the present legal systems and legal orders represent an anthropocentric view and it is “supporting exploitation rather than protecting the natural world from destruction” (Berry, 2006: 107). It perceives that the separation between nature and human beings and the assumption that man is superior to nature are the fundamental causes of the present environmental crisis (Burdon, 2010: 62). Accordingly, it emphasizes that law and governance shall aim to achieve well-being of the comprehensive Earth community and not simply its human component. This jurisprudential ideology has now been accepted and upheld by many jurisdictions around the world.

This chapter seeks to ascertain how Earth jurisprudence can be integrated into the contemporary legal framework in Sri Lanka to protect its oceans and ocean species. In doing so, it considers the MV X-Press Pearl incident which caused an unprecedented marine environmental disaster. The chapter aims to ensure that the oceans and all those who inhabit them will not fall victim to another anthropogenic maritime disaster and that the damage which has already been suffered by them will be adequately rectified.

The chapter proceeds under seven headings. Part 1 introduces Earth jurisprudence and its origin and development. Part 2 explores the scope and the key principles of Earth jurisprudence and their relevance for the protection of oceans. Part 3 provides a brief account of the MV X-Press Pearl disaster and its environmental implications while establishing why Earth jurisprudential principles are relevant to the incident. Part 4 analyzes how the existing marine environmental protection legal framework in Sri Lanka provides for the protection of more than the instrumental values of oceans. Part 5 evaluates how Earth jurisprudence is recognized in Ecuador, New Zealand, and India and what comparative insights could Sri Lanka glean from these three jurisdictions. Part 6 lays down suggestions to integrate Earth jurisprudence into the present legal framework of Sri Lanka to protect its oceans against anthropogenic maritime disasters. The final part of the chapter lays down the conclusions.

Earth Jurisprudence: Philosophical and Theoretical Origins and Development

Earth jurisprudence is a philosophy of law and governance that perceives human beings only as a part of the wider Earth community (Cullinan, 2011: 13). Koons, referring to Cullinan and Nash, defines Earth jurisprudence as “an inclusive and system based theoretical perspective that supports robust environmental regulation and recognizes a kinship with the field of environmental ethics” (2011: 45).

Burdon recognizes several underlying reasons for the origin of this theory. First, Earth jurisprudence was developed as a response to the present environmental crisis. Earth jurisprudence believes that the fundamental cause of the present environmental crisis is the separation between nature and human beings (Burdon, 2010: 62). Second, Earth jurisprudence can be considered a form of critical legal theory. Proponents of Earth jurisprudence criticize the law for legitimizing certain social relations and hierarchies (Burdon, 2012: 30). In fact, the advocates of Earth jurisprudence hold that the “separation and hierarchical ordering of the human and nonhuman worlds” lie at the very foundation of many Western legal theories (Graham, 2003: 19; Burdon, 2012: 28–29). Third, Earth jurisprudence can be regarded as a development from the environmental movement and environmental philosophy (Burdon, 2012: 30).

Initially, many of these ideas were not well-received. Nevertheless, Earth jurisprudence has eventually become increasingly popular, finding its way into the legal frameworks of many jurisdictions around the world. An important thing to be noted

here is that in many jurisdictions this recognition took place at an intersection where the contemporary legal frameworks absorbed the concepts from the traditional legal frameworks of Indigenous communities (O'Donnell, 2020: 647). While the principles presented in Earth jurisprudence do appear novel and innovative in Western legal philosophies, they formed a part of many Indigenous ontologies for centuries if not for millennia. For these communities, nature is not only a living being but also a conscious, sentient, and agentic being (Booth, 2008: 799).

After examining the origin and the development of Earth jurisprudence, the chapter now turns to explore the main principles of Earth jurisprudence and their relevance for the protection of oceans against anthropogenic maritime disasters.

Elements of Earth Jurisprudence and Their Relevance for the Protection of Oceans

There are many scholarly works defining the features of Earth jurisprudence in a variety of ways. Almost all of them uphold similar ideologies with slight differences in their expressions and wordings. The following discussion will explain four key features of Earth jurisprudence and their relevance for the protection of oceans.

Legal Personhood and Rights of Nature

First, one of the main features of Earth jurisprudence commonly recognized by scholars is legal personhood and rights of nature. Legal personhood and rights of nature simply means that nature must have a personhood recognized by law that is distinct from the legal personhood of human beings and must hold corresponding rights. The contemporary legal frameworks, influenced by legal positivism, place all rights and values in the man (Burdon, 2011:63). Berry (1999: 72) holds, “[a]ll rights have been bestowed on human beings. Other than human modes of being are seen as having no rights. They have reality and value only through their use by humans.” It appears from these ideas that the contemporary legal frameworks uphold only the instrumental value of nature. One of the best ways of remedying this is the recognition of legal personality and legal rights of nature.

Who can be a legal person is one of the most intense debates in legal scholarship. However, the legalists adopt a fairly straightforward approach in this regard. For them, anything or anyone can be a legal person and hold corresponding rights as long as it is compatible with the purpose of any particular law (Naffine, 2009: 21). This view is affirmed by many proponents of Earth jurisprudence and the rights of nature. For instance, Tănasescu (2022: 22) argues that a legal person is that entity that the law declares to be a legal person. O'Donnell (2020: 648) affirms this idea holding that from a legal perspective, the legal person is nothing more or less than a construct of law. Accordingly, oceans can be legal persons if they are constructed as such by the law.

It is also recognized that if nature is perceived as a legal person, then it must have a set of corresponding rights. According to O'Donnell (2020: 648), what brings the abstraction of the legal person into being is the assignment of rights and duties. Following the scholarly work of Berry, this study recognizes that oceans, as a component of the universe, already hold certain rights: the right to be, the right to habitat, and the right to fulfill their role in the ever-renewing process of the Earth community (Cashford, 2011:9).

What is the relevance of legal personhood and the rights of nature for the protection of oceans? Constructing oceans as a legal subject, with rights and powers of their own, is a way of empowering them (O'Donnell, 2019: 185). It will make sure that the oceans are more visible to the law (O'Donnell, 2019: 24) and they can fight for their own preservation and protection and the injuries suffered by them will not always be considered relative to human beings.

Great Jurisprudence

Second, Earth jurisprudence recognizes two levels of law that arise from the interdependent relationship between man and nature. The first level of law is great law which contains the rules and principles of nature (Burdon, 2011: 60, 2014: 81). The concept of great law was first introduced by Berry who holds that "Earth is our primary teacher as well as the primary law giver" (Berry, 1999: 64). The term "great jurisprudence" or "great law" was coined subsequently by Cullinan (2011: 13) who defines it as "fundamental relationships and principles that constitute the Earth community." The second level of law is human law which contains binding rules and principles promulgated by the law-making authority of a community (Burdon, 2011: 67).

Earth jurisprudence emphasizes that human law shall be consistent with great law due to two underlying characteristics of the former. First, as pointed out by Burdon (2011: 60, 2014: 82), "human law derives its legal quality and the power to bind in conscience from the great law." Second, human laws which contravene the fundamental principles and relationships that constitute the Earth community can be considered a corruption of law and will therefore be illegitimate and unlawful.

Thus, the human law governing oceans must acknowledge the inseparability, interrelatedness, and interactions between and among human beings, oceans, and ocean species and restore man to "a place of intimate intercourse with the vast organism that constitutes the Earth" (Worster, 1994: 82). If this link is ignored, and humans dominated the oceans and exploited them as they wish, the negative consequences can be enormous.

Community Ecological Governance

The third element of Earth jurisprudence focused on in this research is community ecological governance. There are traditions, cultures, and religious practices which

see nature for more than its materialistic value. The idea of community ecological governance stems from observing these Indigenous customs and practices which maintain close, intimate relationships with nature. Such relationships are “far from being, competitive, destructive, and exploitative and allow for mutual co-existence and nourishments” (Mason, 2011: 41). These communities live in intimate communion with nature, without formal laws or rules compelling them to behave as such. Consequently, it becomes impossible for them to do things that sever this intimate relationship. Even though they do not use the term “Earth jurisprudence” explicitly, their way of living is the true spirit of Earth jurisprudence (Mason, 2011: 40–43).

Community ecological governance requires not only interest-led consultation but also consultation with local communities, nature, and its laws in the ecological law-making process. Thus, “laws must respect traditional knowledge, cultural heritage, benefit sharing, human rights, nature rights, self-determination, and community land rights” (Filgueira and Mason, 2011: 199). The concept of community ecological governance thus emphasizes two basic ideas. First, community knowledge holders and elders must be consulted, and their knowledge must be respected in the development of the laws aimed at the regulation of the affairs between man and nature. Second, it is pivotal to revive the relational stewardship responsibilities to nature contained within Indigenous and traditional laws and ontologies.

How does community ecological governance become relevant in the protection of oceans against anthropogenic maritime disasters? The traditional value systems will be able to guide contemporary communities away from the Western ideologies which perceive exploitation of the Earth to be a natural trait of human beings (Booth, 2008: 799). They will guide the communities to protect the oceans for the intrinsic and relational values that they hold.

Restorative Justice

The fourth indicator of Earth jurisprudence adopted in this research is restorative justice. According to Marshall (1996:37), “restorative justice is a process whereby all parties with a stake in a particular offence come together to resolve collectively how to deal with the aftermath of the offence and its implications for the future.” Restorative justice can be utilized across a wide variety of offences and a wide variety of victims (including individuals, communities, and the environment) and a wide variety of outcomes (Hamilton, 2008: 269).

The adoption of the concept of restorative justice in environmental issues over retributive justice allows the offender or the wrongdoer to make amends as quickly as possible and to rejoin the Earth community, healing the severed relationship in the interest of the well-being of the whole (Mason, 2011:43). This research holds that in determining the harm caused by anthropocentric maritime disasters, not only the damage suffered by the human communities but also the damage suffered by the oceans itself must be considered. Measures must be taken to cure the damaged oceans and restore the intrinsic values of the ocean ecosystems.

The above discussion recognized four key elements of Earth jurisprudence as laid down by different legal scholars and established their relevance for the protection of oceans. The next part of the chapter explains the MV X-Press Pearl disaster which was termed “the worst maritime disaster to have struck Sri Lanka” (UN Environmental Advisory Mission, 2021: 3) and establishes how the Earth jurisprudence debate is relevant to the incident.

The MV X-Press Pearl Disaster and Earth Jurisprudence

On 20 May 2021, Singapore-flagged MV X-Press Pearl containership experienced a chemical fume eruption while it remained anchored around 9 nautical miles (17 kilometers) northwest of the Port of Colombo in Sri Lanka’s national waters. On 25 May 2021, the ship got caught in an intense fire. At the time, it was carrying 1486 containers containing hazardous and noxious substances including 25 tons of nitric acid, caustic soda, methanol, 9700 tons of potentially toxic epoxy resins, micro-plastics, and 87 containers carrying several types of plastic pellets aboard (The UN Environmental Advisory Mission, 2021: 5–6). The ship continued to burn for around a week, irrespective of the efforts to extinguish the fire (*Centre for Environmental Justice, 2021*: 11). After the fire was doused, the vessel was attempted to be towed to a deeper water refuge which unfortunately failed, resulting in the partial sinking of the vessel. By 17 June 2021, the entire vessel sank and settled in the seabed only with its castle and some of its cranes partially visible (The UN Environmental Advisory Mission, 2021: 5).

The immediate consequences of the incident were thick plumes of black smoke, the potential spill of dangerous and hazardous substances on board the vessel into the ocean, large quantities of plastic pellets and other debris from the ship washing ashore, and an oil slick continuously leaking to the ocean from the ship (The UN Environmental Advisory Mission, 2021: 5). The long-term impacts of the incident are more far-reaching. The UN Environmental Advisory Mission focuses on seven main environmental consequences of the disaster: oil pollution, chemical pollution, risks arising from the shipwreck and lost containers, plastic pollution, impacts on wildlife and sensitive environments, impacts on fishery resources, and air pollution. While an in-depth discussion of these effects is not possible within the length of this chapter, it must be emphasized that these consequences affect humans and non-humans related to the ocean ecosystems alike.

In order to ensure that oceans will not be ravaged for human benefit, it is vital that Sri Lanka think beyond an anthropocentric legal framework and uphold the essence of Earth jurisprudence. The next part of the chapter discusses how the features of Earth jurisprudence discussed in Sect. 3 of this chapter are reflected in the present legal framework of Sri Lanka aimed at the protection and conservation of oceans against maritime disasters similar to MV X-Press Pearl.

The Role of the Contemporary Marine Environmental Protection Laws in Sri Lanka in the Protection of Intrinsic and Relational Values of the Oceans

In ascertaining the potential of the contemporary legal framework in Sri Lanka in protecting the intrinsic and relational values of the oceans against MV X-Press Pearl or similar disasters, attention must be given to the Constitution of Sri Lanka and the key legislations governing the area, namely, Marine Pollution Prevention Act, No. 35 of 2008, and Fisheries and Aquatic Resources Act, No. 02 of 1996.

The Constitution

The 1978 Constitution of Sri Lanka does not reflect great jurisprudence or expressly recognize legal personhood and rights of nature. First, as far as great jurisprudence is considered, the constitution has only three weak references to the environment. The first two references embodied in Articles 27(14) and 28(f) recognize the shared responsibility of the state and community to protect the environment, but these provisions are not enforceable before any court or tribunal. The third reference imposes duties on the parliament and the provincial councils to make laws to protect the environment in consultation with one another. These limited references reflect the insignificance attached to the rules of nature in the constitution. Second, while the Sri Lankan judiciary expanded the *locus standi* in environment-related cases to include anyone acting in the interest of the general community, it has never expanded legal standing to nature or parts of nature or recognized them as legal persons.

Third, whether the constitution expressly encourages the use of Indigenous customs and traditions in environmental governance is problematic. However, the judiciary in Sri Lanka has emphasized the significance of drawing on ancient wisdom in the *Bulankulama* case. *Bulankulama* is a fundamental rights petition filed against the decision of the government to lease out a phosphate mine situated in the area called Eppawela to a foreign company. In the case, honorable Amerasinghe J. cited the separate opinion of Judge Weeramantry in *Gabcikovo-Nagymaros Project* in saying:

[t]he ingrained values of any civilization are the source from which its legal concepts derive and the ultimate yardstick and touchstone of their validity . . . the time has come when these must be integrated into the corpus of the living law. The task of the law is to convert such [ancient] wisdom into practical terms. (*Bulankulama v Secretary, Ministry of Industrial Development*, 2000: 255)

The ancient wisdom of Sri Lanka emphasizes deep relational values in nature. As pointed out by Edirisinghe and Lim (2021: 150), “it was not uncommon in ancient Sri Lanka to treat nature on par with or even as superior to human beings.” Nevertheless, these native ontologies and practices rarely found their way into the interpretation of the constitution.

Fourth, as far as restorative justice is considered, the judiciary, in one of the recent cases, emphasized that the polluter has a duty to restore the environment to its previous condition (*Centre for Environmental Justice*, 2020). The case is a writ application filed against an alleged illegal settlement of internally displaced persons in a forest complex adjoining Wilpattu National Park. The court issued a writ of mandamus and ordered the Conservator General of the Department of Forest Conservation to implement a tree planting program “in any area equivalent to the reserve forest area used for resettlement of internally displaced persons” (*Centre for Environmental Justice*, 2020: 12). The court further directed the seventh respondent of the case, the then Minister of Industry and Commerce, to bear the full cost of the above tree planting program since he has been instrumental in using the forest land for non-forest purposes. The decision is debatable on the ground whether a tree planting program in any area equivalent to the deforested forest area can be taken as a true restoration of the invaluable forest that was lost. Yet, the decision of honorable Justice De Silva shall be considered a significant landmark in the environmental jurisprudence in the country for its recognition of the duty of the polluter to restore the environment in clear and cogent terms.

The researcher does not wish to establish that the constitution is incapable of dealing with maritime disasters like MV X-Press Pearl. The limited constitutional provisions aimed at the protection of the environment referred to above have been successfully utilized in many environment-related cases. There are two basic ways in which the public can hold the government authorities of Sri Lanka accountable for their failure to prevent the MV X-Press Pearl disaster and compel them to take appropriate measures to remedy the damage. They can invoke the equality clause embodied in Article 12(1) of the Constitution together with the constitutional duty imposed on every person in Sri Lanka to protect nature in terms of Article 28(f) of the Constitution. In fact, there is already a fundamental rights petition filed by the Centre for Environmental Justice claiming that actions and/or omissions of the relevant government authorities constitute a violation of the fundamental rights guaranteed to the petitioners, the citizenry of the country, and the future generations under Article 12(1) of the Constitution (*Centre for Environmental Justice*, 2021: 21–22). Second, the people can invoke the writ jurisdiction under the constitution and compel the government authorities to exercise the powers vested in them to protect the marine environment against the consequences of the disaster.

The argument here is that these remedies are human-centered. Consequently, the issue will be looked at from an anthropocentric viewpoint. It promotes the misconception that only man matters and the rest of the ocean matters only if it is linked to the interests of man. Oceans do not have their own right to exist and flourish neither all the other species depending on the oceans. This fosters human supremacy in ocean governance and empowers humans to protect their interests against the maritime disasters that they created. The oceans, on the other hand, suffer from pollution and are legally handicapped to fight against it. The recognition of environmental restoration by the Sri Lankan judiciary shall however be appreciated since it sets a precedent of compelling the polluter to bear the costs of restoring the

pollution-ravaged oceans in the X-Press Pearl incident. Nevertheless, Sri Lankan Constitution has a long way to go in protecting the oceans for their own interests.

Following the above discussion on the constitution, this chapter now turns to discuss whether the Marine Pollution Prevention Act reflects Earth jurisprudential principles and protects the more than instrumental values of oceans against anthropogenic maritime disasters.

Marine Pollution Prevention Act, No. 35 of 2008

Marine Pollution Prevention Act, No. 35 of 2008 (hereinafter referred to as MPPA), provides for the prevention, reduction, and control of marine pollution in the territorial waters, any other maritime zone, the foreshore, and the coastal zone of Sri Lanka (Preamble). It also provides for the establishment of the Marine Environment Protection Authority (hereinafter referred to as MEPA). The MPPA provides both criminal and civil liability in the cases of certain types of pollution.

Section 26 of the Act imposes criminal liability for the discharge or escape of pollutants into the territorial waters of Sri Lanka. Section 27 prohibits the dumping of any pollutant into the territorial waters of Sri Lanka or any other maritime zone except in accordance with a permit issued by MEPA. Both sections make the offender liable for a fine. Section 30 imposes civil liability on the polluter for any damage caused to the marine environment or its interests by the pollution and the costs of any measures taken for the purposes of preventing, reducing, or removing any damage caused by the pollution.

These provisions carry certain links with restorative justice which can be established through much deliberation. The damage caused by MV X-Press Pearl unambiguously falls within the scope of Sects. 26, 27, and 30. In terms of Sect. 30, the polluter is expected to bear all the costs of pollution. Therefore, even though it is not expressly enumerated, it can be assumed that it also includes the cost of environmental restoration. The act however is not reflective of the other three principles of Earth jurisprudence recognized in this chapter.

The next part of the chapter focuses on the third legal instrument relevant to the MV X-Press Pearl disaster, which is the Fisheries and Aquatic Resources Act.

Fisheries and Aquatic Resources Act, No. 02 of 1996

The presence of the word “resources” in the title of the Fisheries and Aquatic Resources Act, No. 02 of 1996 (hereinafter referred to as FARA), itself suggests the presence of the anthropocentric characteristic of finding the worth of nature merely in its material value. This is further manifested in the purpose of the act: “to provide for the management, regulation, conservation, and development of fisheries and aquatic resources in Sri Lanka” (FARA, 1996: preamble). Filgueira and Mason (2011: 200) recommend, “looking at the Earth as a living being and stop using the

word ‘resource’ when we speak about nature is one practical method of adopting Earth jurisprudence.”

The MV X-Press Pearl incident has violated several provisions embodied in FARA. Section 27(3) prohibits the dumping of poisonous, explosive, or stupefying substance or other noxious or harmful material or substance in Sri Lankan waters. Section 37 makes it an offense to “discharge waste or any other polluting matter or disturb, interfere with or destroy, fish or other aquatic resources or their natural breeding grounds or habitat in fisheries reserves without a valid permit.” Both provisions make the MV X-Press Pearl disaster an offense under Sri Lankan law, but from an anthropocentric viewpoint. The two provisions form a part of a legal framework that perceives ocean species as resources and, therefore, protects them on the basis of their relative significance or the instrumental values for human beings. FARA is clearly a part of the existing Western legal orders which provide specific legal protection for certain entities.

Thus, it is certain that the legal framework of Sri Lanka does not necessarily reflect Earth jurisprudential principles with regard to the protection of oceans. It does recognize restorative justice but still has a long way to go in embracing and accepting man to be just a part of nature and protecting the oceans for more than the instrumental values that they hold. The next part of the chapter seeks to examine how Earth jurisprudential approaches are adopted through constitutional, legislative, and judicial means in three selected comparative jurisdictions, namely, Ecuador, New Zealand, and India. It also ascertains what comparative insights could Sri Lanka learn from these jurisdictions.

Earth Jurisprudence in Other Jurisdictions

Many jurisdictions around the world are now increasingly recognizing and integrating the principles of Earth jurisprudence into their domestic legal frameworks. When observing how different jurisdictions are bringing Earth jurisprudence into their respective legal frameworks, three fundamental approaches can be identified. They are through the constitution, legislation, or through judicial activism. This part of the chapter selected three case studies to demonstrate each of these approaches.

Constitutional Recognition: Ecuador

Ecuador recognizes the rights of nature in its constitution which has been in place since 2008. Rights of nature making their way into the constitution is particularly impressive and equally significant because “Constitutional guarantees are usually at the apex of the hierarchy of norms established by legal systems and trump any conflicting norm of lower value” (Shelton, 2010: 266).

These constitutional provisions are basically derived from the belief of *Pachamama*. According to Indigenous Andean cosmovision, *Pachamama* is a

female deity of the Earth who presides over agriculture, embodies the mountains, and causes natural disasters (Jenkins, 2015: 450). Guzman holds:

The institutionalization of the rights of nature was a result of intercultural dialogue since indigenous organizations indirectly participated in the drafting process of the Constitution. Therefore, indigenous people in Ecuador and their nature ontologies had a significant influence on this emerging theory. (Juan José Guzmán, 2019: 79)

This demonstrates the use of community ecological governance in practice and the acceptance of ancient wisdom in the highest law of the country.

According to Article 10 of the Constitution, nature is entitled to claim the rights recognized for it by the Constitution. Chapter 7 of the Constitution lays down the rights held by nature. These include:

[R] rights of nature to exist, persist, maintain and regenerate its vital cycles, structure, functions and its processes in evolution, rights of nature to be restored, the right of the people to demand the recognitions of rights for nature before the public organisms, the duty of the State to promote respect towards all the elements that form an ecosystem and to apply preventive and restrictive measures on activities that might lead to the extinction of species, the destruction of ecosystems and the permanent alteration of natural cycles, and the right of persons, communities, people, and nations to benefit from the environment and the natural wealth. (Constitution of Ecuador, 2008: Art 71–74)

The Ecuadorian Constitution thus recognizes nature as a legal person, its crucial rights, restorative justice, and community ecological governance. All these together facilitate the man to maintain intimate relationships with nature.

Legislative Recognition: New Zealand

New Zealand is a perfect example to demonstrate how the Earth jurisprudential principles are integrated into the legislative framework. In New Zealand, two pieces of legislation; the Te Urewera Act of 2014 and Te Awa Tupua (Whanganui River Claims Settlement) Act of 2017 followed an Earth jurisprudential approach for the protection of two significant members of the Earth community.

The Te Urewera Act seeks to establish and protect the legal identity of the Te Urewera National Park which is the ancestral home of the Tūhoe people of Aotearoa New Zealand (Tănăsescu, 2020: 439). In terms of Sect. 11 of the Act, Te Urewera is recognized as a legal entity. The academic literature holds that the declaration of something as a legal entity does not carry the same legal implications as recognizing something as a legal person since a living entity would not hold any legal rights or duties without being conferred the status of a person (O'Donnell, 2020: 650). However, it shall be noted that the legislation uses the words "legal entity" and "legal person" interchangeably. In the exact words used in Sect. 11 of the Act, "Te Urewera is a legal entity, and has all the rights, powers, duties and liabilities of a

legal person.” Therefore, it can be assumed that the legislators intended Te Urewera to be a legal person capable of holding rights and duties.

The second legislation, the Te Awa Tupua (Whanganui River Claims Settlement) Act of 2017 declares Te Awa Tupua to be a legal person. Section 12 of the Act recognizes Te Awa Tupua as “an indivisible and living whole, comprising the Whanganui River from the mountains to the sea, incorporating all its physical and metaphysical elements.” Collins and Esterling (2019: 202), however, hold that “while the use of legal personality appears to provide the river with authority and control over itself, in practice its legal rights are limited. This is because the Te Awa Tupua Act does not vest ownership of all parts of the River in Te Awa Tupua.” Referring to Sect. 41 of the Act, they state that what is transferred to Te Awa Tupua is what is owned by the government, which comprises only “parts of the riverbed and the *pakohe*, gravel, sand, and shingle in or on the vested land.” Nevertheless, the recognition of these two members of the community of beings as legal persons shall be accepted as a progressive step forward in the attempt to adopt Earth jurisprudential principles in contemporary legal frameworks.

The other significant feature of the legislative recognition of the rights of nature in New Zealand is the role played by Indigenous communities and their knowledge in the process. Section 13 of the Act recognizes intrinsic values which represent Te Awa Tupua. According to Professor Bosselmann (2017: 165), these intrinsic values are directly drawn from Indigenous literature. This integration of the knowledge of Indigenous communities who lived in harmony with these rivers and lands for centuries is clearly an adherence to the principle of community ecological governance emphasized in Earth jurisprudence.

Judicial Recognition: India

India recognized Earth jurisprudential principles in 2017, in two landmark cases, *Mohd Salim v State of Uttarakhand and others* (2017) (hereinafter referred to as *Mohd Salim* case) and *Lalit Miglani v State of Uttarakhand and others* (2017) (hereinafter referred to as *Lalit Miglani* case). The High Court of Uttarakhand recognized the Ganges and Yamuna Rivers as legal persons in the two cases.

The first case, *Mohd Salim*, was filed against the industrial pollution of the Ganges and Yamuna Rivers and the failure of the relevant authorities to take effective measures to clean up the rivers. The court, delivering its judgment, held that “an extraordinary situation has arisen since rivers Ganges and Yamuna are losing their very existence” (*Mohd Salim*, 2017: 4). The court then highlighted that the rivers are considered divine and, therefore, worshipped by the followers of Hinduism in India. The court accordingly granted legal personhood to the two rivers and declared several administrative authorities to be *in loco parentis*, or the human actors acting on behalf of the rivers, to conserve and protect the two rivers and their tributaries (*Mohd Salim*, 2017: 11–12).

The second case, *Lalit Miglani* took a step ahead of the *Mohd Salim* case and conferred rights on the entire ecosystem associated with the rivers Ganges and Yamuna. The court invoked its parens patriae jurisdiction and declared that:

the Glaciers including Gangotri and Yamunotri, rivers, streams, rivulets, lakes, air, meadows, dales, jungles, forests, wetlands, grasslands, springs and waterfalls are a legal entity/legal person/juristic person/juridical person/moral person/artificial person having the status of a legal person, with all corresponding rights, duties and liabilities of a living person, in order to preserve and conserve them. (*Lalit Miglani*, 2017: 64)

Similar to the previous *Mohd Salim* case, *Lalith Miglani* judgment also referred to and relied on Indian mythology and religious beliefs drawing on ancient wisdom prevalent in the communities.

This recognition of the legal personhood of nature in India was, however, stayed by the Supreme Court in the special leave petition, *the State of Uttarakhand* 2018 v *Mohd Salim*. Nevertheless, in 2022, a decision by the Madras High Court in *A Periyakaruppan v The Principal Secretary to Government* once again revived the rights of nature dialogue in India and declared that nature has personhood in the eyes of the law. It also accorded nature with “the rights akin to fundamental rights/legal rights/constitutional rights for their survival, safety, sustenance and resurgence in order to maintain its status and to promote their health and wellbeing” (*A Periyakaruppan*, 2022: 21).

While Ecuador, New Zealand, and India have not recognized Earth jurisprudence specifically with regard to the oceans and their protection, they do provide some significant lessons which can be applied in the context of the protection of oceans against anthropogenic maritime disasters. The next part of the chapter will lay down suggestions to reform the Sri Lankan law pertaining to the protection of oceans and ocean species to better reflect their own interests drawing on the lessons from these three comparative jurisdictions.

Recommendations

The main recommendation of the study is that Sri Lanka must integrate Earth jurisprudential principles of legal personhood and rights of nature, great jurisprudence, community ecological governance, and restorative justice into the ocean protection legal framework. This could be done in the following three methods.

Judicial Recognition

The first method of incorporating Earth jurisprudence into Sri Lankan law shall be through judicial activism following the example set by India. The judiciary has always played a progressive role in environmental protection in Sri Lanka filling the

gaps in the written law through creative interpretation. Thus, it is suggested that the judiciary recognize and apply Earth jurisprudential principles for the protection of the oceans. Oceans in Sri Lanka shall be recognized as legal persons with their own rights to exist, persist, and participate in the evolution of the Earth community. Moreover, the court shall uphold restorative justice once again and shall compel the parties responsible for the MV X-Press Pearl disaster to restore the affected marine environment to its previous condition. In doing so, the court shall draw on ancient wisdom in Sri Lanka which recognized nature on a par with man long before Earth jurisprudential concepts emerge in the contemporary legal world.

Legislative Recognition

Second, it is suggested to follow the New Zealand approach and recognize Earth jurisprudence through legislative enactments. The author suggests a new legislation with the following salient features.

First, this piece of legislation shall recognize oceans as living persons with rights, who can sue for their own preservation. The legislation shall recognize three basic rights of the oceans: the right to exist, persist, and participate in the evolution of the Earth community. All the other rights required for the effective exercise of these three fundamental rights shall also be recognized. Second, the legislation shall recognize restorative justice and shall emphasize that the pollution-ravaged oceans can demand the polluters to restore their condition to pre-pollution stage. Third, the legislation shall respect and draw on the ancient wisdom in Sri Lanka which does not see a division between man and nature, encourage community participation in the governance of oceans, and most importantly, ensure the maintenance of a mutually enhancing relationship between the ocean and human communities. Fourth, the enactment shall establish in clear and cogent terms that the rights of human beings to use oceans for their sustenance are not really rights but special privileges which come with a greater responsibility to keep the balance of oceans and ocean ecosystems intact. Finally, the legislation shall respect and uphold great jurisprudence; oceans shall be governed in such a way that is consistent with fundamental laws and principles governing the universe.

Constitutional Recognition

The third suggestion is bringing a constitutional amendment introducing a separate chapter to the constitution that recognizes the rights of the whole Earth and the Earth community and not just of the oceans and ocean species following the Ecuadorian Constitution. This chapter should recognize great jurisprudence, rights and legal personhood of nature, community ecological governance, and restorative justice in environmental destruction.

Conclusion

MV X-Press Pearl disaster has caused an unprecedented damage to the Sri Lankan oceans and all those who form a part of these oceans. The far-reaching implications of the incident will adversely affect the ocean and marine lives for many years to come. These species and the ocean itself were stripped of their values, health, and perhaps even their continuous survival. The best method to empower oceans to fight against this level of pollution is the express recognition of Earth jurisprudence in the domestic legal framework. It respects oceans and ocean species as a salient and integral part of the wider Earth community, just like the man himself. Unfortunately, Earth jurisprudential principles are not comprehensively reflected in the contemporary legal framework aimed at the protection of oceans in Sri Lanka. The time has come when these crucial principles must be integrated into the corpus of the contemporary law in Sri Lanka, following the examples set by the international community, to preserve oceans and all its members for the sake of all of the Earth community.

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Disaster Management Laws: International and Indian Perspectives 117

Tarun Arora and Nibedita Bhattacharjee

Contents

Introduction	1756
International Norms on Disaster Management	1758
Three-Tier Disaster Management Authorities	1767
Conclusion	1769
References	1770

Abstract

No crisis ever before has put the whole of humankind into such a vulnerable position as caused by the COVID-19 catastrophe. It placed everyone under a sense of fear, want, and marginalized dignity of life of individuals. The states being responsible under the doctrine of *parens patriae* to protect human lives and as guarantors of liberties of individuals faced an unprecedented challenge and were trapped in the state of helplessness. It warrants a revisit of “social contract theory” to ensure “freedom from fear” and “freedom from want” in addition to enlarging the scope of the obligation to guarantee the protection of life, liberty, and protection. The chapter underlines the scope of the state’s obligations to reduce risk, manage disaster, and rehabilitate. Adoption of the Hyogo Declaration, 2005, Sendai Framework, 2015, and Sustainable Development Goals, 2015, at the international level depicts and reiterates international solidarity to preserve the dignity of human life and strengthen the resilience to mitigate the gravity of disasters. The compatibility of the Indian legal framework on disaster management with the principles of international humanitarian law has been evaluated.

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Keywords

Dignity · Freedom from fear · Freedom from want · Rehabilitation · Risk reduction · Social contract

Abbreviations

DDMA	District Disaster Management Authority
DM	Disaster Management
DR	Disaster Risk
DRR	Disaster Risk Reduction
GIS	Geographic Information System
GOI	Government of India
KM	Kilometer
NDEM	National Database for Emergency Management
NDMA	National Disaster Management Authority
NDMP	National Disaster Management Plan
NDRF	National Disaster Response Force
NEC	National Executive Committee
NGO	Non-Governmental Organization
NIDM	National Institute of Disaster Management
No.	Number
Nos.	Numbers
NPDM	National Policy on Disaster Management
NSDI	National Spatial Data Infrastructure
s.	Section
SDMA	State Disaster Management Authority
SEC	State Executive Committee
ss.	Sections
UDHR	Universal Declaration of Human Rights
UN	United Nations
UNGA	United National General Assembly
WCED	World Commission on Environment and Development

Introduction

Dignity is indeed an inherent attribute of human personality in a civilized society. The conception of dignity certainly necessitates freedom from fear and want. The preamble to the UDHR sets out the goal to establish a civilized society in the post-Second World War scenario. It clearly states the obligation of the member-states to guarantee the inseparable rights of an individual in pursuit of justice and peace in the world. The COVID-19 pandemic compelled humanity and almost every institution across the globe to redefine its goals, revisit the priorities, and restructure the procedure of realization. No crisis ever before has put humankind into such a

vulnerable position as the COVID-19 catastrophe. Neither any part of the world nor any walk of life such as governance, health, finance, trade, commerce, education, and transportation remained immune to its grip. It placed the whole mankind under a sense of fear, want, and marginalized dignity. The states, being responsible under the doctrine of *parens patriae* to protect human lives and guarantee the dignity of individuals, faced an unprecedented disaster and were trapped in a state of helplessness.

The responsibility of the UN itself, states, international organizations, non-governmental organizations, scientific and technological societies, humanitarian groups, investment institutions, etc. towards disaster management has been spelt out in several resolutions of UNGA. The need for a multi-disciplinary and multi-dimensional global strategy promoting international and intra-national coordination to deal with different kinds of disasters was pointed out in the report titled “Our Common Future” (WCED, 1987), and it was acknowledged by UNGA through its resolution A/42/427 (UNGA, 1987a, b). Later during the 96th plenary meeting of UNGA in December 1987, the idea of a global program for natural disaster reduction was conceived to strengthen the collaborative efforts among culturally and economically diverse nations. Furthermore, the UNGA adopted a resolution A/42/169 to designate the next decade as an international decade for natural disaster reduction and to foster international cooperation and concerted effort to assemble, disseminate, and apply the scientific and technical knowledge about the causes and effects of natural disasters (UNGA, 1987a, b). Subsequently, the resolution nos. 44/236 and 46/182 adopted in December 1989 and December 1991 respectively demonstrate the efforts for the development of an integrated approach for disaster management and heralding a global culture of prevention. The movement was further strengthened by Agenda 21, Rio Declaration, Yokohama Strategy and Plan of Action for a Safer World 1994, Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters 2005, Sendai Framework for Disaster Risk Reduction 2015–2030, Sustainable Development Goals, 2015, and Paris Agreement at the international level which depict international solidarity, its commitment to preserve the dignity of human life, and strengthen the resilience to mitigate the gravity of disasters (UNGA, 1994, 1999, 2000, 2002, 2003, 2004, 2005, 2015).

Henceforth, the international fraternity has been consistently taking measures to monitor, revisit, and reshape its framework on disasters management. The exercise of revisiting *social contract* in the form of a variety of resolutions resulted in the addition of obligation of the member states for rehabilitation, disaster response, and risk reduction at international and intranational levels. Accordingly, the Member States also reshaped their legislative and policy mechanism towards disaster mitigation and prevention based on measures concerning preparedness, response system, management plans, functioning of communication network, community-based mitigation, and capacity building of stakeholders. India being a signatory to different international instruments also reshaped its legislative and policy framework on disaster management. The laws dealing with disaster management in India can be studied under two categories: indirect laws and direct laws. The expression “indirect laws” has been used for the scattered and sector-specific approach to address threats

posed by disasters in a fragmented way like fire, explosive flood, the dam burst, tsunami, cyclone, lightening earthquake, snow avalanches, landslide, chemical, industrial, nuclear, biological, poisoning accidents, stampede, epidemics, pest attack, etc. Above threats are also covered under selective provisions of certain general laws, e.g., Indian Penal Code, 1860; The Indian Evidence Act, 1872; The Explosive Act, 1884; The Epidemic Disease Act, 1897; The Destructive Insects and Pests Act, 1914; The Poisons Act, 1919; The Petroleum Act, 1934; The Drugs and Cosmetics Act, 1940; The Factories Act, 1948; The Model Town and Country Planning Act, 1960; The Atomic Energy Act, 1962; The Civil Defense Act, 1968; The Insecticides Act, 1968; The Wild Life (Protection) Act, 1972; The Code of Criminal Procedure, 1973; The Water (Prevention and Control of Pollution) Act, 1974; The Forest (Conservation) Act, 1980; The Air (Prevention and Control of Pollution) Act, 1981; The Bhopal Gas Leak Disaster (Processing of Claims) Act, 1985; The Narcotic Drugs and Psychotropic Substances Act, 1985; The Railways Act, 1989; The Railways Accidents and Untoward Incidents (Compensation) Rules, 1990; The Public Liability Insurance Act, 1991; The Chemical Weapons Convention Act, 2000; The Protection of Plant Varieties and Farmer's Rights Act, 2001; The Biological Diversity Act, 2002; The Weapons of Mass Destruction and their Delivery Systems (Prohibition of Unlawful Activities) Act, 2005; The Food Safety and Standards Act, 2006; and The Civil Liability for Nuclear Damage Act, 2010; (NDMA, 2015). On the other hand, "direct law" conveys the idea of an integrated and coordinated approach to manage disaster to minimize the loss to life and property. The Disaster Management Act, 2005, falls under the category of direct laws as it was enacted to respond to the call of the international fraternity to provide legal backup to disaster management measures. The scope of discussion in this chapter has been confined to the Disaster Management Act, 2005. The forthcoming discussion deals with the evolution of standards and norms of international level through Yokohama, Hyogo, and Sendai Framework. It underlines basic principles of disaster management and also maps the integration of these principles in the national framework on disaster management in India. Highlighting the four objectives of the Act, the next part of the discussion uncovers structural and operational framework – mitigation and adaptation, disaster risk reduction and damage control and build back better, along with financial and institutional mechanism. The compositions, jurisdictions and functions of the three tier mechanism have been explained. Furthermore, the binding nature of the provisions of the Act has been elaborated with the help of enforceable measures. These measures provide the punishment in respect of the violation or deviation from the standards of behavior expected in these statutory norms.

International Norms on Disaster Management

International norms on disaster management can be precisely specified as under (Fig. 1):

To realize the above principles at the national level, the obligations of the member states under three landmarks can be described as under:

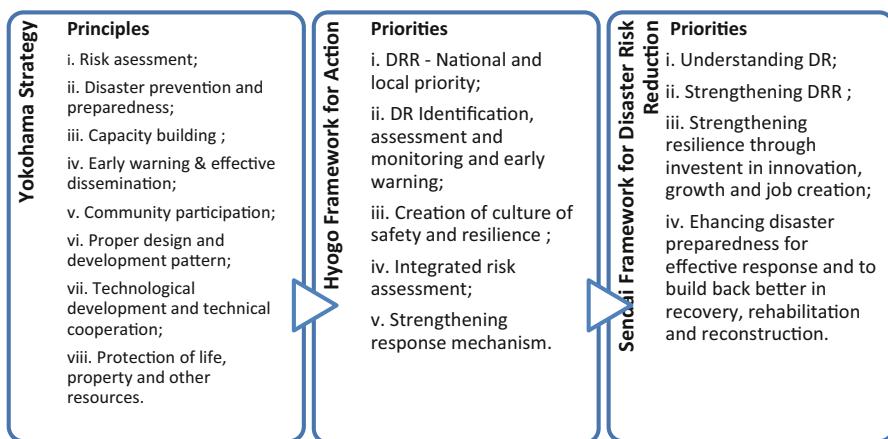


Fig. 1 Fundamental Principles of Disaster Management

Yokohama Strategy – It encouraged the demonstration of strong political will to minimize vulnerabilities, introduce legislation, and formulate multi-dimensional comprehensive policies ranging from national to community levels. The review of the implementation of the Yokohama Strategy highlighted gaps in organizational, legal, and policy sectors of governance, risk identification, assessment, monitoring, early warning, knowledge management and education, etc. (A/CONF.206/L.I).

Hyogo Framework – It emphasized upon creation of a strong capable national integrated disaster risk reduction mechanism with adequate statutory backup consisting of proper regulations and well-defined mechanisms to promote compliance, incentivization of risk reduction, and mitigation activities (UNDRR, 2005).

Sendai Framework – It reiterated the primary responsibility of member states to prevent and reduce disaster risk through cooperation, sharing responsibility by stakeholders, protection of life, property and right to development, inclusive participation, strong legislative and executive back up at a national and municipal level, intra-agency and inter-agency coordination, cost-effective investment on capacity building and infrastructure development, and support of developed nations to realize the ultimate goal of *build back better* (UNDRR, 2015).

Indian Perspectives – Taking note of the vulnerability of India to disasters such as 58.6 percent of the landmass prone to earthquakes of moderate to high intensity, over 40 million hectares (12 per cent of land) prone to floods and river erosion, cyclones on account of 7516 km coastline, droughts and approximate 5700 km coastline prone to tsunamis as observed in the new millennium, and 68% cultivated area prone to drought along with risk from landslides and avalanches, the GoI resolved to revisit its relief centric approach in disaster management (NPDM, 2009). The traditional relief-centric approach based on deployment of specific response teams, mobilization and movement of resources, alternative and effective communication, and proper dissemination of information proved ineffective disaster management. The mandate of the Yokohama strategy was to take mitigation

measures for the prevention of hazards from turning into disasters. The lessons taught by the disastrous effects of tsunami, earthquakes, unprecedented rains, seasonal floods, droughts, land-sliding, and rail accidents compelled the government to change its stance from relief centric to a holistic approach covering prevention, mitigation, preparedness, response, relief, and rehabilitation at par with international standards. The government prepared a strategic roadmap in October 2002 to reduce the country's vulnerability to disaster. The State Governments were directed to develop similar roadmaps on the above parameters. The State of Gujarat (then the immediate victim of the Bhuj earthquake) enacted legislation, namely, Disaster Management Act, 2003.

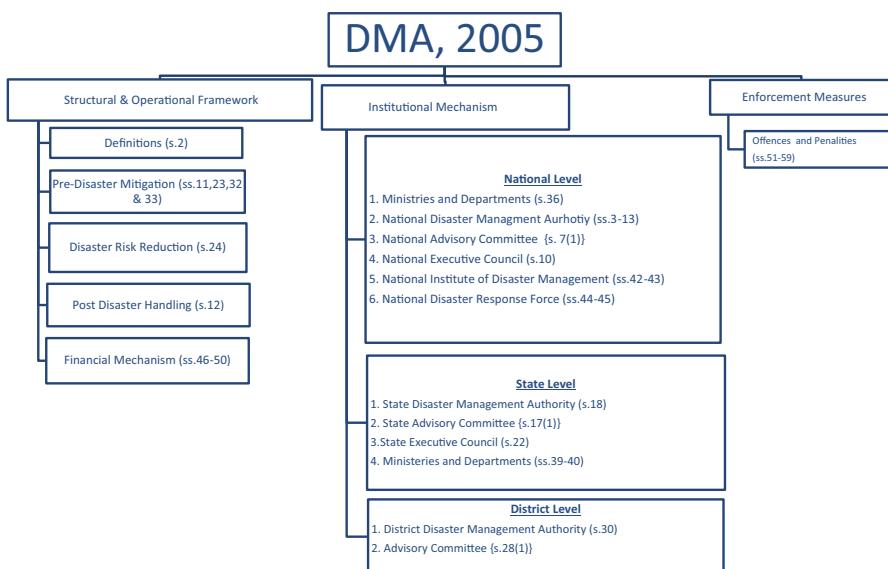
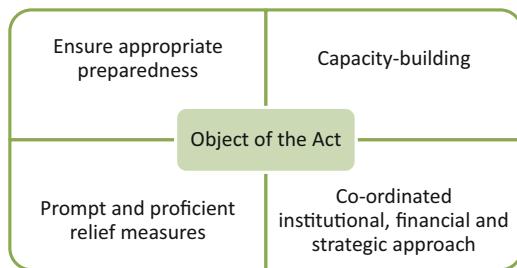
To begin with the constitutional scheme towards the management and handling of disasters in India, the Seventh Schedule of the Constitution does not contain any specific entry on disaster management. Nonetheless, the Parliament derived its competence to enact the Disaster Management Act, 2005, from the liberal interpretation of entry 23 (social security and social insurance) of Concurrent List, Article 21 (right to life and personal liberty), Article 38 (State's obligation to provide for the welfare of the people), and Article 51 (to honor international treaty obligations) of the Constitution. There are two more entries in the State List empowering the state governments to make laws concerning disaster in a sectoral context, such as entry 14 – agriculture, including water protection against pests and plant diseases – and entry 17, water, including water supply, drainage, and embankments (NDMA, 2015). Based on a conjoint reading of these entries, it was recommended by the Standing Committee of the Ministry of Home Affairs to ensure more prompt and professional response and relief measures with legislative back-up. Therefore, the Disaster Management Act, 2005, was passed with the purpose to provide institutional mechanism and coordination for prevention and mitigation, measures for ensuring preparedness, and capacity building of stakeholders to manage disasters (DRSC, 2005).

The Preamble: The objectives of the Act as spelt out in the Statement of Objects and Reasons are “to enact a law on disaster management to provide for a requisite institutional mechanism for drawing up and monitoring the implementation of disaster management plans, ensuring measures by various wings of government for prevention and mitigation effects of disasters and for undertaking a holistic, coordinated and prompt response to any disaster situation” (LS, 2005). The objectives of the Act have been explained in Fig. 2:

The structure of the Act can be elaborated with the help of the following flowchart (Fig. 3):

The figure presents a comprehensive view of the Act under three heads – structural and operational framework, institutional mechanism, and enforceable measures. It demonstrates the integration of the standards laid down in the Yokohama Strategy, the Hyogo Framework, and the Sendai Framework on disaster risk reduction. A detailed discussion on the provisions of the Act can be made as under:

Structural and Operational Framework: The structural and operational framework provides insights into the practical aspects of actual implementation and enforcement of the different provisions of the Act to realize the objective of effective

Fig. 2 Objectives of the Act**Fig. 3** Scheme of the Disaster Management Act, 2005

management of disaster. Before proceeding further, it will be apt to understand the meaning of certain words and expressions repeatedly used in the operational and enforceable part of the Act. These words and expressions have been defined in the definition clause as under:

Definition Clause: Though S.2 of the Act enumerates 20 definitions yet only a few *important* definitions are being elaborated here to develop the understanding of the different provisions:

The expression “Capacity Building” has been defined under s.2(b) of the Act. It has been used 19 times in the Act. The use of the word *includes* in the definition makes it inclusive and dynamic. The object of defining the expression is to recognize the importance of equipping the stakeholders with minimum basic skills to contribute effectively to disaster risk and reduction. The definition signifies the underlying approach of the legislature to envision building build of the resilience of the nation

and communities to disasters. It emphasizes upon the need for identification and creation of resources along with training of human resources for effective handling of disasters.

S.2(d) defines the word “Disaster.” It is the most used expression (299 times) in the Act and demonstrates its importance as it uproots human life. The use of the word *means* in the language indicates that the definition is exhaustive and comprehensive. The expression “disaster” has been given a wide connotation by including various kinds of events or incidents under its purview. The scope of the provision is large enough to cover the occurrence not only on account of natural or man-made reasons but also accident and negligence resulting in adversely affecting the interests of the community. It covers disasters, the nature and magnitude of which is beyond the managing capacity of the community of the affected area.

The expression “Disaster Management” has been defined under s.2(e) of the Act. It has been used 122 times in the Act. The entire Act revolves around the concept of management of disasters. It is an exhaustive definition covering various facets of disaster management like prevention, mitigation, disaster risk reduction, capacity building, preparedness, rescue, relief, rehabilitation, and reconstruction measures.

The next important expression is “Local Authority” given under s.2(h) of the Act. The definition is in consonance of the role of the local and ground level stakeholders in response and management of the disaster as spelt out under Hyogo and Sendai Framework. The expression “local authority” is inclusive, and it has been used 13 times in the Act recognizing the role played by the local authority in times of disaster. The local authorities possess first-hand knowledge of the community’s socio-economic infrastructure and environmental requirements.

The word “Mitigation” has been defined in an exhaustive sense under s. 2(i) and used at 57 places in the Act. Mitigation measures play a vital role in reducing the risk and impact of disasters threatening the community as a whole. Furthermore, the word “preparedness” has become relevant in post Hyogo scenario, and it has been used 35 times in the Act. Its meaning is exhaustive emphasizing the diligence and prompt action to deal with the sinister disaster situation and its effects. It focuses on understanding the impact of a disaster on the community and the outreach to respond and recover from a disaster. In tune with the mandate of build back better, the term “reconstruction” has been defined in a comprehensive sense to cover disaster recovery. It has been used 8 times in the Act and carries thorough implications in disaster management. A disaster disrupts human lives, and therefore, restoration of all the services and revitalization of the economy is important. The reconstruction measures can be integrated into long-term development plans to reduce the impact of future risks posed by disaster.

Principles of Operational Framework: A global paradigm shift from the relief-centric approach to an integrated approach towards disaster management was witnessed as a follow-through of the Yokohama Strategy. This integrated approach encapsulated prevention, preparedness, and mitigation warranting cooperation and contribution of all stakeholders. The GoI also responded positively to the time-honored goal to streamline its development agenda by giving adequate space for

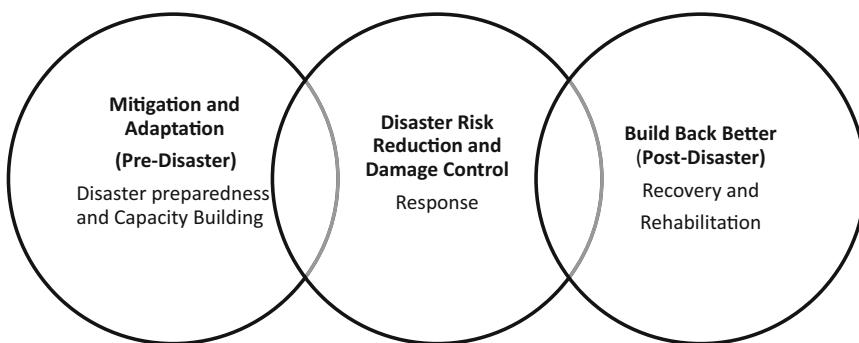


Fig. 4 Principles of Operational Framework

disaster risk reduction. The Indian outlook towards disaster management operational framework has been depicted in Fig. 4):

Disaster Prevention, Mitigation, and Adaptation: The Act contains a multipronged mitigation approach to build the resilience of stakeholders and communities to disasters. It aims to prevent hazards from turning into disasters through planned development, mitigation planning in high priority development projects, and involvement of the state, district, local, and indigenous resources to contribute to strengthening preventive and mitigation mechanisms. The Act envisions different kinds of disaster management plans to be prepared by the NEC, the ministries and the departments of Central and State Government, SEC, and DDMA. The NDMA approves disaster management plans prepared by the NEC, the ministries, and the departments of the Central Government. The SDMA approves the disaster management plans prepared by the SEC, the ministries and the departments of State Government, and the DDMA. These plans integrate preventive and mitigation measures into development plans along with measures for preparedness and capacity building to respond to any threatening disaster situation (ss.11, 23 & 30). These plans are regularly reviewed by the respective authorities [ss. 11(4), 23(5) & 31(4)].

Disaster Risk Reduction and Damage Control: Loss to life and property can be minimized by the immediate and effective response. The Act provides an integrated, synergized, and proactive mechanism to take care of the special needs of vulnerable sections. The responsibilities of the SEC are to reduce the risk of disaster, contain the damage, control and restrict vehicular traffic in the affected area, movement of persons, temporary construction of bridges, conduct search and rescue operations, abolition of unsafe structures, removal of debris, providing shelter, food, drinking water, and essential medical services as per guidelines laid down by NDMA and SDMA, giving directions to the concerned department, district, or other authorities having jurisdiction on the affected areas to take necessary measures for rescue, evacuation, providing immediate relief to save lives, resources for emergency response, rescue, relief, procuring on exclusive or preferential use of amenities from any authority or any person, involve

NGOs, and proper dissemination of the information to the public to respond to the disasters (s.24).

Post-Disaster Basic Principle: Build Back Better: S.12 of the Act lays down guidelines for the minimum relief standards necessary for post-disaster assistance to the affected population.

The NDMA lays guidelines for minimum standards of relief to the persons affected by disaster, protecting the affected communities, combating disruption of lives and property, and dealing with the effects of threatening disaster situations. The standards may include access to shelter, food, drinking water, medical cover, and sanitation, special arrangements for widows and orphans, and *ex gratia* assistance to the victims (s.12). The NDMA also possesses the power to recommend relief in repayment of loans or grant fresh loans to the affected persons on concessional terms for rehabilitation (s.13). Similarly, S. 19 of the Act specifically deals with the developing standards of relief by the State Authority by following guidelines of the NDMA. These standards can be periodically reviewed to address the contemporary needs of communities affected by disasters. These two sections underscore the adoption of the “build back better” principle in their scope and cover various kinds of activities such as technology and project impact assessment; physical, socio-cultural, or economic environment, psycho-social support, and trauma counseling; the role of NGOs and corporate sector; review and redefining recovery with safe development in the area of roads, housing, drinking water resources, sanitary, drainage, and availability of credit facilities; supply of raw material in various fields – agriculture, trade, and business – and upgradation of storage, processing, and marketing for livelihood restoration of affected, marginalized, and vulnerable sections (NPDM, 2009).

Financial Mechanism: For proper implementation and enforcement of preparedness, identification of risk and vulnerable areas, response, relief, reconstruction, and rehabilitation, a sound financial mechanism is indispensable. Keeping in view the significance of financial backup to implement the provisions of the Act, Chap. IX provides for the constitution of different kinds of funds, namely, the National Disaster Response Fund, the National Disaster Mitigation Fund, the State Disaster Response Fund, the District Disaster Response Fund, the State Disaster Mitigation Fund, and the District Disaster Mitigation Fund (ss.46–48). The NDRF has been created under the National Disaster Response Fund. This fund is also available to NEC for emergency response, relief, and rehabilitation following the guidelines of the Central Government in consultation with the NDMA [s.46(2)]. The language of S.50 provides adequate flexibility to use the respective funds by the authorities in case of immediate or emergency procurement of resources necessary for the relief by relaxing the rigor of financial rules like inviting of tenders, etc. For illustration, during COVID-19, the Ministry of Finance relaxed certain conditions of procurement of necessary goods and services (MoF, 2020). Furthermore, the Disaster Management Policy permits the State Governments to use 10% of the funds allotted under the different central schemes for disaster management in case of need (NPDM, 2009).

Institutional Mechanism: The aforementioned structural framework can be implemented and executed through the institutions. The Act emphasizes the decentralization of powers with a systematically designed hierarchical framework for effective functioning of the institutions to fulfill the mandate of reducing not only the impact of disasters but also ensuring preparedness, identification of disaster-prone areas, implementing early warning system, dissemination, and proper strategic measures for disaster management. The role of the institutional mechanism can be explained under the following heads:

The functions enumerated in Table 1 are inclusive. The language of ss. 35 (1–2) and 38 (1–2) empower the Central Government as well as the State Governments to take all measures necessary or expedient for the realization of the objectives of this Act. Furthermore, s. 35 (3) imposes a duty upon the Central Government to extend appropriate support to other countries affected by a major disaster (Table 2).

Table 1 Measures by the Central and State Governments

Nature of functions	Central government	State government
Coordination of actions of various ministries, departments, government authorities, and NGOs related to disaster management	{s.35(2)(a)}	{s.38(2)(a)}
Integration of measures for disaster prevention and mitigation into multiple development plans and projects	{s.35(2)(b)}	{ss.38(2)(e)} & {39(2)(f)}
Allocation of funds for disaster prevention, mitigation, capacity-building, preparedness	{s.35(2)(c)}	{s.38(2)(d)}
Ensure that ministries and departments take necessary measures for preparedness to effectively respond to disaster	{s.35(2)(d)}	{ss.38(2)(g) & (i)}
Cooperation and assistance to State Governments and coordination with the UN agencies and government of foreign countries for the Act	{ss.35(2)(e) & (g)}	
Cooperation and assistance in disaster management to different national, state, and district authorities and committees and to ministries and departments of GoI	—	{ss.38(2)(b) & (c)}
Deployment of the armed forces and the civilian personnel for the Act	{s.35(2)(f)}	—
Establish institutes for research, training, and developmental programs in the field of disaster management	{s.35(2)(h)}	—
Establishment of adequate warning systems to the level of vulnerable communities	—	{s.38(2)(h)}
Any other matter necessary and expedient for the effective implementation of the Act	{s.35(2)(i)}	{s.38(2)(l)}
Ensure in times of sinister disasters the resources of different departments of State are made available to the NEC, the SEC, and the District Authorities for the effective response, rescue, and relief	—	{s.38(2)(j)}
Rehabilitation and reconstruction aid to the victims	—	{s.39(2)(k)}

Table 2 Responsibilities of the Ministries or Departments of GoI and State Government

Nature of functions	Central government	State government
Necessary measures for the prevention of disasters, mitigation, preparedness, and capacity-building according to the guidelines of the National Authority	{s.36 (a)}	{s.39(a)}
Integration of measures for disaster prevention or mitigation into multiple development plans and projects according to guidelines of NDMA	{s.36 (b)}	{s.39(b)}
Effective and prompt response to any threatening disasters – (i) under the guidelines of NDMA and NEC; (<i>Central Government Departments</i>) (ii) under the State Plan and the guidelines of NEC and SEC; (<i>State Government Departments</i>)	{s.36 (c)}	{s.39(d)}
Review enactments, policies, rules, and regulations and incorporate necessary provisions for disaster prevention, mitigation, or preparedness	{s.36 (d)}	{s.39(e)}
Allocation of funds for prevention and mitigation of disasters, capacity-building, and preparatory measures thereon	{s.36 (e)}	{s.39(c)}
Assistance to the NDMA and State Government (<i>Central Ministries and Departments</i>) and the NEC, the SEC, or the DDMA (<i>State Ministries and Departments</i>) in drawing up plans and training of personnel, carrying out rescue and relief operations, assessing the damage from a disaster, rehabilitation, and reconstruction	{s.36 (f)}	{s.39(f)}
Provisioning for resources in consultation with the SDMA for implementation of District Plan by its authorities at district level	–	{s.39(g)}
Make available its resources to the NEC and the SEC (<i>Central Ministries and Departments</i>), the NEC, the SEC, or the DDMA (<i>State Ministries and Departments</i>) for providing emergency communications, transporting relief goods and personnel, providing evacuation of persons or livestock from threatening disaster situation or disaster, rescue, temporary shelter, and other immediate relief, essential services – drinking water, health care, setting up temporary bridges, jetties, and any other action necessary for disaster management	{s.36 (g)}	{s.39(h)}
The ministries or departments of GoI to prepare disaster management plan following the national plan with specifications regarding the integration of mitigation measures as per the NDMA and the NEC guidelines, role and responsibilities towards preparedness and capacity-building, annual review and update of the plan, and submission to the NDMA for approval The departments of State Government have to perform an additional task of identification of types of disasters to which different parts of State are vulnerable	{ss.37 (1) (a) (i) to (V), (b) (c) & (2)}	{ss.40 (1) (a) (i) to (v), (b), (c), (2) & (3).

Three-Tier Disaster Management Authorities

The Act provides for the establishment of three-tier disaster management authorities – the NDMA, the SDMA, and the DDMA. The Chairperson of the NDMA is the Prime Minister of India (s.3), while about the SDMA and the DDMA, the respective Chief Minister (s.14) and the Collector or District Magistrate or Deputy Commissioner (s.25) respectively is the Chairperson.

The NDMA is responsible for laying down the policies, plans, and guidelines for disaster management and effective response to the disaster. To give effect to the objective mentioned above, the NDMA lays down policies and approves the National Plan and plans prepared by the Ministries and Departments; lays down guidelines for the SDMA to frame their State Plan and different Ministries or Departments of the GoI coordinates, enforcement and implementation of the policy, and plan for disaster management; recommends funds for mitigation; provides support to the countries affected by disasters; takes measures for prevention, mitigation, or preparedness and capacity-building for dealing with the threatening disasters situation; and lays down broad policies for the functioning of the NIDM (s. 6). Likewise, the SDMA possesses all the powers and performs the above functions at the state level (s.18) excluding the function of providing support to other countries given in clause (h) of the s. 6(2).

The NDMA and SDMA perform their respective functions to manage and respond to the disasters with the help of different authorities such as the NEC and the SEC (Executive Councils), the NIDM, the NDRF, the DDMA, and Local Authorities. The Act establishes the NEC (s.10) and the SEC (s.22). The Executive Councils shall perform the responsibility for implementing the policies and plans of the respective authorities (NDMA & SDMA) and ensure the compliance of directions issued for the management of disasters in their respective jurisdictions. The NIDM functions under the broad guidelines and policies laid down by the NDMA and is responsible for planning and promoting training and research in the area of disaster management, development of national-level information mechanisms on disaster management policies, prevention, and mitigation {s.42(9)(a)}. Furthermore, NDRF is a specialist task force that works under the supervision, direction, and control of the NDMA (ss.44–45).

The DDMA acts as the district planning, coordinating, and implementing body and takes all measures necessary for disaster management according to guidelines laid down by the NDMA and SDMA. Besides the functions of preparation of disaster management plan, coordination, implementation, and monitoring of various plans by the different departments at the district level and local authorities, it identifies the areas vulnerable to disasters and buildings to be used as relief centers and camps, reviews capability for responding to disaster and preparedness, facilitates community training and early warning systems, and ensures participation of NGOs and social welfare institutions [s.30].

To ensure ground-level implementation of the Act, the local authorities shall ensure the skill development of officials in disaster management; proper management of resources; and confirmation of prescribed standards in construction projects

(s.41). The local authorities have to carry out relief, rehabilitation, and reconstruction activities following the State and District Plan (s.41).

Enforceable Measures: For ensuring the compliance of obligations specified under the Act, the Act also contains penal provisions to address failure in performance of obligations, violations, and contraventions of the provisions of the Act. These provisions classify the offenses and prescribe the punishment for each offense as under (Table 3):

The above provisions of the Act are comprehensive and address a wide range of offending activities frustrating the purpose of the Act. The Act cover offences committed by government departments, companies, and corporate bodies as well (ss. 55 & 58). In case, an offence or contravention under the provisions of this Act is committed by a government department or the company or the corporate body, the Act makes provision for proceeding against the head of the department, person-in-charge of the company, or director or manager of the corporate body unless the contrary is proved as to their involvement in the alleged contravention. Nonetheless, insertion of exception clauses for heads of the department and in-charges of the company or corporate bodies along with imposing a bar on a complaint to be filed by

Table 3 Offences and penalties

S. no.	Offence	Punishment
1	Obstruction in the discharge of functions of any officer or employee of the institutional framework defined under the Act {s.51(a)}	Imprisonment up to one year or with fine or with both
2	Refusal to comply with any direction given by or on behalf of Central Government, State Government, NEC, SEC, or DDMA resulting into loss of lives or imminent danger thereof{ s.51(b)}	Imprisonment for up to two years
3	False claim for obtaining relief, assistance, repair, reconstruction or other benefits consequent to disaster from any authority (s.52)	Imprisonment up to two years or with fine or with both
4	Misappropriation or appropriation of entrusted money, material, or other things given in custody for providing relief to the affected, for own use or disposal of such item in custody or compelling another person to do so (s. 53)	Imprisonment up to two years or with fine or with both
5	Making or Circulation of false alarm or warning as to disaster, its severity or magnitude leading to panic (s.54)	Imprisonment up to one year or with fine
7	Refusal to perform or withdrawal by oneself from performing the duties assigned to any officer in an official capacity or ceases to perform duty without express written permission of superior officer or lawful excuse (s.56)	Imprisonment up to one year or with fine
8	Contravention of the order of NEC, SEC, or DDMA, etc. u/s 65 regarding the use of any resource, premise, or vehicle needed for a prompt response, rescue operation, or rehabilitation or reconstruction (s.57)	Imprisonment up to one year or with fine or with both

a common man (as spelt out under s. 60) are the provisions that relax the rigor of the law. For ensuring effective, prompt, and dedicated response to the disaster for minimization of loss to property and persons, the law should be rigorously implemented. The appearance of such exception clauses in provisions concerning liability depicts the adoption of the doctrine of strict liability while looking at the gravity of such incidents; the doctrine of absolute liability could have served the purpose of the Act in a better way. Such exception clauses may carry room for breeding corruption and poor implementation of such an important law.

Conclusion

Given the foregoing discussion, it can be submitted that the Disaster Management Act, 2005, is a comprehensive legislation and demonstrates the incorporation of most of the strategic dictums of Yokohama Strategy, Hyogo Framework, and Sendai Framework. The fundamental postulates of international disaster management framework such as disaster prevention, preparedness and mitigation, disaster risk reduction as national and local priority covering identification, assessment, and monitoring of disasters, early risk warning, strong collaborative institutional mechanism, and use of knowledge, innovation, and education to build a culture of safety, effective and quick response, and resilience have been incorporated in the Act itself. Another important feature of the Act is that it prohibits discrimination on the ground of sex, caste, community, descent, or religion (s.61). This provision represents the spirit of inclusive governance underscored in Sustainable Development Goals and Articles 14–17 of the Constitution of India. Also the priorities adopted in Sendai Framework such as understanding disaster risk, strengthening disaster risk governance for proper management, and investing therein along with enhancing disaster preparedness for effective response and rehabilitation through “Build Back Better” have also been included in disaster management policy and disaster management plans of different ministries such as National Disaster Management Plan, 2016 (NDMP), National Agriculture Disaster Management Plan, 2020 (NADMP), Ministry of Railways Disaster Management Plan, 2019 (MoRDMP), etc. During the COVID-19 pandemic, the NEC constituted Empowered Groups by exercising its powers conferred under s.10(2)(h) and (i) of the Act to take comprehensive and integrated response (MHA, 2020).

Additionally, the NPDM provides for vulnerability mapping and analysis through hazard zonation by utilizing GIS-based databases like NDEM and National Spatial Data Infrastructure NSDI to reduce the risk posed by disasters and control the damage. The policy contains several measures to realize the objectives of the Act through early warning system, consistent monitoring of critical infrastructures like dams, roads, bridges, flyovers, railways lines, power stations, water storage towers, irrigation canals, delta water distribution networks, river and coastal embankments, ports, civil utilities, domain-specific disaster management plans, animal care-shelter and fodder developing a culture of preparedness for disaster management through planning based on bottom-up approach and operationalization of plans. The Act

makes it mandatory to include “disaster management” as a “standing item” in the agenda of meetings of Inter-State council, Zonal Council, and “reporting item” National Development Council to integrate disaster management in all development plans. Besides, the policy provides a classification of the level of disasters, incident command system suitable to the level of disaster, prompt and effective medical response team information management, etc.

To sum up, it can be submitted that the creation of a culture of safety through preparedness, resilience, and rehabilitation is a continuous process demanding constant review and upgradation of the disaster management framework. Accordingly, efforts have been from time to time to reshape the Indian disaster management framework in consonance with international standards.

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Paradigm Shift in Disaster Management: 118 Bangladesh Experience

Mahfuzul Haque

Contents

Introduction	1774
Global Scenario	1775
Bangladesh Scenario	1776
Best Practices in Disaster Management	1777
Community-Based Disaster Management	1778
Conclusion	1779
References	1779

Abstract

Disaster management is no longer based on traditional relief, rehabilitation, and rescue operation. It is more tilted towards disaster risk reduction, smart early warning system, emergency response, fast evacuation, transfer to safety of a cyclone shelter, and adoption of pre-disaster and post-disaster plan. It's a major paradigm shift. Such a strategy change has been able to reduce loss of lives and properties to a great extent in recent years. Disaster plans and policies adopted by various governments did reflect this paradigm shift in line with globally adopted Hyogo Framework and Sendai Framework. In Bangladesh, the "Standing Orders on Disaster 2010" and Bangladesh National Plan for Disaster Management, 2010–2015 and other guidelines stressed emphasis on disaster risk reduction. They also underscored the need to strengthen coping strategies and emergency response measures. The chapter argues that the paradigm shift from post-disaster relief and rehabilitation to disaster preparedness, risk reduction measures, smart early warning systems, and promptness of the volunteers and local administration did substantially reduce death and destruction in recent years. The chapter further unearthed the coping strategy, the local coastal communities are applying, as they are trying to survive over the generations. Community-based disaster

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management proved to be very handy and useful in case of periodic hazards. Instead of structural solutions, the chapter in conclusion recommended implementation of various policy guidelines adopted by the government, inter-agency collaboration, community participation in disaster management, and good disaster governance.

Keywords

Community-based disaster management · Disaster governance · Disaster risk reduction · Emergency response · Hyogo Framework · Paradigm shift · Sendai Framework

Introduction

Bangladesh is a country frequently visited by climate change-induced disasters. The country is frequently visited by disasters like floods, cyclones, tornados, and tidal surges. Hazards like drought and desertification also periodically visit the country. During monsoon, floods are generally accompanied by river-bank erosion. These disasters continuously interrupt lives and livelihood of the coastal, charland, and drought-prone areas of the country. Because of its location on the conical shaped Bay of Bengal, the country attracts regular cyclones and tidal surges. There are around 35 million people in the coast of Bangladesh stretched over 710 km from Satkhira to Saint Martin's island. Out of them, seven million people are living in high-risk zone (Rasheed, 2011).

Tropical cyclones named Sidr and Aila hit the coastal areas of the country in 2007 and 2009, respectively. They caused havoc on human lives and properties, but in comparison to earlier cyclones, the loss was much less. Around 3,363,406 and 190 people lost their lives, respectively, during Sidr and Aila (GOB, 2010). Decreased death and destruction was possible due to effective coordination and networking among various tiers of the government machineries, NGO volunteers, and activist groups engaged in disaster risk reduction and emergency response. Around 3,30,000 and 1,38,882 people died, respectively, in the coast of Bangladesh during the cyclones of 1970 and 1991, respectively (GOB, 1990, 2009a). However, loss has been substantially reduced in recent years due to effective disaster management during pre-disaster, disaster, and post-disaster period, implementation of disaster risk reduction, and emergency measures.

According to experts, disasters are not always seen as "extreme events" created by the nature. They are of the view that due to faulty implementation of development projects, procrastination in undertaking repair and maintenance works, poor collaboration between various agencies of the government, disasters take place. Fredrick Cuny (1983) gave a classic example, which stated that an earthquake in California in 1971 of 6.4 magnitude in richer scale caused only 58 deaths, while another earthquake in 1973 of lesser magnitude of 6.2 destroyed the central city of Managua, Nicaragua, killing 6000 people. This very example suggests that impacts of a

disaster depends on people's vulnerability and people's ability to cope with the disaster. Disasters are now considered as events not necessarily created by the nature but due to faulty implementation of development projects undertaken without social and environmental considerations. A project implemented without conduction of Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA) is likely to turn into a disaster; we call it as "development disasters." Experts are of the view that risks unmanaged or mismanaged for a considerable long period of time would cause a disaster.

Policy makers and planners are increasingly subscribing to this paradigm shift from relief and rehabilitation to disaster risk reduction, emergency response, and cyclone preparedness program. Following this paradigm shift, long-term mitigation and adaptation measures are being taken. The process of this transformation may take some time. Both the government and the development partners are to change their priority for an effective disaster governance. In order to mainstream the paradigm shift in to various plans and policies of the government, good disaster governance is necessary.

The chapter is mainly based on secondary sources of literature and author's personal experience while working with the community members. Based on digested knowledge received from primary and secondary sources of literature, the overall goal of this chapter is to examine effectiveness of the argument that the policy departure from traditional relief and rehabilitation to disaster risk reduction did actually bring any benefit to the affected communities. The chapter argued that the paradigm shift from responding after a disaster to pre-disaster preparedness and mitigation activities is extremely necessary for an effective disaster governance.

Global Scenario

Natural disasters in recent years both in frequency and ferocity are on the rise due to global warming and emissions of greenhouse gases. Disaster risk reduction has become a global concern these days. In the backdrop of such an alarming situation, a number of international conferences are held attended by world leaders aiming at reducing the wrath of disasters. Hyogo Framework (2005–2015) adopted in Japan in 2005 urged the global communities to pursue an "integrated multi-hazard approach" in order to reduce the incidence and severity of disasters. A unique opportunity was created to promote a strategic and systematic approach in reducing vulnerabilities and risks to hazards. The framework underscored the need for building the resilience of nations and communities to disasters (Hyogo, 2005).

Hyogo Framework for Action was followed by adoption of Sendai Framework for Disaster Risk Reduction in March, 2015 (Sendai, 2015). The 15-year Plan put emphasis on disaster risk management, while the earlier plans dealt with disaster management only. The plan urged the global community for reduction of disaster risk by preventing new and existing risk and to strengthen resilience of the community. It provided a set of guiding principles, which included the primary responsibility of states was to prevent and reduce disaster risk. Further to that both natural

and man-made disasters have been included within the purview of disaster risk reduction.

These two frameworks acknowledged contribution of indigenous knowledge and practices (IKP) of the local community concerning disaster risk reduction, climate change adaptation, and natural resource management. Sendai Framework underscored the need to integrate IKP and coping strategy of the local community in disaster-prone areas. Sendai highlighted on the role of the stakeholders in disaster management. It put stress on the role of the local and indigenous peoples, their experience, and traditional knowledge in implementation of various international agreements. In this regard, the Framework suggested that measures are to be taken to validate the IKP through scientific knowledge. It advocated for mainstreaming disaster risk reduction in all national plans, policies, and guidelines.

The twenty-first Conference of the Parties (COP-21) to UN Framework Convention on Climate Change held in December 2015 in France adopted the “Paris Agreement,” which suggested a greater role and involvement of the local community in disaster risk reduction. Country parties agreed to limit global warming well below 2 °C compared to pre-industrial level. They agreed that mitigation to climate change by reducing carbon emissions was the ultimate form of disaster risk reduction. It is to be mentioned that reducing greenhouse gases to 1.5 °C would immensely contribute to reduction to disasters. Paris Agreement has been made effective since 2020.

Bangladesh Scenario

Bangladesh is one of the few countries, which took a pragmatic approach in revising and updating its plans and policies targeting reducing disaster impacts. In line with the Hyogo Framework, Bangladesh adopted the Standing Orders on Disaster (SOD, 2010), describing the duties and responsibilities of various levels of the Government from local union level to central level involved in disaster risk reduction, disaster preparedness, and emergency response. The Orders clarified the risk reduction measures and outlined activities for different tiers of the government agencies during the warning, disaster, and post-disaster period (SOD, 2010). It is now a globally accepted model of guidelines for the volunteers and officials engaged in disaster management. In recent days, casualties have reduced to a great extent due to a shift from relief and rehabilitation to disaster warning and disaster risk reduction, as laid down in SOD.

National Plan for Disaster Management (NPDM) 2010–2015 is another important document, which works as a “model to guide disaster risk reduction and emergency response” (GOB, 2010). The model has three key components, which are defining the risk environment; managing the risk environment; and responding to the threat environment. NPDM focused on the likely threats and consequences thereof. It identified the risks and suggested actions in order to eliminate, reduce, or manage risk. The plan further promoted “community-based adaptation” and encouraged the disaster management officials to practice disaster risk reduction and emergency response.

Emergency response described warning period (alert and activation); disaster onset (response); and post-disaster period (relief, early recovery, and rehabilitation). Emphasizing on the disaster risk reduction, the government further adopted the Bangladesh National Disaster Management Guidelines in 2015. The guidelines put more emphasis on disaster risk reduction, food, and livelihood security. The guidelines stressed the need to accelerate adaptation measures to climate change and reduce the risk to disaster (GOB, 2015). It is to be mentioned here that the National Plan for Disaster Management (2016–2020) with caption, “Building Resilience for Sustainable Human Development,” in its mission statement stated that the Plan would achieve “a paradigm shift in disaster management from conventional response and relief to more comprehensive risk reduction culture, and to promote food security as an important factor in ensuring the resilience of communities to hazards” (GOB, 2016).

It is to be noted that the plans and policies are for implementation and cannot be enforced without proper legal support. Mindful of this shortcoming, the government enacted the Disaster Management Act in 2012. The act had a provision for setting up of an authority to try the offenders for failing in their duties to reduce disaster risks and protect lives of the people. The proposed authority would try officials for their failure in disaster predicting and adopting contingency measures (GOB, 2012). Invoking the Act, the Government can declare an area as a “Distressed Area” preventing people from undertaking destructive activities. Under the Act, a national fund would be formed on disaster response, relief, and rehabilitation.

Best Practices in Disaster Management

Bangladesh has incorporated disaster management into poverty reduction strategy and in national plans, like the 5-year plans and long-term visionary plans. NPDM 2010–2015 is being revised to align itself in line with the Sendai Framework, Climate Change Agreement, and the Sustainable Development Goals (GOB, 2016). Some of the best practices (GOB, 2009a) in DRR being followed by Bangladesh are to (a) understand the paradigm shift in disaster management from relief and rehabilitation to disaster risk reduction; (b) ensure early warning dissemination through CPP volunteers; (c) empower local communities and their resilience in order to undertake a community-based disaster management; d) reduce the risk factors by building cyclone shelters, flood shelters, *killas* (raised earth), and disaster-proof low-cost rural housing; and e) introduce saline-tolerant, flood-tolerant, and drought-tolerant varieties of crops and massive afforestation to combat onslaught of tidal surges.

Various plans, policies, and strategies aptly described this new paradigm shift in disaster management. They are the National Adaptation Programme of Actions (NAPA), 2009, and Bangladesh Climate Change Strategy and Action Plan (BCCSAP), 2009) (GOB, 2009c, d). Realizing that the challenges and impacts of climate change and disaster are of development concern, both NAPA and BCCSAP addressed the key elements that create synergies between disaster risk reduction and

climate change adaptation (Islam et al., 2013). In an effort to compare impacts of the four major cyclones in the last 40 years and their aftermaths on the coast of Bangladesh, it is found that due to lack of proper strategy and directions 3,30,000 people died in Great Bhola cyclone in 1970 and another 1,38,882 people died in Gorky in 1991 (GOB, 2010). As we undertook a paradigm shift in disaster management in line with good practices, only 3406 people died in cyclone *Sidr* in 2007 and another 190 in *Aila* in 2009 (GOB, 1990, 2009a). Relatively low number of deaths caused by *Sidr* and *Aila* is widely considered as the result of government's efforts in cyclone forecasting, early warnings, and prompt evacuation. Moreover, 43,000 CPP volunteers stationed in the coastal islands are playing an important role in attending the threatened communities and circulating cyclone warning and evacuation orders via megaphones, handheld bullhorns, bicycle-mounted loudspeakers, and house-to-house contacts. Moreover, storm forecasting and warnings issued by the Storm Warning Centre of the Department of Metrology have been very effective and users-friendly.

Community-Based Disaster Management

Due to periodic cyclones and tidal surges, the coastal community has developed some age-old practices in facing natural disasters. "Community-based adaptation" to climate change is local-level practices, based on the priorities set by the communities themselves (Reid et al., 2014). According to Pandey (Undated), Community-Based Disaster Management (CBDM) is based on grassroots consultation in a participatory way. Gero et al. (2011) observed that community-based disaster risk reduction aims to reduce the vulnerability and enhance the resilience of local communities to the impacts of disaster. CBDM helps the local community to understand its vulnerabilities to natural disasters and to develop critical survival strategy and resilience in facing a disaster.

During a disaster, women and children because of their vulnerability need special care and attention as they are less mobile than men (GOB, 2009b). Hassan (2000) observed that people in the coastal islands can withstand a disaster because of their short-term survival strategy. Their survival strategies include holding on coconut trees with a rope in tidal surges, seeking refuge in nearby embankments or higher place, holding on floating logs, thatched roof, and straw piles. They cling to floating bunches of coconuts as they look for a safer place during the tidal surge.

Over the generations, the villagers have learned techniques of preserving food during and after a disaster. They bury dry foods, mainly thatched rice, underground in mud-sealed earthen pots. They salvage the foods, when the water is gone. Water is mostly contaminated during a cyclone and concomitant tidal surges. People suffer from diarrhea. They harvest rainwater and drink coconut water to quench their thirst. Similar to food preservation, their survival strategy includes wearing of *Salwar* and *Kameez*, which help them to swim and not traditional *Sarees* (traditional female dress in south Asia). Haque (2013) maintained that outside help and relief goods generally appear much later of the event. During this intervening period, their

age-old knowledge and practices help them to survive. They eat stems and roots of edible plants. Nasreen (2000) observed that women in flood-hit areas use herbal medicines for prevention of diarrhea and dysentery. They put juice of certain leaves to stop bleeding in injuries.

They are good construction engineers too. While constructing a house, they use local thatching materials and ensure that the roof has a slope towards the wind and not against. They plant indigenous varieties of plants surrounding their homesteads. For example, in *haor* wetlands in the north-east, local varieties of trees like *Hizol*, *Karoch*, and *Barun* are planted, which could withstand flash floods. Local grass *Nalkhagra* helps them to protect the houses from *Afaals* (wave actions) (Haque, 2000, 2019). They raise the plinth level of their houses and construct *killas* (raised earth) for shelter of their cattle heads during a disaster.

Conclusion

In effecting this paradigm shift, the mindset of the people needs to be changed. Over dependence on the donors and development partners needs to be stopped. Instead of waiting for the government, people themselves are to take community-based actions to combat a disaster. Lack of inter-agency coordination to be avoided. Women, children, and the handicaps need special care and attention. Indigenous communities with linguistic and religious barrier need special assistance.

In a coastal country like Bangladesh, disasters like cyclones, tornadoes, and tidal surges would regularly visit, and they cannot be controlled. Death and damages could be reduced through better management practices. It is true that effective implementation, updating, and enforcement of the rules and regulations are badly needed to adjust and accommodate with the changing scenarios. Regular updating requires grassroots consultations with the community. CBDM is fairly in a nascent stage and needs to be documented, promoted, and propagated. It has been proved that instead of typical structural methods, people in the coast through their indigenous knowledge and practices along with better management practices did survive many natural disasters.

It is suggested that further studies could be undertaken to develop a full-fledged CBDM to be based on following an elaborate methodology of consultation with the grassroots people in the coast. Following official adoption of CBDM, efforts are to be taken to mainstream community-based adaptation measures in national plans and policies of the government.

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Comparative Analysis of Legal Framework for Disaster Management in Pakistan, India, and Bangladesh

119

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Contents

Introduction	1782
Rationale for the Study	1783
Research Methodology	1783
Research Questions	1783
Concept of Disaster and Disaster Management	1783
The Status of Disaster Hazards in South Asian Region	1784
The Comparative Analysis of the Disaster Management Law in Pakistan, India, and Bangladesh	1786
Conclusion and Recommendations	1789
References	1791

Abstract

Tropical cyclones and typhoons have wreaked havoc in South-East Asia, East Asia, and South Asia. Several areas of the region are frequently affected by natural calamities, which have a disastrous effect on socio-economic, cultural, and environmental effects. The COVID-19 pandemic added another layer of complexity to disaster management efforts, as nations had to deal with both the pandemic and threats connected to climate change. India, Pakistan, Bhutan, Nepal, Bangladesh, and a few other countries have been victims of natural calamities like earthquakes, floods, and cyclones. There are many similarities and challenges caused by frequent disaster in India and its neighboring two countries in terms of geographical conditions and economic issues. This chapter aims to make comparative analysis of the legal framework related to disaster

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management in these countries. The law related to disaster management in all these countries have been introduced during the period between 2005 and 2010. The comparative study of this legal framework in all these nations have been made with the objectives to know the actions taken by them for the management of disasters. The chapter also aims to analyze the legal framework of these countries to study the scope of the definition of the term disaster, the aims and objectives of the law, the structure for disaster management authorities, the provisions for post-disaster actions and their coverage and limitations, and also the description on typology of disasters. It also tries to analyze the provisions related to community resilience covered under the laws of these nations. Based on the analysis, it tries to conclude with recommendations to identify the best practices adopted by each country for disaster management and to prepare a comprehensive and common action plan to be adopted by all these nations to mitigate and prevent disasters.

Keywords

Disaster management · Disaster mitigation · South Asia · International framework

Introduction

Since the dawn of humankind, disasters have caused severe harm to human life, property, and resources. In the last few decades, the world has experienced natural and man-made disasters at a large extent. The Chernobyl nuclear plant disaster of 26 April, 1986 (Erin Blakemore, National Geographic, 2019), the Bhopal Gas Disaster in 1984, the frequent earthquakes, floods, tsunamis, pandemic, and wars have caused great loss to the humans. The society and nations have always responded to manage such disasters. The technological innovations in the last few years have increased the hope of mankind for better management of the disasters. It is high time to prioritize to save the world from such disasters through effective disaster management framework. Particularly comprehensive measures are required to combat social and economic issues caused by disasters in South Asia which is a disaster-prone area. The main reasons of the present study are to see whether a common model of legislations can be developed across the South Asian region carving out existing legal systems for overseeing mitigating disasters at this region by enlisting the structures and processes of contemporary legal framework with specific focus on Pakistan, India, and Bangladesh. This chapter is divided into three main parts, i.e., (1) introduction of research methodology and rationale of study, (2) the concept of disaster management and comparative analysis, and (3) conclusions and recommendations are drawn from the analysis of the existing data on frameworks operational in these countries.

Rationale for the Study

The purpose of this comparison is to know the best legal measures adopted by these nations for disaster management and to recommend and amend necessary provisions to be adopted in the Indian legal framework based on this study. The nature of disasters experienced by countries like Bhutan, Bangladesh, and Pakistan is more or less similar to the conditions in India. The similarities of economic, political, and social conditions of these countries and the nature of disasters experienced by the citizens are reasons for selecting these countries for the comparative study. Again, the other reasons of the present study are to see whether a common model of legislations can be developed across the South Asian region carving out existing legal systems for overseeing the mitigation of disasters in this region by enlisting the structures and processes of contemporary legal frameworks.

Research Methodology

The present study used the doctrinal methods and desk review for exploring the relevant literature for the regulatory framework of disaster management legislations existing in the Southern part of Asia specifically Pakistan, India, and Bangladesh. Other sources of secondary literature like reports, documents, working papers, and other relevant sources have also been used and analyzed for the present study.

Research Questions

The key research points for the present research are the following: how far the existing regional framework of legislation of countries, namely, Pakistan, India, and Bangladesh, oblige to fulfill the mandate of international treaties in context to safety and security of its vulnerable population.

It delves into structure of the legal framework for disaster management for effective disaster management and disaster risk reductions in Pakistan, Bangladesh, and India. It also tries to identify the special features of disaster management law of each of these nations and best practices followed by them. The present research also tries to investigate the scope for the comprehensive common practices to be followed by these nations to combat the issues related to climate change and other disasters and management thereof.

Concept of Disaster and Disaster Management

According to United Nations Office for Disaster Risk Reduction (UNDRR), researchers and bodies working on the same have tried to conceptualize the twin term of disaster and disaster management in the context disaster risk management.

“Disaster” is a serious disruption of the functioning of society, causing humongous human, material, or environmental losses which exceed the ability of affected society to cope using only its own resources. Disaster is any incident which threatens human safety and/or damages, or threatens to damage, buildings, collections, equipment, and systems (Eden & Matthews, 1996). Disaster includes an unusual, natural, or man-made event caused by frustration of technological systems, which temporarily overwhelms the response capacity of human communities, groups of individuals, or natural environments and which in turn causes massive damage, economic loss, disruption, injury, and/or loss of lives (Parker, 1992). So, a disaster is damage caused by natural forces, natural calamities, or by human intervention. It can be both man-made and natural. Disaster management is a challenge for any society or nation. Disaster management can be defined as the body of policy and administrative decisions, the operational activities, and the actors and technologies that pertain to the various stages of a disaster at all levels (Lettieri et al., 2009). The Asian Development Bank (ADB) in its Disaster manager’s handbook has defined disaster management with a practical approach to help provide a common concept throughout the disaster management activities. It has been defined as “an applied science which seeks, by the systematic observation and analysis of disasters, to improve measures relating to prevention, mitigation, preparedness, emergency response and recovery chronologically.” The handbook laid out the characteristics which are common to the definition of disaster as *disruption to normal life, human effects, effects on social structure, and the community needs*. So, broadly there are four components of disaster, i.e., hazard, exposure to hazard, vulnerability, and coping capacity of the people to face the disaster with available knowledge, skill, and resources (Milutinovic & Garevski, 2009). Hazards of any disaster may include damage to property, loss of human lives, economic loss, displacement, etc. Vulnerability can be seen as potential of damage. It is the potential threat to people and property by the disaster (Lazarevski & Gjorgon, 2017). In recent years, the focus has been changed from disaster management to risk reduction through disaster resilience. Natural calamities are harmful when they cause hazards. So, it is required to reduce risk of hazards of any disaster and equally important to make the people ready to adapt to and face it with available resources and skill. It is applicable for both natural hazards and man-made hazards. Precautionary measures from the government and coping capacity of the community to tackle the hazards can be proved very effective in reducing the risk of the disaster particularly for the disaster-prone countries of South Asia.

The Status of Disaster Hazards in South Asian Region

The South Asian countries frequently face the hazards of disasters – natural and man-made as well. In recent years, the impact of climate change and rising temperature has been witnessed through the rise in sea level and increased frequency of

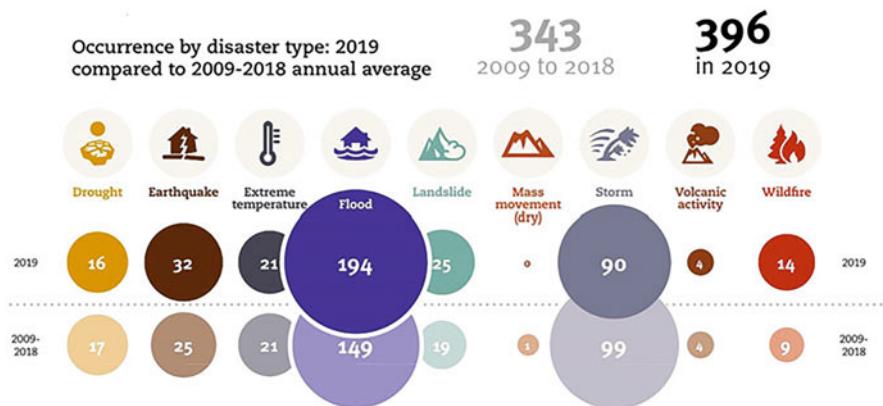


Fig. 1 Comparative status of occurrence of disasters in the period 2009–2018 and in the year 2019. (Source: Occurrence by disaster type 2019. Image: CRED. <https://www.un-spider.org/news-and-events/news/cred-publishes-2019-disaster-statistics> available at <https://www.un-ssspider.org/sites/default/files/ND19-2.jpg> accessed on 22.2.22)

floods in this part of the world. The South Asia Disaster Report, 2008 (See Duryog Nivaran & Practical Action, South Asia Disaster Report 2008), indicates that total 128 natural disaster incidents were recorded between 2006 and 2008. Total 8000 people lost their lives in 86 incidences of flood. India and Bangladesh were major areas of natural disasters during this as estimated by South Asia Disaster Report, 2008. As per the records of the year 2020 published by Asian Disaster Research Centre, total 163 disasters have been recorded in the Asian Region (Natural Disaster Data Book, 2010). There is a never-ending upward trend of disasters over the decades. More recently, climate change impacts are evident through frequent hazards due to floods and cyclones in the Southern most regions of the continent. The following comparative status of the disaster data for different periods validates the increasing trend (Fig. 1).

Trade Insight of DRR efforts indicate about the above that the South Asia region falls under high-risk zone of the world.

The South Asian Countries have to develop an effective framework for the disaster risk management. The establishment of South Asian Association for Regional Cooperation (SAARC) and later in 2006 Disaster Management Centre was a right step toward that direction. It aims at providing suggestions on policy, advocacy, and research actions required for the risk management system.

Many of the South Asian Countries have developed the law for disaster management, but how far they are (un)able to address the issues related to human victims of such incidents is to be seen or examined. Are they in a position to reduce climate vulnerability? To understand this, a comparative analysis of the disaster management law of various countries of South Asia has been made.

The Comparative Analysis of the Disaster Management Law in Pakistan, India, and Bangladesh

The comparative analysis of the disaster management law of Pakistan, India and Bangladesh has been examined on the following points:

1. The purpose of the Act
2. The scope of the law
3. The level and structure of the disaster management authorities
4. The role of involving the communities in the disaster management through legal framework
5. Special features of each law
6. The overall coverage of law for preventive and mitigating measures for the disasters

The scope of the comparison is limited only to the specific laws related to disaster management in each of the countries mentioned above. The aim of the comparative study is to understand the good practices followed through each law and to adopt the best practices to be adopted from each law. It also aims to recommend certain common measures which all three countries can initiate in common to prevent and mitigate disasters.

Pakistan

Historically, Pakistan has been a natural disaster-prone country. Before the enactment of Pakistan Disaster Management Act [PDMA], 2010, the Calamity Act of 1958 was in existence to deal with disasters. The integrated approach to manage disasters was introduced through the National Disaster Management Ordinance 2006 (NDMO) which was converted into PDMA Act in 2010.

The law related to management of disaster in Pakistan was passed *ex post facto* in 2010. Earlier, it was in effect from August 2007.

The main agency to look after disaster was entrusted with the title National Disaster Management Act, 2010.

Majority of the countries have come out with laws from 2005 to 2010 as these same countries were undergoing climate change and other natural disasters during the same periods.

Pakistan is one of the signatories to the UN Hyogo Framework for Action (HFA) 2005–2015.

The Act is a reactive step and tries to respond to the gaps in the available legal framework to tackle disasters. The Act was passed to manage the issues related to disasters to which the earlier legal framework does not respond or for which it is inadequately equipped. The Act has no specific objectives.

The definition of the disaster given in the Act is comprehensive as it includes both natural and human-made disaster. There are ambiguities in the definition as it includes some accidental incidents making the understanding more complex which is either not clearly defined or indecisive in its capacity. The word “substantial” used

in definition also needs to be more concise/precise and clear. It does not help in interpreting the word at administrative and legal level.

The three-tier structure has been provided by the Act for the management of disasters in the country.

National Disaster Management Commission [NDMC] is the highest policymaking body for disaster management and to take care of the issues related to integration of disaster risk management, implementation of policy, and development plans for disaster management. The policy decisions are implemented through National Disaster Management Authority [NDMA].

The Provincial Disaster Management Commission [PDMC] works at provincial level. The disaster management authorities are working at national, provincial, and district level and also at grassroots tahsil level. The National Disaster Management Authority works at national level in coordination with the National Disaster Management Commission. The Provincial Disaster Management Authority is functioning at the provincial level, and the District Disaster Management Authority is working at the district level. All the three authorities have powers to establish a technical committee for effective coordination for the implementation of the Act. Apart from this, there will be union councils at the village level and community organizations also have the mandate to give its input and work in sync with others. So, one can assume that the structure is well defined from top to bottom for the implementation of the Act.

The Act also suggests for establishment of National Institute of Disaster Management for research, development, and training and for National Disaster Management Fund under section 27.

The provinces are also required to establish Provincial Disaster Management Fund to deal with issues related to disasters.

Section 5 and 25 of the Act suggests for preventive and mitigating measures to be taken for disasters. But there is a lack of detailed provisions suggesting measures to be taken to implement these sections and detailed measures for Disaster Risk Reduction [DRR]

At present, most of the South Asian countries are facing issues related to global warming and climate change. The present Act does not contain any direct provision related to prevention and mitigation of issues related to climate change which is the major cause for natural disasters. The Act does not contain the provision with detailed plan on developing community resilience.

India

India is also one of the disaster-prone countries with its multiplicity of diverse geo-climatic zones. It experienced severe earthquake in 2001. In the wake of it, the state of Gujarat in India enacted a Disaster Management Act for Gujarat in 2003. To further strengthen the mechanism in 2005, the Union Ministry of Home Affairs enacted the National law, i.e., National Disaster Management Act with a soul mission of “To build a safer and disaster resilient India by a holistic, pro-active, technology driven and sustainable development strategy that involves all stakeholders and fosters a culture of prevention, preparedness and mitigation.”

The definition of disaster provided under the Act is not inclusive.

The Act also provides for three tier structures for disaster management: National Disaster Management Authority [NDMA] is constituted at the national level for formulating and enforcement of the plan and policy for disaster management as per the provisions in section 6 of the Act. It is assisted by the National Executive Committee (NEC) which provides assistance in implementing the plans and policies framed by the NDMA.

At each state level, the State Disaster Management Authority is established which follows the directions of the National Disaster Management Authority and National Executive Committee to take measures for disaster management. The Act also provides for the establishment of State Executive Committee [SEC]. The SDMA has the power to review the development plan to ensure that it is integrated with disaster prevention and mitigating measures. This power of SDMA has wider scope than the powers with NDMA.

The Act provides for the establishment of the District Disaster Management Authority at each district level. The DDMA has wide powers to take preventive measures. The act follows top-down model approach in decision-making and implementation of the Act, but DDMA has been exceptionally vested with wide range of powers to take preventive and mitigating measures for the disasters. It is a positive feature of the Act as the local issues can be well addressed at the local level by the local authorities due to diverse factors affecting the varied geo-climatic zones and related issues and challenges arising out of it. But effective involvement of local authorities is essential which is not provided or mandated by the Act which is counter productive in the long run for implementation of such operations.

The Act also provides for the creation of National Disaster Response Force [NDRF] in the year 2006. In a very short span of time, NDRF has rescued over 1.44 lakh precious human lives and also evacuated more than 7 lakh stranded persons from disaster situations within the country and abroad which is a very positive impact of this provision as witnessed during the last 15 years.

The Act also provides for constitution of National Disaster Mitigation Fund under NDMA and National Disaster Response Fund under NEC.

Looking at the huge population, larger geographical area with diverse climatic conditions, and the magnitude and impact of disasters, the National Disaster Management Act of 2005 has been successful in responding to the crises proactively and promptly.

Bangladesh

Bangladesh is one of the disaster-prone countries like India and Pakistan. In 1993, Disaster Management Bureau was established. In 2000, Comprehensive Disaster Management Program was created. After this, Ministry of Food and Disaster Management was established in 2005. The Disaster Management Act came into effect in 2012 in Bangladesh.

The Bangladesh National Disaster Management Act was enacted in the year 2012, but before the Act was passed the Government had a “Bangladesh Climate Change Strategy and Action Plan (BCCSAP) 2009” which was linked to the climate

change and the potentials for the disaster and considered as one of the primary pillars of disaster management.

Bangladesh is one of the signatories of the UN Hyogo Framework for Action (HFA) 2005–2015 and follows the SAARC Sendai Framework for Disaster Management, the basic principles of which are also reflected in the 5-year plan of Bangladesh.

The Act is divided into a three-tier structure for the management of disasters in the country. “The National Disaster Management Council (NDMC)” is the Council that will regulate the focus on long-term strategic goals for disaster management and addressing the commitment and demonstration of key issues along with establishing the relations between visions, goals, and strategies of the government to the strategies and aligning priorities of national and international drivers. See Haque and Bhuiyan (► Chap. 126, “Managing Disasters in Bangladesh: Legislative Framework and Judicial Developments”).

The NDMC has the power to lay down the guidelines and strategies as well as the approaches used for the emergency response, current disaster risk reduction, and preparation programs.

“The Department of Disaster Management” and “National Disaster Management Research and Training Institute” implement disaster risk reduction programs, and emergency humanitarian aid, rescue, and rehabilitation programs.

The Research and Training Institute will implement pertinent initiatives, such as studies on enhancing disaster management techniques as well as the impacts of climate change and disasters. The DDMC operating at the district level should formulate the procedures along with the plans for recovery which delineates damage assessment procedure, and such plans shall be updated and reviewed annually.

“The National Disaster Response Co-ordination Group (NDR-CG)” and “Local Level Disaster Management Committee and Group” have the primary role of assessing the catastrophic occurrences in different parts of the region, and activating the disaster response and swift rescue procedures, simultaneously making sure that the resources are dispatched for the disaster, and proper transmission of warning signals should be considered.

By organizing the post-disaster relief efforts and guaranteeing prompt delivery of extra supplies and tools to regions where communications are hindered, the coordination group should also oversee the post-disaster rescue and search activities. Along with offering advice on risk reduction and disaster preparedness measures, they help sustain information flow in emergency situations like disasters.

Conclusion and Recommendations

After analyzing the legal framework for disaster management existing in Pakistan, India, and Bangladesh, it is observed that the laws in all three countries follow top-down approach model for implementation of the objectives of the laws. All these laws have national, provincial, and district or local authorities to plan and make policy to implement the law related to disaster management.

All the three countries mentioned above have well-developed legal frameworks with proper statutory authorities to implement the provisions of the legal framework as discussed above. The structure and the functions of the authorities are well defined. The expectations from the statutory authorities are clearly laid down. On these points, uniformity in the legal framework of all the above countries is apparent.

But there is lack of uniformity in approach to inclusion of linkages of climate change with disasters and statutory measures for the same in all three nations' legal framework. Except for the legal framework of Bangladesh which addresses in detail climate change and its linkages with disasters in the act, policy, and planning, this provision is not included or is at nascent stage in the legal framework of India and Pakistan.

These frameworks do not include the disasters due to development and displacement which is a very subtle but consistently ongoing issue.

All the three nations have very robust mechanism for disaster management, but there is a difference between comprehensive planning and execution for disaster mitigation and prevention. Except for the disaster management law of Bangladesh, all other laws do not directly and in detail discuss the linkage of disasters due to climate change and mitigating measures for the same. Contrastingly, the National disaster management law of Bangladesh defines climate change and also includes it in detail in the Act to their advantage.

There is less participation/ involvement of people in disaster management authorities established at national, state, or district level under the disaster-level legal framework of all these countries investigated here.

There is a need to empower the local authorities more in comparison to state and national authorities. The bottom-up approach model is essential as all these nations have excellent potential of community participation in resolving the issues.

There is also a need of effective capacity building provision under the legal framework for disaster management in all the three countries.

It is likewise essential to formulate uniform policy to include disaster prevention and mitigating measures in the development planning framework. Environment Impact Assessment (EIA) can also be included as one of the mandatory provisions of process for industrial and infrastructure development activities carried out by these countries to further their economic growth.

It is equally essential to integrate the measures to prevent climate change with the disaster management laws. The industrial policies and related framework should also be framed in the context of the provisions of the disaster management laws.

The technological innovations and its sharing, exchange, and transfer with neighboring countries are also required as Pakistan, Bangladesh, and India share common challenges of disasters and are also affected commonly. India and Bangladesh have signed Memorandum of Understanding in 2021 for taking measures through cooperation for disaster management, resilience, and mitigation. This MOU aims to extend cooperation in the field of advanced information technology, early warning systems, remote sensing and navigation services, and expertise for disaster preparedness, response, and mitigation and move toward real-time data

sharing. Similar measures should be taken for concrete joint action plan by neighboring countries.

The technological and AI support system should be enhanced for disaster management and preventive measures. Artificial intelligence and innovative technology can bring a paradigm shift in the area of agriculture, water, energy, land, and forest use in these regions as we have seen that the communities here are predominantly based on traditional farming which demands huge use of all such resources.

The collateral of disasters like loss of basic education, poor health due to disaster-induced mobility and migration, food crises and hunger, and reviving major chunk of natural resources like reservoirs, dormant rivers, streams, lakes, ponds, and natural forest has to be one of the primary focuses of public policy framework in the South Asian region.

Above all, linking livelihood through sustainable ways of living to future disaster calls for legal safeguard to avoid and mitigate climate disaster in the future which lies ultimately with awareness and actions of the community inhabiting in these regions as all share common vulnerabilities and fragility in terms of disasters and other hazards (man-made or otherwise).

Joint collaborative framework and creative financial mobilization with flexible interpretation of legal nuances of all these countries would certainly help in creating a better disaster-resilient citizenry to live their life in more sustainable ways.

To broadly conclude, there is an urgent need of ensuring that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation of policy, identifying, assessing, and monitoring disaster risks, enhancing early warning, use of knowledge, innovation, and education to build a culture of safety and resilience at all levels, reduction of the underlying risk factors, and strengthening disaster preparedness for effective response mechanism at all levels across all the countries examined for this purpose.

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Part X

International Law and Collaboration During Disasters



Introduction: International Law and Collaboration During Disasters

120

Muhammad Ekramul Haque

Disaster management works at its pinnacle only with efficient international cooperation and collaboration. Many disasters have instilled in them so many multifaceted factors that it is almost impossible for a nation to tackle them on their own, and that is where regional and international cooperation comes into play. This cooperation is necessary at all national levels, which might require a coordinative body between the many branches which work even on local and national levels. The existence of current contemporary legal frameworks in this regard forms a kind of backbone in terms of the navigation a country might need when maneuvering through the waters of novel legislation in this field. The International Disaster Response Law (IDRL) guidelines, developed by the International Federation of Red Cross and Red Crescent Societies, play a crucial role in promoting a common understanding of the legal obligations and responsibilities of states, international organizations, and humanitarian actors in disaster situations. Other pivotal legal instruments which are underscored by international cooperation and collaboration in disaster management are the United Nations International Strategy for Disaster Reduction (UNISDR), which paid specific heed to a comprehensive approach attending to disaster risk reduction, preparedness, response, and recovery, and the United Nations Disaster Assessment and Coordination (UNDAC) system, which laid the bricks to support disaster-affected countries in assessing needs, coordinating humanitarian responses, and providing technical support to national authorities. The European Union has developed its share of tools for international cooperation as enshrined in the Disaster Assistance and Protection Program (DAPPED) which includes provisions for rapid

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response, coordination, and is designed to complement the efforts of affected countries and other international actors. Establishing the International Relief Union in 1921 marked the beginning of the origins of international disaster law, paving the way for the subsequent development of a sophisticated branch of international law over the course of the next century, although the whole system “[does] not constitute a coherent whole and most of those with a binding character are unevenly distributed across different geographical areas” (Giustimiani, 2021). Despite concerted efforts, a comprehensive legal framework surrounding disasters has yet to be formulated, as a result soft international law remains as a predominant component within the broader realm of international disaster law. The guidelines for the domestic facilitation and regulation of international disaster relief and initial recovery assistance (IDRL Guidelines), adopted in 2007, are milestone international legal standards regarding disaster management, although these are nonbonding soft international laws (<https://disasterlaw.ifrc.org/idrlguidelines>, accessed on 12 April 2023). Disaster management strongly needs collaboration and thus this is an integral part of international disaster law (Singh, 2018).

As there is no uniform law dealing with disaster matters, the International Law Commission (ILC) attempted to make developments in this facet. ► [Chapter 124, “The International Law Commission and International Disaster Law,”](#) has elaborated the works done, so far, by the ILC. This chapter focused on the Draft Articles on the Protection of Persons in the Event of Disasters (DAPPED) adopted by the ILC. The DAPPED has adopted some novel approaches which are significant additions to the international disaster law gene pool. The DAPPED has the future potential of being adopted as a binding convention, till then it will continue to impact international disaster law as a nonbinding soft international law.

Disasters inexorably impede the full realization and attainment of a variety of human rights, thereby exerting a deleterious and pervasive influence on the lives of those effected. Hence, it is paramount that international disaster laws provide provisions and mechanisms to protect human rights in a disaster situation. ► [Chapter 128, “International Human Rights Law \(IHRL\) in Disaster Risk Reduction \(DRR\) Planning,”](#) has clearly established a nexus between international human rights law and disaster risk reduction planning. It is argued that proper integration of IHRL in DRR planning can prevent infringement of many human rights and can eventually ensure better protection of human rights.

Again, international cooperation and solidarity are essential conditions for the protection of human rights during disasters. ► [Chapter 123, “International Law, Human Rights, and Public Health Emergencies During Disasters: A Developing Country Perspective,”](#) has pointed out the issue of possible human rights violations during public health emergencies at the time of disasters and argued that solidarity and international cooperations can reduce the risk of human rights violations in developing countries. The author has rightly concluded that solidarity is a duty under international law which exists equally during the pre- and postdisaster periods.

According to international law, the right to health holds an inimitable status as a vital human right. ► [Chapter 130, “COVID-19 Pandemic and Health for All,”](#) has portrayed that a set of human rights, including the right to health, is affected by

disasters. Taking the example of the COVID-19 pandemic, the author of this chapter has established a jurisprudential development of international law regarding disaster. It is argued that each state owes a strict legal obligation under international law to protect the human rights of the people, including the right to health. This right-based approach eventually imposes a legal obligation on the state to protect the right to health and other human rights during disasters. On the basis of this right-based approach, it is finally argued that a right-based disaster management policy should be adopted to face disasters including one like COVID-19 pandemic.

Many principles of international humanitarian law act as parts of international disaster law in different ways. ► [Chapter 135, “Humanitarian Relief in the Time of Covid: The Law and the Reality,”](#) has identified how international humanitarian legal principles can be applied in different disaster situations. It is also argued that different states can be benefited by the use of international humanitarian laws during the periods of disasters.

The International Disaster Response Law (IDRL) guidelines deal with, *inter alia*, duty of a state to protect the internally displaced persons (IDPs) in the event of disaster. However, the author of ► [Chap. 125, “Duty of the State to Protect Internally Displaced Persons in the Event of Disaster,”](#) shows that the relevant IDRL guidelines are not novel principles, rather they are made based on the existing principles of international law. ► [Chapter 132, “Disaster Displacement and International Refugee Law: Locating Legal Protections in the Context of Climate Change Migration,”](#) has further clarified the legal protections under International Refugee Law (IRL) in the context of disaster-driven human displacement (DHD) and climate change migration.

Encompassing a country’s domestic perspective, this section has included a number of chapters on different issues of disaster management. It has already been pointed out that soft international legal standards continue to impact different national legal systems to make laws in conformity with those standards. ► [Chapter 117, “Disaster Management Laws: International and Indian Perspectives,”](#) has examined the compatibility of the Indian disaster management laws with international law, especially with the principles of international humanitarian law. It is argued that the fundamental principles of international law regarding disaster management have been adopted in the Indian laws, and, specifically speaking, the Disaster Management Act, 2005, a comprehensive Indian legislation, generally complies with international legal standard on disaster management including the Yokohama Strategy, Hyogo Framework, and Sendai Framework.

The chapters on Bangladeshi legal regime include ► [Chaps. 121, “Legal Aid Services for Disaster-Induced Gender-Based Violence in Coastal Bangladesh,”](#) ► [126, “Managing Disasters in Bangladesh: Legislative Framework and Judicial Developments,”](#) ► [127, “Persons with Disabilities in COVID 19: Bangladesh Perspective,”](#) ► [129, “Nuclear Disaster: Assessing the Compliance of Global Nuclear Safety Regime in Bangladesh,”](#) ► [131, “Climate Change and Disaster Management in Bangladesh,”](#) and ► [134, “Corporate Responsibility to Protect Human Rights: Evaluating the Legal Framework of Bangladesh in Light of International and Regional Standards.”](#) These chapters deal elaborately with various issues from

domestic perspective, which will be a useful resource to see how a country faces pertinent issues surrounding disasters. There is a chapter from the Sri Lankan perspective, which has portrayed armed conflict as human-made disaster and has examined how the civilians can be protected in such situations under international law. The sole chapter written on the Indonesian system has examined the doctrine of executive immunity in times of COVID-19 from an Indonesian perspective. The chapter on “A Comparative Analysis of Disaster Legislation in South Asia” is significant as it analyses disaster legislation from a holistic South Asian perspective. As regional cooperation plays a crucial role in disaster management, such a study will undoubtedly be pivotal in managing disasters in South Asia.

Finally, although this section has not been an exhaustive compendium of all relevant issues regarding international law and collaboration during disasters, this has included the study of some basic issues from a jurisprudential perspective, like the discussion on the right-based approach or examining different issues from international legal perspective, and an investigation to determine the relationship of international disaster law with international human rights law, humanitarian law, and refugee law. The country-specific chapters will set a fundamental premise as to the research in this field and facilitate further study surrounding congruent issues from different national perspectives.

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Legal Aid Services for Disaster-Induced Gender-Based Violence in Coastal Bangladesh

121

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Contents

Introduction	1800
Context	1801
Methodology	1802
Understanding the Target Community: Housing and Socio-economic Condition	1802
Rights-Based Approach, GBV, and Natural Disaster	1804
Rights-Based Approach as a Theory	1804
How Natural Disaster Affects GBV: Theories and Experiences from Around the World	1804
Rights-Based Approach to GBV in Disasters	1806
The National Legal Framework: The Role of Law and Policy in Discussions on Inequality in Terms of Gender, Sex, and Locality	1807
The Disaster Management Act 2012	1807
National Plan for Disaster Management (NPDM) 2016–2020	1808
Standing Regulatory Orders 2010	1808
International Agreements and State Implementation	1809
Common Gaps and Challenges in GBV Frameworks During Disasters	1809
Access to Legal Support for GBV Protection During Disasters: Case Studies from Bangladesh	1809
Lack of Participatory Process	1810
No Holistic View	1810
Lack of Transparency and Accountability	1811
Not Producing Sustained Results	1812

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How Lack of Legal Aid Services Affects Disaster Induced Gender-Based Violence	1812
Equality	1813
Transparency	1814
Accountability	1815
Empowerment	1816
Conclusion	1816
References	1816

Abstract

Natural disaster triggers need for control in abusive households, intensifying domestic violence. This chapter analyses how natural disaster-induced gender-based violence (GBV) affects women in the coastal region of Bangladesh, with special focus on the challenges of access to legal support. Using Human Rights Based Approach (RBA) and mixed methodology, the authors analyze how existing patriarchy and dysfunctional local governance create a serious reluctance to access the state legal aid system to address GBV.

Keywords

Rights-based approach · Access to justice · Women · Domestic violence · Legal aid · Legal consciousness

Introduction

The World Risk Report 2021 ranks Bangladesh as the 13th highest disaster-prone country globally (Relief Web, 2021, p. 7). Annually experiencing multiple large-scale disasters and affecting millions of people, Bangladesh is one of the few states with specific executive wings focused on disaster management. Recently, Cyclone Bulbul (2019), Cyclone Fani (2019), Cyclone Mora (2017), Tropical storm Dianmu (2016), and Roanu (2016) with Cyclone Aila (2009) and Cyclone Sidr (2007) claimed the highest human, environmental, and infrastructural casualties (Relief Web, 2009). The 1991 Cyclone and 1970 Cyclone Bhola claimed about 150,000 and 500,000 lives, respectively, with far reaching socio-political and economic consequences. The discussions on natural disasters in Bangladesh have traditionally focused on climate change and development issues, with Sustainable Development Goals (SDGs) now receiving more focus. However, one aspect remains very little discussed: gender-based violence (GBV) in disaster contexts.

In a nutshell, this study found that domestic violence (including sexual assault and dowry-related violence) increased following the disaster(s). However, because GBV is a social problem in Bangladesh with high levels of violence already existing, it is not always easy to distinguish the GBVs occurring specifically as a result of disaster, although the increased impoverishment was a direct result of disaster and a direct cause of GBV. This chapter utilizes the framework of the human rights-based approach (RBA), which uses the lenses of quality, transparency, accountability, and empowerment to assess the GBV and its relation with natural disasters.

We begin the chapter by contextualizing gender-based violence within the Bangladeshi coastal villages prone to river erosion. Section “[Introduction](#)” describes the research area and introduces the research objectives and methodology. Then we address the relevant theories on gender-based violence and disaster through a short but focused literature review. Here we trace the development of rights-based approach to human rights, its main benchmarks and components, and the theory’s evolution in connection with natural disasters by referring to some key empirical works. The third section introduces the readers to the national legal framework on disaster management and its (lack of) attention to gender-based violence. Section “[Access to Legal Support for GBV Protection During Disasters: Case Studies from Bangladesh](#)” is the heart of the chapter where we discuss the case studies from Bangladesh with detail analysis. This part also analyzes how the lack of a proper legal framework affects people’s legal consciousness and access to justice rights. Section “[How Lack of Legal Aid Services Affects Disaster Induced Gender-Based Violence](#)” applies to rights-based approach to analyze how lack of legal aid affects disaster-induced gender-based violence in the village. Finally, we conclude by summarizing the key findings from our field data.

Context

This study intends to address the scholarly gap existing in Bangladesh on the connection between disasters and GBV. As a catalyst for triggering GBV, natural disasters have an equal or even bigger role than armed conflict and political disturbance. Moreover, while natural disasters are “not products of inequality; their impacts can fall very unevenly on different members of society” (Farber & Chen, 2006). While rushing to shelter during natural disasters, often the most vulnerable, including women, children, individuals with physical disabilities, are left behind, making them even more vulnerable to violence (IFRC and ICRC, 2015, pp. 16–17). Shelters get extremely crowded, where sexual predators and families, unaccompanied women and children are all housed together, which exposes people to increased risk of GBV. For people in abusive domestic relationships, disaster means increased tension and stress, triggering a need for control and power which induces further violence from the abuser. Disaster also breaks down whatever little legal infrastructure is available in the remote areas of a country like Bangladesh. This appears as a factor in the intersectionality of the victims (such as women, poor, abused, displaced by disaster). Thus, while people are more vulnerable, getting redressed is equally more challenging. This affects the victims and survivors of GBVs’ right to equality, right to health, right to safety and security, and right to access to justice.

This study tries to explore the following:

1. Identify the impacts of disasters on GBV in the study area
2. Reveal the accessibility or nonaccessibility to the legal support by the victims

3. Analyze the context, reasons, and facilities to access/nonaccess to the legal support by the victims
4. Analyze the impact of accessibility of legal support on the victims from a Rights Based Approach (RBA).

Methodology

We have applied mixed methods for data collection and qualitative methods for case studies. We included quantitative survey of community members by a professional surveyor, followed by a combination of key informant interviews with a structured questionnaire and focus group discussions (FGDs) at the community level with the affected community. The survey was later followed up by one focused group discussion and two qualitative interviews (one female and one male).

As researchers, we encountered limitations such as silence around discussing GBV and short time allocated for the data collection. We travelled to the locality for the KII and in-depth interviews, and we found some interesting insights as to the levels of awareness on access to legal aid for addressing GBV-related issues during times of disaster, which we discuss later in this chapter.

Understanding the Target Community: Housing and Socio-economic Condition

The research was conducted over 4 months in the Kachia Village of Bhola Sadar Union. Bhola sadar Upazila (Bhola district), with an area of 413.16 km², Kachia Union (GO code 58), has an area of 4170 acres, with a total population of 13,560 people and an official literacy rate of 67.12%, BBS 2022 (BBS, 2011). The Kachia village is the main village in the union. The sample size for household survey was 82, where one member from each household has been surveyed. The margin of error has been taken at 5%, the confidence level 95%, and the response rate 50% (Fig. 1).

The study area is disaster prone. In the past 10 years, 82 households have fallen victim to floods, while 75 households have lost land to riverbank erosion. This hampers their economic growth and stability. The disaster-induced financial loss has been the chief factor behind their impoverishment, as seen from the charts below (Tables 1 and 2).

The average socio-economic condition of the target community is very poor. 74 out of 82 households were displaced families induced by riverbank erosion, and 42 households out of 82 have rented land (around 80 sq. feet) for 3000 taka (approx. 38 USD) for a year, while the displaced people themselves bore the expense for buying household materials. Most of these people were farmers, but now most of them being landless have resorted to myriad professions such as auto driver, barber, fishing (both fisherman and fishing boat labor), housekeeper, day-laborer, assistant to local lawyer, poultry, and rickshaw-puller.

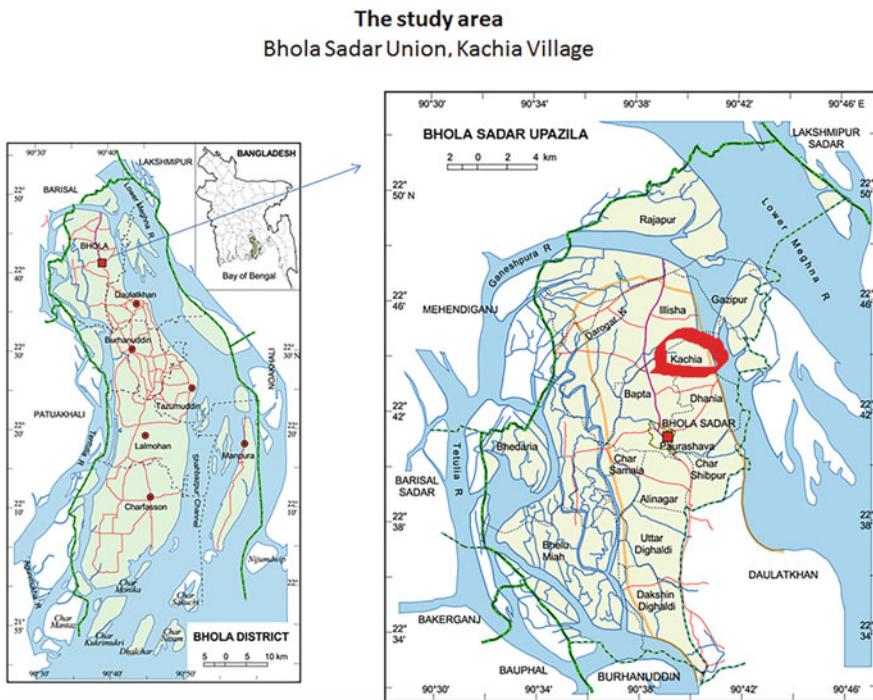


Fig. 1 Image: administrative map of the study area. (Source of the map: Banglapedia)

Table 1 Riverbank erosion-induced displacement

Category	Number of respondent	Percentage of respondent (%)
Yes	74	90.2
No	8	9.8
Total	82	100.0

Table 2 Disaster-induced displacement frequencies

Category	Number of respondent	Percentage of respondent (%)
Loss of entire house/part of it	74	79.3
Loss of livestock	8	11.0
Loss of cultivable land	82	75.6
Damage to crop	65	68.3
Loss of family member	9	2.4
Health complications	62	58.5
Other problems	56	2.4
Total	356	297.5

Rights-Based Approach, GBV, and Natural Disaster

Rights-Based Approach as a Theory

Natural disasters are traditionally seen as creating challenges mainly related to humanitarian concerns and calling for humanitarian assistance. In this context, little attention is given to human rights protection, which has appeared to be a grave need and concern for the survivors of natural disasters (IASC, 2011).

With the advent of the right to development as a human right, we saw the debate on a rights-based approach to development where the protection of the people's rights is considered paramount in development considerations. Introduction of human rights law into international law created a people-centric approach (Goonesekere, 1998). Whereas international law traditionally treated the states as the primary subjects and left the individual to the sole jurisdiction of their states, human rights shifted the focus on individuals, bringing back agency and creating accountability of the states. While the larger part of human rights discourse focuses on civil and political (CP) rights, the economic, social, and cultural (ESC) rights consist of an equally vital part of the human rights paradigm. CP rights are associated with the notion of negative action by the state, a vital aspect that distinguishes these rights from the ESC rights, the social-welfare centered delivery of services necessary to fulfill the basic needs such as food, health, shelter, and education (Goonesekere, 1998, para. 4).

As per the rights-based approach (RBA), development is not in conflict with human rights; rather development is a process to ensure the ultimate fulfillment of those rights. According to the OHCHR, RBA seeks to redress discriminatory practices and unjust distributions of power that impede development progress (OHCHR, 2006). In case of gender equality, RBA ensures that development process ensures and includes women participation and empowerment.

The main principles of the RBA framework are fourfold: equality, transparency, accountability, and empowerment. In cases of disaster management and GBV response, equality refers to ensuring rights holders receive the services they are entitled to, transparency means those affected by the disaster and GBV have full access to information in order to make informed decisions, accountability refers to holding duty bearers (i.e., State agencies who can distribute those resources) responsible for doing or not doing their part, and empowerment means post disaster the community members can participate in the rehabilitation process in order to ensure sustainable effects (Rice et al., 2017, p. 118).

How Natural Disaster Affects GBV: Theories and Experiences from Around the World

Cardona observes that "Disaster is a contested notion" and can be more easily conceptualized than defined (2004, p. 37). Scholars define it differently: To Rahman, "disaster" is a "summative concept" or a "sponge word" (Rahman et al., 2015, p. 185).

According to Quarantelli, disaster is “an event, concentrated in time and space, in which a community experiences severe danger and disruptions of its essential functions, accompanied by widespread human, material or environmental losses, which often exceed the ability of the community to cope without external assistance” (1998). Therefore, disaster is a natural or man-made event, directly related with vulnerability, to which the affected individual or society is unable to cope with, resist, and recover from its impacts (Blaikie et al., 1994, pp. 29, 320). However, vulnerability of an individual or group depends on “the interaction of the hazards of place (risk and mitigation) with the social profile of communities” (Cutter et al., 2000). While discussing vulnerability, older people, children, female, or minority groups (disabled and others) are more vulnerable to natural disasters (West & Orr, 2007). However, being a woman does not lead to disaster vulnerability; rather gender becomes a strong factor to create differences between men and women along with socio-cultural and economic factors, gendered responsibilities and roles, social attitude, and norms periods (Nasreen, 2010; MacDonald, 2005). Bradshaw and Fordham observed that in disasters, casualties are higher among female groups compared to males, especially where women’s socio-economic status is low (2013). However, “women who survive there may be longer-term and more intangible ‘secondary’ impacts such as a rise in violence or greater insecurity in employment” (Bradshaw & Fordham, 2013).

Gender-based violence increases in disasters: during and postdisaster periods (CARE International, 2013; Enarson, 2012; Goulds, 2013; Wiest et al., 1994). The experience of several disaster shows the increase of domestic violence, verbal and sexual abuse, dowry abuse, isolation, rape, and forced marriage: Hurricane Katrina in 2005, Indian Ocean tsunami in 2004, New Zealand snowstorm in 2006, China earthquake in 2008, the 2010 Haiti earthquake, and the BP oil spill in Florida in 2010 (MacDonald, 2005 p. e178; Houghton et al., 2010; Chan & Zhang, 2011; Madre et al., 2011). Goulds mentioned that when poverty strikes in disasters, child marriage becomes a coping strategy (2013). Besides, changes in household dynamics create an unequal power relation and context for domestic violence – such changes include men failing to fulfill his gendered role as the bread winner while more women get NGO loans and reliefs for family income. However, it should be noticed here that GBV is common to most of the societies during nondisaster periods and has a long history: In this case, Bangladesh is not exceptional.

The forms of violence include physical, sexual, economic, emotional, and controlling behavior. According to the Bangladesh Bureau of Statistics, about 72.6% of married women are abused by their husbands at least once in a lifetime (BBS, 2016). However, such statistics do not present the whole picture. Traditionally it is expected to keep domestic violence within family or society rather than report it to the police or media (Hossain & Suman, 2013). Only 12.9% out of 41.7% injured victims reported to the authority (BBS, 2015). These conditions raise questions about the extent of GBV during and post disasters in Bangladesh.

There is no government database on changing GVB conditions during Bangladesh disasters except some sporadic research. According to Nasreen, GBV increases during floods in Bangladesh (Nasreen, 2010). Rashid and Michaud explain

how female adolescents face GBV while taking shelter in floods (2000). GBV also increases during cyclones and riverbank erosion. Akter et al. studied the impacts of riverbank erosion on rural women and revealed the close relationship between financial insecurity and domestic violence like wife battering and abandoning wife (2019). In another study, riverbank erosion victims identified five sectors of insecurity after disasters and GBV is one of them (Rahman et al., 2015). This research reveals a higher number of domestic violence among the riverbank erosion victims.

Rights-Based Approach to GBV in Disasters

Adopting an RBA in policy and legislative framework includes gender mainstreaming to ensure gender equality. GBV depicts the imbalance of power and inequality resulting from the social depiction of masculinity as the powerful and prominent gender. In a conservative society like Bangladesh, (this study is limited to the experiences of cis-gender heterosexual women) preventing GBV would primarily require specifically calculating women's needs and requirements in terms of program design, policy making, and legislative framework (UNGA, 1998, para. 4). This leaves the transgender and gender fluid people beyond help.

According to the working paper by UN Women, a human rights-based approach in fighting GBV requires developing the capacities of "duty-bearers," that is, the state and its agencies responsible for implementing the law. These would include, *inter alia*:

- Ensuring that police understand the reality of domestic violence and that they must intervene in domestic violence situations, even when it occurs in the privacy of a home, when a woman makes a complaint.
- Ensuring that health care providers assist women in making their own decisions about reporting abuse and that the health care providers may step in when necessary.
- Ensuring that the justice administration system and the legal system (especially relating to laws on sexual violence, the type of evidence admitted into courts, and the nature of prosecution) consider the gender-based nature of violence and understand that women survivors face stigma and discrimination that may deter them from reporting or filing a case right away (UN Women, 2010).

RBA works hand in hand with the rights-holders as well, ensuring the capacities of "rights holders" are also developed by:

- Ensuring services are available, accessible, and known to women and girls
- Undertaking legal rights training for women and girls
- Engaging with customary, traditional and religious leaders (who ascribe to human rights and gender equality) to reach underserved populations, such as the elderly, women with disabilities, ethnic minorities. (UN Women, 2010)

The natural disaster response policies designed by the state adopt a traditional top-down approach which addresses the affected population as victims rather as rights holders. This approach has a significant impact on the policy and response mechanism by not incorporating the basic principles of the RBA. However, before analyzing the lack of RBA approach, we will discuss the legal framework for gender-based violence and disaster management in Bangladesh.

The National Legal Framework: The Role of Law and Policy in Discussions on Inequality in Terms of Gender, Sex, and Locality

Bangladesh does have a comprehensive disaster management program, a well-developed plan, mainstreaming strategies, and disaster management institutions, but the whole operation of the disaster management is highly centralized. The objectives of the disaster response mechanism are to coordinate agency efforts at different stages in the disaster management cycle, including disaster management practices, disaster mitigation, emergency preparedness, emergency response, disaster management mechanism, early recovery, and immediate rehabilitation (Habib et al., 2012, p. 29). According to the Preamble of the National Planning for Disaster Management Bangladesh, the disaster management vision is:

...to reduce the risk of people, especially the poor and the disadvantaged, from the effects of natural, environment and human induced hazards... to a manageable and acceptable humanitarian level and to have in place an efficient emergency response management system.

The Bangladesh Government's regulatory framework includes:

- Disaster Management Act 2012
- National Plan for Disaster Management 2006–2012
- National Disaster Management Policy 2015
- Standing Orders on Disasters (SOD) – guidelines for Government at all Levels

The Disaster Management Act 2012

The DMA 2012 establishes the roles and responsibilities of Ministries, committees, and appointments. Among the major objectives of the Act are preparing for managing the response to the effects of a disastrous event, assisting in effectively responding to and recovering from a disaster or an emergency, and establishing risk reduction as a core element of disaster management (Habib et al., 2012, p. 32).

The Act in its definition clause defines several significant concepts, such as rehabilitation, services, security. These clauses testify that legislation acknowledges toned for holistic protection of the victims through psychosocial wellbeing. This allows the state enough elasticity to include more services, including legal services.

Ensuring these would translate into the empowerment principle of the RBA. However, we argue that mere words are not sufficient to encompass the legal protection or safety in cases of GBV response, but it can be argued that in potent cases the definition should be broadened to include such security measures. However, it also needs to be noted that in GBV cases, the services required are often postevent, that is, responsive as much as preventive.

National Plan for Disaster Management (NPDM) 2016–2020

The current NPDM was preceded by the NPDM 2010–2015, the first policy document for comprehensively addressing the disaster risks in the country. This plan led to the establishment of a legal basis for DM through the Disaster Management Act 2012 and reflected the basic principles of the SAARC Framework on Disaster Management (SAARC, 2015) and Hyogo Framework of Action 2006–2015.

The current 2016–2020 framework and other mechanisms require more emphasis on managing risks in a gender responsive manner (Ahmed, 2019, p. 2). The current plan also considers national, regional, and international frameworks, particularly the Sendai Framework for Disaster Risk Reduction (SFDRR). This plan prioritizes the following hazards: flood, cyclone, earthquake, riverbank erosion, landslide, salinity intrusion, drought, tsunami, arsenic contamination, human-induced hazards. The NPDM takes a “whole-of-government” approach, and it also attaches importance to engagement of the private sector (Ahmed, 2019, p. 3). The NPDM mentions legal measures as one of the ways to “prevent new and reduce existing disaster risk... reduce hazard exposure and vulnerability to disaster... and thus strengthen resilience” (NDPM, 2015, clause 81). The plan mentions gender as a consideration for ensuring people-centered, multihazard, multisectoral forecasting and early warning systems (NDMP, 2015, Priority 4).

It is noteworthy that nowhere in the NPDM gender is considered in conjunction with legal aid or legal assistance, especially, legal aid does not appear among the different types of assistance to be provided during periods of disaster.

Standing Regulatory Orders 2010

The Standing Orders on Disaster describe the detailed roles and responsibilities of committees, Ministries, and other organizations in disaster risk reduction and emergency management and establish the necessary actions required to implement Bangladesh’s Disaster Management Model. However, in reality, budget allocation, deciding on relief items, finalizing disaster management mechanisms lie with the discretion of the higher authorities at central level so that the local government institutions are involved only at a theoretical level. Local actors are at mercy of the central disaster management authority to respond to the needs of the victims (Daily Star, 2008).

International Agreements and State Implementation

In December 2015, the International Conference of the Red Cross and Red Crescent saw States and the Movement adopt a ground-breaking Resolution on “Sexual and Gender Based Violence: Joint Action on Prevention and Response.” This resolution was a direct outcome of the studies we undertook in Bangladesh, Samoa, Myanmar, and elsewhere (Sabina, 2016, p. 24). Overall, there are low levels of awareness on gender needs and GBV risks and patterns among key disaster responders, including the government and Bangladesh Red Crescent Society (BDRCS) staff (IFRC, 2016, p. 12).

This results in a generalized understanding of GBV vulnerability across key stakeholders, where interviewees present women and children as most vulnerable. An understanding of how boys, men, and minority groups, such as lesbian, gay, bisexual, transgender, and intersex (LGBTI), are affected.

Common Gaps and Challenges in GBV Frameworks During Disasters

From a legal perspective, research has underlined the importance of developing a comprehensive and gender-sensitive legal framework for disaster management. Lack of official and proper data affects addressing GBV, especially in disaster periods. The colonial laws and social prejudices also make it very difficult to report GBV, notably sexual violence. In a study by the IFRC in Bangladesh, it was found that long legal delays and threats against victims and witnesses obstruct access to justice for GBV (IFRC, 2015).

Given the stigma associated with GBV, it is not surprising that little if any data are available on GBV in disasters. Another factor is the breakdown of systems for reporting GBV during and after a disaster. Officials are usually fully occupied in disaster response, they either have no time to maintain records or accord them lower priority, and often the officials themselves are affected during disasters (UNDP and Other UN Bodies, 2012, p. 9).

Access to Legal Support for GBV Protection During Disasters: Case Studies from Bangladesh

As seen from the above discussion, the victims in the study area are victims of intersectionality: they have suffered from GBV and natural disasters. Both these adversities have affected the women in the study area primarily on financial grounds (i.e., disaster leading to poverty leading to domestic violence) which due to their gender identity have manifested in a specific form of violence from which men generally do not suffer in Bangladesh (ASK, 2021).

While Bangladesh has laws for protection and rehabilitation of victims of GBV and victims of natural disasters, the two groups are treated exclusively of each other. As such, laws dealing with GBV do not consider the victim’s financial aspects,

whereas laws dealing with natural disasters rarely consider legal aid/services to be an emergency service during the times of disaster. The existing legal framework is insufficient for protecting and rehabilitating such intersectional victims.

In any legal system, the laws affect the society as much as social perspectives affect the laws (Friedman, 1969), (These phenomena are known as the “internal” and “external” points of view in sociolegal jurisprudence. Roscoe Pound was the first jurist to talk about how there is a gap between legal change and social change, leading to different perspectives on how legalities are deemed differently by common people and legal professionals/institutions (see Friedman, 1969).) leading to how people experience and approach the laws in a given society or community (Merry, 1990, p. 5). (This is known as legal consciousness, a framework applied in sociolegal studies. Legal consciousness studies “the ways in which law is experienced and interpreted by specific individuals as they engage, avoid, or resist the law and legal meanings.”) This legal consciousness is produced and revealed in what people *do* and what they *say*, (Fritsvold, 2009, p. 810), and our findings show that social and religious norms influence people’s experience of law, which often means not resorting to law.

Lack of Participatory Process

Qualitative interviews with the local stakeholders depict serious lack of participation from the rights holders in the study area. The community members, both male and female, do not know about the legal processes for addressing GBV during and post natural disasters. Neither villagers nor the local government officials and representatives know that the legal aid offices are supposed to operate at a union level. The Union Parishad (UP) Chairman’s office rarely took initiatives to mobilize the UP level legal aid office, and the district level legal aid office’s promotional activities do not penetrate deep into villages situated in the remote corners of Bhola. On the day of our field visit, the UP chairman’s office conducted an awareness raising session on disaster management. The UP member observed that local people rarely consider legal aid a necessary disaster management service and do not think GBV as an issue worth addressing during disaster management or after.

No Holistic View

The disaster management programs in Bangladesh mostly focus on the emergency relief and rehabilitation needs of the people and strive to control the human and economic casualty of disasters. Programs guided by RBA take a holistic view of the context within which it would be operating, including environment, the community, civil society, local and national authorities. It further considers the socio-political and legal framework that determines the relationship between those institutions and the resulting claims, duties, and accountabilities. The policies are not tweaked according to the socio-cultural needs of the communities for which they operate. Consequently,

the local political henchmen and leaders adopt the response plans at their discretion with little consideration for women victims.

Lack of Transparency and Accountability

RBA in policy design ensures that the particular human right(s) in question gets addressed through clear indicators and benchmarks, and specifies who is accountable. Specifying the accountability makes the process more transparent and empowers communities to hold the duty-bearers accountable so that rights violations get attention and recognition.

The GBV in the study area rarely ends up in the state-sanctioned formal justice administration sector. Most cases are communally mitigated through the intervention of the UP Chairman. While the UP chairman has no legal jurisdiction or authority to address such cases, there is no way to hold him accountable, because the community members consider him the sole authority in such issues. This is a clear case of nonparticipatory practices at the local government level, where the power imbalance affecting the rights-holders results in their forfeiting the right to access to justice (Fig. 2).

The police take a lax approach to domestic violence and other GBV. While domestic violence, rape, and physical assault related to dowry demands are non-compoundable offences, the police often compound them through the intervention of the Officer in Charge and female friendly police officer, a practice not backed by law. (Interviews with the OC of the Bhola Sadar Police Station, 23 December 2019.) Deep-rooted patriarchy and lack of feminist understanding of law affect how police

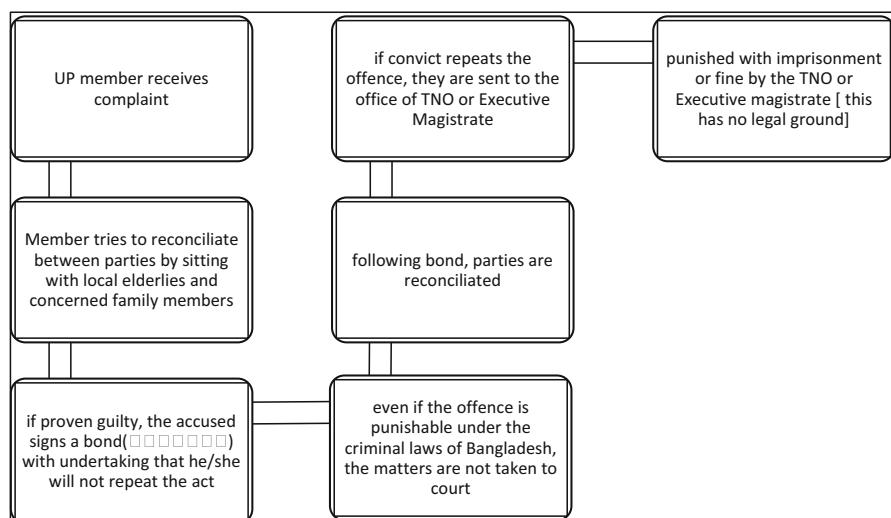


Fig. 2 Informal dispute resolution system as practiced in the target community

approach GBV cases. Two police officers mentioned adultery by women as a prime reason behind domestic violence. The local UP members prevent the villagers from approaching the police, (Interviews with Sub-Inspector and Assistant Sub-Inspector Bhola Sadar Police Station, 23 December 2019.) and therefore, people file cases as a last resort, after the local reconciliation fails to bring them justice. (As of December 2019, four suits were filed under Nari-o-Shishu Nirjaton Daman Ain related to dowry. There were three rape cases.) Even the district legal aid office and the magistrate courts are pro-reconciliation.

Not Producing Sustained Results

Bangladesh's existing social norms and patriarchy often fight against state sanctioned laws and rules. Our interviews show that many respondents hold women responsible for GBV. On the condition of anonymity, we received reports that there are judges at the district court who believe rapist can be absolved of their crime upon marrying the rape victim. (Interview at the Bhola District Court premises, 23 December 2019.) Respondents have highlighted following points:

- Many wives behave subversively with their husbands.
- River-bank erosion unemployment often pushes people for job hunting in cities. Long distance relationships result in psychological distancing and domestic violence.
- Marriages are unofficially solemnized without *kabin* registration, especially in the *char* area. Later husbands deny the marriage and beat the wife.
- Cases received at the District court show that the existing crime rate has an intrinsic relation with domestic violence, where men resort to criminal conspiracy to dispose of their wives. The following case study is interesting on this point:
A fisherman's wife had asthma. The fisherman's mother in law incited the fisherman to remarry her daughter (the fisherman's sister in law). The fisherman suffocated his wife. The case is pending before the Tribunal now.

How Lack of Legal Aid Services Affects Disaster Induced Gender-Based Violence

RBA operates on the premises that to achieve sustained progress, human rights principles must feature in governance (OHCHR, 2006, p. 7). However, the Disaster management Act 2012 and the Standing Orders of 2010 do not emphasize women as a marginalized population during periods of natural disaster. There are no provisions in the legal framework that may ensure the risk of GBV and further exposure to it be curbed down for women and similarly threatened gender groups during crises.

Equality

When responding to the needs of the community members during or post disaster, state services should be delivered in a way that prevents discrimination on grounds of race, sex, age, or other social categories (IASC, 2016, principle 1.1).

The first impetus is to save lives (both human and livestock) and property during natural disasters. With life comes security and bodily integrity of persons. These lifesaving measures are universally recognized as the first line of disaster management response, including evacuation (Ferris, 2012, p. 3). Evacuation process needs to follow standards so that people may uphold their rights, that families are not separated, and that people feel safe living in temporary shelters with other community members. Temporary shelters should be planned and managed to protect against gender-based violence.

Our study found both these aspects in the study area. While the danger signals are announced and people instructed to evacuate, the community members worry about protecting their homes and properties against petty crimes like theft and looting (IASC, Principle, II.1), as well as for the *parda* and safety of their female members (IASC, Principle, I.9). Often, male members move out first to make a subjective evaluation if evacuation would indeed be necessary, and often opt not to evacuate to ensure the women are safe inside the family home. While the IASC Guidelines mention that persons unwilling to leave should not be evacuated against their will unless such forced evacuation is in accordance with law, the evacuation notices are given following the procedural standard in Bangladesh. Hence, people choosing not to evacuate for want of safety of women is a grave violation of their right to safety and security.

The temporary shelters are not well equipped to ensure female needs. In many coastal areas of Bangladesh, school buildings serve as temporary shelters which do not cater to specific gender needs like menstrual hygiene, sanitary napkins. Over-crowded shelters expose girls to further vulnerability through sexual assault and rape. While the national policies provide for life-saving assistance like dry food, safe drinking water, oral saline, blankets, and drugs, there is no mention of special accommodation for women, which prevent women and men from receiving these services. Postdisaster situations, the underlying link between loss of property by disaster and increase of domestic violence as a form of GBV has not been sufficiently explored in Bangladesh. To make these cases of GBV justiciable, they have to be presented under the guise of dowry violence. (Interviews in Kachia, 23 December 2019.)

The GBV has far reaching consequences for women and girl children in the locality. Many women, fearing for the safety and security of their daughters, send them off to cities as domestic aides. This forced migration perpetuates the cycle of GBV because the deprivation of education means the girls grow up often to face the same powerlessness of their mothers. We found that while people are more open about violent consequences like child marriage, dowry, sending off daughters to cities as domestic help, women rarely opened up about the physical assault and battery from their husbands. Physical assault is acceptable as a way of life and the

persisting fear of sharing the experience with outsiders. The respondents rarely consider domestic violence as gender-based “violence.”

Transparency

Transparency is important for ensuring nondiscrimination and challenging unequal power structures in the community (Berman, 2008, p. 11). The principles of equality and nondiscrimination require the duty bearers, that is, the state, to ensure that social protection programs meet the elemental standards for all rights holders: accessibility, availability, and acceptability (CESCR, 2007). Services available to the community need to be accessible and useful. Accessibility has further conditions set by the General Comment 19, which are not fulfilled:

- a. Coverage: All community members, especially the individuals belonging to the most disadvantaged groups, must be covered by the services.

Theoretically, the DMA 2012 covers all persons affected by natural disasters, focusing on vulnerable groups. In terms of GBV protection, the Domestic Violence Prevention Act 2010, the Dowry Prohibition Act 1980, and the *Nari O Shishu Nirjaton Domon Ain* 2000 are available. Furthermore, the Legal aid and Services Act 2000 provides for legal aid committees at national, district, upazilla, and union level. However, the Union level legal aid committee was nonexistent in Kachia.

- b. Eligibility: The selection used to identify beneficiaries within a program must be reasonable, proportionate, and transparent.

The GBV laws lay down specific offences against women.

- c. Affordability: Any protective services requiring contributions in the form of direct or indirect charge must be stipulated in advance and must be affordable for all.

Legal aid and Services Act 2000 has specific provisions saying destitute people and victims of domestic violence are eligible for receiving legal aid (LASA, 2000, Sect. 2 (a)).

- d. Participation and information: Beneficiaries of programs must be able to participate in the program’s administration and have the right to seek, receive, and impart information on entitlements clearly and transparently.

In Kachia, most people approach the court through *muhuris*, that is, court clerks, and have no idea about the legal aid scheme. Though there are regular advertisements in the local print media about legal aid services, the low literacy rate makes it unlikely to reach the intended target group beneficiaries.

- e. Physical access: Benefits must be provided promptly, and beneficiaries must have physical access to receive benefits and information, with particular attention to disaster-prone areas (CESCR, 2007, para. 27).

In Bangladesh, the DMA 2012 covers all people and the Disaster Management and Relief officer work from the district and upazilla level. However, the legal aid office is only functional at the district level; the distance makes seeking legal aid services cumbersome for vulnerable people. Our discussions with the legal aid officer (in charge), Bhola, show that the District level legal aid committee is quite active. The committee has a meeting every 3 months, although the law stipulates monthly meetings (LASA, 2000, Sect. 11(2)), where beneficiaries participate.

Accountability

Accountability in a human rights-based framework relates to states setting up systems to ensure human rights are not violated and that redress is provided to those who are wronged (Concannon & Lindstrom, 2011, p. 1176).

Fieldwork shows that people have a low tendency of redressing GBV and other disputes through legal services. While people did not identify legal aid services as a necessary service spontaneously, the majority acknowledged it when questioned about their necessity. People do need legal services intervention. However, the idea of legal services is quite traditional and informal regarding access to justice. As opposed to addressing social problems and criminal activities, family disputes are considered a private issue by the respondents and as such preferred not to disclose to the *thana pulish*, that is, police, court, and legal aid officers (Table 3).

Table 3 Reasons for avoiding Legal services for addressing domestic violence

Category	Number of respondents	Percentage of respondent (%)
Fear of losing social respectability	3	3.7
Husband will no longer accept/take back if wife seeks legal help	15	18.3
Mutual reconciliation	23	28.0
Too much expensive	4	4.9
Court does not give proper solution	1	1.2
Chairman solves problem	14	17.1
Police demands money for assistance	0	0.0
Seeking legal remedy is complicated and troublesome	3	3.7
Village elders can help solve the problem	1	1.2
Husband will not accept her anymore	1	1.2
Political influence prevents proper justice	1	1.2
Reconcile thyself	1	1.2

The table depicts the idea of family as a private sphere and, consequently, family disputes as a private matter, not inviting external intervention. The local UP chairperson and the influential political leaders operate as de facto dispute resolution authorities.

Empowerment

A human rights-based approach to disaster response includes the active, free, and meaningful participation of all parts of society, including impacted communities, grassroots organizations, minorities, rural populations, and women (Concannon & Lindstrom, 2011). Various factors influence survivors' access to support services, including social norms, logistical challenges, lack of awareness, preference for community-led justice processes, prior relationship between perpetrator and survivor (if any), trust in the police, and family support. The preference to use traditional customary practices, arbitration, and sentencing (salish) in rural areas presents challenges for women and girls' access to justice. According to an expert, women and girls in Bangladesh are disproportionately impacted by disasters, but women's contributions to disaster risk reduction are often overlooked (Ahmed, 2019, p. 2).

Existing patriarchal views also hamper the legal empowerment of community women. The legal aid officer working with the Bhola District Court faced formidable challenge of balancing the application of law against existing social mores, affecting the cultural acceptability of judicial and legal services.

Conclusion

This study shows that despite the prevalence of laws and policies, the awareness about gender-based violence and formal access to justice mechanisms is below par in the remote areas of Bangladesh. Through qualitative and quantitative study, we analyzed how social prejudice, patriarchy, and dysfunctional local government have contributed to a serious threat of life and liberty to women in the study area. This affects gender equality with far-reaching consequences for rights to education, information, health, and access to justice. The current legal framework is inadequate and insufficient to cater to a wholesome social need, breaching Bangladesh's constitutional and international pledges.

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Doctrine of Executive Immunity in Times of COVID-19: Experience from Indonesia

122

Rosa Ristawati, Radian Salman, and John Roberto Sampe

Contents

Introduction	1822
The Nonnatural Disaster Under Indonesian Laws and COVID-19	1823
State Emergency v Public Health Emergency	1824
Executive in Times of COVID-19	1825
Executive Powers During Public Health Emergency	1826
Executive Immunity During Public Health Emergency	1828
Courts on Executive Immunity	1831
Conclusion	1832
References	1833

Abstract

The Indonesian constitution provides the basis for the president as the executive to issue the executive laws and any policies to take measures in dealing with the COVID-19 impacts. The chapter will provide an analysis of how and what are the limits of the executive powers in Indonesia in dealing with COVID-19 as well as how the legal framework in Indonesia provides the basis of any measures taken by the executive in Indonesia. There are at least two important issues; the first is whether or not the executive has any limits in taking measures dealing with COVID-19; in this context, does the principle of executive immunity apply and in what conditions and circumstances? The second issue would be about how other branches (the legislative and the courts) would be the counterbalance vis-a-vis the executive branch. In Indonesia, since the beginning of COVID-19, there have been many executive laws and policies issued by the executive. Measures taken have covered various aspects ranging from social, economic, monetary and fiscal policy, tax, and any kinds of social restrictions in the health policies including vaccines. The issues in this chapter will be analyzed mostly from the normative

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perspective. The analysis will focus on the extent to which the constitution permits the executive to issue measures on all kinds of policies delivered in laws. It will assess whether the laws are compatible with dealing with the situation and the implementation of the laws.

Keywords

The executive · Executive immunity · The Indonesian constitution · Emergency law · Executive immunity and pandemic

Introduction

The COVID-19 pandemic pushed the Indonesian president to declare a “public health” emergency through Presidential Decision No. 11/2020. The public health emergency declaration was issued on March 31, 2020, based on Article 4 (1) of the Indonesian constitution which gives the executive power to the president of Indonesia and in accordance with Law No. 6/2018 on the health quarantine. Furthermore, Law No. 4/1984 designates the minister of health as the responsible person for taking any measures to anticipate and overcome the emergency. The role and responsibility of the minister of health are also mentioned in Government Rules No. 41/1991 on the prevention of infectious disease. At the more technical level, the Ministry of Health Act No. 1501/MENKES/PER/X/2010 on the infectious disease which causes the epidemic and the efforts to overcome it mentioned that the minister of health is the minister who has a responsibility when there are extraordinary circumstances as a result of the endemic within a certain area of Indonesia. The current and most relevant law concerning the countermeasures of COVID-19 is Law No. 24/2007 on disaster countermeasures. The law determined that the epidemic of a disease like the plague is one of the man-made (nonnatural) disasters.

Decision-making takes place in a special manner during an emergency; hence the government becomes a subject of legal immunity (Hoffman, 2007). According to the Indonesian constitution, there is no provision concerning executive immunity. However, Article 12 of the constitution stipulates that the president as the executive has the power to declare an emergency. This clause gives loopholes for the executive to take any measures with limited responsibility. An emergency law is not only for an emergency but could also be made at any time of a serious urgent situation according to Article 22 (1) of the Indonesian constitution. In addition, the urgent situations have been determined by the constitutional court in Court Decision No. 138/PUU-VIII/2009. In the court’s decision, the court rules on at least three urgent situations, namely, (1) urgent circumstances as a result of a legal issue which requires a fast and accurate solution according to the law, (2) there is still no law concerning any specific issue that could lead to a legal vacuum or there is insufficient law dealing with the situation, and (3) the legal vacuum could not be resolved if the law has to be made by normal mechanisms of the law-making process since the situation is urgent and needs an immediate law to deal with it.

As Indonesia struggled with the pandemic COVID-19, the president has issued two Government Regulations in Lieu of Law (PERPU). The two PERPUS do not contain the objectives to address specific issues of anticipation of the COVID-19 per se. Among these two laws, one aims to solve the instability of the state economy by anticipating the national economic threats (PERPU 1/2020). This emergency law strengthens the committee of financial system stability which has already been legally established by Law No. 9/2016 on the prevention and anticipation measures of the financial system crisis. Article 27 Sec. (2) shields the members, the secretary, the member of the secretariat of the committee, the official or the ministry of the financial staff, Bank Indonesia, the Authority of Financial Services, and the agency of curator and other officials relevant to the implementation of the PERPU from any legal responsibilities in the civil or criminal area; as long as they are doing their duties, good faith is shown, and they do not conflict with the laws. In addition, Article 27(3) of the Emergency Law 1/2020 shields the executive from any administrative claims in the administrative court. Dealing with an unprecedent event such as the pandemic is a great challenge for the government. Under this state of emergency, society tends to have a high dependency toward the directions that governments take. Given the situation, policy-makers should be given the necessary flexibility to ensure that appropriate measures are being taken. However, despite being granted the immunity, the government must abide by the law and should act in good faith. Violations toward law or abuse of power by the executive branch will not go unpunished even at the time of pandemic.

The Nonnatural Disaster Under Indonesian Laws and COVID-19

According to the Indonesian Disaster Management Law (Law 24/2007), a disaster takes its form in naturally or unnaturally caused events or series of events that threaten and distract the life and livelihood of the community and may result in human casualties, environmental destruction, property loss, and psychological impact. Furthermore, disasters may be classified into natural disasters, nonnatural disasters, and social disasters. Natural disasters include earthquakes, tsunamis, volcano eruptions, floods, droughts, hurricanes, and landslides. On the other hand, according to the law, nonnatural disasters are, namely, the failure of technology, failure of modernization, epidemic, and disease pandemic, whereas social disasters may be caused by human beings and include social conflicts between groups or between communities and terrorist organizations.

COVID-19 may not be the only pandemic that has happened in Indonesia. It was in 1918–1919 when Indonesia faced the influenza pandemic which may have been the most lethal short-term epidemic of the twentieth century (Chandra, 2013). The pandemic of COVID-19 was serious enough on its own to have been defined as a nonnatural disaster according to the scope of the disaster in Indonesian law. The Indonesian president (President Joko Widodo) in April 2020 laid out the legal basis in the form of an Executive Law of Presidential Decree (KEPPRES) 12/2020. The president ordered that all the local governments in the provinces, municipalities, and

cities be the decision-makers in the special task force team to deal with COVID in their relevant jurisdiction. However, in making any policy countermeasures to combat COVID-19, they have to take into consideration the policy issued by the central government. The order is one of the consequences of the unitary form of the state. To this extent, the local policy has to be under the central policy issued by the government of the Republic of Indonesia.

State Emergency v Public Health Emergency

Bjørnskov and Voigt have argued that governments that are democratic are more likely to declare an emergency than those that are autocratic (Bjørnskov & Voigt, 2018). In Indonesia, there are different terms for a state emergency and a public health emergency. However, the constitution only stipulates a general term for a state emergency. According to Article 12 of the Indonesian constitution, the president may declare a state of emergency, whereas the condition for a declaration of a state of emergency and all consequences resulting from the declaration are regulated by law. At this point, the constitution only prescribes a general scope of state of emergency. Other than that, the specific scopes of state emergency are defined by laws. The declaration of a public health emergency is under the scope of a state of emergency. The declaration may be issued in a particular situation when there is an extraordinary threat to public health under the threat of contagious diseases and/or events caused by nuclear radiation, biological contamination, chemical contamination, bioterrorism, and food that threaten the health and potentially spread across regions or countries.

The scope of a public health emergency is set according to Law 6/2018 on the health quarantine. The Indonesian president (President Jokowi) declared the public health emergency in March 2020 as a response to the contagious virus of COVID-19 pandemic (Djalante et al., 2020). The declaration on the public health emergency confirms its legal basis. It has several consequences including the policy of large-scale social restriction. The public health emergency finds different terms from the state emergency. According to Article 1 (2) Law 6/2018 on quarantine, the public health emergency may refer to the situation where the public health or community health is threatened by an extraordinary event of contagious and infectious diseases and/or an event caused by nuclear radiation, biological contamination, chemical contamination, bioterrorism, and food contamination which may endanger public health and potentially cause cross-border transmission.

On the other hand, the state emergency finds its constitutionality according to Article 12 of the Indonesian constitution which stipulates that the president can declare a state of emergency. Any conditions and consequences are regulated by law. Furthermore, the legal basis of the state of emergency is found in the Emergency Law No. 23/1959 which stipulates that the president as the commander in chief could declare all or part of the territory of the Republic of Indonesia under a state emergency with the level of civil emergency or war/military emergency defined in three situations, if:

- (a) In the legal term of peace and security of all, the territory or part of territories of the Republic of Indonesia is under threat by insurgencies, internal conflicts, or natural disaster which potentially could not be overcome by ordinary military equipment
- (b) War or threat of war which potentially provokes disturbances or sexual outrage arises within the territory of the Republic of Indonesia by any means
- (c) The state is under threat or particular situations which are potentially harmful to the entire life of the state

Currently, Article 51 in Law No. 24/2007 also authorizes local government to enact the declaration. To this extent, the public civil emergency has a different level of threat, but both are equal in the intensity of the situation which potentially threatens the state and community.

Executive in Times of COVID-19

Starting from the beginning of the pandemic, the president of the Republic of Indonesia announced the first Indonesian case of COVID-19 in March 2020. As the follow-up measure dealing with the pandemic, the president signed and issued the Presidential Decision 11/2020 on the Public Health Emergency (KEPPRES 11/2020). With KEPPRES 11/2020, the president of the Republic of Indonesia decided that coronavirus disease 2019 was the disease that caused a public health emergency. It is also the legal basis for the president to declare the state of a public health emergency. As a consequence, the president took measures and assigned the head of the National Disaster Management Agency to lead the COVID-19 task force. It is established by the Presidential Decision 7/2020. The task force is to speed up, and focus, integrated and synergistic measures for dealing with COVID-19. It is because measures taken to deal with COVID are covering all aspects which means all departments including the local government. The task force is under, and directly responds to, the president based on Article 2 KEPPRES 7/2020, coherent with Article 10 of the presidential decision that states that the task force reports to the president and, if it is needed, a report on an extraordinary situation must be provided.

The task force consists of directors (the ministers of the Coordinating Ministry of Human Development and Culture; Coordinating Ministry for Political, Legal, and Security Affairs; Ministry of Health; and Ministry of Finance) and coordinators (the acting chief is the head of the National Disaster Management Agency; deputies – assistant operations commander of the Indonesian National Armed Forces and operational assistant to the chief of the Indonesian National Police with members consisting of a person in charge from the Coordinating Ministry for Human Development and Culture, the Ministry of Health, the Ministry of Home Affairs, the Ministry of Foreign Affairs, the Ministry of Transportation, the Ministry of Communication and Information Technology, the Ministry of Education and Culture, the Ministry of Religion, the National Disaster Management Agency, the Republic of Indonesia National Armed Forces, the Indonesian National Police, and the staff of

the Presidential Office). At the local government level, the governor and mayors/regents may establish a local COVID-19 task force after the recommendation and consideration from the chief of COVID-19. The local COVID-19 task force has to coordinate, in close collaboration with the ministry, the government and, among local government, the private sector and other relevant institutions. The presidential decision specifies that measures taken in dealing with COVID-19 at the local level must take into consideration the direction from the COVID-19 task force.

On other aspects, a special committee for economic stability has been established with the emergency law issued by President Number 1/2020 as the very first measure taken after the start of the pandemic, which also had been converted into Law No. 2/2020. The first measure taken by the president aimed at securing the stability of the economy. The law was issued on the basis that the pandemic threatened the stability of the macroeconomy of Indonesia with potential risk to domestic economic activities. Therefore, the establishment of a special committee for the stability of the financial system was thought of as an important effort. The mitigation measure is for anticipation of negative impacts on the state finances and the economic stability of Indonesia.

Executive Powers During Public Health Emergency

As discussed earlier, the executive power in Indonesia has a broader scope in the area of executing laws and running the state administration according to the constitution. The president as the head of government as well as the head of state has the power to take any measure in time of emergency including in the situation of pandemic (Aziz et al., 2020). In principle, the executive branch is the pivotal branch in a time of pandemic. The executive includes the president, the ministers, and other executive departments under the president such as special committees and local government. Notably, Locke in de Wilde (2010) argues that the emergency law might usually be implemented in the event of an emergency. However, according to Law No. 6/2018 on health quarantine, Article 4 clarifies that the central government and the local government are responsible to protect the health of the people of Indonesia from any threats of diseases and/or any risk factors of health that can cause a public health emergency. The central government in this context refers to the president. This article is the legal basis expressing the scope of powers which includes taking any measures to safeguard public health and to anticipate any risk caused by any diseases. Coherently, Law No. 24/2007 has covered the aspect of disaster management long before the enactment of Law No. 6/2018. To this extent, any measures in any aspect could be qualified as legal. Furthermore, Article 5 of the Law No. 6/2018 provides a legal basis in the time of a public health emergency, for the government to take responsibility for the conduct of an integrated system of health quarantine. To do so, the local government may be involved. In the time of a public health emergency, the government is responsible to ensure the availability of resources to support the health quarantine mechanism.

Moreover, Article 11 of the Health Quarantine Law may include the scope as well as the limitation for the executive powers. The article requires that the government, in conducting the power and its authority, has to be accurate based on threat and impact analysis and the effectiveness of measures. It also has to consider the resources, technical matters in accordance with state sovereignty, security, and economic social and cultural life. The scope of measures includes any measures with regard to the quarantine, isolation, vaccination or prophylaxis, referral, disinfection, and/or decontamination of people according to symptoms and indications, large-scale social restrictions, and mitigation measures of disinfection, decontamination, disinfection, and/or extermination of virus vectors in baggage, cargo, containers, transportation means, facilities, goods, postal packages, and transport equipment. In addition, the government may also take any measures in accordance with health and security needs and control of environmental media as deemed fit. Responsibility for any measures of health quarantine is in the hands of the public officer or public health quarantine which is under the relevant minister who answers to the president.

The scope of authority of the executive powers may be extended in a more detailed and technical matter. In the time of pandemic, the government through the public officer may impose a mandatory vaccination not only for Indonesian people but also for those people wishing to enter or to leave Indonesia. With regard to the large scale of social restrictions, the law on Article 59 stipulates that the scope of authority includes putting a limitation for school activities and workplace, limitations on religious activities, and limitations on public activities or public facilities. In general, the law provides the legal basis for the expansion and discretionary authority of the ministers to take other necessary and additional measures. According to the Health Quarantine Law, the government may impose a large scale of social restriction in times of pandemic. The government will be able to put certain limitations on the suspected areas of the virus to prevent possible spread.

The large scale of social restrictions is specifically regulated in the government regulation of 20/2021 on large scale of social restrictions to limit the spread of COVID-19. Article 2(1) regulates that the minister of health approves the local government policy to have large scale of social restrictions or limitations on the movement of the people and goods in a province or municipality/particular city. The regulation gives the authority to the local government with the approval from the minister of health with regard to the imposing of the social restriction, although exercising that authority should consider the epidemiology; threats; effectiveness; available resources; technical matters; political considerations; economic, social, and cultural matters; and defense and security. In implementing large-scale social restrictions, the closure of workplaces and schools and restrictions of religious activities and public facilities are allowed but with restrictions. However, the government should not overlook educational needs, work productivity, and religious activities. The most important thing is that the government must have regard to facilitating the fulfilment of the basic needs of the people.

Article 6(1) stipulates that the governor/mayors may propose the enactment of large social restriction to the minister of health. In approving this, the minister has to

consider the recommendation of the chief of the COVID-19 task force. The central government and the local government altogether are responsible for implementing the timely measures for quarantine for pandemic for public protection and anticipation of any risks which potentially cause a public health emergency. To this extent, the government has to observe the diseases and all risks that threaten public health. It means that the health quarantine and any relevant measures are the government's response against the pandemic. During the pandemic, the government of Indonesia imposed a large scale of social restriction mostly in the 10 epicenters of virus transmission in the country. The large scale of social restrictions was to limit the spread of the virus in some provincial, city, and regency governments (Muhyiddin & Nugroho, 2021).

It started in April 2020, when the first case appeared in Indonesia. The large scale of social restriction could be imposed under two conditions. Firstly, the number of cases and/or the number of related deaths had increased and spread significantly and, secondly, whenever there was an epidemiological link with similar events in other regions or countries. At this point, the local government in the region may extend the powers and impose any measures to mitigate the impacts of the pandemic as well as reduce the virus transmission. For example, the Jakarta government put a limit to religious rights by prohibiting religious praying in all mosques and other religious places. Jakarta's authority also puts a strict limitation to the mobility rights and temporary suspension of office and tourism activities (Syafri et al., 2020). Specific and technical measures also could be imposed by the government, including the postponement of any official visits, remote schooling, unessential facility closures, and other measures taken in dealing with the situation. On the other epicenter region, West Java, the authority issued Governor Regulation 36/2020.

Other measures were taken including measures in the area of social protection and poverty, state revenue and tax collection, fiscal policies, stock exchange, inflation, monetary policy, and exchange rates (Olivia et al., 2020). Other than those areas, the executive branches also enforced a new approach to the protective and developmental models of social policy (Yuda et al., 2021). In terms of immunity, the public officers are responsible for the health quarantine and have no executive immunity. Article 76 only mentions that they only have the right of legal protection and health protection from any risk of organ damage. The principle of executive immunity does not apply to this legal responsibility. Article 76 Sec. (2) states that sanctions may be imposed against officers who act against the law.

Executive Immunity During Public Health Emergency

A review of executive immunity in the judicial power by Columbia Law School (1951) states that general immunity is not granted to cabinet officers, however, because of the constitutional separation of powers. The president, as a branch of government, has a very crucial standing in the constitution (Amar & Katyal, 1995). There are two types of immunity – absolute or qualified – according to the discretionary duty at issue. Only qualified immunity applies to an official acting in good

faith. Absolute immunity, on the other hand, prevents any judicial inquiry into the subjective intentions of an officer (Keller, 2021). Absolute doctrine does not apply to the executive under Indonesian law but qualified does. In the “qualified” immunity concept, discretion is granted in a quasi-judicial manner, but not if an officer’s actions are motivated by “malice” – a distinction from absolute immunity (Mandery, 1994). Article 27 (the attachment to Law No. 2/2020) stipulates that in principle, executive immunity includes the cost spent by the government and/or the institution of the KSSK to implement the state budget policy in the area of tax and state expenditure including the local budget policy.

Article 27 attachment of Law Number 2 of 2020 regulates immunity, among others, as follows: (1) costs that have been incurred by the government and/or the committee (KSSK) member institutions in the context of implementing state revenue policies including policies in the field of taxation, state expenditure policies including policies in the field of regional finance, financing policies, financial system stability policies, and national economic recovery programs are part of the economic costs of saving the economy from the crisis and are not state losses. Furthermore, Sec. (2) of the article stipulates that the committee (KSSK members, KSSK secretary, KSSK secretariat members, and officials or employees of the Ministry of Finance, Bank Indonesia, the Financial Services Authority, as well as the Deposit Insurance Corporation and other officials), related to the implementation of this government regulation in place of law, cannot be prosecuted in any courts if in carrying out the duties, they act on the basis of good faith and follow the provisions of the laws and regulations. Moreover, Sec. (3) of the article states that all actions, including decisions taken based on this government regulation in place of law, are not objects of a lawsuit in the state administrative court.

Article 1 Sec. (3) of the Indonesian constitution clarifies that Indonesia is a state ruled by law, which means that everything follows the law, the executive immunity included. Article 27 which refers to the immunity clause may be one of the bases for executive immunity in times of public health emergency. In the classical theory, the doctrine of executive immunity may have its roots from the ancient doctrine of “the queen can do no wrong.” In an environment of normal conditions, declaring an emergency allows an immediate response (Greene, 2018). According to the constitution, the immunity clause may overrule any of the constitutional provisions particularly Article 27 and Article 28 D (1) which regulate equality before the law. However, Article 12 may be the basis of the executive immunity since it provides the basis for the state to have the right to take any measure to stabilize the situation and maintain peace and security. Article 27 of the annex of Law No 2/2020 provides a legal basis that any cost spent by the government in a time of a pandemic, including the policy on the area of taxation, local budget, and the national economic recovery, may not be considered as a state loss.

As a consequence, the state auditor may not evaluate the spending of any budget concerning the budget spending in a time of a pandemic, and so there are no checks and balances to the budget spending by the parliament. To this extent, the executive immunity includes the scope that there is no monitoring and evaluation of the state budget spent by the government in times of a pandemic, particularly the budget for

taking any measures in the name of the efforts for dealing with a public health emergency. This may be conceptualized as an authoritarian economy. Furthermore, the executive immunity may also base its legality in government regulation no. 4/2008 for the financial system of social security. This may give immunity against legal process to the minister of finance, governor of the central bank, and/or other parties executing their duties according to the emergency law because of their decision-making in a time of a pandemic.

In a time of a pandemic, the budgeting power which belongs to the parliament may also be switched to the president according to Article 27 of Law 2/2020. The president may unilaterally change the budget in a time of a pandemic. There are several aspects beyond reasonable doubt of adopting executive immunity. One is because of the difficulty of decision-making during difficult situations. As the decision-maker, the executive has limited choices. When the president of Indonesia decided to have large scale of social distancing, it was believed to be the best solution. Moreover, no legal consequences threaten this. However, some may demand the government to be brought to the administrative court. During the community activity restriction enforcement, several small entrepreneurs brought claims against President Jokowi to the administrative court claiming compensation. The restriction is based on the numeric severity level which indicates the numbers of cases, hospital occupancy, death rate, and other indicators.

The executive immunity shields the executive as long as good faith is present. In Indonesia, this situation may be influenced by the criminal code which gives the legal basis for any acts by public officers whenever it is derived from their duties and whenever it is an official order under legitimate authority. In civil procedures, with abuses of powers being the exception, public officers may not be sued during a financial crisis. Based on the description, in assessing a violation of the principle of equality before the law in Article 27 Paragraph (2) of Law Number 2 of 2020, the standard is whether the provisions that are considered to distinguish the treatment have met the rational and objective standards. Law Number 2 of 2020 was issued as a response to save the national economy and maintain financial system stability in COVID-19 pandemic conditions. The pandemic also brought the need for preventive policies on the economic system. The necessary policy could be seen as unusual under normal conditions. However, based on certain considerations, those policies were urgently needed to prevent a negative economic impact. Therefore, to maintain the integrity of policy-makers, it is necessary to guarantee the immunity of their policies, although unlimited authority is not a solution either. Therefore, Article 27 Paragraph (2) also contains restrictions – good faith. It can be concluded that the reasons underlying the provisions of Article 27 Paragraph (2) have met the rational and objective standards, and therefore these provisions do not conflict with the principle of equality before the law.

The Constitutional Court Decision No. 37/PUU-XVIII/2020 reviews Law Number 2 of 2020 concerning the stipulation of Government Regulation in Lieu of Law Number 1 of 2020. The existence of Article 27 of attachment to Law 2/2020 is

intended to provide confidence for parties who in carrying out their duties and authority by attachment to Law 2/2020 have been based on good faith and following statutory regulations. This is in line with the legal principle of limited immunity for the state and/or its representatives, not absolute immunity so it violates the principles of justice and equality in law and government as understood by the petitioners. From the perspective of immunity theory, the legal protection provided in Article 27 Paragraph (2) belongs to the category of limited immunity. This theory of limited immunity provides protection/immunity to the state and its representatives against the legal remedies of other parties as long as the acts meet the requirements; they must have good faith and carry out their authorities by the laws. On the other hand, the immunity may be illegal and beyond the laws, if the mens rea is malicious and the action is against the legislation.

Courts on Executive Immunity

The Court Decision No. 75/PUU-XVIII/2020 on the judicial review on Law No. 2/2020 on the enactment of the Emergency Law No. 1/2020 on the state budget policy and the financial stability of the economic system in a time of a pandemic and/or on the effort to deal with any threats against the national monetary or monetary stability system vis-a-vis the constitution. In addition to the Constitutional Court Decision Number 26/PUU-XI/2013, the court has also examined Article 16 of the advocate law and gives the following considerations: “that protected in Law 18/2003 does not necessarily make advocates immune from the law. Because the right to immunity depends on whether the professional work is carried out in good faith or not.” In the elucidation of Article 16 of Law 18/2003, it is stated, “What is meant by good faith is carrying out one’s professional duties for the sake of upholding justice based on the law to defend the interests of his clients.” Thus, the notion of good faith given in the elucidation of Article 16 of Law 18/2003 requires that even when defending the interests of his clients, advocates should remain based on the rule of law. Not only in the two decisions on Article 16 of the advocate law but the court also even gave its interpretation of the phrase of good faith in Article 16 of the advocate law on the material review of Article 21 of the anti-corruption law. This means that the immunity fails when “good faith” is not fulfilled. Therefore, there is no reason to postulate the unconstitutionality of Article 21 of the PTPK law on the basis of the immunity rights possessed by advocates because the norms of the act in place do not affect the validity of the said immunity rights.

The constitutionality of immunity rights is placed in Law 2/2020. Granting immunity through statutory regulations on certain subjects is possible and does not conflict with the law. The concept of immunity can also be found in several considerations of the constitutional court. The Constitutional Court Decision No. 57/PUU-XVI/2016 judicial review of Law Number 11 of 2016 concerning the waiving of tax states, “... the implementation of a Tax Amnesty cannot be reported,

sued, investigated, or prosecuted, both civilly and criminally if carrying out duties is based on good faith. . . .” With the same regard, on the court’s decision of 26/PUU-XI/2013 on the judicial review on Law No. 18/2003, the court affirms the legal protection against any legal process or prosecution for the lawyer whenever they are on duty and in the office with good faith.

Therefore, the executive immunity in a time of a pandemic only refers to it being applied with good faith. The scope of executive immunity is limited in Law UU 2/2020 in Article 27 Sec. (1), (2), and (3) of Law No. 2/2020 which says, “(1) The costs arising from the Government’s financial rescue policies related to the crisis are referred to as part of the economic costs to save from the crisis, not state losses. (2) Policy-making officials cannot be prosecuted by criminal and civil law if in carrying out their duties they based their work on good faith and following the legislation. (3) All actions including decisions taken based on this Government Regulation in place of Law are not objects of a lawsuit that can be submitted to the state administrative court.” Thus, the granting of immunity rights in Law 2/2020 aims to enable the government to carry out the policies that have been taken to save the state’s condition, in this case, the state’s financial policy in conditions of the COVID-19 pandemic based on Law 2/2020. The construction of the regulation of the government’s immunity rights in Article 27 of Law 2/2020 is also under the existing concept of immunity, namely: a) immunity is given only concerning the implementation of Law 2/2020; b) immunity is given if the task is carried out based on good faith; c) it must comply with statutory provisions.

Immunity rights are considered necessary for state officials to carry out their duties by the concept of proper immunity. The immunity rights of state officials are not without limits and accountability but fenced off with signs of good faith and the provisions of applicable laws and regulations. Immunity rights in Article 27 Paragraph (1) of Law 2/2020 are not absolute and do not eliminate elements of state losses. If Article 27 Paragraph (1) of Law 2/2020 is considered to have eliminated the essential element of corruption, namely, “the existence of state losses” as regulated in Article 2 Paragraph (1) and Article 3 of Law Number 31 of 1999, then it is necessary to examine the definition of state losses which is the essential element of corruption in Article 1 Number 22 of Law Number 1 of 2004 concerning the state treasury, “Losses of the State/Region are a shortage of money, securities, and goods, which are real and definite in amount as a result of actions against the law either intentionally or negligently.”

Conclusion

Executive immunity may apply in Indonesia due to its legal basis. The Indonesian constitution does not explicitly stipulate it, but it implicitly derives from the emergency clause which stipulates that the president may declare a state of emergency and the condition for a state emergency declaration and all consequences resulting from the declaration are regulated by law. To this extent, the executive immunity in

Indonesia may be derived from the legislation. In the situation of COVID-19, the law in Indonesia is explicitly classifying the situation as a nonnatural disaster. Therefore, the executive branch has a pivotal role in dealing with the situation. The executive branch, which belongs to the president, enacted the public health emergency and put effort into dealing with the consequences. In taking measures by the public health emergency, the law has shielded the executive branch (the president, the relevant ministers, and public executive officers) with the executive immunity. The law affirms the implementation of executive immunity in the emergency with good faith. There are several legal rationalities to apply the doctrine. First, in a public health emergency, the executive branch as decision-maker has limited choices. Second, preventing the spread of the virus and anticipating the number of cases are urgent. Another rationality is that it is difficult to take any decision in uncertain times. However, executive immunity does not exempt the government from any legal process. Whenever the situation is back to normal, a citizen may sue or claim compensation from the government as the executive branch in Indonesia if there is any constitutional loss or legal injury.

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International Law, Human Rights, and Public Health Emergencies During Disasters: A Developing Country Perspective

123

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Contents

Introduction	1836
International Law, Human Rights, and Public Health Emergencies in Developing Countries	1837
Tackling the Human Rights Violations and Public Health Emergencies During Disasters Through the Duty of Solidarity	1839
Pre-Public Health Emergencies: Duty of Solidarity Before Emergency	1844
Post-Public Health Emergencies: Duty of Solidarity After Emergency	1845
Conclusion: Ensuring Human Rights to Health During Public Health Emergency in a Developing Country	1846
References	1846

Abstract

The interface between international law, human rights, and public health emergencies during a disaster is intricate. This chapter explores the dynamics of such an interface from a developing country perspective. It contends that despite the blunt provisions of international law the human rights in these countries are exceedingly susceptible to violation during such emergency and without accentuating the duty of solidarity under international law these countries would not be able to tackle the human rights violations for several reasons, including economic, sociopolitical, and strategic. The significance of this chapter lies in exploring the resilience of the duty of solidarity under international law to secure human rights in developing countries in both pre- and post-public health emergencies.

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Introduction

A public health emergency is an extraordinary event that constitutes a public health risk through the international spread of disease or other serious causes of concern (WHO, 2019). Public health emergencies can originate from a wide array of causes, including outbreaks of life-threatening epidemic diseases, natural disasters, and other environmental factors (Kim-Farley & LeBlanc, 2021; Eccleston-Turner & Wenham, 2021). International Health Regulations also provide that some public health emergencies may become of international concern when an extraordinary event is poised to “constitute a public health risk to other States through the international spread of disease and to potentially require a coordinated international response” (WHO, 2007).

A public health emergency, during which an overwhelming number of people may need medical attention, healthcare systems get overburdened, and public life may come to a stalemate, demands a multilayered response spanning from the stage of prevention to the stage of remedy at all levels of social and political life (National Academics of Sciences et al., 2022; Jennings et al., 2016; Reilly & Markenson, 2011). As such, a multilayered response to public health emergencies involves a wide range of international laws and human rights regimes; therefore, the international laws, human rights, and public health emergencies stand in a complex relationship.

The world has experienced the intricate interconnectedness of international law and human rights with public health emergencies during the latest Covid-19 pandemic (Mannan et al., 2021). The Covid-19 crisis across the globe also revealed how a minor crack in the relationship of international law, human rights, and public health could lead to an inevitable disaster reinforcing the intricacy and sensitive nature of such a relationship. The nexus between international law, human rights, and public health emergencies could be traced from the fact that international human rights law guarantees everyone the right to the highest attainable standard of health and obligates governments to take measures to prevent threats to public health and provide medical care to those who are in need.

Human rights also recognizes that in the circumstance of serious public health threats and public emergencies threatening the life of the nation (UN Commission on Human Rights, 1984), restrictions on some rights can be justified when they have a legal basis, are strictly necessary, based on empirical evidence and neither arbitrary nor discriminatory in application, of limited duration, subject to review, respectful of human dignity, and proportionate achieve the objective (Human Rights Watch, 2020) which is binding on WHO Member States, also provide for the prevention

and management of public health risks arising from the cross-border spread of disease, while avoiding “unnecessary interference with international traffic and trade” during a public health emergency (WHO, 2007).

International law and human rights offer a comprehensive framework for dealing with public health emergencies, as, on the one hand, they impose positive obligations on the states to protect people’s lives during public health emergencies, and, on the other hand, they provide guidelines on how to restrict some social and political rights striking a balance between the concerns of a state and its citizen. These positive obligations and necessary restrictions are closely intertwined to create a conducive environment that ensures a space of mutual respect between the concerned government and its citizen by promoting and protecting human rights and securing social and psychological well-being when they are in dire need of them owing to a sudden breakdown of sociopolitical structure for an emergency and its obvious impacts.

Ensuring this conducive environment is extremely challenging and crucial in developing countries owing to fragile health infrastructure, lack of surplus resources, and massive economic disparity among the people in these countries. It is also difficult owing to an underlying impasse between international law, human rights, and public health emergencies. This chapter explores the dynamics of such an interface from a developing country perspective. It contends that despite the blunt provisions of international law the human rights in these countries are exceedingly susceptible to violation during such emergency and without accentuating the duty of solidarity under international law these countries would not be able to tackle the human rights violations for several reasons, including economic, sociopolitical, and strategic. The significance of this chapter lies in exploring the resilience of the duty of solidarity under international law to secure human rights in developing countries in both pre- and post-public health emergencies.

International Law, Human Rights, and Public Health Emergencies in Developing Countries

Theoretically the interconnection between international law, human rights, and public health emergencies is well established, but in the real world, the way they interact and impact each other is not identical in the global south and north. Statistics from various human rights reports show that poor human rights records of developing countries coincide with their miserable public health conditions (Reza et al., 2020). Researchers are often left in a conundrum while sorting out the underlying reasons for such a parallel relationship between poor human rights observance and poor public health conditions. Some argue that it is poor compliance with the international law that leads to poor public health conditions, while others conclude that lack of economic resources is primarily responsible for poor public health infrastructure. However, a wiser view concludes that sheer incompliance with international law, lack of adequate resources, and poor public health infrastructure

constitute a triangle of causation, leaving the developing countries in an unending cycle of misery.

The developing countries barely can maintain a functional state mechanism with proper public services due to inadequacy of resources, which ultimately results in an underfunded public health sector poorly equipped to deal with any emergency health crisis. On the one hand, lack of decent education coupled with employment crises lead toward rampant corruption and absence of rule of law, and, on the other hand, lack of politically aware middle class often facilitates authoritarian regimes to undermine international laws and human rights in developing countries. Besides, it is also well proven that poverty and ill-health are strongly interlinked: lack of education, lack of nutritious food or safe water, and unhygienic living conditions often have a negative impact on the health of populations – with the effect that poor people suffer the highest burden of disease. Contrarily, poor health invariably increases vulnerability to poverty and increases the risk of poverty being transmitted to the next generation (WHO, 2008). Given the above circumstances, the developing countries are entangled in the perpetual whirlpool of poor public health and human rights crisis.

During any health disaster, the situation in developing countries worsens to an unbearable degree for various reasons, such as lack of strong democratic culture, states' inability to deal with the emergent social and economic reality, lack of adequate health infrastructure, and scarcity of resources. As the statistics show that developing countries have poorer democratic culture (Institute for Democracy and Electoral Assistance, 2021), being insecure about losing the political status quo, the authoritarian or semi-authoritarian regimes in those countries become more repressive in fear of any potential political uprising and hence become more apathetic toward human rights and international laws. For instance, according to the democracy index (Economist Intelligence Unit, 2021), the Covid-19 pandemic has caused an unprecedented rollback of democratic freedoms and human rights, mostly in developing countries, in 2020 (The Economist, 2020).

International travel restrictions imposed due to any global pandemic such as Covid-19 also adversely affect the developing countries by stagnating economies that are substantially reliant on foreign remittance and trade. Most importantly, in the time of a health disaster, lack of economic affordability often forces the developing countries to relocate their resources to the health sector instead of investing them in other democratic institutions and thereby causing human rights failure during public health emergencies. Religious bigotry, along with weak democratic institutions, sometimes results in the subjugation of human rights of religious communities by making them scapegoats of government's failure, the recent example of a hate campaign toward Muslims in India could be an example of this (OECD, 2020). All propaganda machines of the Indian ruling party BJP with the assistance of many mainstream media had categorically targeted the Tablighi Jamaat (an Islamic preaching movement of Sufi tradition) by accusing them of intentionally spreading coronavirus all across the country, resulting in mass bullying of the Muslim community in India. The imposition of forced cremation on Sri Lanka's Muslim community and denying them of their right to burial according to Islamic rituals was

another tragic example of how any public health crisis could make any minority community extremely vulnerable to human rights violation in countries with fragile democratic institutions (BBC, 2020).

The emergent economic crisis resulting from any health disaster further compels developing countries to disregard international laws in many areas of public affairs. Some emerging developing nations such as China and India were seen to be reluctant to comply with international laws as they were afraid to lose economic growth had they fully complied with WHO guidance and relevant provisions of International Health Regulations (IHR) (OECD, 2020). Such reluctance is also found across Asia, where many states are not the parties to core human rights instruments, including the International Covenant on Civil and Political Rights (ICCPR) and International Covenant on Economic, Social and Cultural Rights (ICESCR). Apart from this, the principle of sovereignty and noninterference further cause the states to disregard or manipulate the legitimate attention of the right seekers during an emergency.

Global politics, regional geopolitics, and national democratic culture also significantly contribute to the worsening human rights situation of developing countries. Given the fact that developing countries are heavily reliant on global powers and enjoy less autonomy in international affairs due to economic dependence and fragile democratic institutions, the added vulnerability of any emergent health crisis makes the developing countries even more subservient to the political interests of global and regional powers. The vaccine diplomacy in the context of the Covid-19 pandemic also culminated in a strenuous “politics of crisis” adversely affecting many developing countries around the world (Crisis Group, 2020). For instance, the geopolitical factors have influenced Bangladesh’s decision-making regarding vaccine procurement rather than public health concerns, as in the early stage of the pandemic, China had offered vaccines to Bangladesh, but it did not respond to the Chinese gesture out of Indian pressure and rather ordered vaccines for Indian SERUM institute. Later on, Bangladesh had suffered from a severe shortage of vaccines when India suddenly stopped supplying vaccines to address its own virus outbreak (Khatun, 2021). Apart from Bangladesh, many other developing countries across Asia, Africa, and Latin America, being at the crossroads of complex global and regional geopolitics, suffered from a similar shortage of vaccines and other medical essentials during the Covid-19 pandemic.

However, the following discussions explore the potentials of international solidarity in addressing human rights violations and public health emergencies during disasters in developing countries.

Tackling the Human Rights Violations and Public Health Emergencies During Disasters Through the Duty of Solidarity

In a globalized world of interconnected threats and challenges, it is in each country’s self-interest that all of them work collectively based on the principle of solidarity (Alam, 2021). Hence, the cause of larger well-being can only be achieved by broad, deep, and sustained global cooperation among states. Such cooperation is possible

only if every country's policy consideration is not confined to the needs of its own citizens but also the needs of others (UN Report, 2005). The need for such global cooperation was felt most intensely when humanity was faced with an unprecedented pandemic like the Covid-19 as it has brought forth a wide array of complex economic, scientific, and medical challenges the world has never seen.

The spirit of international solidarity was embedded in the very DNA of international, and hence, the values of solidarity have been reflected in all major universal conventions. The obligation of states to cooperate is anchored in Articles 1, 55, and 56 of the UN Charter. Article 1 provides for international mechanisms to promote the social and economic advancement of all peoples and regards international cooperation in solving economic, social, cultural, or humanitarian problems as a fundamental objective of the United Nations. Article 55 of the Charter further obligates the UN to promote higher standards of living, full employment, and conditions of economic and social progress and development; solutions to international economic, social, and health-related problems; international cooperation; and universal respect for, and observance of, human rights and fundamental freedoms.

Under Article 56, "members pledge themselves to take joint and separate action in cooperation with the Organization for the achievement of the purposes set forth in Article 55," imposing a legal obligation on states (Simma & Other, 2002). Apart from the UN Charter, there are numerous international treaties and conventions that reinforce the duty of solidarity under international laws. Given the wide emphasis of solidarity under international laws, it can be argued that obligation of international cooperation and solidarity, where they concern the most fundamental human rights, can go beyond the limits of State borders, as they are owed *erga omnes* (to all humanity) rather than merely *inter partes* (UN Resolution, 2002).

However, the idea of international solidarity is not limited to international assistance and cooperation, aid, charity, or humanitarian assistance; it is a wider concept and principle that includes sustainability in international relations, especially economic relations, the peaceful coexistence of all members of the international community, and equitable sharing of benefits and burdens (OHCHR, 2011). Related to the concept of international solidarity is the principle of burden sharing that entails constructive engagement and cooperation of state and non-state actors in the jurisdictions of needs (Alam, 2021). Accordingly, there is ample scope for international solidarity through cooperation in the field of science, medicine, and protection of human rights during the time of public health disasters. Some of the ways in which international solidarity can help in tackling fragile human rights situation and protecting public health during a health disaster has been elaborated in the following.

Increasing the Surveillance and Monitoring of Human Rights Situations Across the Globe Through International Solidarity During Disasters: As has been stated earlier that with the sudden outbreak of any public health emergency the human rights observance in developing countries suffers from massive setback, in such conditions, enhanced surveillance of such critical situations could ensure greater accountability of ruling regimes in those countries. Constant monitoring through media reports along with the sanctions of diplomatic pressure can reduce the risks of

potential human rights violations to a great extent. The international community can employ local and multinational NGOs to further increase the surveillance of human rights (Goold & Lazarus, 2019; Standford et al., 2021; Murphy, 2018) compliance across the globe with a special emphasis on developing countries where democratic institutions are mostly fragile.

International Solidarity in the Field of Information Technology and Digital Communication to Strengthen Human Rights Reporting Mechanism: As the authoritarian or semi-authoritarian regimes in developing countries are more likely to censor the neutral coverage of media and suppress the free voices of the masses during any sort of civil unrest or public emergency, the online modes of public communications such as social media, blogs, and other digital platforms could be utilized as alternative forums for informing the global community about the actual scenario on the ground. Hence, the international community can harness the strength of digital communication by empowering the masses to connect with the global community and bypass all forms of government censorship. Tech giants like Facebook and Google may introduce many special features to facilitate real-time updates of what is happening around the world evading all forms of unjust censorship imposed by any authoritarian regime. However, while crafting such evasive features or facilitating the above reporting mechanisms, the legitimate concerns of state sovereignty under international law should not be overlooked.

Mounting International Pressure on National Stakeholders Through Sanctions and Diplomacy: Since the end of the cold war era, as the countries are more fearful of losing trade volume than facing wars, economic and political sanctions have been a more effective way of furthering any international agenda. For example, in the latest war between Russia and Ukraine, instead of going for a direct military confrontation with a nuclear superpower like Russia, the western world had rather opted for imposing numerous economic and political sanctions on the invading state in order to neutralize its biting force (Aljazeera, 2022). Given the effectiveness of economic sanctions in the modern world to further any legitimate political objective, it is highly feasible that the same strategy could be employed to hold the countries accountable for infringing human rights during any public health emergency.

Hence, if major global powers come to a consensus on imposing economic or political restrictions on any developing nation that uses the crisis as a shield for abusing human rights, such incidents of violations would come to a significant halt. However, while imposing any such sanction, the international community must remain respectful of the legitimate concerns of state sovereignty and must not encroach upon the limits set by established rules of international laws. Apart from sanctions, sometimes a good deal of friendly diplomacy can resolve many complex issues where even sanctions fail to nail the deal. So, the international community should give adequate diplomatic efforts to stop human rights violations during any public health emergency. In pursuit of such diplomacy, the international community may employ both state and nonstate actors for the fruitful realization of the objectives in this respect. However, in either cases of sanction or diplomacy, the powerful actors of the international community must abstain from weaponizing these tools for

achieving their own political objectives other than the well-being of the common people.

International Solidarity in the Field of Health Science and Other Relevant Studies: As due to the ever-evolving nature of epidemiological diseases, medical science is struggling to deal with the challenges of public health emergencies; countries with less scientific advancement suffer most from the sudden outbreaks of any health crisis. Apart from medical science, other branches of scientific studies and technical expertise also help significantly in addressing any public health disaster and making proper crisis management plans for the future. Since most of the developing countries lack any well-developed scientific and technological infrastructure, without a strong and coherent solidarity in the field of medical science and technology, humanity shall never be able to achieve resilience against the unending chain of global health disasters. Therefore, the international community should come forward to train and equip the developing nations with more advanced medical and pharmaceutical technologies so that they become self-reliant on their own resources during any public health crisis rather than begging from others.

Enhancing International Cooperation in Digitalization of Works and Expanding the Scope of Online Jobs: As the world enters the era of the fourth industrial revolution bringing a massive paradigm shift in the global job market, digitalization becomes crucial for any economy that wants to compete in the evolving realm of modern economy. While explaining the significance of the fourth industrial revolution, the author of the book *The Fourth Industrial Revolution* Mr. Klaus Schwab observed that “to a large extent, the millennial generation is setting consumer trends. We now live in an on-demand world where 30 billion WhatsApp messages are sent every day and where 87% of young people in the US say their smart phone never leaves their side and 44% use their camera function daily. This is a world which is much more about peer-to-peer sharing and user-generated content. It is a world of the now: a real-time world where traffic directions are instantly provided, and groceries are delivered directly to your door. This ‘now world’ requires companies to respond in real time wherever they are or their customers or clients may be” (Schwab, 2016). McGinnis observes that “the Fourth Industrial Revolution is a way of describing the blurring of boundaries between the physical, digital, and biological worlds. It’s a fusion of advances in artificial intelligence (AI), robotics, the Internet of Things (IoT), 3D printing, genetic engineering, quantum computing, and other technologies. It’s the collective force behind many products and services that are fast becoming indispensable to modern life. Think GPS systems that suggest the fastest route to a destination, voice-activated virtual assistants such as Apple’s Siri, personalized Netflix recommendations, and Facebook’s ability to recognize your face and tag you in a friend’s photo. As a result of this perfect storm of technologies, the Fourth Industrial Revolution is paving the way for transformative changes in the way we live and radically disrupting almost every business sector. It’s all happening at an unprecedented, whirlwind pace” (McGinnis, 2020).

However, given the above features of Fourth Industrial Revolution, the winners will be those who are able to participate fully in an innovation-driven economy by providing new ideas, business models, products, and services with high levels of

technological sophistication and IT skills (Schwab, 2016). As has been illustrated earlier that modern public health emergencies cause massive economic disruptions, resulting in the stalemate of public life due to health safety measures such as quarantine and lockdown; therefore, digitalization of economy and expanding the scope of online job opportunities would magically reduce the freezing impacts of such public health emergencies. Reports also show that while every other field of economy had experienced massive downfall during the latest pandemic, most of the online-based platforms have seen unprecedented growth despite economic stalemate. It is also known that scarcity of resources due to economic slowdown during the pandemic is deeply and intricately connected with human rights violations in developing countries. So, considering the immense potential of digitalization, international communities must come forward to assist the developing countries in digitizing their economy and thereby reduce adverse consequences on the economy.

Flexibility in Global IP Regulations to Ensure Maximum Availability of Medical Innovations for Developing Countries: Most health-related disasters require urgent availability of specific medicines, vaccine doses, or other essential medical equipment such as ICU, oxygen cylinders, and ventilators. As we know that developing new vaccines, rare medicines, and other complex medical essentials requires advanced scientific expertise and high-tech industrial hubs, only rich countries with surplus resources can afford to ensure prompt availability of such medical essentials during any public emergency. In such cases, developed countries with advanced technological hubs often obtain the upper hand in the politics of crisis by creating a monopoly over medical essentials and subordinating poorer nations subject to their political interests. For instance, in the latest Covid-19 crisis some 6 billion doses out of the 8.6 billion confirmed sales were preordered by governments in high- and middle-income countries, as most of the vaccine manufacturing, research, and development companies were heavily concentrated in high-income countries (Nature, 2021).

This trend is not confined to any specific occasion; rather, the world has witnessed similar practices in all aspects of international politics for decades where developed countries try to gain full advantage of their privileges. In such situations, international solidarity by agreeing to patent waiver in the field of medical innovations by developed countries would end the unethical monopoly of global north to a great extent during disasters and would bring much-needed relief to the developing nations. Though generous practice of patient waiver is never easy for the involved stakeholders in these situations as it requires sacrificing millions of dollars of economic revenue, this is where international solidarity must set its best possible example by preferring humanity over temporary commercial gains.

Direct and Indirect Financial Assistance for Developing Countries: As has been elaborated earlier that those economic constraints lie at the core of all crises during the time of disasters, having a universal framework for global economic solidarity is quintessential for maintaining human rights *status quo* as well as for tackling the public health disasters across the developing nations. Along with providing direct financial assistance, the developed countries could facilitate in situ growth of vulnerable developing economies during disasters that would give them greater

autonomy in preparing indigenous solutions for their own crisis management instead of relying on imposed ones. For example, direct financial assistance in the form of monetary loans can help the developing countries to keep their economies going by maintaining the flow of currency. Such financial loans can be sourced both from international institutions such as the IMF and World Bank and as well as from developed countries with rich economies. Developed countries can also provide indirect financial assistance in the form of tax and tariff waiver while importing commercial goods from developing countries. For instance, developed countries such as the European Union can help Bangladesh by reducing import duties on the garment products as Bangladesh's economy is largely reliant on the Readymade Garments (RMG) sector. Such direct and indirect financial assistance would greatly reduce the sufferings of toiling masses living in developing countries that would help to minimize adverse consequences of public health emergencies.

The duty of solidarity has the potential to prevent human rights violations before the emergency occurs through developing the necessary infrastructure and other sociopolitical and economic tools in the developing countries. It can also substantially contribute to minimizing the cost of such an emergency if it could not at all be prevented during the post-emergency period.

Pre-Public Health Emergencies: Duty of Solidarity Before Emergency

Given the nature and characteristics of recent public health disasters, public health experts opine that human-made actions such as environmental and ecological disruptions, deforestation, and destruction of biodiversity are more responsible for these calamities than acts of God (Berardelli, 2020). As the root causes of health disasters are discoverable, public health emergencies are not completely unpredictable, rather they are preventable by addressing the underlying factors that cause the disasters. For instance, Dr. Peter Daszak, a professor at Columbia University and president of the EcoHealth Alliance, commented that conversion of tropical forests into agricultural land and livestock farms is responsible for 30% of known emerging diseases (Berardelli, 2020). Another major factor that contributes to the outbreak of the health crisis is unregulated international trade in pet and livestock animals along with unsanitary conditions. In the above scenario, strong international solidarity in identifying and diagnosing the above contributing factors can help in formulating and implementing a comprehensive plan of action for future prevention of public health disasters. In this regard, in line with Professor Daszak's proposal, the following areas of international solidarity have been recommended below: first, launching a global effort to identify the potential viruses in wildlife that could cause the next possible epidemic outbreak as scientists estimate that there are 1.7 million of such potential viruses. Secondly, working with, and observing the communities that are the hotspots of emerging diseases and also identifying the risk behaviors that cause the viruses coming into contact with human population from wildlife. Finally, preemptive efforts to develop vaccines not only to prevent the already known

diseases, but also the new viruses we discover in wildlife for future protection (Berardelli, 2020).

Lack of early preparedness is another significant factor that leads to catastrophic consequences for developing countries. For example, in the latest Covid-19 pandemic most of the nations were taken by sheer surprise as they were underprepared for a crisis of such magnitude. The underpreparedness of many developing as well as developed countries could be elaborated by the following facts that they underestimated the danger when the virus outbreak happened, did not have proper crisis management plans for the pandemic, suffered from the shortage of essential medical supplies, and lacked adequate public health expenditure due to budget deficits (OECD, 2020). Therefore, the international community should cooperate to build capacity for early preparedness for possible disasters. Besides, international efforts should be made to formulate a comprehensive framework for solidarity under international law as there is no separate and consolidated corpus of international law for global solidarity during public health disasters, other than some sporadic provisions from different treaties.

Post-Public Health Emergencies: Duty of Solidarity After Emergency

Like the pre-emergency period of disasters, the post-emergency phase of any public health disaster is equally important for proper management of any crisis. Given the paralyzing effects of contemporary public health emergencies on all spectrums of public life, all countries, especially the developing countries, suffer from a long chain of awful consequences. The unending stress on the economy is the most notable aspect of any such crisis, and since the public health disasters tousle any country's economy, leading to chaos in all other spheres of public life as every aspect of modern life is intricately dependent on the economy.

Hence, international cooperation should be actively pursued with the spirit of solidarity in introducing a framework of long-term economic recovery in the post-disaster phase and finding a viable solution thereby (Skogly, 2006; Roemer et al., 2020). The international community should make a specific plan of action for the post-emergency phase to rebuild the economies that have been ravaged by the devastating impacts of such a public health emergency. Special financing initiatives taken in this regard must include developing countries, taking notes of their dissimilar capacities and needs into consideration. Multilateral financing and special debt relief measures should be adopted commiserating with specific needs of all developing countries. The post-emergency rehabilitating financial schemes should also not disregard the contemporary pressing issues such as enabling green industrialization to address global climate change. Otherwise, the developing countries would set back the de-carbonization progress achieved in the pursuit of financial recovery, which would eventually lead to newer crises due to inevitable environmental disruptions.

However, apart from economic consequences, public health emergencies also leave deep wounds on the moral, social, cultural, and political fabrics of any society.

The social instability resulting from economic stalemate during any public health emergency eventually erodes the overall value system of the society, leading to creepy cultural and moral consequences for the society. Hence, the international community should not completely overlook the moral and cultural consequences of the crises by limiting its focus purely on economic affairs. Finally, the efforts of international cooperation should focus on transformative recovery instead of being confined to restoring the status quo. Hence, efforts should be made to transform the lessons learned from the experience of any crisis into a plan of action leading toward a better future.

Conclusion: Ensuring Human Rights to Health During Public Health Emergency in a Developing Country

With the increased frequency of public health disasters over the last few decades, public health emergencies are on the trajectory of becoming the biggest existential threat to the entire human race in near future. What used to be a local health problem once, now with the sheer speed of globalization and modernity, it turns into a global concern within a few days. Now no nation can ignore a health emergency only because it takes place in another part of the world, as in such an interconnected global village, the old binary of “we vs. them” is no longer a functional reality. Given the above reality, coming to international solidarity during a public health emergency is not a humane option, rather an inescapable responsibility without performing that no one would be safe in the disastrous future.

This chapter has explored how international solidarity can work within the framework of international law in different phases of public health emergencies. The chapter also argued with an implying conclusion that without strong bondage of international solidarity nations neither will be able to prevent nor recover from the rubble of any public health disaster. The ongoing Covid-19 pandemic is the latest example of our time that reinforces the importance of global solidarity in tackling any public health emergency. Besides, this digital age of information technology, where the sufferings of people around the world are being televised, is the most suitable time for building global solidarity by harnessing the spirit of shared human values and making people convinced that we all belong to the same humanity.

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The International Law Commission and International Disaster Law

124

Quazi Omar Foysal

Contents

Introduction	1850
The Drafting History of DAPPED	1851
The Overview of DAPPED	1851
The Normative Framework of DAPPED	1854
A (Long?) Walk to Codification	1856
ANNEX: Draft Articles on the Protection of Persons in the Event of Disasters	1857
References	1861

Abstract

International Disaster Law (IDL) does not provide a uniform legal framework contained in a single instrument. Instead, it comprises various treaties, customary international law, general principles of law, and soft law instruments. In order to forge a uniform instrument for regulating disaster relief and disaster risk reduction, the International Law Commission (ILC), upon the recommendation of the UN General Assembly, incorporated “Protection of persons in the event of disasters” into its program of work in 2007. ILC appointed Eduardo Valencia-Ospina (Colombia) as the Special Rapporteur for the topic. Finally, ILC adopted the Draft Articles on the Protection of Persons in the Event of Disasters (DAPPED) in 2016 and recommended the UN General Assembly consider the possibility of developing a Convention based on it in the same year. Now, DAPPED is under the consideration of the Sixth Committee of UNGA. DAPPED added a novel discourse to IDL. The present chapter will, following introductory words, highlight the drafting history of DAPPED. Then, it will provide an overview of the contents of DAPPED and its normative framework, respectively. The final section of this chapter will deal with the possibility of convening a

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Convention based on DAPPED and its prospects as other sources of international law.

Keywords

International Disaster Law · International Law Commission · Draft Articles on the Protection of Persons in the Event of Disasters

Introduction

Despite the fact that disasters are one of the oldest phenomena of the human environment where human beings inhabit, the efforts to mitigate the disaster risks and regulate the needs of the persons affected in the aftermath of disaster via international law instruments have been very recent phenomena. It does not imply the absence of an international legal regime on disaster risk reduction and disaster relief forming International Disaster Law (IDL). Instead, IDL can be described as a *pot pourri* of multilateral, regional, or bilateral treaties, state practice, guiding principles on internal displacement, various UN General Assembly (UNGA) resolutions, and soft law guidelines and principles that shed light on different legal aspects of disaster management (Allan & O'Donnell, 2012: 345). Sivakumaran (2017) considers that the existing regime of IDL adopts a “piecemeal approach.” With a view to formulating a coherent and uniform body of IDL to mitigate the disaster risk and to provide protection to the victims in the event of disasters, the International Law Commission (ILC), the subsidiary body of UNGA entrusted with the mission of codification and progressive development of international law, incorporated the topics “protection of persons in the event of disasters” into its long-term program of work in 2007. After a decade of work, the ILC adopted the Draft Articles on the Protection of Persons in the Event of Disasters (DAPPED) in 2016 and made recommendations to the UNGA for “the elaboration of a convention on the basis of the draft articles.” Generally, the work of ILC is very authoritative in the international plane due to its rigorous working methods and the use of both soft and hard law norms in the formulation of its instruments. More importantly, the majority of the instruments produced by the ILC have been very influential in the codification and crystallization of international law in different fields of law in the forms of customary international law and treaty law (Azaria, 2020; Bordin, 2014; Caron, 2002). Though the legal status of the contents of the DAPPED and its future as a convention is open to debates, it can be said, *a priori*, that the DAPPED is an essential legal instrument in the field of IDL. In this background, the chapter will first describe the procedural history of ILC’s work on DAPPED. Then, it will move to depict the contents of DAPPED in the light of its commentary. It will then endeavor to spot the normative sources used in the Draft Articles (DArts) and the natures of obligations contained in those provisions. The chapter will end with the prospects of DAPPED in the realm of international law, especially with reference to the possibility of forging a uniform, universal treaty basis.

The Drafting History of DAPPED

Upon a recommendation of the UN Secretariat to include “Protection of persons in the event of disasters” in its long-term program of work in 2006, the ILC adopted the decision to incorporate that topic in its program of work in 2007. Henceforth, the UNGA took note of the same in its sixty-first session in the same year. The ILC appointed Eduardo Valencia-Ospina as Special Rapporteur for the purpose. The Special Rapporteur produced eight successive reports in 2008, 2009, 2010, 2011, 2012, 2013, 2014, and 2016, and the Drafting Committee of the ILC made seven reports including the DArts adopted by the first and second readings in 2009, 2010, 2011, 2012, 2013, 2014, and 2016. The DArts adopted by the ILC received comments from several Governments, International Organizations, and Non-governmental Organizations ([Analytical Guide to the Work of the International Law Commission: Protection of persons in the event of disasters](#)). Finally, the ILC adopted the final text of 18 DArts along with their commentaries on its second reading in 2016. Simultaneously, it made a recommendation to the UNGA for developing a Convention based on DArts.

The Overview of DAPPED

DAPPED comprises a preamble and 18 DArts together with its commentaries. The Preamble highlights the nature of the instrument, the ambit of the application, and the fundamental principles that shaped the foundation of the instrument. The first preambular paragraph delineates the mandate of the UN in the progressive development and codification of international law, and by doing so, it suggests that DAPPED incorporates both progressive development and codification of international law. The second preambular paragraph highlights that DAPPED applies in the situations of both natural and man-made disasters having both short-term and long-term impacts. The third preambular depicts the essential needs of the persons whose lives, well-being, and property have been affected by the disaster and the respect for the rights of such persons. The fourth preambular paragraph reminds the importance of solidarity, coexistence, and cooperation in international society in all phases of a disaster. However, the final preambular paragraph reiterates the status of the principle of sovereignty at the heart of disaster management and hence reaffirms the primary role of the disaster-affected State in the provision of disaster relief management.

DArt 1 incorporates the scope of application of DAPPED. Its scope *ratione materiae* covers the rights and obligations of the disaster-affected States towards the persons present in their territory or jurisdiction regardless of their nationality and those of third States, intergovernmental organizations, NGOs, and other entities with the capacity to cooperate in the disaster management. Its scope *ratione persone* has been narrowed down to natural persons, but it also focuses on the activities of States and intergovernmental organizations on the primary basis and those of NGOs and other private entities or civil societies on the secondary basis. It excludes the relief

and consular assistance provided by third States to their nationals abroad. Its scope *ratione temporis* comprises, as understood from the wording “in the event of,” the post-disaster period and early recovery phase. However, considering its framework on Disaster Risk Reduction (DRR), it variably applies to the pre-disaster phase. Its scope *ratione loci* extend primarily to the areas affected by disasters, but it also applies to the assisting States and the transit States.

DArt 2 supplements DArt 1 by providing additional guidelines on the scope of the DAPPED. It clarifies its purposes, i.e., (1) the “adequate and effective” disaster response and (2) DRR, and its objects, i.e., the fulfilment of the essential needs of the disaster-affected people commensurate with the full respect for their rights. As mentioned earlier, the DAPPED is mainly concerned with disaster relief management. Nevertheless, the DRR occupies a vital area of its scope. On the other hand, DArt 2 has made an impeccable conflation of “need-based approach” and “rights-based approach,” making them complementary, not exclusive. The term “rights” should be interpreted as “human rights” with reference to the provision of DArt 5. DArt 3 provides the definitions of Disaster, Affected State, Assisting State, Other Assisting Actors, External Assistance, Relief Personnel, and Equipment and Goods for the purpose of DAPPED. The definition of disaster is the key to understanding the scope of the DAPPED, and the first part of the next section will deal with it.

DArts 4–6 enumerate the founding principles that apply in the event of disasters. DArt 4 states about the protection and respect of “the inherent dignity of human persons” during disasters. The principle of human dignity lies at the core of almost all the universal and regional human rights instruments and eventually encroaches into the regime of international humanitarian law embodied in the Four Geneva Conventions 1949 and its Two Additional Protocols 1977. The obligation of the provision includes both a negative obligation (respect) and a positive obligation (protect). It denotes that the States shall not only refrain from violating the human dignity of the affected persons, but they shall also be equally obliged to protect against the violation of such principles. Finally, “in the event of disasters” should not be understood to include the post-disaster phases only, it should also be interpreted to incorporate the pre-disaster phases, especially the DRR.

DArt 5 provides for the protection and respect of the human rights of the disaster-affected persons during the disasters. Like DArt 4, DArt 5 incorporates both negative and positive obligations. However, it qualifies “human rights” by adding “in accordance with international law.” It may have two understandings. First, all the States do not have similar human rights obligations due to their status of ratifications and reservations. Besides, the human rights obligations of international organizations and other actors have different underpinnings. Additionally, it also hints at the potential roles of customary international law. Thus, the phrase “in accordance with international law” helps to determine the exact description of a State or other assisting actors involved in the event of disasters. Second, it also reminds the potential application of other rules of international law, as hinted by DArt 18(1), while dealing with refugees and internally displaced persons affected by disasters. DArt 6 enlists principal humanitarian principles applicable during disasters, i.e., the principles of humanity, neutrality, and impartiality in conjunction with the principle

of non-discrimination. The principles of humanity, neutrality, and impartiality have been in vogue in humanitarian actions for a long time. Though they have roots in international humanitarian law, they have evolved to fit into the field of humanitarian assistance with their own credentials. The principle of non-discrimination is also very vital in humanitarian assistance. However, the inclusion of “taking into account the needs of the particularly vulnerable” in DArt 6 denotes that the principle of non-discrimination should include the notion of positive discrimination in pertinent cases.

DArt 7 deals with States’ duty to cooperate with other States, with the UN, with the Red Cross and Red Crescent Movements, and with other assisting actors. Reference of the “duty to cooperate” can be found in several international law instruments, and it can be said to be a well-established principle of international law. Furthermore, the proper appreciation of the principle of “duty to cooperate” in the context of disasters can be seen as the key to effective disaster relief management. DArt 8 complements DArt 7 by providing the list of forms of cooperation: humanitarian assistance, coordination of international relief actions and communications, and making available relief personnel, equipment and goods, and scientific, medical, and technical resources.

DArt 9 states the measures to be taken before the event of disasters for reducing the risk of disasters. It enumerates that States shall take appropriate measures, including the adoption of the legal framework and the prevention, mitigation, and preparation for potential disasters. It goes further to state that the DRR measures include the conduct of risk assessments, the collection and dissemination of risk and past loss information, and the installation and operation of early warning systems.

DArt 10 outlines that the affected States have the duty to ensure the protection of affected persons regardless of their nationality and the provision of their relief assistance in their territory or under their jurisdiction. Regarding disaster relief assistance, the affected States bear the primary obligation in directing, controlling, coordinating, and supervising such activities. It appears that DArt 10 stresses the importance of the territorial sovereignty of the affected States in the operation of disaster relief assistance. However, in the event when the national response capacity of the affected States appears to be manifestly inadequate to deal with the impacts of a disaster, DArt 11 provides that those affected States have the duty to seek assistance from other States, the UN, and other assisting actors to the extent to its inadequacy. The phrase “as appropriate” implies that the affected States enjoy discretion to determine whomsoever to approach. When such a request for assistance is made to a State, the UN, or other assisting actors, the addressee of the request, as DArt 12(2) asserts, shall expeditiously give due consideration to such request and notify its decision to the affected State. DArt 12(1) adds that any States, the UN, or other potential assisting actors may, independent of the request for assistance and the question of the capacity of the affected State, decide to assist the affected State and make a unilateral offer of assistance to it. DArt 13 chalks out the role of “consent” concerning an offer for external assistance. First, it affirms that the requirement of “consent” of the affected States is essential for accepting external assistance. When such an offer for external assistance has been made to an affected State, it cannot

withhold its consent on an arbitrary basis. It adds that the affected States to whom an offer for assistance has been made have an obligation to inform their decision on such offer in a timely manner. The phrase “whenever possible” in DArt 13(3) implies that such obligation is an obligation of means, not an obligation of result.

DArt 14 accentuates the nature of conditions to be imposed by the affected States on the provision of external assistance. An affected State has the discretion to impose conditions on the provision of external assistance according to the provisions of DAPPED, applicable rules of international law, and its national laws and commensurate with the needs of the affected persons and the quality of the assistance. The formulation of such conditions shall stipulate the scope and type of external assistance. DArt 15(1) requires that the affected States make necessary arrangements within their legal systems to facilitate the prompt and effective provision of external assistance. Such arrangement shall facilitate (1) regarding relief personnel, privileges and immunities, visa and entry requirements, work permits, and freedom of movement and (2) regarding equipment and goods: customs requirements and tariffs, taxation, transport, and the disposal thereof. DArt 15(2) ordains the affected States to ensure the accessibility of the relevant legal framework for ensuring their compliance. DArt 16 underscores that the affected States have an obligation to ensure the protection of the relief personnel and of equipment and goods in their territory or under their jurisdiction or control. The phrase “take the appropriate measures” suggests that such obligation is an obligation of means, i.e., the States shall do their best to ensure the protection of relief personnel and of equipment and goods in question. DArt 17 recounts that any affected State, the assisting State, the UN, or other assisting actor may terminate external assistance at any time following appropriate notification and upon consultation with regard to such termination and the modalities of termination.

DArt 18(1) illuminates the relationship between the norms contained in the DAPPED and other rules of international law. This provision may be interpreted in several directions. First, the application of DAPPED will not prejudice the application of other rules of IDL in the form of international, regional, or bilateral treaty law, customary international law, or the general principle of law. Second, it implies that international law on other subject matters (e.g., refugee law) continues to apply to disaster-affected persons. Third, it also indicates that DAPPED is a part of the IDL and the norms of IDL continue to develop outside of the scopes of DAPPED. However, DArt 18(2) qualifies the scope of DArt 18(1) by excluding the applicable rules of international humanitarian law (IHL). The following section will shed light on the exclusion of IHL from DAPPED in detail.

The Normative Framework of DAPPED

The normative framework of DAPPED can be well understood with reference to the definition of disaster, the exclusion of IHL from its scope, the nature of the obligation, and the nature of the constituent norms. The inclusion of a definition of “disaster” is one of the novelties of DAPPED. DArt 3(a) defines “disaster” as “means

a calamitous event or series of events resulting in widespread loss of life, great human suffering and distress, mass displacement, or large-scale material or environmental damage, thereby seriously disrupting the functioning of society.” According to this definition, a disaster for the purpose of DAPPED must meet two requirements: (1) threshold of a calamitous event or a series of events and (2) nature of the impacts of such event or events. DAPPED sets a very high threshold for a calamitous event to qualify as a disaster. If a calamitous event or a series of events does not reach the threshold of causing one of four possible outcomes, i.e., (1) widespread loss of life, (2) great human suffering and distress, (3) mass displacement, and (4) large-scale material or environmental damage,” it will fall within the definition of a disaster. The phrase “a series of events” denotes that a series of small-scale calamitous events that reach the threshold of a disaster will be deemed to be a disaster within the meaning of DAPPED. This definition of disaster includes both natural and human-made disasters. It applies equally to sudden-onset events (e.g., earthquake or tsunami), slow-onset events (e.g., drought or sea-level rise), or frequent small-scale events (e.g., floods or landslides). If a disaster, irrespective of its origin or nature, does not reach the threshold of the abovementioned outcomes, it will not get the benefit of DAPPED. For example, if a calamitous disaster occurs in the middle of an ocean or on an uninhabited island and does not result in any of the four outcomes, that event will not get covered by DAPPED. Regarding the second requirement, i.e., the nature of the impacts of a disaster, DAPPED clarifies that a disaster must cause serious disruptions in the functioning of societies. It denotes that if any disaster reaches one of the four thresholds but does not cause serious disruption of the functioning of society, it will still be outside the purview of DAPPED. However, the term “society” remains unclear. Bartolini (2017) suggests that “society” should be, upon the implication adduced from the contemporary practices, interpreted as “community” or “society at any scale” rather than “entire society.”

Generally, incidents of armed conflicts can be considered human-made disasters. In those cases, there arises a question on the applicability of DAPPED to the disasters resulting from armed conflicts. The exclusion of the application of IHL from DAPPED signifies that the disasters resulting from armed conflicts are excluded from the definition of disaster *per se*. IHL provides a specific and solid legal framework to protect persons affected by disasters resulting from armed conflicts (Fisher, 2007: 349–351). Besides, its norms predate the DAPPED and are widely recognized. The application of IHL in the event of disasters resulting from armed conflict provides additional protection to the victims, even if such a disaster occurs concurrently with another type of disaster. However, it does not render that DAPPED will remain completely inapplicable. It continues to apply where IHL does not apply. If the impact of an armed conflict reaches the threshold of disasters, the IHL provides a stricter legal regime for humanitarian assistance. It can be exemplified by the instances of humanitarian assistance to be provided in the occupied territories or rebel-controlled territories. In those cases, the application based on the primacy of the affected State may lead to uncomfortable situations. (Bartolini, 2017: 1113–1114).

DAPPED incorporates both vertical and horizontal dimensions of obligations. Its vertical dimension of obligation thrives on emphasizing the relationship between the

assisting actors and the affected persons while dealing with the protection of the latter's rights. DArt 4 (human dignity), DArt 5 (human rights), and DArt 6 (humanitarian principles) exhibit the vertical dimension of obligations contained in DAPPED (Kälin, 2019: 28–50). Bartolini (2017) highlighted that these principles are reminders of the obligations from other sources without providing any detailed substances. Kälin (2019) added that the non-specification of the abovementioned principles might invite complexities in their application to practical settings. The horizontal dimension of DAPPED entails the regulation of the legal relationship between an affected State and assisting actors in the event of disasters. The provisions of DArt 8 to DArt 17 contain the horizontal dimension of obligations. However, there are divergent views regarding the status of such obligation in international law. While the ILC commentaries on DAPPED listed several international law practices claiming to support the horizontal dimension of obligation, Tladi (2017), who was also a Member of the ILC during the adoption of DAPPED, commented that neither customary international law nor treaty law supports the existence of such a nature of the obligation.

The legal nature of the norms contained in the DAPPED can be understood from the working method of the ILC. The mandate of ILC aims at both the codification and the progressive development of international law. The preamble of DAPPED also highlighted this *modus operandi* of ILC. Thus, the Draft Conclusions or Draft Articles of the ILC contains both *lex lata* and *lex ferenda* in general (Azaria, 2020). Sivakumaran (2017) already showed that the existing sources of IDL derive from different treaties, customary international law, general principles of law, and soft law instruments. The formulation of DAPPED benefited from such sources (Pronto, 2019). It is also evident from the ILC commentaries on DAPPED.

A (Long?) Walk to Codification

Article 23 of the Statute of the International Law Commission 1947 provides that ILC may make four possible recommendations to the UNGA following the adoption of its Draft Conclusions or reports: (1) to take no action, the report having already been published, (2) to take note of or adopt the report by resolution, (3) to recommend the draft to the Member States with a view to the conclusion of a Convention, and (4) to convene a conference to conclude a Convention. In the case of DAPPED, ILC decided to recommend to the UNGA to elaborate a Convention. The UNGA Res. 71/141 (19 December 2016) took note of DAPPED and invited the Governments to submit comments on ILC's recommendation to conclude a Convention based on DAPPED. It also decided to include this issue in the provisional agenda of its seventy-third session (2018). The UNGA Res. 73/209 (14 January 2019) took note of the views and comments expressed in the Sixth Committee at the seventy-third session of the UNGA and the comments and observations already received from Governments on DAPPED. It also requested the UN Secretary-General to invite the Governments that are yet to submit their comments and observations. It further decided to include the item in the provisional agenda of its seventy-fifth

session (2020). In the seventy-fifth session, the UNGA, on the recommendation of its Sixth Committee, decided to defer this agenda item to the seventy-sixth session (2021). It was decided in the seventy-sixth session (2021) of the UNGA that a working group of the Sixth Committee of the UNGA will examine DAPPED and consider ILC's recommendation to elaborate a Convention based on DAPPED and in the light of views and comments expressed in the debates of the Sixth Committee and the comments and observations already received from Governments on DAPPED in four full consecutive days at the Seventy-Eighth and seventy-ninth sessions of UNGA, and the said working committee will report to the Sixth Committee on the outcome of its deliberations at the seventy-ninth session (2024) to enable the UNGA to devise a further course of action on DAPPED. (A/75/435).

At the current stage, the States appear to take four positions on the elaboration of a Convention based on DAPPED. The first group of States made positive evaluations of the contents of DAPPED without indicating their positions on the treaty negotiation. The second group of States showed their readiness for the treaty negotiation. The third group of States reiterated that they preferred to have time for the digestion of the norms in State practice. The last group of States raised doubt about the possibility of a future Convention (Bartolini, 2016, 2017: 1130–1133). Thus, the possibility of a future Convention on the Protection of Persons in the Event of Disasters cannot be dismissed.

Pending the possibility of a future Convention, the Draft Articles and Reports prepared by ILC may continue to impact the development of international law in another way. Generally, the Draft Articles already possess a sort of authority in international law due to the nature of the representation of the Members and their elections, the engagement of States and relevant actors concerning their preparation, and the nature of the sources used in such preparations (Bordin, 2014). This phenomenon explains why international courts and tribunals frequently rely on the works of ILC in their decisions, sometimes as a source of customary international law. (Azaria, 2020: 178–181) This can be best illustrated by Articles on Responsibility of States for Internationally Wrongful Acts 2001 (ARSIWA). Though the scope and nature of the norms contained in ARSIWA are different from DAPPED, it can be expected that the latter will encourage uniform State practices in the form of national legal frameworks or bilateral or regional treaties and may even lead to the crystallization of customary international law.

ANNEX: Draft Articles on the Protection of Persons in the Event of Disasters

Adopted by the International Law Commission at its sixty-eighth session, in 2016, and submitted to the General Assembly as a part of the Commission's report covering the work of that session (A/71/10), para. 48. The report will appear in Yearbook of the International Law Commission, 2016, vol. II, Part Two.

Bearing in mind Article 13, paragraph 1 (a), of the Charter of the United Nations, which provides that the General Assembly shall initiate studies and make recommendations for the purpose of encouraging the progressive development of international law and its codification,

Considering the frequency and severity of natural and human-made disasters and their short-term and long-term damaging impact,

Fully aware of the essential needs of persons affected by disasters, and conscious that the rights of those persons must be respected in such circumstances,

Mindful of the fundamental value of solidarity in international relations and the importance of strengthening international cooperation in respect of all phases of a disaster,

Stressing the principle of the sovereignty of States and, consequently, reaffirming the primary role of the State affected by a disaster in providing disaster relief assistance,

Article 1

Scope

The present draft articles apply to the protection of persons in the event of disasters.

Article 2

Purpose

The purpose of the present draft articles is to facilitate the adequate and effective response to disasters, and reduction of the risk of disasters, so as to meet the essential needs of the persons concerned, with full respect for their rights.

Article 3

Use of terms

For the purposes of the present draft articles:

- (a) “Disaster” means a calamitous event or series of events resulting in widespread loss of life, great human suffering and distress, mass displacement, or large-scale material or environmental damage, thereby seriously disrupting the functioning of society;
- (b) “Affected State” means a State in whose territory, or in territory under whose jurisdiction or control, a disaster takes place;
- (c) “Assisting State” means a State providing assistance to an affected State with its consent;
- (d) “Other assisting actor” means a competent intergovernmental organization, or a relevant non-governmental organization or entity, providing assistance to an affected State with its consent;
- (e) “External assistance” means relief personnel, equipment and goods, and services provided to an affected State by an assisting State or other assisting actor for disaster relief assistance;
- (f) “Relief personnel” means civilian or military personnel sent by an assisting State or other assisting actor for the purpose of providing disaster relief assistance;

- (g) “Equipment and goods” means supplies, tools, machines, specially trained animals, foodstuffs, drinking water, medical supplies, means of shelter, clothing, bedding, vehicles, telecommunications equipment, and other objects for disaster relief assistance.

Article 4

Human dignity

The inherent dignity of the human person shall be respected and protected in the event of disasters.

Article 5

Human rights

Persons affected by disasters are entitled to the respect for and protection of their human rights in accordance with international law.

Article 6

Humanitarian principles

Response to disasters shall take place in accordance with the principles of humanity, neutrality and impartiality, and on the basis of non-discrimination, while taking into account the needs of the particularly vulnerable.

Article 7

Duty to cooperate

In the application of the present draft articles, States shall, as appropriate, cooperate among themselves, with the United Nations, with the components of the Red Cross and Red Crescent Movement, and with other assisting actors.

Article 8

Forms of cooperation in the response to disasters

Cooperation in the response to disasters includes humanitarian assistance, coordination of international relief actions and communications, and making available relief personnel, equipment and goods, and scientific, medical and technical resources.

Article 9

Reduction of the risk of disasters

1. Each State shall reduce the risk of disasters by taking appropriate measures, including through legislation and regulations, to prevent, mitigate, and prepare for disasters.
2. Disaster risk reduction measures include the conduct of risk assessments, the collection and dissemination of risk and past loss information, and the installation and operation of early warning systems.

Article 10**Role of the affected State**

1. The affected State has the duty to ensure the protection of persons and provision of disaster relief assistance in its territory, or in territory under its jurisdiction or control.
2. The affected State has the primary role in the direction, control, coordination and supervision of such relief assistance.

Article 11**Duty of the affected State to seek external assistance**

To the extent that a disaster manifestly exceeds its national response capacity, the affected State has the duty to seek assistance from, as appropriate, other States, the United Nations, and other potential assisting actors.

Article 12**Offers of external assistance**

1. In the event of disasters, States, the United Nations, and other potential assisting actors may offer assistance to the affected State.
2. When external assistance is sought by an affected State by means of a request addressed to another State, the United Nations, or other potential assisting actor, the addressee shall expeditiously give due consideration to the request and inform the affected State of its reply.

Article 13**Consent of the affected State to external assistance**

1. The provision of external assistance requires the consent of the affected State.
2. Consent to external assistance shall not be withheld arbitrarily.
3. When an offer of external assistance is made in accordance with the present draft articles, the affected State shall, whenever possible, make known its decision regarding the offer in a timely manner.

Article 14**Conditions on the provision of external assistance**

The affected State may place conditions on the provision of external assistance. Such conditions shall be in accordance with the present draft articles, applicable rules of international law and the national law of the affected State. Conditions shall take into account the identified needs of the persons affected by disasters and the quality of the assistance. When formulating conditions, the affected State shall indicate the scope and type of assistance sought.

Article 15

Facilitation of external assistance

1. The affected State shall take the necessary measures, within its national law, to facilitate the prompt and effective provision of external assistance, in particular regarding:
 - (a) Relief personnel, in fields such as privileges and immunities, visa and entry requirements, work permits, and freedom of movement; and
 - (b) Equipment and goods, in fields such as customs requirements and tariffs, taxation, transport, and the disposal thereof.
2. The affected State shall ensure that its relevant legislation and regulations are readily accessible, to facilitate compliance with national law.

Article 16

Protection of relief personnel, equipment and goods

The affected State shall take the appropriate measures to ensure the protection of relief personnel and of equipment and goods present in its territory, or in territory under its jurisdiction or control, for the purpose of providing external assistance.

Article 17

Termination of external assistance

The affected State, the assisting State, the United Nations, or other assisting actor may terminate external assistance at any time. Any such State or actor intending to terminate shall provide appropriate notification. The affected State and, as appropriate, the assisting State, the United Nations, or other assisting actor shall consult with respect to the termination of external assistance and the modalities of termination.

Article 18

Relationship to other rules of international law

1. The present draft articles are without prejudice to other applicable rules of international law.
2. The present draft articles do not apply to the extent that the response to a disaster is governed by the rules of international humanitarian law.

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Duty of the State to Protect Internally Displaced Persons in the Event of Disaster

125

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Contents

Introduction	1864
Disaster Displacement and Its Reality	1865
The Reality	1865
Special Needs of Displaced Persons due to Post-displacement Vulnerability	1866
Policy Options for Disaster Displacement	1866
Internal Displacement	1867
The Guiding Principles on Internal Displacement	1868
Other Regional Instruments	1869
International Disaster Response Law (IDRL)	1869
The Draft Articles on the Protection of Persons in the Event of Disaster	1870
Obligation of the States	1872
Human Rights and Disaster Displacement	1872
International Cooperation and Assistance	1874
Conclusion	1875
References	1876

Abstract

This chapter attempts to discern the predominant norms of the International Disaster Response Law (IDRL) that (the norms) principally deal with the State's duty to protect the Internally Displaced Persons (IDPs) in the event of disaster and demonstrates that the newly developed IDRL has not developed any new legally binding norms or new legal bindingness in the existing norms relating to IDPs; rather, it mostly reiterates the existing corpus of norms with legal bindingness from other regimes of international law, mainly International Human Rights Law

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(IHRL). The discussion on IDRL in the chapter revolves around the Draft Articles on the Protection of Persons in the Event of Disaster (Draft Articles), the major holistic international legal instrument on IDRL. In framing the norms related to protection of IDPs, the Draft Articles highly rely on the Guiding Principles for the Internally Displaced (Guiding Principles), a non-binding soft law instrument adopted by UNGA. The protection norms derive their legal bindingness directly from international human rights law (IHRL). Under the IHRL regime, the States enjoy a considerable range of leeway in derogating and restricting the rights on certain grounds which may be utilized as justification for human rights violation. The Draft Articles impose the primary duty of protection on the affected State, while assisting States have a voluntary duty to assist the affected State by the virtue of the principle of international cooperation and assistance.

Keywords

Internally displaced person (IDP) · International Disaster Response Law (IDRL) · Disaster displacement · Human rights

Introduction

Internally displaced persons (IDPs) and their protection regime tend to be viewed as a matter of policy question within the affairs of domestic authority rather than a legal one. Nonetheless, IDPs have been recognized as a specific category through the Guiding Principles on internal displacement (the Guiding Principles), a “soft law” instrument of international law on IDP protection within the framework of United Nations (UN) system. With the development of International Disaster Response Law (IDRL), protection of disaster-displaced persons has been gaining momentum in international law. Internally displaced persons (IDPs) in the event of disaster have come under the umbrella of IDRL, which is the core focus of the chapter.

The chapter provides an overview of the situational realities of disaster displacement revolving around the complex dynamics and multi-causality of the problem. It identifies the special needs of the disaster affected IDPs in the process and borrows some policy options that need to be engaged with to tackle the problem. The second section describes the protection regime under the Guiding Principles on internal displacement. The third section highlights on protection regime of IDPs in the event of disaster under the corpus of IDRL. The chapter endeavors to demonstrate that the abovementioned protection regime does not possess any legal bindingness by the virtue of itself, rather derives it from other sources of international law. In doing so, the chapter focuses on the Draft Articles on the Protection of Persons in the Event of Disaster (the Draft Articles) for two reasons: firstly, the Draft Articles are the sole holistic and universal instrument of IDRL; and secondly, the Draft Articles are combination of codification of the existing norms and progressive development of IDRL regime.

Disaster Displacement and Its Reality

International Law Commission (ILC) defines “disaster” in the Draft Articles as “a calamitous event or series of events resulting in widespread loss of life, great human suffering and distress, mass displacement, or large-scale material or environmental damage, thereby seriously disrupting the functioning of society.” An apparent reading of the definition establishes a causal relation between “disaster” and “mass displacement.” Disaster displacement may be better construed as involuntary or forced displacement of people from their place of habitual residence as a result of disaster or to escape the aftermath of disaster (Kalin & Chapuisat, 2016). Disaster displacement has taken the place of one of the biggest humanitarian challenge in the present time given its magnitude and complex dynamics (Kalin & Chapuisat, 2020). The magnitude of the problem of displacement can be fathomed through empathic understanding of the large number of the persons displaced in the event of disaster and the multi-causal dynamics of the event that occurred due to the interplay of multiple factors in multiple disaster scenarios which eventually result in multiple displacement scenarios.

The Reality

According the reports of Internal Displacement Monitoring Center (IDMC), between 2008 and 2014, around 184 million people were displaced due to sudden-onset disasters. The average number of people displaced due to weather and climate-related hazards is 22.7 million during the period of 2009–2019, a total of 249.7 million people were displaced only in the last decade. The World Bank estimated that without any timely measures, the number of displaced will be over 143 million within 2050 in the sub-Saharan Africa, South Asia, and Latin America. However, the gathered data does not reflect the actual number but the part of it. Especially, data collected on internal and protracted displacement is meagre. There is only one non-Governmental Organization (NGO)—Internal Displacement Monitoring Center (IDMC) that is keeping proper record and information of IDPs. The lack of information and data relating to IDPs has been pushing the issue into oblivion (Ferris, 2015). Nonetheless, the UN Secretary-General’s Agenda for Humanity identified reducing displacement as one of the core responsibilities of the international community with a commitment to ameliorate Internal Displacement by at least 50 percent by 2030.

Disaster displacement occurs when the disaster affected people are forced to leave their domicile due to exposure to the impact of natural hazard. There may be three disaster scenarios: (i) sudden-onset natural disaster including earthquakes, tropical storms, floods, and landslides; (ii) slow-onset natural disaster, such as drought, recurring floods, salinification of ground water and agro land, sea level rise, and coastal erosion; and (iii) scenario combining the elements of slow and sudden-onset hazards (Kalin & Chapuisat, 2016). Regarding the factors behind displacement, the Nansen Initiative Protection Agenda identified that it is the interplay of the three

factors: (i) exposure to the disaster, (ii) vulnerability of the affected population, and (iii) natural hazard that lead to the situation of displacement (Kalin & Chapuisat, 2020). The second factor (of vulnerability of the affected population consists all the socioeconomic and political factors that render the population vulnerable to disaster. A population is said to be vulnerable when it has weak resilience to withstand the effects of disaster. There may be multiple factors associated with vulnerability in case of disaster displacement which include poverty, marginalization, poor urban planning, population growth, weak governance, human rights violation, and so forth (Goodwin-Gill & McAdam, 2021). Interplay of these scenarios and factors ensues displacement which may be occurred b: (i) spontaneous flight by the population from the disaster affected area, (ii) ordered and enforced evacuation by the States, and (iii) involuntary planned relocation of the population by the States (Kalin & Chapuisat, 2016). Exposure to slow-onset disaster or combination of sudden and slow-onset disaster may protract the period of disaster, eventually displacement for a long period (Kalin & Chapuisat, 2018). For instance, disasters like salinity intrusion or desertification render the affected place inhabitable for a protracted period of time.

Special Needs of Displaced Persons due to Post-displacement Vulnerability

Persons displaced in the event of disaster need special protection and humanitarian assistance given their post-displacement vulnerability. Displaced persons generally lose their place residence and property which make them distinct from other people (Kalin & Kunzil, 2019). The initial struggle of displaced persons is to immediate and unprepared escape from the danger zone and find a shelter. Such disastrous experience of flight leads to post-traumatic and other forms of psychological disorders. In the process of flight, they may lose their family members and community ties. Displaced persons may lose access to the basic needs including proper shelter for residence, livelihoods, education, healthcare, and so forth. The protection related to shelter of the displaced persons is found to be one of the most poorly addressed issue of humanitarian response (Mooney, 2005). The shelters provided to the displaced persons are generally of extremely poor condition; very few of them are sheltered in formal camp where most remain in temporary makeshift lodging. The vulnerable state of the displaced persons additionally renders them susceptible to discrimination, exploitation, and further victimization. The rate of gender-based violence, forcible recruitment, trafficking, and other forms of abuse is higher against the IDPs (Mooney, 2005).

Policy Options for Disaster Displacement

In the submission to the high-level panel on internal displacement, set up by the UN Secretary-General, Professor Kalin et al. proposed three policy options to prevent displacement: (i) reducing hazards, (ii) reducing exposure to disasters, and

(iii) reducing vulnerability against disasters. When displacement cannot be prevented, protection and assistance regime comes into play (which may be called the fourth policy option) (Kalin & Chapuisat, platform). The first policy option of reducing hazardous incidents or disasters is associated with sustainable management of the environment and prevention of climate change which is not covered by this chapter. The second policy option requires reducing exposure to the disaster by moving the affected persons out of harm's way to safe place through planned relocation which must be followed by repatriation after the effects of disaster cease to exist. To reduce the vulnerability of the displaced people (which is the third policy option), it is essential to identify the vulnerable class and enhance their capacity by building social resilience through rule of law and good governance (Dhumal, 2018). The fourth policy option deals with the protection and humanitarian assistance of the displaced persons. The persons displaced by disaster are entitled to human rights and humanitarian assistance to meet their basic needs until they find durable solutions through safe return or resettlement and integration that end their displacement (Kalin & Kunzil, 2019). To various degree, all the four policy options are mirrored in the IDRL. The chapter focuses on the third and fourth policy option and their reflection on the Draft Articles and the Guiding Principles.

Internal Displacement

The Guiding Principle on Internal Displacement (the Guiding Principle) defines internally displaced persons (IDP) as, “persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognized state border.” Most of the disaster displacements are internal due to displaced peoples’ tendency to remain close to their home and hope to return as soon as the situation develops (Orchard, 2019).

IDP has long been treated firmly as the “domestic affair” of the national authority and an issue of policy question rather than a legal one (Kalin, 2006). The special protection and assistance provided to IDPs are mostly on ad hoc basis (Orchard, 2019). There is no lead international agency dedicated to the plight of the IDPs. Prior to 2005, various agencies of UN collaborated with each other and shared the responsibilities for the protection of the IDPs under the banner of so-called collaborative approach. In 2005, the Inter-Agency Standing Committee initiated “Cluster Approach” which is actually division of the labor among the UN and other agencies (Ghráinne, 2021). As of now, only one NGO-Internal Displacement Monitoring Center is now playing the primary role in collecting and providing data and information. The UN Human Rights Commission adopted a soft law instrument, the Guiding Principles on Internal Displacement (the Guiding Principles) back in 1998 which still serves as the major UN instrument for IDPs.

The Guiding Principles on Internal Displacement

The Guiding Principles on Internal Displacement is a corpus of 30 principles which, in a broad sense, may be compressed into three norms (Orchard, 2019). The first norm recognizes IDPs as a distinct group who has specific needs and requires specific protection through international actions through the definition clause. The second norm entitles IDPs to the enjoyment in full equality of the “same rights and freedoms under international and domestic law as do other persons in their country” (Principle 1). According to Kalin, IDPs require more specific address (which is yet absent), given their special needs (Kalin, 2005). The third norm recognizes the need of assistance of IDPs and the (direct or indirect) responsibilities of both domestic state and international community.

The matters that the Guiding Principles address are protection against displacement (Principles 5–9); protection during displacement (Principles 10–23), the framework for humanitarian assistance (Principles 24–27), and protection during return, local integration in the locations where persons have been displaced, and resettlement in another part of the country (Principles 28–30). Principle 6 states that IDPs have the “right to be protected against being arbitrarily displaced from his or her home or place of habitual residence.” In cases of disasters, an evacuation will be regarded as arbitrary displacement unless the safety and health of the affected have been ensured. Further, displacement shall last no longer than required by the situation at hand. Responsible authorities must ensure all feasible measures to minimize displacement and provided the displaced with proper accommodation, satisfactory conditions of safety, nutrition, health, and hygiene. They shall not be separated from their family members. Principle 8 states that “displacement shall not be carried out in a manner that violates the rights to life, dignity, liberty and security of those affected.”

The Guiding Principles emphasize on IDP’s right not to be discriminated in any ground, especially on the ground that they are internally displaced (Principle 4). Principle 3 states that IDPs have the right to request and to receive protection and humanitarian assistance from national government. The Guiding Principles recognize IDP’s right to live with dignity, integrity, liberty, and security, right not to be taken hostage or in slavery, right to be free from torture, forced labor, violence, sexual exploitation, and any degrading treatment. They are entitled to freedom of thought, religion, opinion, and expression, right to seek employment, and right to vote. Freedom of Movement of the IDPs includes interning and free movement in and around open camp, freedom of choosing residence, right to seek safety in another part of the country, and right to leave country and seek asylum in any other country. IDPs are entitled to safe access to food, shelter, clothing, healthcare, and education. They have the right to property which includes the right to get back the property they left behind. Every IDP has the right to be recognized as a person before the law and right to have all the legal documents issued. They have the right to remain together with their family. Principle 28 enshrines that after ceasing of the cause of displacement. IDPs have the right to return to their original place of residence or begin a new life in the area where they are relocated and integrated. The responsible authority

must ensure the safety, security, and liveable conditions are recreated in the place of return.

The Guiding Principles are mostly restatement of the existing provisions of International Human Rights Law (IHRL), International Humanitarian Law (IHL), and International Law for the Refugees, in a more detailed and need-specific way (Kalin, 2008). Yet, it is an open question that whether the Guiding Principles contribute any advance to the existing body of law related to IDP. The answer is affirmative according to Orchard. The Guiding Principles replenish the gaps and gray areas identified by Compilation and Analysis of Legal Norms (1996) undertaken by Francis Deng, the former Representative of the Secretary-General for IDP (Kalin, 1998). For instance, the Guiding Principles develop application of principle of non-refoulement in the context of internal displacement (Orchard, 2019). Cantor made a case for IDP's right to safe and voluntary return under Principle 28 as one of the "hardening of the soft law" instance (Cantor, 2018), though Kalin and Chapuisat still consider this as an "unfulfilled promise" of the international community towards IDP (Kalin & Chapuisat, 2018).

Other Regional Instruments

Among the regional instruments associated with IDP, the Great Lakes Protocol and the Kampala Convention (both of them are operative in Africa) are worth mentioning. Both of the instruments adopt the Guiding Principles' definition of IDP. The Kampala Convention, which has been adopted as a treaty with thirty-five signatories at present, recognizes the Guiding Principle as well. The Convention commits to obligate the State parties to enact national legislation to domesticate the Guiding Principles. Kalin commended the provision as one step further than the UN, which can serve as an example for other regions (Kalin, 2007).

International Disaster Response Law (IDRL)

The work of producing the Draft Articles on the Protection of Persons in the Event of Disaster (2016) has been undertaken by the International Law Commission (ILC) with an aspiration to develop a universal and holistic body of International Disaster Response Law (IDRL) and fill up the long "yawning gap" of the fragmented body of IDRL (de Guttery, 2012; Sivakumaran, 2017). Yet there is no overarching convention in IDRL, rather it is being governed by subject-specific and disaster-specific treaties; regional, sub-regional, and bilateral treaties; soft law; and policy documents. The ILC referred and recommended the Draft Articles to the UN General Assembly to be elaborated and adopted as a convention. No agreement has been reached by the State parties in this regard yet (Bartolini, 2017).

Apart from the ILC, International Federation of Red Cross and Red Crescent Societies (IFRC) has developed "Guidelines for the Domestic Facilitation and Regulation of International Disaster Relief and Initial Recovery Assistance" (IFRC

Guidelines) and “Model Act for the Facilitation and Regulation of International Disaster Relief and Initial Recovery Assistance” (IFRC Model Act) as “a reference tool for voluntary use by disaster management officials and/or legislators who wish to develop domestic legislation, regulation, and/or procedures in their countries for managing potential future international disaster assistance” (IFRC, 2013). Sendai Framework for Disaster Risk Reduction 2015–2030, a policy agreement, was adopted and endorsed by the UN General Assembly with a view to enhance disaster resilience and reduce vulnerability to the effects of disaster, implemented by the United Nations Office for Disaster Risk Reduction (UNDRR). There are numbers of other regional and subject-specific instrument like Nuclear Accident Convention, Tampere Convention, Inter-American Convention, Caribbean Disaster Agreement, ASEAN Agreement, and so forth.

The Draft Articles on the Protection of Persons in the Event of Disaster

The Draft Articles contain elements of both progressive developments of international law (*lex ferenda*) and codification of existing norms (*lex lata*) related to disaster (Sivakumaran, 2017). The aspects of progressive development are mainly reflected in the provisions relating to the cooperation and assistance among the States and international organization and disaster risk reduction, where codification of the existing norms is reflected in the provisions regarding protection for disaster victims (Valencia-Ospina, 2008). The codified body of norms contains both hard and soft norms, though the distinction is opaque. Similarly, the proportion and distinction between progressive development and codification remain moderately vague. Though the Draft Articles as a whole are still considered to be a soft law instrument, the current form of the Draft Articles is not the final one as it appears from the Convention-like pattern of the text. Until the adoption of the Draft Articles as a Convention, the hard norms located in the Draft Articles will derive their binding forces from other binding sources of international law (Sivakumaran, 2017).

Protection of the Victims of Disasters in the Draft Articles

Despite the scope of the Draft Articles is set out in Draft Article 1 to be the protection of persons in the event of disaster, greater emphasis has been put on the “rights and obligations of the States in relation to one another” (ILC, 2016). Only three draft articles address the protection of the persons affected in the event of disaster (Bartolini, 2017). Among these three, Draft Article 2 states that the purpose of the Draft Articles is to *inter alia*, “meet the essential needs of the persons concerned, with full respect of their rights”; Draft Article 4 enshrines that the inherent dignity of the human persons must be respected and protected in the event of disaster; Draft Article 5 confirms the respect for and protection of the human rights of the disaster affected persons. Finally, Draft Article 6 sets out that the principles of humanity, neutrality, and impartiality must be followed in response to disaster.

The term “protection” is not defined in the Draft Articles. ILC’s commentary on the Draft Articles incorporates both positive and negative obligation of the States into its protection regime. Draft Article 4 and Draft Article 5 both highlight “respect” and “protection” of human dignity and human rights. “Respect” refers to State’s obligations to non-interfere with people’s rights, where “protection” requires adoption of number of measures by the States to prevent human rights violation by any non-actor and ensure satisfaction of individual needs of disaster affected persons (ILC, 2016). ILC’s commentary confirms that being the reiteration of the human rights obligation of the States in the event of disaster, it eventually encompasses the human rights obligation expressed in the international human rights instruments. The obligation of the State extends to the progressive realization of the economic, socio, and cultural rights as enumerated under the International Covenant on Economic, Social, and Cultural Rights (ICESCR). The provision of minimum core obligations under ICESCR (immediate realization of essential foodstuffs, essential healthcare, basic shelter and housing, education for children) also continues in the event of disaster.

Though the Draft Articles based its protection regime on IHRL, it adopted a synthesis of both the right-based and need-based approaches of protection which is reflected in the purpose of the Draft Articles (which is “to meet the essentials needs of the person concerned, with full respect of their rights in responding to and reducing the risk of disaster.” “The person concerned” refers to the persons directly affected by the disaster, including the ones displaced due to disaster (Valencia-Ospina, 2008). The combination of the both approaches is also reflected in Draft Article 10 which equally emphasizes on state’s duty to ensure protection of persons and provisions of disaster relief assistance. Draft Article 6 accentuates the need-based approach by highlighting that the response to disaster shall take place “while taking into account the needs of the particularly vulnerable” and applying the principle of neutrality, impartiality, and non-discrimination. ILC’s commentary assures that the principle of non-discrimination does not exclude positive discrimination, rather the later part of Draft Article 6 provides for affirmative action for the vulnerable ones. The ILC deliberately kept the term “particularly vulnerable” open ended to include any individuals or groups that might find themselves vulnerable in the event of disaster (ILC, 2016). The situation of vulnerability entails protection with taking into account special needs. The IFRC Guidelines also include the displaced persons as a group with special needs.

The temporal scope of protection is set out in the Draft Article 1. Protection under the Draft Articles shall be provided “in the event of disaster.” According to the ILC, the terms “in the event of disaster” imply that the temporal scope of the Draft Articles extends from pre-disaster preparatory phase to post-disaster recovery phase (ILC, 2016). It also applies to protracted displacement situation where humanitarian assistance is necessary for a longer period of time (Kalin, 2019; Kalin & Chapsiat, 2018). The ILC further confirms that the scope of the Draft Articles extends to the disaster risk reduction through reducing “exposure” and “vulnerability” in the pre-disaster stage (Draft Article 9) (ILC, 2016). As per Draft Article 9, the State has an obligation to “reduce the risk of disaster by taking appropriate measures.” The

measures include *inter alia* adopting legislation or regulation to prevent, mitigate, and prepare for disaster. The Sendai Framework encourages the States to take measures to reduce vulnerability through building resilience. A concurrent reading of the Draft Articles and the Sendai Framework shows that State's obligations towards displaced persons in the event of disaster start at the pre-disaster stage with building resilience and reducing vulnerability, and it ends by finding a "durable solution" for them at the post-disaster stage. "Durable solution" for the displaced persons refers to a phase where their need of specific assistance and protection linked to their displacement cease to exist and such person can enjoy human rights without discrimination on the basis of their displacement (IASC, 2010).

Obligation of the States

The Draft Articles recognize separate duty of the "affected State" and "assisting State." Affected State refers to the "State in whose territory, or in territory under whose jurisdiction or control, a disaster takes place," where "assisting State" refers to the State "providing assistance to an affected State with the consent of affected State." As per Draft Article 10, the affected State has the duty to ensure the protection of persons in its territory or territory under its jurisdiction. The affected State also plays the primary role in management of relief assistance. On a similar tone, the Guiding Principles place the primary duty and responsibility to provide protection and humanitarian assistance for IDPs on the national authorities. As reflected in the Preamble to the Draft Articles, the State remains the responsible actor by the virtue of the principle of sovereignty (ILC, 2016), a principle enshrined in the numerous international legal instruments and judicial pronouncement, having the status of customary international law (Besson, 2017). The concept of "sovereignty as responsibility" derives from the doctrine of *parens patriae*. A doctrine of domestic law, *parens patriae*, places the sovereign as the protector of its weaker subject (Dhumal, 2018). The term "sovereignty as responsibility" was coined by Francis Deng, the first Representative for the UN Secretary General for IDP, to emphasize the duty of the State in protecting the IDPs (Phil Orchard). The Draft Articles do not create any legal duty to assist the persons affected by disaster on the part of the assisting States. The assisting States may offer the affected States any assistance with the consent of the latter one which must essentially be voluntary. The only duty an assisting State assumes under the Draft Articles is to provide due consideration to the request of assistance from the affected State (Draft Article 12).

Human Rights and Disaster Displacement

The general reference to the human rights in the Draft Articles is a recognition that the IHRL is applicable in disaster situation. Similarly, the Guiding Principles reiterate the human rights of the IDPs drawn from the IHRL by analogy. The ILC recognizes the Guiding Principles as a non-binding codified text of best practice for

the protection of human rights which serves to contextualize the existing human rights obligations towards the IDPs in the event of disaster (ILC, 2016). Conjointly, the Draft Articles and the Guiding Principles serve as a legally non-binding text that identifies the existing human rights norms for the protection of IDPs in the event of disaster on a need-based approach, without establishing an independent and novel body of norms (Kalin, 2019). These norms derive their legal bindingness from the IHRL instruments. In the commentary, ILC labels the Draft Article 5 as just the reminder of the obligation of States under IHRL. While these norms derive their bindingness from other regime, they simultaneously derive the limitations as well. The ILC confirms that the reference to the rights in the Draft Articles incorporates the limitations as well which is further supported by Draft Article 18 which stressed that the Draft Articles shall operate without prejudice to other applicable rules of international law.

The so-called derogation clause in IHRL enables States to exonerate itself from any obligations to respect and protect human rights by derogating them on the ground of public emergency or by limiting them invoking certain justifications recognized in international law (Sommario, 2012). It is true that the States need to restrict certain human rights in disaster situation to operate effective and successful disaster management (Sommario, 2012). For instance, freedom of movement of the people in the disaster stricken area may be restricted, or freedom of expression may be reasonably restricted in order to stop spreading disaster-related rumors and panic. Article 4 of the International Covenant on Civil and Political Rights (ICCPR) provides for a derogation clause which exonerates the States from treaty violation on the ground of public emergency. It must be underlined that natural or man-made disaster qualifies as public emergency (Questiaux, 1982). The derogation clause cannot be invoked unconditionally. UN Human Rights Committee (HRC) points out in General Comment 29 that two conditions must be met: the emergency must be of such degree that “threatens the life of a nation”; and there is official proclamation and notification of a state of emergency (HRC, 2001). IHRL instruments also permit leeway in restricting human rights to the States in non-emergency situation. Any such restriction must meet the three pronged test: the restriction (i) is prescribed by law, (ii) pursues a legitimate aim, and (iii) is necessary and proportionate to that aim (HRC, 1984; Sommario, 2022). The first criterion requires the restriction to be imposed by any national “law.” The European Court of Human Rights opined that the law must be “formulated with sufficient precision to enable the citizens to regulate their conduct” (Sommario, 2022). To fulfil the second criterion, the States restricting human rights have to make a plausible case that they have a legitimate purpose to impose the restriction. Thirdly, there must be clear demonstration of necessity to impose the restriction in a proportionate manner. Proportionality refers that the restrictive measure taken must be the least intrusive one (HRC, 1984). The States are actually granted the leeway or “margin of appreciation” to determine whether a restriction passes the test (Kratochvil, 2011).

However, often this leeway is used by the States to justify State’s failure in protecting human rights or even worse, in respecting human rights. A report submitted to the UN Human Rights Council stated that the IDPs are subjected to

significantly higher level of human rights violations than any other persons (HRC, 2009). The same report also identified that the human rights violation of IDPs is not always intentional but often happened due to bad policies, lack of capacity, or negligence of the States. In either case, States can make use of the leeway to justify its failure. As to the economic, social, and cultural rights (ESC rights), the States have a general obligation to progressively realize the apparently non-justiciable rights. Yet, States' retrogression from realizing the ESC rights can be justified in case of severe economic difficulties, *force majeure*, distress, or state of necessity (Reidel, 2011). Further, the ESC rights can be limited by the States for the purpose of promoting general welfare. The approach of "progressive realization" is unable to meet the immediacy of the need of shelter, foodstuffs, and healthcare of disaster affected IDPs. The UN Committee on Economic, Social, and Cultural Rights (CESCR) issued "minimum core obligations" approach under which the States must all time guarantee the minimum essential rights, i.e., essential foodstuffs, equal access to primary healthcare, basic shelter and housing, and basic education. The CESCR affirms that these core obligations are non-derogable and States must take necessary actions to ensure the rights even in the time of natural disaster, though the reality of practice of the States shows the contrary (Giustiniani, 2021). Nonetheless, the State can exonerate itself from the core obligations by invoking resource constraints. A State unable to provide the core rights due to economic constraints only has the burden of justifying that every effort was made to fulfil the obligations (Giustiniani, 2021). The rationale behind is that the presence of natural disaster can severely undermine the capacity of the State to realize the obligation under the International Covenant of Economic, Social, and Cultural Rights (ICESCR) (Muller, 2009). Considering the lack in capacity and hardship of the States (especially the developing States) to fully realize their obligation, the CESCR adopted and incorporated the concept of international cooperation and assistance in the ICESCR (CESCR, 2003).

International Cooperation and Assistance

The ILC recognizes the indispensability of international cooperation and assistance for the protection of persons in the event of disaster, especially in the time when the affected State lacks the capacity to tackle disaster situation. Draft Article 7 highlights the States' duty to cooperate among themselves while implementing the Draft Articles. Draft Article 8 provides an inclusive list of forms of assistance. Draft Article 11 connotes that if the disaster manifestly exceeds the national capacity of the affected State, it has a duty to seek assistance from other States and organizations. The UN General Assembly, in the Resolution 46/182, also recognized that the affected States may lack capacity against the magnitude and duration of catastrophe, and it may need urgent assistance from international community. As per Draft Article 12, assisting States may offer external assistance to the affected State upon the request or with the consent of the affected State. Such offers, whether unilaterally

or requested, are essentially voluntary and do not create any legal duty to assist (ILC, 2016). The ILC considers that the principle of international assistance and cooperation derives from the State's obligation under international human rights instrument and customary international law. The major reference human rights instrument for the principle is the ICESCR. The ICESCR imposes some degree of duty upon the States to take steps through international cooperation and assistance in order to realize the economic, social, and cultural rights. The idea behind the principle was that the wealthier States should assist the poorer States. However, in the context of the human rights obligations of the States to render international assistance and cooperation, the principle remains the one of entirely abstract nature (Giustiniani, 2021). It would be difficult to say that this commitment of international assistance and cooperation has any legal bindingness. In General Comment 3, the CESCR circumvents imposing any obligation on the part of the (wealthier) States to provide assistance and cooperation to the (affected) States. Rather, it tied the issue of international assistance with the responsibility of the individual (affected) States. General Comment 3 notes that the States have an obligation to make maximum use of its available resources which are existing within the State and availed through the international assistance and cooperation (CESCR, 1990). In other words, under ICESCR, the States have obligation only to avail but not to provide international assistance and cooperation. In the same way, the Draft Articles adopt the principle with no binding obligation on the part of the assisting States to cooperate. Though the principle of international assistance and cooperation is a well-established principle in international law, contention that there exists any legal obligation of the States to provide assistance would be a hyperbole (Saul et al., 2014).

Conclusion

The main finding of the chapter is that the Draft Articles do not introduce any hard norm into the normative framework under international law for the protection of internally displaced persons in the event of disaster. The Draft Articles effectively structure and blend the existing norms with the new norms within the policy option framework (see section “[The Guiding Principles on Internal Displacement](#)”). The norms related to the duty of the States and international assistance and cooperation are extrapolated from IHRL by analogy. While extrapolating the norms of voluntary and slow-paced international assistance and cooperation, issues like immediate character of disaster situation and technical and financial incapacity of the affected States have not been given justified consideration. However, ILC’s original purpose was to develop treaty norms for IDRL which is lucid from the treaty-like language of the Draft Articles (Sivakumaran, 2017). Blending hard norms with the soft one has its virtue. According to Sivakumaran, the soft norms may eventually be hardened by the effect of the hard norms (Sivakumaran, 2017). Nonetheless, the Draft Articles remain the single holistic international legal instrument on the event of disaster till today.

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Managing Disasters in Bangladesh: Legislative Framework and Judicial Developments

126

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Contents

Introduction	1880
Constitutional Framework for Disaster Management in Bangladesh	1881
Scope for Emergency Power	1881
Impact of International Legal Instruments	1882
Legislative Framework for Disaster Management in Bangladesh	1883
Disaster Management Law	1883
Meteorology Law	1885
Taxation Laws	1885
Aviation Laws	1886
Judicial Approach in Managing Disasters	1886
Conclusion	1889
References	1889

Abstract

The focus of the chapter will be on disaster management laws in Bangladesh and will shed light on judicial developments. Apart from critically examining disaster management laws, the chapter will analyze the relevant milestone litigations filed before the Supreme Court of Bangladesh in the last 50 years. The chapter will make some conclusive comments on the statutes and domestic judicial remedies in Bangladesh. Through this examination we aim to portray the lengths to which

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the law has been applied and to gauge how beneficial the domestic legal remedies have been to the current scenario.

Keywords

Bangladesh · Disaster law · Statutes · Case law

Introduction

The location of Bangladesh is just on the bank of the Bay of Bengal; its riverine foundation of the territory makes it one of the most vulnerable countries in the world. The condition of Bangladesh is emanated quite adequately through relevant statistics. The emergency events database of Universite Catholique de Louvain reports that the most frequent disasters to affect the citizens of Bangladesh are storms (around 52%), while floods are the second most harmful (31%) (UCLouvain, [n.d.](#)).

Based on these reports and statistics, Bangladesh is regarded as one of the most disaster-prone territories of the world. The Intergovernmental Panel on Climate Change (IPCC) ranks Bangladesh as the seventh most vulnerable country to climate change (Saleemul Huq, [2022](#)). Every year the country faces not only natural calamities like floods, cyclones, droughts, and landslides but also man-made disasters like the Rana Plaza collapse and influx of Rohingya migrants.

The people of Bangladesh have remained victim to disasters, both man-made and natural, for a long time. Only recently has the country learned to live and deal with disasters through their effective management. In order to do that, the parliament of Bangladesh has enacted several legislations which prescribe ways and means for an effective disaster management system. Besides legislation, the government has adopted several policy instruments, issued gazette notifications, and provided guidelines in that direction. Such legislations, directives, and guidelines, at times, were not adequate. In situations like those, if people resorted to the judicial system, the courts gave the government certain directions. The legislations and directives which although most of the times are based on international legal instruments do not always conform to them.

This chapter identifies a number of lacunae in the existing legal framework of Bangladesh in its efforts to manage disasters so that effective measures can be taken to strengthen our legal framework. Part II shall shed light on the constitutional framework for dealing with disasters of different kinds and enquire whether the constitution framers contemplated such disasters and the necessity of extraordinary measures in case of a disaster. In Part III, this chapter deals with the legislative framework of Bangladesh highlighting the loopholes in the domestic legal framework in consonance with its international legal obligations. Finally, Part IV focuses on the judicial decisions time to time issued by the Supreme Court of Bangladesh, often as a stopgap measure. This chapter concludes that although there has been massive development in the framework for managing disasters, there are still some avenues for further development.

Constitutional Framework for Disaster Management in Bangladesh

Scope for Emergency Power

The original constitution of Bangladesh 1972 did not contain any provision for emergency measures, nor did it have specific reference to any extraordinary use of executive or legislative power in case of any unusual event. However, the legislators soon felt the need for emergency provisions in the constitution. In the Constitution (Second Amendment) Act 1974, the legislators added provisions for emergency in the constitution in three different provisions: Articles 141A–C. Now the constitution of Bangladesh contains explicit provisions regarding the grounds of proclamation of emergency. Article 141A, although has not expressly mentioned a disaster, natural or man-made, situation as a ground for proclamation of emergency, has created an indirect scope for the proclamation of emergency if it appears that the economic life of the state is threatened by internal disturbance. Article 141A says:

If the President is satisfied that a grave emergency exists in which the security or economic life of Bangladesh, or any part thereof, is threatened by war or external aggression or internal disturbance, he may issue a Proclamation of Emergency for one hundred twenty days:

Provided that such Proclamation shall require for its validity the prior counter signature of the Prime Minister.

Leading constitutional law jurist of Bangladesh, Mahmudul Islam, noted that the constitution does not provide any explanation of terms and phrases like “war or external aggression” and “internal disturbance” (Islam, 2012). Due to such space for interpretation, there are disagreements among scholars as to when emergency can be declared. Although there are some alternate views, in favor (Hoque, 2020) and against (Ahmed, 2020), such leeway may include the case of disasters which consequently has had a negative impact on the economic life of Bangladesh. Notably, Bhuiyan argued that during the Covid-19 crisis, it was pragmatic of Bangladesh to deal with the allegedly emergency situation by a legislative model rather than by proclamation of emergency since the latter one takes a more restrictive approach to protection of rights (Bhuiyan, 2020). His opinion relied on the empirical research of Tom Ginsburg and Mila Versteeg (Ginsburg & Versteeg, 2020).

The significance of an emergency mechanism is that the restrictions on the power of the state to impose restrictions on certain fundamental rights will no longer be effective. Thus, it will be possible to impose any restriction whatsoever to contain the emergency situation. However, as opposed to popular belief, a proclamation of emergency does not automatically suspend fundamental rights; rather separate law needs to be enacted to impose such restrictions.

The court considered, in *Iqbal Hassan Mahmood alias and Iqbal Hassan Mahmood Tuku vs. Government of Bangladesh and others* (05.12.2007 – BDHC): LEX/BDHC/0034/2007, that natural disaster is a general ground for declaring emergency. In the words of the court:

It would be difficult to find out a nation that never faced a state of emergency in its history. The need to declare a state of emergency may arise from situations as diverse as an armed action against the state by internal or external elements, a natural disaster, civil unrest, an epidemic, a financial or economic crisis or a general strike. The implementation of emergency law invariably leads to restrictions on normal economic, civil or political activity and rights in order to address the extraordinary circumstances that have given rise to the emergency situation.

Although the court considered that natural disasters may be grounds for issuance of proclamation of emergency, the court also was cautious about the overexploitation of the emergency power allocated to the executive. In the words of the court:

Certain restrictions may be fully justified. At the same time, there is a danger that a government will take advantage of a state of emergency to introduce unwarranted restrictions on human rights and civil liberties, to neutralise political opponents, to postpone elections, or for other self-serving purposes that would be more difficult to pursue under normal circumstances. It is also in the experience, in some country there has been tendency to maintain state of emergency for years or even decade long after the original reason for its proclamation has disappeared.

From the above discussion, it is clear that the executive has the discretion to impose restrictions on such fundamental rights under the constitutional framework. However, the government needs to be cautious in using emergency powers.

Impact of International Legal Instruments

The constitution of Bangladesh does not have any provision about the status of international law in the domestic corpus juris. Despite such silence, through various judicial decisions, it is a settled issue that Bangladesh, generally speaking, is a dualist country (Hossain & Bhuiyan, 2019; Haque, 2017, 2021). It means international law does not directly apply in Bangladesh's legal system. Thus, unless an international legal instrument has been ratified by the parliament of Bangladesh, such international laws are not directly implementable in Bangladesh even if the country has signed the international covenant, convention, or treaty.

Such principle will also be equally applied in the case of disaster-related international law. Thus, in order to assess whether our disaster management legal framework is adequate, attention should be given to the corpus juris of Bangladesh and not international instruments where Bangladesh has signed the treaty. However, there are some judicial decisions in which the Supreme Court of Bangladesh has directly applied the provisions of international law instruments which are nonbinding for Bangladesh. For example, in the *Hussain Muhammad Ershad v Bangladesh* (2001) 21 BLD (AD) 69, Justice BB Roy Chowdhury drew contents from the nonbinding *Universal Declaration of Human Rights*. In this case, the court observed that international law can be applied in order to fill in any vacuum in the domestic law, provided that international law is not found to be conflicting with domestic law.

Thus, this judicial approach has created a wider scope for the application of international law in Bangladesh.

Legislative Framework for Disaster Management in Bangladesh

There are a number of laws in Bangladesh that may be invoked to manage disasters in Bangladesh. A number of these laws require upgrades and reform to conform with international standards of disaster management. This part of the chapter shall critically discuss the legislative framework for disaster management in Bangladesh.

Disaster Management Law

The major law dealing with management of disasters is known in its name: the Disaster Management Act 2012. It defines a disaster, constitutes a national disaster management council, and imposes a penalty for relevant offences. This law is backed up by different implementing instruments, for example, the Disaster Management Policy 2015, the Standing Orders on Disaster 2019, and the National Plan for Disaster 2016–2020. Before the Disaster Management Act 2012 was enacted, the method pursued by governments across the spectrum used to be based on relief-centric measures. With the enactment of the Disaster Management Act 2012, the policy has observed a paradigm shift in its approach, from a “relief-centric” approach to a “holistic one.” If we take a comparative approach and look at our neighboring countries, it seems that this was meant to be the way forward for all the nations. For example, when India faced a major “Gujrat earthquake,” India also moved toward a preparedness approach from a post-disaster relief mechanism (Guru, 2019).

The National Disaster Management Committee (NDMC) is chaired by the prime minister. This committee is responsible for coordinating the entirety of the national efforts for disaster management. Section 6(h) of the act empowers the NDMC to take any means necessary to manage disasters properly. Despite the silence of the law, it seems that it is the jurisdiction of the NDMC to decide whether any sort of international assistance would be required. It has been also indicated in the Armed Forces Divisions (AFD)’s 2020 Standard Operating Procedure for Multinational Coordinating Center. The 2019 Standing Orders on Disaster assigns the Ministry of Foreign Affairs to be the bridge between foreign governments and INGOs with help from Bangladeshi missions abroad. The same ministry is responsible for setting up a system for timely receipt of international humanitarian assistance and relief. Thus, it seems that the Ministry of Foreign Affairs only takes steps when the NDMC directs it to do so.

The government has the power to frame policies with regard to “international and regional disaster management.” There is another provision (Sec. 32) in the law that prescribes for establishing a disaster management fund. Any fund received from foreign government, organization, or any international organization with the approval of the government shall be deposited to the fund. The act also gives the

government power to receive and provide cooperation from other foreign countries to conduct relief operations during the disaster period. In that direction, the government is allowed to enter into memorandum of understanding, international agreement, convention, treaty, or any other legal document with foreign states and regional or international organizations. The act also keeps a provision for ensuring accountability backed by a sanction mechanism. Section 39 provides that if anybody misuses the funds of the disaster management fund, then that person may be punished for this offense for not more than 1 (one) year rigorous imprisonment or not more than 1 (one) lakh Taka fine or both punishments. Notably, nobody is given the responsibility to oversee such use or misuse of funds. However, the deputy commissioner may make a written allegation to the court under Sec. 45.

There are a number of ways to improve the current disaster management law of Bangladesh. Firstly, the act is silent about regulation of international disaster assistance. Though the government is given the power to frame rules, even after a decade, such rules remain unframed. Secondly, the 2019 Standing Orders on Disaster does not prescribe the mode of humanitarian coordination. The government should undertake immediate measures to enact a rule where the time frame within which assistance is to be offered and the factors to be taken into consideration while offering or accepting assistance should be provided. The role of the international humanitarian actors should also be detailed in the 2019 SOD. Thirdly, the procedure for coordination between NDMC and the Ministry of Foreign Affairs should be specified in the act itself or may be listed down as a function of the NDMC. Fourthly, there is no special provision for ensuring security to the international actors without going through the respective deputy commissioner. A centralized mechanism may be adopted to ensure the international actors who have come forward to provide assistance are not facing troubles due to red tapes of bureaucracy. Fifthly, the 2019 Standing Orders on Disaster is oblivious of the minimum standard of humanitarian recovery activities. In the absence of minimum standard provisions, the quality of recovery efforts may fail to fulfill its true purpose. Sixthly, although it seems that the provision for imposing penalty for misappropriation of funds equally applies to the foreign funds because the foreign funds will be a part of the disaster management fund, the law can clarify it by further inclusion in the legislation.

A better mechanism for enhancing accountability may be designed by introducing reporting methodology or reforming the existing reporting protocol. Right now, there is a gaping vacancy on a position of check and balance, which is quite pivotal in battling corruption and other dishonest methods related to handling monetary funds. The sole person responsible to reporting any discrepancies in handling the funds is the deputy commissioner, which makes the system vulnerable to a plethora of issues. Where the person in charge will be discouraged to make a report as it, advertently or inadvertently, will inevitably put into scrutiny and question his own actions and capabilities, quite nearly turning it, essentially, into a “self-reporting system.” Given the fact that there are both positive and negative arguments on the utility of self-reporting system (Simmons & Creamer, 2019; Kornblum, 1995; Creamer & Simmons, 2019; Scott & Balthrop, 2021), in the Bangladeshi context, it would be more befitting to either have a fixed body to monitor and evaluate the

reports submitted or employ a third-party external observer to do so outside the jurisdiction of the deputy commissioner.

Moreover, the Disaster Management Act is silent about the details to be included in a request for foreign assistance. Although the standard operating procedure of the Armed Forces Division prescribes a form for request for foreign assistance, a legislative inclusion of the form and prescription of the process can make sure all the stakeholders are duly obliged to follow the instructions.

Meteorology Law

The Meteorology Act 2018 provides for establishment of Bangladesh Meteorological Department. This department is responsible for monitoring and overseeing the exchange of information with foreign states. It is also empowered to do so in case of regional/international organizations in consonance with the international obligations of the state. In this regard, Sec. 6(1)(b) provides due direction for mutual cooperation of the state with other states and non-state entities. It states that the department shall provide expert opinions and data to the interested stakeholders, research institutes, and agencies and exchange weather services data with all concerned domestic and international organizations in view of national needs and international obligations. This seemingly incorporates the obligations under the SAARC Disaster Response Agreement. However, the procedure of exchanging such information has not been specified. A possible revision of the law or a further adoption of a rules can address this concern.

Taxation Laws

The National Board of Revenue published the Standing Order no. 47/98/customs which declares all goods imported by any diplomatic mission, persons enjoying diplomatic privileges, and organizations/persons enjoying “special privileges” are eligible for the “rapid clearance procedure.” The Standing Order also applies to any relief items. Goods qualifying for the rapid clearance procedure shall get immediate out-pass seal without any physical examination or “unstuffing” procedure. Other laws and policies that are relevant in this regard are Customs Act 1969, Income Tax Ordinance 1984, and VAT Act 2012. These laws regulate the exemption or reduction in duties and taxes with regard to relief items.

Again, Sec. 19 of the Customs Act 1969 provides the government a general power to exempt goods from custom duties. The section states that if the government is satisfied, after consultation with the National Board of Revenue, and that it is necessary in the public interest to do so, it may exempt any goods imported into, or exported from, Bangladesh from customs duties partially or wholly.

The National Board of Revenue (NBR) has issued the Statutory Regulatory Order (SRO) no. 61 (SRO no. 61-law/92/1444/customs) exempting listed humanitarian goods from duties and taxes if they are imported by Bangladesh Red Crescent

Societies or any foreign/local NGO registered under the NGO Affairs Bureau or by any other unregistered foreign or local organization. Subsequently, through SRO no. 178 – law/2012/2406/customs, the NBR excluded the listed items from pre-shipment examinations. The NBR has the authority to arrange such facilities from time to time considering the national need.

Aviation Laws

The Civil Aviation Act 2017 is silent about a system for priority landing of airplanes carrying humanitarian assistance supplies. In April 2020, the Civil Aviation Authority of Bangladesh issued a directive keeping provisions for foreign operators to carry cargo in the passenger compartment for the “unhindered supply chain of medical equipment and different essential goods/commodities.” There are instances when the Civil Aviation Authority of Bangladesh issued circulars to arrange special or suspend particular flights. For example, they issued circulars on 14 May 2020 and 28 May 2020 regarding the suspension of flights to and from certain countries. The gazettes stated that international flights of the following type, cargo, emergency landing, technical stop, medical evacuation, special flight operation, relief/humanitarian assistance, and citizen evacuation, shall continue as usual. Therefore, there are exceptions to international travel restrictions facilitating movement of humanitarian relief teams. For citizen evacuation and humanitarian assistance, permission must be obtained from the Ministry of Foreign Affairs. This implies that the CAAB has the authority to allow for special provisions for emergency situations. However, it is recommended that the Civil Aviation Act should be amended to provide the authority with the authority to allow for priority landing of flights carrying international humanitarian assistance.

In addition, the establishment of the National Emergency Operation Center (NEOC) has been a milestone. As a response to the Nepal earthquake in 2015, the Bangladesh government understood the need for a complete disaster preparedness for Bangladeshi citizens. The NEOC is a three-tier system that facilitates an inter-governmental framework for coordination in regulating the responses during national and international disasters.

Judicial Approach in Managing Disasters

The first case that used the term disaster in the sense we are using it now in disaster law is Dr. Mohiuddin Farooque vs. Bangladesh decided in 1996. In this case, the then Chief Justice ATM Afzan noted that ecological disaster has the impact of an economic disaster because environment and ecology have become matters of universal concern. In his words:

... all the environmental deterioration and risks we have experienced to date have occurred at levels of population and human activity that are much less than they will be in the period

ahead. And the underlying conditions that have produced this dilemma remain as dominant, driving forces that are shaping our future and threatening our survival.

Noting such observation, the Supreme Court of Bangladesh granted Bangladesh Environmental Lawyers Association (BELA) locus standi to intervene when public interest and constitutional rights of people are threatened.

In granting locus standi in favor of Bangladesh Environmental Lawyers Association (BELA), the court said that “a national organization . . . , which claims to have studied and made research on the disputed project, can and should be attributed a threshold standing as having sufficient interest in the matter, and thereby regarded as a person aggrieved to maintain the writ petition.” The grant of locus standi to persons not directly aggrieved was a milestone because now people could come forward against the government for their action or inaction.

In another case, *Mohiuddin Farooque and Ors. vs. Bangladesh and Ors.* (28.08.1997 – BDHC): LEX/BDHC/0422/1997, the wheels of justice progressed further when the High Court Division of the supreme court acknowledged the necessity of foreign assistance in “managing” disasters. In a case related to a development project aimed at controlling flood which regularly brings miseries to the people of the flood-prone areas of the district of Tangail specially during the rainy season of the year, namely, FAP 20 project, the court noted:

In the event of any interference into the “FAP-20” activities, the country will be deprived of the benefits expected to be derived from the implementation of the scheme and also from getting foreign assistance in the development work of the country and in future, donor countries will be apprehensive in coming up with foreign assistance in the wake of natural disaster. At the present stage of the implementation of the project, it will be unpractical to stop the work and to undo the same. But in implementing the project, the respondents, cannot with impunity, violate the provisions of laws of the land referred to and discussed above.

When arsenic became a major problem for Bangladesh and was showing disastrous impact, the court noted, in *Rabia Bhuiyan, MP vs. Ministry of LGRD and others* (27.08.2005 – BDAD): LEX/BDAD/0006/2005:

... the extreme gravity of the situation and the serious effect of continuing arsenic contamination through drinking ground water on public health, this Court directs the respondents to fulfil their legal obligations to provide safe water to millions of persons across Bangladesh.

Thus, the supreme court has taken different stopgap measures to prevent disasters, natural or man-made, from time to time. The court has also directed the government to take necessary measures, because in the words of the attorney general, natural disasters affect common interest of many countries at the same time (*Faridul Alam and Ors. vs. Bangladesh and Ors.* (22.07.2010 – BDHC): LEX/BDHC/0348/2010). He substantiated that natural disasters have no borders and one single event can affect many neighboring countries at once. He argued that any disturbance of basic elements of the environment can seriously create

impediment for “life” on the planet within the meaning of “life” under Article 32 of the constitution.

In *Ain-o-Salish Kendra (ASK) and another vs. Bangladesh, represented by the Secretary, Ministry of Labour and Manpower and others* (05.09.2010 – BDHC): LEX/BDHC/0034/2010, the court appreciated the role of the NGOs and INGOs in alleviating the poor and distressed segment of the citizenry. But the court recommended that the works of these organizations can be more meaningful and more fruitful if there is a central independent body coordinating the resources of these platforms altogether in a planned manner. In case of a disaster situation, such an independent body can be a one-stop solution center for the INGOs and foreign countries who will be coming forward with their financial and technical assistance.

The court in another case, namely, *Bangladesh Legal Aid and Services Trust (BLAST) vs. Bangladesh and others* (13.10.2010 – BDHC): LEX/BDHC/0077/2010, pointed out that the building code provides for precautionary measures and protection against natural disaster by earthquake. The court thus directed the government to make sure the building code is being properly followed and such is being regularly monitored.

In a natural or man-made disaster of massive or minor scale, the defense services of the country play a big role in rehabilitating the people of the country. The court emphasized on the role of civil-military relationship in crisis management for the greater interest of people at large. The Appellate Division noted their heroic performance during such crisis times as follows (*Bangladesh Bank vs. East West Property Developments (Pvt.) Limited and Ors.* (16.03.2017 – BDAD): LEX/BDAD/0007/2017):

A defence force is an asset of our country. The primary responsibility for raising a defence force in a country is for national security including its boarder and approaches; to defend the country’s sovereignty; to contribute to and, where necessary, lead peace and security operations; to protect the country’s wider interest by contributing to international peace and security, and the international rule of law; to contribute to whole-of-government efforts at home and abroad in resource protection, disaster relief, and humanitarian assistance; peacekeeping, crisis management and humanitarian relief operations; protection of the internal security; defense scientific research and development; defence procurement and purchasing and so on. It can be said in brief that today the obligation of military is beyond their primary role of battling the external enemy as there is a perceptible shift towards internal security involving deactivating terrorists, winning the hearts and minds of aggrieved people of the country, riot control, saving lives during natural disasters and military diplomacy.

When popular news media in Bangladesh started reporting risks of earthquakes in Bangladesh during 2010–2011, it created much distress among people. The news media then reported that the Bangladesh government does not have sufficient equipment necessary for rescue operation in case an earthquake happens. The High Court Division was moved by one NGO, namely, Human Rights and Peace for Bangladesh. The court agreed with the contention of the petitioner NGO and directed the government to buy necessary equipment required for rescue operation in an earthquake (*Human Rights and Peace For Bangladesh (HRPB) And Others*

Vs. *Government Of Bangladesh And Others* 63 DLR (2011) 71). The court also directed the government to constitute a high-powered committee composed of ministers, experts, NGOs, etc. at the earliest time. The name of the committee is Earthquake Preparedness and Awareness Committee. The court also directed the Ministry of Finance to allocate a budget as soon as the committee has agreed upon the list of necessary equipment to buy. The committee was also instructed to meet frequently and make recommendations to the government from time to time. Thus, the judiciary has time and again taken stopgap measures addressing different ground realities which have not been addressed in the legislation.

Conclusion

This chapter shows that Bangladesh has made a paradigm shift in its approach for “managing” disasters. Before 2012 what was a post-disaster relief distribution-centric initiative, now it has become disaster response and preparedness centric. In the words of one commentator, Bangladesh turned from a reactive approach to a proactive approach (Sultana, 2016). The constitutional discourse as regards whether emergency can be proclaimed during a natural or man-made disaster remains a moot. However, this chapter argues that in such events, emergency can be proclaimed if the president is satisfied in the due manner. The legislature has enacted a number of laws and amended quite a few legislations lately to incorporate the modern problems that was not addressed earlier. However, there are still avenues for further improvement of the legislative framework. The judiciary of Bangladesh has from time to time adopted stopgap measures to address the unnoticed problems. When found lethargic or indifferent to a problem, the Supreme Court of Bangladesh has even given direction to solve the crisis, e.g., *Human Rights and Peace For Bangladesh (HRPB) And Others Vs. Government Of Bangladesh And Others* 63 DLR (2011) 71. The sooner we develop our legal framework toward a better disaster management system, the more we will be benefited in times of crises.

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Persons with Disabilities in COVID 19: Bangladesh Perspective

127

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Contents

Introduction	1892
Disability and COVID-19 Pandemic	1893
Development of Human Rights-Based Disability Models	1893
Development and Protection of Disability Rights in Bangladesh	1894
Pre-pandemic Global and Regional Disaster Guidance	1896
Disability-Inclusive COVID-19 Preparedness and Response Plans	1897
Disability-Inclusive Pandemic Management Framework in Bangladesh	1897
Implementation of Disability Targeted COVID-19 Strategies in Bangladesh	1899
Findings	1903
Conclusion	1904
Reference	1905

Abstract

Persons with disabilities (PWD) remain vulnerable and susceptible to discrimination in crisis, whereas they are entitled to inclusive protection. During the COVID-19 pandemic, global health and other public services nearly collapsed, putting the disability needs on the backfoot. Hence, the World Health Organization (WHO) and the United Nations (UN) provided comprehensive and disability-inclusive disaster management guidelines for the member states to secure PWD. Even though Bangladesh adopted response plans in compliance, disability integration failed to reach the level of expectation. The cardinal disability rights instrument, the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) 2006, obliges the state parties to target and mainstream disability rights during risks and emergencies. Though Bangladesh has the Rights and Protection of Person with Disability Act (RPPDA) 2013 in compliance, the scope of the legislation during crises remains uncertain. This qualitative

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research investigates whether the current safeguard measures are adequate in protecting PWD of Bangladesh amid the COVID-19 pandemic. The chapter first critically examines the existing national disability safeguard measures and then explores the extent of the protection during the pandemic in compliance with international guidance. Relevant primary sources like national and international legislation, guidelines, and policies are analyzed. Secondary sources like authoritative journal articles, books, and newspaper reports are explored to investigate the disability situation. The pandemic management strategies in Bangladesh fall short in disability protection without comprehensive planning and adequate enforcement mechanism. Disability-inclusive disaster regulatory measures and proper monitoring are necessary to yield better protection in future crises.

Keywords

Persons with disabilities · PWD · COVID-19 pandemic · Bangladesh · Disability

Introduction

The COVID-19 pandemic disproportionately affected persons with disabilities (PWD) and unmasked underlying inequalities in accessing their rights. Generally, the PWD suffer and die disproportionately during disasters (UNISDR, 2014). They are also unequally excluded from disaster planning, management, and decision-making processes (UNISDR, 2014). The PWD were more prone to COVID-19 infection and had difficulty accessing health and other support services (UN, 2020a, d; WHO, 2020, 2021). Pandemic prevention measures also posed additional physical barriers (ILO, 2020a; UN, 2020a, d; WHO, 2020). Women and children with disabilities endured significant risks of gender-based violence (GBV) (UNDESA, 2020). The PWD also faced financial hardships and remained least protected with social insurance benefits (Center for Inclusive Policy, 2020; IASC, 2020; ILO, 2020a). Their enjoyment of human rights was disrupted during the pandemic.

Disability considerations are imperative under the Sendai Framework for Disaster Risk Reduction 2015–2030 (Sendai Framework) to build back better after disasters. The preparedness, response, and recovery plans follow the twin-track approach of disability inclusion, which implies mainstreaming and targeting disability rights during crises. The member states are bound to prioritize disability in risk management as per the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) 2006. In compliance, Bangladesh enacted the Rights and Protection of Person with Disability Act (RPPDA) 2013. Unfortunately, the RPPDA fails to clarify the extent of disability rights during emergencies and lacks a monitoring framework. The United Nations (UN) circulated disability-inclusive pandemic response plans for comprehensive, sustainable, and resilient national Disaster Risk Reduction (DRR) and Disaster Risk Management (DRM) frameworks. PWD comprised 6.94% of the population of Bangladesh (Bangladesh Bureau of Statistics, 2016).

Following international guidance, Bangladesh adopted disability-specific pandemic management strategies. The qualitative research investigates whether the current safeguard measures are adequate for disability protection during the COVID-19 pandemic in Bangladesh.

The chapter critically examined the extent of disability protections in the pre-pandemic DRM frameworks and COVID-19 specialized plans by analyzing the existing laws, guidelines, and strategies. Necessary secondary sources like books, journals articles, and newspaper reports were analyzed to assess disability situations amid the pandemic. The chapter is divided into three parts; introduction, main body, and conclusion. The main body first elaborates on the development of disability rights and the evolution in Bangladesh. Then, pre-pandemic national, regional, and global disaster risk management (DRM) strategies are discussed. International and national pandemic response strategies are subsequently analyzed. Accessibility of disability rights during the pandemic in Bangladesh is also critically examined. Finally, the key findings are summarized.

Even though the national disaster strategies mandated disability inclusion, the implementation framework was inadequate in Bangladesh. Hence, targeting and mainstreaming disability rights became challenging during the pandemic. Specialized pandemic strategies failed to protect PWD in the absence of extensive national planning and monitoring. As a result, the humanitarian impact of the COVID-19 pandemic was high among PWD in Bangladesh.

Disability and COVID-19 Pandemic

Development of Human Rights-Based Disability Models

The medical model was the most influential early model. Disability was a personal tragedy that needed social assistance for treatment and rehabilitation (Degener, 2016; Kayess & French, 2008; Schulze, 2010). The model solely relied on the afflictions caused by the impairments and the social help rendered to cure them. It segregated PWD from society and placed them on specialized schemes and welfare programs (Kayess & French, 2008). The other significant model was the social model, which regarded disability as a social construct (Degener, 2016; Kayess & French, 2008). The social prejudice against the PWD resulted in oppression, which needed to be rejected (Degener, 2016; Kayess & French, 2008). This model shifted the focus from impairments to social inclusion of disability (Degener, 2016; Kayess & French, 2008). It aimed at substantive equality by planning specialized and targeted arrangements for the PWD like flexible working hours, communication in accessible formats, compensation, assistance, etc. The disability rights movements have emerged from the social model and influenced the development of the UNCRPD. However, the UNCRPD is the primary outcome of the human rights model, which observes disability from a right-based approach. It views PWD as individuals with inherent human rights and ensures holistic social inclusion. Even

though this model concentrates on transformative equality, it does not negate substantive equality (Degener, 2016).

The UNCRPD made a paradigm shift from the welfare approach to a right-holder approach (Kayess & French, 2008), but it is not the first international document to secure disability rights. The Universal Declaration of Human Rights 1948 (UDHR), the International Covenant on Civil and Political Rights 1966 (ICCPR), and the International Covenant on Economic, Social, and Cultural Rights 1966 (ICESCR) safeguard some disability rights. The Committee on Economic, Social, and Cultural Rights (ESCR) declares that the PWDs are entitled to the human rights affirmed in the UDHR (General Comment No. 5, Para 34). The Convention on the Rights of the Child 1989 (CRC) and the Convention on the Elimination of All Forms of Discrimination Against Women 1979 (CEDAW) also highlight the rights of women and children with disabilities. Still, a comprehensive international document securing disability rights was absent till 2006. Some early efforts were made via the adoption of the World Program of Action Concerning Disabled Persons 1982 (WPA) and the UN Standard Rules on the Equalization of Opportunities for Persons with Disabilities 1993. The non-binding soft laws remain inadequate, and consequently, the UNCRPD was adopted in 2006.

Instead of creating new rights, the UNCRPD aligns the existing human rights with disability needs (Degener, 2016; Kayess & French, 2008). It upholds individual and collective equality (Article 3, 4 and 5) and highlights disability integration in the Sustainable Development Goals (SDGs) (Preamble para (g)). The PWDs often face disability-based discrimination, which nullifies their human rights (CESCR, General Comment No. 5, Para 15; UNCRPD, Article 2). Every state party to the UNCRPD is bound to eliminate disability-based discrimination and uphold disability rights in peace and crisis (Article 4, 5 and 11). Disability-integrated Disaster Risk Reduction (DRR) and Disaster Risk Management (DRM) frameworks are crucial to secure their rights and accessibility (Article 9(1), 10 and 11). Bangladesh, a party to the UNCRPD, is also obligated to uphold disability rights, especially during disasters and crises.

Development and Protection of Disability Rights in Bangladesh

The Constitution of Bangladesh secures the accessibility to fundamental rights by the PWD (Article 26, 44 and 102(2)) and guarantees equality and non-discrimination (Article 19, 27 and 28). It also endorses specialized laws for the vulnerable population to promote transformative equality (Article 28(4)). The Government of Bangladesh (GoB) is also duty-bound to facilitate their access to basic necessities and render adequate social security (Article 10, 11, 15, and 21). The first Disability Welfare Act 2001 was adopted in compliance with the constitutional obligation. However, it became ineffective due to inadequate remedial mechanisms (Mitsuhiko et al., 2014). Bangladesh ratified the UNCRPD in 2007 but took 6 years to enact the RPPDA in 2013. The RPPDA combines social and right-based models (Mitsuhiko et al., 2014). The Neurodevelopmental Disabled Persons Protection and Trust Act

2013 was also adopted for the social integration of persons with mental and intellectual disabilities.

The UNCRPD defines PWD as persons with long-term physical, mental, intellectual, or sensory impairments (Article 1). Disability arises from the interaction between the PWD and their attitudinal and environmental barriers (UNCRPD, Preamble Para (pp) (e)). The open-ended and evolving definition of disability creates scope to include diverse impairments within national legislation (Schulze, 2010). The RPPDA identifies disability as a prolonged and permanent physical, mental, intellectual, developmental, or sensory impairment that debars a person from full and equal participation in society (Section 2(9)). It also defines 12 types of disabilities, including autism, Down syndrome, multiple disabilities, etc. (RPPDA, Section 3–13). However, the RPPDA fails to cover permanent disabilities due to work injury, despite the UNCRPD inclusion (Article 1). Nevertheless, the list is not exhaustive, and the National Cooperation Committee can include new forms of impairments (RPPDA, Section 15).

The GoB established several committees at the national, district, and Upazila/city levels as per the RPPDA that collaborate with the Ministry of Social Welfare (MoSW) in preserving disability rights. Each committee plays a supervisory role over the subordinate committee, but their role in protecting disability rights in crises is ambiguous. Representation from females and the Organization of the Disabled Persons (DPOs) is ensured in these committees. Unfortunately, these committees have no reserved seats, especially for PWD, despite the UNCRPD mandate (Article 29). The RPPDA aims to create a national disability database (Section 31). The PWD, by themselves or via representatives, can apply to the local committees (City or Upazila) for their ID cards (RPPDA, Section 31(1) and Schedule, Rule 1). The Department of Social Services (DSS) under the MoSW has been collecting disability data since 2013. The Disability Information System (DIS) application is launched, and the Usage of PWD Data Policy 2021 is also adopted to aid data collection and usage. Unfortunately, the database is still incomplete.

The RPPDA intends to eliminate disability-based discrimination, which occurs when PWD are biased against and prevented from enjoying their rights due to their disability (Section 2(20)). The Act also provides a list of disability rights (Section 16) and ensures their access to justice (Section 2(17) and 38). The PWD (by themselves or by representation) can file a criminal case for specific offences to the Court of First Class Magistrate or seek compensation (Section 37 and 38). They are also eligible for legal aid (RPPDA, Schedule, Rule 12 read with Legal Aid Services Act 2000, Section 7(a) and Legal Aid Services Regulation 2014, Rule 2). Nevertheless, the framing of the rights is vague, and the Act lacks a functional remedial mechanism. The PWDs are entitled to priority protection during crises (UNCRPD, Article 11). The schedule lays a few disability-inclusive disaster guidelines for the GoB (Rule 13), but their priority protection is not guaranteed as a substantive right in the RPPDA. The guidelines mainly deal with priority protection in health, safe shelter, and recovery during disasters (Schedule, Rule 13) and lack extensive human rights protection in crises. The Act fails to define and clarify the nature and the extent of disability rights during crises.

The RPPDA is supposed to guide the GoB to secure disability rights during emergencies, which unfortunately is vague in the Act itself. The earlier COVID-19 pandemic response and management strategies had no disability-inclusive provisions without precise guidance. Before analyzing the national pandemic strategies, the paper briefly discusses the PWD integrated global and regional DRR and DRM guidelines before and during the pandemic.

Pre-pandemic Global and Regional Disaster Guidance

The DRR strategies aim for disaster resilience and sustainable development by reducing existing disaster risks (UN, 2016). The DRM is the application of DRR strategies to manage current and future disasters (UN, 2016). Effective and sustainable DRR and DRM frameworks consider the adverse effect of risks and humanitarian emergencies on PWD and emphasize their meaningful participation in assessment, planning, implementation, and monitoring (UNCRPD, pp(o), Article 4 and 11). Disability mainstreaming is also necessary for post-disaster management endeavors (UNCRPD, General Comment No. 2). Inclusive disaster planning targets and mainstreams disability at national and local levels. The Sendai Framework, the 2030 Agenda for Sustainable Development Goals (SDGs), and the UNCRPD provide key guidance to aid governmental action for disability-inclusive sustainable disaster planning. The COVID-19 pandemic is a large-scale biological hazard under the Sendai Framework (Para 15), hence the member states are duty-bound to follow Sendai guidance in the pandemic management. The Sendai Framework lays the blueprint to substantially reduce disaster risks by 2030 via people-centric and rights-based disaster management. It emphasizes equal and non-discriminatory disability participation in the DRM strategy (Guiding Principle (d)). The Dhaka Declaration on Disability and Disaster Risk Management 2015 and the Dhaka Declaration 2015 + 1 call for disability mainstreaming at the regional level in coherence with the Sendai guidance and SDGs (Dhaka Declaration, Declaration 2 and 7; Dhaka Declaration 2015 + 1, Declaration 1, 5, 6, and 7).

The Asia Pacific region is a disaster-prone area with 650 million PWD living at high risk during disasters (UNISDR, 2014). The Incheon Strategy to Make the Right Real for Persons with Disabilities in Asia and the Pacific 2012 attempts to implement the Sendai strategy in the region. It sets out ten disability-specific development goals for 2013–2022 and provides strategic guidance to the governments. The Action Plan to Accelerate the Implementation of the Incheon Strategy 2017 is also adopted to speed up regional implementation. The United Nations Office of the Disaster Risk Reduction (UNDRR) coordinates and evaluates Sendai implementation at international, regional, and national levels. The UNDRR recently passed a Strategic Framework 2022–2025 (SF 22–25) (UNDRR, 2021) to accelerate Sendai application in the post-pandemic world. The pandemic necessitates cross-border cooperation in planning, management, and targeted implementation. In this regard, the UN and the WHO circulated necessary guidance. The following part briefly discusses the disability-inclusive international pandemic management strategies.

Disability-Inclusive COVID-19 Preparedness and Response Plans

The WHO declared the COVID-19 pandemic under the International Health Regulations 2005 (IHR) in March 2020. A pandemic is an extraordinary public health-related event with a risk of transmission to other states that requires a coordinated international response (IHR, Article 1). The UN established a Crisis Response Management Team (CMT), and the WHO provided Strategic Preparedness and Response Plan (SPRP) at regular intervals. Based on SPRP, 170 countries have established national response plans and coordination mechanisms till January 2021 (WHO, 2021). However, the DRM capacity significantly varies in the least developed countries (LDCs) due to their systematic underinvestment in disaster management (UN, 2020f). The updated SPRP (operational till 31 January 2022) contains particular guidelines to assist the LDCs (WHO, 2021), and the UNDRR calls for global humanitarian financing (UNDRR, 2019, 2021). The initial required funding to successfully implement the Global Humanitarian Response Plan was \$10.3 billion, which increased exponentially (UN, 2020e). The developed countries financed approximately \$1.9 billion by March 2020 to the LDCs in prevention, control, treatment, and vaccination (UN, 2020f). Also, private individuals and international organizations have contributed more than \$ 95 million (UN, 2020f). Nevertheless, the funding and assistance remain inadequate in managing the crisis.

The primary responsibility for inclusive and resilient DRM lies in the individual state (Sendai Framework, Target (e); SF 22–25, Element 2; UNCRPD, Article 11). Several disability-integrated UN guidance (both international and regional) was issued to assist the member states (ESCAP, 2020; UN, 2020a, d). The UN also established a working group to promote disability integration in crisis response and funding (UN, 2020a). The International Labor Organization (ILO) provided a call for action for all the stakeholders (ILO, 2020c). The Inter-agency Standing Committee (IASC) extended specific guidelines for securing the accessibility to basic necessities, livelihood, and public services of the PWD (IASC, 2020). Besides, 138 countries made a joint statement for disability inclusion in their response and recovery plans (UN, 2020a). The PWD are more vulnerable in the LDCs (Schulze, 2010). These countries require special funding and assistance from international and development donors for their inclusion in disaster plans (UN, 2020f). Bangladesh, an LDC, also pledged for promoting PWD rights during the pandemic. The following part examines the inclusive response strategies in Bangladesh and their implementation during the pandemic.

Disability-Inclusive Pandemic Management Framework in Bangladesh

The national DRR framework includes risk assessment, planning, mitigation, and enhanced preparedness and cooperation (MoDMR, 2019). The DRM strategies aim at risk prevention, reduction, and management for a resilient future (MoDMR, 2019). The DRM framework of Bangladesh primarily consists of the Disaster

Management Act (DM Act) 2012, the National Disaster Management Policy (DM Policy) 2015, Standing Order of Disasters (SOD) 2019 (MoDMR, 2019), National Plan for Disaster Management (NPDM) 2016–2020 (MoDMR, 2017) and 2021–2025 (MoDMR, 2021), and Plan of Action to Implement Sendai Framework for Disaster Risk Reduction 2015–2030 (MoDMR, 2018). The Ministry of Disaster Management and Relief (MoDMR) is the epicenter of national disaster management framework implementation. The DM Act and Policy highlight disability prioritization in DRM plans (DM Act, Section 27 and DM Policy, Principle 2.2). The disaster management national and local committees under the MoDMR have disability representation and consultation in every stage of DRM (MoDMR, 2019). A comprehensive disability database is essential for inclusive DRM (DM Policy, Principle 10.3; SOD, Point 5.2.4), which is yet to develop in Bangladesh. The local committees under MoDMR prepare age, sex, disability, and occupation disaggregated lists for long- and short-term disaster planning (MoDMR, 2019). Unfortunately, the ministerial collaboration between the MoSW and MoDMR in identifying PWD at risk and securing disability rights has not been provided in the national DRM plans. The RPPDA, who guides the national DRM strategies in disability inclusion, also remain silent.

The Ministry of Health and Family Welfare (MoHFW) issued an official gazette declaring COVID-19 a public health emergency under the Infectious Diseases (Prevention, Control, and Elimination) Act 2018 in March 2020 (GoB, 2020b). However, the Act does not contain any disability specialized provision for emergencies. In the 31 points direction on 03 April 2020, the Prime Minister (PM) directed the MoDMR to keep the PWD in special consideration while distributing reliefs (GoB, 2020a). They will receive special humanitarian assistance during disasters under the Disaster Management (Fund Management) Regulation 2021. Unfortunately, their priority access to healthcare and basic necessities has not been highlighted in the direction. The first COVID-19 National Preparedness and Response Plan of March 2020 failed to include disability-specific provisions. Later, a revised and disability-inclusive plan, titled the Bangladesh Preparedness and Response Plan (BPRP) (MoHFW, 2020a), was issued. The BPRP includes targeted risk communication and adaptive service delivery plans for PWD (Plan 10). The MoHFW also circulated a specialized guideline for ensuring priority healthcare of the PWD as a high-risk group in compliance with the WHO guidelines (MoHFW, 2020b). Even though the general vaccination guidelines remain silent about PWD (MoHFW, 2020a), a new guideline for disability prioritization in vaccination was issued in 2021 (MoHFW, 2021).

The earlier national pandemic guidelines failed in disability consideration. The ambiguity in the RPPDA regarding the extent of disability protection during crises contributed to their invisibility in the national pandemic management strategies. The NPDM of 2016–2020 mandated PWD-inclusive disaster recovery and rehabilitation strategies with no clear outline (MoDMR, 2017). Bangladesh has learned from the mistakes, and the NPDM for 2021–2025 plans a disability-inclusive futuristic DRM that aligns with the Sendai Framework and Dhaka Declaration 2015+1 (MoDMR, 2021). A PWD national task force was formed in 2020 to collaborate with the

MoDMR for disability mainstreaming and targeting during the pandemic (MoDMR, 2020a). Several government guidelines stressed cooperation with DPOs/NGOs and disability advocacy groups in implementing and monitoring disability-integrated pandemic plans (MoDMR, 2020a, 2021; MoHFW, 2020b). The following part critically analyzes the implementation of the disability-inclusive COVID-19 government strategies in different sectors in Bangladesh.

Implementation of Disability Targeted COVID-19 Strategies in Bangladesh

Priority access to health and daily necessities, disaster information, social security and aid, safe shelters, strong employment protection etc. are preconditions to the independent living of the PDW during crises (UNCRDP, Article 9 and 11). Bangladesh adopted disability-inclusive pandemic management strategies to secure their access to independent living requirements. The following part analyzes these strategies and examines the implementation.

Healthcare

The PWDs are entitled to access emergency healthcare amid the pandemic, and a denial constitutes disability-based discrimination (UNCRPD, Articles 2, 11 and 25). Due to patient influx, health services have been disrupted worldwide (UN, 2020e; UNICEF, 2020a). Discriminatory triage protocols (which devalued their life), limited access to treatment, physical barriers in accessing hospitals, inaccessible health formation etc. exacerbated the condition of the PWD (IASC, 2020; UN, 2020a; UNDESA, 2020). The states are duty-bound to prioritize and target disability healthcare (physical and mental) via priority treatment and COVID-19 testing, specialized telehealth services, hotlines, etc. (IASC, 2007, 2020; UN, 2020a; WHO, 2020, 2021). Mass vaccination campaigns should also list them as a priority group (International Disability Alliance, 2020).

PWD in Bangladesh are also entitled to emergency medical care during the pandemic (RPPDA, Section 16 (k) and (l) and Schedule, Rule 3, 5 and 13). The National Health Policy 2011 aims to establish a PWD-specialized health service mechanism (Strategy 31), which is yet to be formulated. Disability should be prioritized in emergency healthcare (physical and mental) and COVID-19 testing (MoHFW, 2020b). The specialized health guideline assisted the caregivers and health workers to follow extra precautionary measures to eliminate the risk, as the PWDs are more prone to COVID-19 infection (MoHFW, 2020b). Necessary training should be rendered to the health workers to cater to disability needs (MoHFW, 2020b). The GoB should ensure PWD accessibility to life-saving medication, infection prevention equipment (PPE, hand sanitizer, gloves), and telehealth facilities (MoHFW, 2020b). Even though the general vaccination guideline fails to address disability, later guidance was issued for their prioritization (MoHFW, 2020a, 2021).

The health sector of Bangladesh was overburdened during the pandemic (Needs Assessment Working Group, 2020). PWD have faced more challenges in accessing emergency healthcare as the health system is not disability-inclusive (Begum, 2022; Hasan et al., 2021; Hossain et al., 2020; Needs Assessment Working Group, 2020). The lack of trained healthcare professionals and their unempathetic behaviors increased hardships (Begum, 2022; Hasan et al., 2021). Sadly, the disability disaggregated infection, health service accessibility, and vaccination data are absent. The lack of data made the disability risk and impact assessment even more challenging.

Accessible disaster and disease information is a disability right (UNCRPD, Article 9, 11 and 21; RPPDA, Section 6, 13, 16(d)). The disease information must be circulated in multiple and accessible formats, and community groups should be involved in rapid and targeted outreach (IASC, 2020; UN, 2020d; UNDESA, 2020; UNICEF, 2020b). Bangladesh aimed to circulate disability-inclusive health information via sign language, telecast, pictures, braille, caption, etc. (MoDMR, 2019; MoHFW, 2020b). Rapid circulation of the disease information was done via micing and involving local and religious leaders (MoDMR, 2020a). Cell phone calls introduced a voice warning system about the COVID-19 hygiene protocols. However, the risk-information dissemination remained inadequate for the technologically advanced PWD (Das et al., 2021). Specialized funding was not allocated for disability targeted information circulation. Emergency national hotlines (333 or 16263) provided free telehealth services (MoDMR, 2020a; MoHFW, 2020b), though no disability disaggregated data of the service recipient was found. Moreover, the national health helplines were not accessible to all types of PWD, and no disability-specialized health helpline was launched.

Basic Necessities, Housing, and Education

The PWD are entitled to undisrupted access to food, life-saving medication, wash and hygiene supplies, etc., during disasters (UNCRPD, Article 19 (b); ICESCR, General Comment No. 12; RPPDA, Section 16(f) and 34). Their access to assisted living facilities was disrupted during the lockdown measures (Center for Inclusive Policy, 2020; Women Enabled International, 2020). Argentina, Colombia, Panama, and the UK launched adaptive service delivery systems and community support networks (UN, 2020a). Bangladesh also aimed to establish specialized service delivery points, food aid delivery to households, and help centers for PWD priority access (MoDMR, 2020a; MoHFW, 2020b). Unfortunately, the relief distribution failed to prioritize disability, and many could not access the delivery points due to physical barriers (Diba & Zakaria, 2020). Around 93% of the registered PWD did not get governmental aid and food support due to corruption and mismanagement (Das et al., 2021; Diba & Zakaria, 2020; Hasan et al., 2021). No adaptive delivery service has been developed, and accessing government aid was challenging for them. Maintaining physical distancing in the slum areas remained challenging in Bangladesh, and the slum-dwellers faced increased health risks (Bhattacharya et al., 2021a). Unfortunately, no disaggregated data of infection on the slum-dwelling

PWD were found. Overall, the basic needs of the PWD remain almost neglected during the pandemic.

PWD struggled with uninterrupted Internet connections, accessible learning materials, braille and captioning support, etc., in remote learning (IASC, 2020; UN, 2020a; UNICEF, 2020a). They are entitled to accessible education during disasters (UNCRPD, Article 24; RPPDA, Schedule, Rule 5(5) and 9). The GoB allocated 34.82 crore taka for the schools for disabled children in the 2021–2022 budget (Ministry of Finance, 2021). Still, the number of sign language instructors is inadequate (Mizan, 2021). Their right to education amid the pandemic should be facilitated via accessible remote learning (MoHFW, 2020b). Bangla braille software and text to speech facility were adopted (Mizan, 2021). Class 6–10 courses were telecasted on the national TV channels due to inaccessible and expensive Internet connections (Chowdhury, 2020). Unfortunately, the telecasts were not disability-inclusive (no captioning or sign language). Expensive Internet connections and inaccessible distance-learning measures made many students with disabilities drop out (Bhattacharya et al., 2021a). Hence, the targeted governmental efforts were inadequate for the education of PWD.

Employment

The economic resilience of the PWD drastically declined as many were laid off (ILO, 2020a; UN, 2020c; WHO, 2020). The UNCRPD secures their right to work (Article 27). The Vocational Rehabilitation and Employment (Disabled Persons) Convention 1983 and the Recommendation on Employment and Decent Work for Peace and Resilience (Recommendation no. 205) call for their work opportunities in crisis. Unfortunately, Bangladesh is not a party to any of these ILO Conventions. The UN Guiding Principles on Business and Human Rights highlight employers' responsibility in securing PWD rights (UN, 2011). Some employers adopted special arrangements like telework, paid leave, flexible working, etc., as accessible workplace arrangements (ILO, 2020a). Still, remote working was challenging without braille and sign language-based software and accessible equipment (ESCAP, 2020; ILO, UNICEF, UNPRPD, & IDA, 2020; ILO, 2020b).

The PWDs in Bangladesh are entitled to get employed without discrimination (RPPDA, Section 16(1)(i) and 35(1)). The GoB and employers should be involved to make workplaces accessible for the PWD (leave, telework, special work arrangements, etc.) during the pandemic (MoHFW, 2020b). However, more than 70% were unemployed at the onset of the pandemic, and their economic condition declined (Bhattacharya et al., 2021a, b). The GoB initiated a special subsidy, and the PM declared a special stimulus package for the RMG industries. Still, the RMG owners refused to pay and fired workers due to decreased production and international contract cancellation (Hasan et al., 2021; Hossain, 2021; Kabir et al., 2021; Mizan, 2021). The RMG industries are the largest job market for PWD. Unfortunately, no disability disaggregated data has been found for the RMG workers with disabilities, but it is doubtful that the financial assistance reached them. Moreover, most PWDs are involved in informal work with no job security, and many were

unemployed during the pandemic (Das et al., 2021; Hossain, 2021). As a result, they fell into extreme poverty.

Social Security Measures

Social protection measures are the targeted policies and programs for vulnerable groups (ILO, 2017). Less than 20% of PWD have access to social security measures in LDCs during the pandemic (Durán Valverde et al., 2019), even though they are entitled to priority social protection (UNCRPD, Article 28 and 11; RPPDA, Schedule, Rule 11). Bangladesh has a disability-inclusive social safety net program predating the pandemic. The GoB aims to provide a monthly allowance of 750 taka to 1 million PWD below 59 years and 3000 taka above 60 years under the National Social Security Strategy (GoB, 2015). The budget for 2021–2022 allocated 1820 crore taka to the MoSW to be disbursed among 20.08 million PWD (Ministry of Finance, 2021). The PM declared special humanitarian aid for the vulnerable groups, including PWD (MoDMR, 2020b; MoHFW, 2020b). The MoDMR issued the Disaster Management (Fund Management) Regulations 2021 and convened a committee to supervise the process (MoDMR, 2020b). The local committees under the MoDMR prepared lists of PWD for targeted support (MoDMR, 2020b), as a comprehensive database is absent. Even though the PM directed fair distribution of the aid (GoB, 2020a), many listed PWD were excluded due to corruption (Das et al., 2021; Diba & Zakaria, 2020; Hasan et al., 2021). Many PWD in rural areas remained unaware of the special aid (Das et al., 2021). A detailed and disaggregated database of aid disbursement cannot be found. Without a targeted and practical disbursement mechanism and proper monitoring, the financial support failed to reach them.

Intersectional PWD and Their Vulnerability

The UNCRPD is the pioneering document to protect the diverse range of PWD from compounded discrimination (pp (i), Article 3, 6, 7). Nonetheless, age, gender, poverty, disability, etc. exacerbated the risk during the pandemic (WHO, 2020; Women Enabled International, 2020). Women, children, and older persons with disabilities remained within the high-risk groups (UN Women, 2020; UNFPA, 2020). Besides, the older PWD with comorbidity were deprioritized in triage protocols (IASC, 2020; UN, 2020a, b). Social services for children with disabilities were substantially decreased (UNICEF, 2020a). The GBV against PWD escalated without proper assistance and legal remedy (UN Women, 2020; UNDESA, 2020; UNFPA, 2020).

Sustainable DRM strategies cover all forms of intersectionality and impairments (UN, 2020a, d; UNFPA, 2020). Bangladesh mandates priority protection for women and children with disabilities in disasters and post-disaster rehabilitation (National Children Policy 2011, Policy 6.8, 6.9 and 6.12; National Women Development Policy 2011, Objective 37.3; RPPDA, Schedule, Rule 8, 12, 13). The RPPDA guarantees GBV free environment (Section 16 (k) and Schedule, Rule 12), but the PWD increasingly became victims of GBV during the pandemic (Bhattacharya et al., 2021a; Needs Assessment Working Group, 2020). The special national helplines

(333 and 999) are not disability-integrated. Bangladesh failed to launch a specialized helpline for PWD, despite the mandate of the GoB. The social inequalities suffered by women and children intensified during the pandemic (Bhattacharya et al., 2021a; Das et al., 2021; Diba & Zakaria, 2020; Needs Assessment Working Group, 2020). Females with disabilities were more discriminated against while accessing basic necessities than their male counterparts (Das et al., 2021). The PWD standing at intersectionality became exposed to further discrimination and social exclusion.

A comprehensive disability disaggregated database enables the countries to design better DRM strategies, render tailored support, and assess implementation (IASC, 2020; UN, 2020a; UN Women, 2020; UNDESA, 2020; UNFPA, 2020). The UNCRPD also advocates for a database for better policy application (Article 31). Unfortunately, a detailed disability database is absent, which made extensive COVID-19 impact analysis on the PWD impossible. The following part summarizes the findings of the above discussion.

Findings

Sustainable national DRM frameworks cover all forms of impairments in compliance with the UNCRPD, the Sendai Framework, and other international and regional disaster response standards. However, the fatality of the COVID-19 pandemic went beyond the DRM capacity of Bangladesh. The implementation framework was inadequate in targeting and mainstreaming disability needs. The RPPDA failed to guide the national DRM strategies in disability inclusion, and the ambiguity has resulted in PWD invisibility in the early national pandemic management strategies. Nonetheless, several disability-integrated guidelines were published later. The existing DRR and DRM frameworks lack adequate PWD representation in disaster decision-making and monitoring. The disability targeted funding was insufficient as well. Bangladesh has learned from its mistakes and plans to invest in disability-integrated DRM to build back better. A comprehensive database with age, sex, and disability disaggregated data substantiates tailored governmental support in disasters. Even though the GoB aims to create a national disability database, the registration process is yet to complete. The lack of disability data hampered the pandemic impact analysis in Bangladesh. The GoB should take proactive steps to finalize the national disability database for resilient and inclusive disaster management.

The pandemic prevention measures inadvertently affected the PWD and deprived them of disability rights. Without proper monitoring and implementation, they faced disability-based discrimination despite priority guidelines. The PWD are more prone to COVID-19 infection and are entitled to priority healthcare. Bangladesh failed to create a disability-inclusive health system. During the pandemic, the health workers also lacked adequate training to deal with diverse PWD. The disease information was transmitted in multiple formats and via community engagement at the local levels. Still, the technologically disadvantaged PWD face hurdles in accessing information. The absence of disability disaggregated health and vaccination data highlights their invisibility in the health sector.

The GoB prioritized the PWD in government cash and food aid and aimed to create specialized delivery systems. However, no adaptive delivery system has been launched so far. Many faced physical barriers in accessing service delivery points of governmental aid. Even though the slum-dwellers were at increased risk of COVID-19 infection, no disability disaggregated data on the slum-dwelling PWD were found. The GoB allocated funds to specialized and accessible education for children with disabilities. However, distant learning during the pandemic became extremely difficult due to expensive remote learning mechanisms. The PWDs are entitled to non-discriminatory behaviors at work. Nonetheless, many were fired from work during the pandemic and fell into extreme poverty. Special governmental assistance was declared, of which they remain unaware. No disability disaggregated data regarding the disbursement of the allowances can be found. Many registered PWD were excluded from receiving governmental assistance due to corruption, and proper monitoring for fair disbursement was absent.

The GoB planned for specialized and accessible hotlines for the PWD for fast support. However, no specialized helpline was launched, and the existing national helplines were not disability-inclusive. Women and children with disabilities endured greater risks of GBV. They also faced more discrimination in accessing their rights than their male counterparts. The Covid-19 pandemic revealed the weakness of the existing DRM and the vulnerability of the PWD during crises. Despite disability-integrated pandemic guidance, their social exclusion was pronounced.

Conclusion

The PWD sustained higher risks during the COVID-19 pandemic, and their disability rights were neglected in Bangladesh. While the GoB adopted disability-inclusive response strategies, the lack of implementation frustrated the objective. Unavailable health and support services, unemployment, inadequate government assistance, and corruption in aid disbursement created an unfavorable situation for the PWD. A comprehensive risk assessment based on disaggregated data can substantiate the national DRM, which is still absent in Bangladesh.

Disability-integrated DRM requires additional funding, which Bangladesh is willing to invest. Nonetheless, Bangladesh needs technical and financial assistance from international development donors and business corporations to build back better. The response and recovery plans also require a multi-stakeholder collaboration among GoB, private actors, DPOs, and the local community. Sustainable crisis response plans should be inclusive, informed, transparent, and accountable. PWD representation in crisis decision-making and monitoring ensures their access to rights during risks. Bangladesh needs disability-integrated long-term DRM plans and proper monitoring for future crises. The lesson learnt from the COVID-19 pandemic can help to secure disability rights and guarantee their resilience in future disasters.

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International Human Rights Law (IHRL) in Disaster Risk Reduction (DRR) Planning

128

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Contents

Introduction	1910
Brief Overview of DRR and IHRL Framework	1911
DRR: From Reactive to Proactive Approach	1911
IHRL Framework	1913
Right-Holder and Duty-Bearer Concept	1913
Right to Life: An All-Encompassing Right	1914
Interface Between Disasters and Human Rights	1915
Contributions of IHRL in DRR Planning	1918
Conclusion	1919
References	1919

Abstract

Disaster risk reduction (DRR) is comparatively a new approach to dealing with disasters that aims at preventing new and reducing existing disaster risk and managing residual risk for strengthening disaster resilience by involving a broad range of stakeholders, both public and private across the full cycle of disasters. The efficiency of a DRR planning depends on the proper functioning of these stakeholders (both actors and beneficiaries). Beneficiaries need to be capable of asking for their entitlements, whereas the actors need to be answerable for their performance. This ultimately requires empowerment of the beneficiaries and accountability of the actors. Although DRR instruments contain provisions for encouraging participation of beneficiaries and guidelines for actors, these lag behind in ensuring empowerment of the beneficiaries and accountability of the actors. On the other hand, disasters whether natural or man-made affect the enjoyment of a range of human rights of the affected population. This matter is evident from a number of International Human Rights Law (IHRL) cases

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admitted in numerous instruments of IHRL. However, DRR discipline fails to provide provisions for protecting human rights in disaster situation. In such a backdrop, this chapter recommends the application of IHRL in DRR planning and shows how IHRL can contribute to better DRR planning. The chapter found that the use of IHRL can assist in empowering the beneficiaries and ensuring the accountability of the actors, thereby resulting in an effective DRR planning. In addition, such integration of IHRL in DRR planning would safeguard the enjoyment of human rights of all concerned in a disaster setting.

Keywords

Disaster risk reduction (DRR) · Human rights · International Human Rights Law (IHRL) · Accountability · Empowerment

Introduction

Men's struggle with disasters is not new though the contemporary concept of "disaster" is relatively new. Disaster is defined as "a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources" (UNISDR, 2009, p. 9). While the earlier concept of disaster only meant the occurrence of natural hazards like earthquakes, floods, tsunamis, hurricanes, landslides, and forest fires, the present concept of disaster is described as a result of the intersection of four components (Lazarevski & Gjorgon, 2017): (i) happening of a hazard (hazard means any dangerous phenomenon, substance, human activity, or condition that may cause loss of life, injury, or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage, UNISDR, 2009, p. 17); (ii) exposure of people, property, and other systems to a hazard; (iii) vulnerability (potentials of damage) due to exposure to a hazard; and (iv) coping capacity and resilience of people, organizations, and systems, using available skills and resources, to face the adverse effects of the hazard and recover from the effects of a hazard in a timely and efficient manner.

Globally, losses caused due to disasters (numbers of people died, number of people affected, and losses of economic, social, and environmental assets) are on the increase. For example, during the period 2000–2019, 7348 major disaster events were recorded, causing the deaths of 1.23 million people and affecting 4.2 billion people, which resulted in approximately US\$2.97 trillion in global economic losses (UNDRR, 2020, p. 6). This was a sharp increase over the previous 20 years (1980–1999) when 4212 disasters were recorded, claiming about 1.19 million lives and affecting 3.25 billion people with economic losses of approximately US\$1.63 trillion (UNDRR, 2020, p. 6). With this increase in the number of disasters and consequent havoc, there have been relentless efforts to cope with disasters. Over the years, such efforts become proactive envisioned to reduce the risks and minimize

the impacts in comparison to an earlier reactive approach focused on consequent recovery arrangements. This, in turn, gives rise to the concept of DRR, a proactive approach to disaster management (Rawinji, n.d.). Though DRR plans comprise different targets, priorities for action, and guiding principles, they often fail to bring about material changes in reducing the consequent havoc caused by disasters, including infringement of a range of human rights of the affected population. In such context, it is expected that the incorporation of IHRL that comprises numerous concepts, instruments, standards, and principles designed to protect human rights can contribute to formulating a better DRR plan.

Accordingly, this chapter will focus on the possible implications of integrating IHRL in DRR planning. The chapter is divided into five sections. After the introductory section, the second section will discuss the concept of DRR and the IHRL framework in brief. This will be followed by the third section addressing the interface between disasters and human rights. The next section will highlight the potential benefits of integrating IHRL concepts, principles, and standards in DRR planning. This will follow the conclusion, thereby summarizing the whole chapter.

Brief Overview of DRR and IHRL Framework

DRR: From Reactive to Proactive Approach

DRR stands for the “concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events” (UNISDR, 2009, pp. 10–11). It aims at “preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development” (UNGA, 2016, p. 16). As stated by Lazarevski and Gjorgon (2017), this notion did not come overnight, rather moved from a narrowly perceived technical discipline of the 1990s, to a broad-based global movement of the 2000s focused on sustainable development.

The journey started in 1989 with the United Nations General Assembly (UNGA) proclamation declaring the 1990s as the International Decade for Natural Disaster Reduction (IDNDR) that aimed at improving mutual capacity for (i) mitigating the effects of natural disasters, (ii) assessing potential disaster damage, and (iii) establishing early-warning system and disaster-resistant structures. This clearly demonstrates the reactive nature of early attention being paid to disasters by the international community. The IDNDR was reviewed in 1994 at the First World Conference on Natural Disaster Reduction, thereby adopting the Yokohama Strategy for a Safer World: Guidelines for Natural Disaster Prevention, Preparedness and Mitigation and its Plan of Action (Yokohama Strategy) (Lazarevski & Gjorgon, 2017). This instrument acknowledged that disaster response is not sufficient, rather prevention is vital for lasting improvement in fighting disasters and urged states to

develop and strengthen national capacities in this regard. In furtherance of the Yokohama Strategy, the UNGA established the UN International Strategy for Disaster Reduction (UNISDR) in 1999 for coordinating the disaster reduction activities of the UN system and other regional organizations (Lazarevski & Gjorgon, 2017).

The next breakthrough in the development of DRR notion is the adoption of Hyogo Framework for Action 2005–2015: Building the Resilience for Nations and Communities to Disaster (HFA). Unlike its predecessor, the HFA puts emphasis on a more proactive approach to disasters (HFA, para 8). It favored a strategic and systematic approach to reducing exposures to hazards by developing stronger institutions, mechanisms, and capacities to build resilience (Bartolini & Natoli, 2018). Accordingly, five priorities were identified for action, namely, (i) make DRR a national priority with a strong institutional basis for implementation; (ii) identify, assess, and monitor disaster risks and enhance early warning; (iii) use knowledge, innovation, and education to build a culture of safety and resilience at all levels; (iv) reduce underlying risk factors; and (v) strengthen disaster preparedness for effective response at all levels (Lazarevski & Gjorgon, 2017).

Following the midterm review of 2011, some major gaps were identified in HFA along with progress made in some areas such as passing of national legislations, establishment of early-warning systems, and strengthening disaster preparedness and response (IISD, 2011). The major gaps pointed out were lack of systematic multihazards risk assessments and early-warning systems taking into account social and economic vulnerabilities; poor integration of DRR into sustainable development policies and planning at national and international levels; nonintegration of climate change adaptation and DRR at the national and local levels; and the insufficient level of implementation of the HFA at the local level (IISD, 2011). As such, the UN Conference on Sustainable Development (2012) called for a more integrated approach in DRR in the context of sustainable development (Bartolini & Natoli, 2018).

All these reviews culminated in a fresh start in 2015 with the adoption of a new framework in DRR, the “Framework for Disaster Risk Reduction 2015–2030” during the third World Conference on DRR (Sendai Framework) having 7 targets, 4 priorities for action, and 13 guiding principles. The Sendai Framework has some distinctiveness compared to the earlier instruments on DRR such as emphasis on effective disaster risk management as opposed to earlier disaster management; broadening of scope of DRR to cover all kinds of natural-man-made hazards, as well as related environmental, technological, and biological hazards and risks; recommendation of multihazard management of disaster risk at all levels as well as within and across all sectors; encouragement of participation of all relevant stakeholders, including women, children, and youth, persons with disabilities, poor people, migrants, indigenous peoples, volunteers, the community of practitioners and older persons in the design and implementation of policies, plans, and standards; importance on reducing existing vulnerability to disaster and to prevent the creation of new risks by strengthening disaster resilience; clarification of state responsibility for DRR by calling for all-of-state institutions’ engagement; and emphasis on implementation of integrated and inclusive economic, structural, legal, social,

health, cultural, educational, environmental, technological, political, and institutional measures for preventing and reducing hazard exposure and vulnerability to disaster (Lazarevski & Gjorgon, 2017).

In spite of having the abovementioned innovations in Sendai Framework, concerns are raised by experts that it may fail to achieve its targeted goals due to some factors such as nonbinding nature of the instrument that encourages states to follow the guidelines but cannot bind them; lack of concrete indicators for tracking progress toward its goals; and noninclusion of institutional mechanisms to monitor the implementation (Lazarevski & Gjorgon, 2017).

IHRL Framework

IHRL, as a form of international law, mainly comprises a series of binding treaties, customary international laws, and other nonbinding instruments such as declarations, guidelines, and principles adopted since 1945 conferring legal form on inherent human rights. Emergence and continuous development of IHRL in the international spheres are seen as one of the most significant developments after the end of Second World War (Rehman, 2010). Development in this area of law has different dimensions such as conceptual dimensions (evolution and development of different concepts centering on human rights), legislative dimensions (adoption of different legal instruments at the international, regional, and national levels on human rights issues), and institutional dimensions (emergence of different institutions and forums at the international, regional, and national levels working on human rights). Among all these dimensions, two specific features of conceptual dimensions, i.e., “right-holder and duty-bearer” concept and “right to life as an all-encompassing right” concept will be highlighted in the context of this study.

Right-Holder and Duty-Bearer Concept

In IHRL, every human right entails a claim of entitlement (either individually or collectively) and a corresponding duty toward that right; accordingly, each right reflects a normative relation between a right-holder and a duty-bearer, pertaining to a protected object (Besson, 2015). Claim of entitlement implies that the rights-holders are empowered to claim their rights. Empowerment requires observance of at least three principles: participation, access to information, and nondiscrimination (da Costa & Pospieszna, 2015). Here, participation denotes active, free, and meaningful participation of the rights-holders in the process of realization of the rights; access to information implies easy access to the requisite information for claiming the rights; and nondiscrimination connotes identical treatment in the process of fulfillment of the rights irrespective of gender, economic status, social condition, color, language, race, or other factors (da Costa & Pospieszna, 2015).

Regarding duties toward human rights, duty-bearers’ duties are to respect, protect, and fulfill human rights, i.e., both negative duties and positive duties (General

Comment (GC)3, 1990, which has been subsequently replaced by GC 31, 2004). The obligation to respect implies noninterference with the enjoyment of human rights; the obligation to protect requires preventing human rights abuses; and the obligation to fulfill requires taking positive action to facilitate the enjoyment of human rights.

As a branch of international law, IHRL mainly obliges territorial states, i.e., states are the primary duty-bearers within their territories under IHRL. By becoming parties to IHRL treaties, states bind themselves to carry out the responsibilities under those instruments by putting in place requisite local actions. Accountability of the states as duty-bearers is also ensured under IHRL framework by different mechanisms and procedures such as individual complaints or communications, state reporting procedure followed by issuance of concluding observations, and Universal Periodic Review (UPR) (Carraro, 2019).

Along with this traditional state-centric duty-bearer concept of IHRL, another concept “multi duty-bearer” has evolved in recent times, as stated by Vandenhove & van Genugten (2015, p. 1) that “[h]uman rights law has to move beyond territoriality as the main criterion for assigning human rights obligations.” The concept has emerged in order to bring nonstate actors, like corporations and international organizations, within the purview of IHRL as sometimes they are in a position to greatly affect individuals’ enjoyment of their human rights (Destrooper & Mbambi, 2017; Altwicker, 2018; Lane, 2018). Example of recognition of this concept at the international level is the endorsement of the UN Guiding Principles on Business and Human Rights by the UN Human Rights Council in 2011, which was developed by the Special Representative of the Secretary-General John Ruggie on the issue of human rights and transnational corporations and other business enterprises. This instrument affirms that corporations doing businesses have their own human rights responsibilities distinct from states (Lane & Hesselman, 2017).

Right to Life: An All-Encompassing Right

Right to life, as a form of civil and political (CP) rights, has been protected by all international and regional human rights instruments such as Universal Declaration of Human Rights (UDHR), art. 3; International Covenant on Civil and Political Rights (ICCPR), art. 6(1); European Convention on Human Rights (ECHR), art. 2; American Convention on Human Rights (ACHR), art. 4; and African Charter on Human and Peoples’ Rights (AFCHPR), art. 4. Originally this right was put in place as a right guaranteeing prohibition of arbitrary deprivation of life (Rehman, 2010). However, by way of wider interpretations by international-regional supervisory bodies and national courts, this right has subsequently emerged as a basic right, the enjoyment of which is a prerequisite for the enjoyment of all other human rights (Przetacznik, 1976; GC 36, 2019, which is adopted replacing the earlier two GCs of the 1980s on right to life). Nonderogability of this right in any circumstance is also recognized, as stated in GC 36: “It is the supreme right from which no derogation is permitted even in situations of armed conflict and *other public emergencies*

(emphasis added) which threatens the life of the nation" (GC 36, para. 2). The scope of this right is broadened to include "right to a healthy environment" and "right to peace" (Ramcharan, 1983). In addition, right to life is interpreted as a right to live a quality life, i.e., life with dignity in numerous cases. Examples include *Munn v. Illinois*, 1877; *Maneka Gandhi v. Union of India*, 1978; *Francis Coralie v. Union Territory of Delhi*, 1981. This is also confirmed in GC 36.

Even this right works as a gateway for enforcing a range of economic, social, and cultural (ESC) rights. For example, while dealing with a case regarding workers' protection from occupational health hazards and diseases employed in asbestos industries, the Supreme Court of India applied article 21 of the Indian Constitution comprising right to life. The Supreme Court held that the "right to health, medical aid to protect the health and vigour to a worker while in service or post-retirement is a fundamental right under Article 21, read with Articles 39((e), 41, 43, 48-A and all related articles and fundamental human rights to make the life of the workman meaningful and purposeful with dignity of person" (*Consumer Education & Research Centre and Others v. Union of India and Others*, 1995, para. 27). A similar instance is found in the case, *Chairman, National Board of Revenue (NBR) v. Advocate Zulhas Uddin Ahmed and others* (2010), where the Supreme Court of Bangladesh (Appellate Division) considered right to medical care as part of right to life contained in article 32 of the Bangladesh Constitution and held imposition of Value-Added Tax (VAT) on certain health services as contrary to the provision of the constitution. Thus, it is an established position that right to life is an all-encompassing right, and that the safeguarding of this right is crucial for the enjoyment of the entire range of CP and ESC rights (Ramcharan, 1983).

From the above discussions in this section, it may seem that DRR and IHRL deal with two distinct subject matters; DRR dealing with disasters and IHRL dealing with human rights. In reality, these two subject matters interface in some respects, which will be highlighted in the next section.

Interface Between Disasters and Human Rights

The interface between disasters and human rights lies from two perspectives. Firstly, havoc caused by disasters can result in infringement of a range of human rights. Examples include right to life, privacy, property, housing, and livelihoods (da Costa & Pospieszna, 2015; Sommario & Venier, 2018). Lewis and Maguire (2016) showed this relationship referring to the 2004 Tsunami that struck the coastline around the Indian Ocean on December 26, 2004. Millions of people were affected by this disaster. Disruptions to basic services, food, water, shelter, and health care were caused to those who survived the tsunami. In addition, the disaster left them vulnerable to a variety of other human rights abuses, including human trafficking, sexual and gender-based violence, arbitrary arrests, and discrimination in the distribution of aid (Lewis & Maguire, 2016, pp. 346–47). Secondly, in both cases, state is the primary duty-bearer, i.e., state has the primary responsibility to prevent and

reduce disaster risk (Sendai Framework, para. 19) and to protect, respect, and fulfill human rights (GC 31, 2004, para. 6).

As to addressing the interface between disasters and human rights, disaster discourses stand far behind than the human rights discourses. Human rights issues have expressly been mentioned only in the recent Sendai Framework, which spells that one of the aims of DRR is “to protect persons and their property, health, livelihoods and productive assets, as well as cultural and environmental assets, while promoting and protecting all human rights, including the right to development” (Sendai Framework, para. 19).

Though IHRL does not provide any specific right of protection from disasters, the linkage between disasters and human rights has been addressed adequately in different instruments and judicial decisions. For example, in Res. 22/16 adopted by the Human Rights Council it is acknowledged that “human rights and fundamental freedoms of millions of people around the world are affected in different ways by humanitarian crises, including armed conflict, *natural disasters and man-made disasters* (emphasis added), as well as during the stages of recovery, relief and rehabilitation” (UNGA Res. 22/16, preamble). In GC 36 on right to life, the Human Rights Committee clarifies that states’ duty to protect life implies that “states parties should take appropriate measures to address the general conditions in society that may give rise to direct threats to life or prevent individuals from enjoying their right to life with dignity” (GC 36, para. 26). Such appropriate measures should include, among others, the development of contingency plans and disaster management plans designed to increase preparedness and address natural and man-made disasters, which may adversely affect enjoyment of the right to life, resulting in disruption of essential services (GC 36, para. 26).

In four landmark cases based on right to life (article 2 of the European Convention on Human Rights) – *Öneryildiz v. Turkey* (2005); *Kolyadenko and Others v. Russia* (2013); *Budayeva and Others v. Russia* (2014); and *Ozel and others v. Turkey* (2015) – the European Court of Human Rights found violation of state obligation under article 2 of ECHR in disaster situations.

Among these cases, the case of *Budayeva and Others v. Russia* is the most remarkable one. The case concerned a large-scale mudslide that had happened between July 18–25, 2000, in the town of Tyrnauz causing eight deaths, including the death of relatives of one of the applicants and other casualties. The applicants alleged that the Russian authorities failed to take timely and effective preventive measures, including warning the local population, implementing evacuation and emergency relief policies to halt the havoc and after the disaster, carrying out a judicial inquiry for assessing the responsibilities for the incident. The court found Russia responsible for violation of article 2 of ECHR on both counts, i.e., breach of article 2 in its substantive and procedural aspects. Firstly, the court found violation of substantive aspects of right to life under article 2 due to the failure of the authorities to take timely and effective preventive action. Secondly, the court determined that the lack of state inquiry of the incident also constituted a violation of procedural aspects of article 2. In this case, the court affirmed the duty of states parties to protect life, including in relation to natural disasters, without imposing an impossible or

disproportionate burden on states. Actions expected from states in this regard include, among others, adopting appropriate legislative measures to deal with disaster risk reduction, setting up administrative procedures to monitor potentially dangerous situations, informing people about risks, setting up early-warning systems should a danger be imminent, evacuating the population, conducting investigations to find out about responsibilities of authorities who did not act timely, and compensating survivors from neglect by state authorities (da Costa & Pospieszna, 2014).

Apart from the foregoing general instances under IHRL, reference to disaster issues can be found in some IHRL instruments dealing with rights of special groups of people. For example, while articulating state obligation in situations of risk and humanitarian emergencies, the Convention on the Rights of Persons with Disability (CRPD) explicitly refers to disasters by stating that states must undertake “all necessary measures to ensure the protection and safety of persons with disabilities in situations of risk, including situations of armed conflict, humanitarian emergencies and the occurrence of natural disasters” (CRPD, art. 11). Accordingly, the Committee on the Right of Persons with Disability has urged states to take into account the specific needs of persons with disabilities in their DRR plans in its Concluding Observations on several occasions (Shucksmith, 2017). In 2018, the Committee on the Elimination of Discrimination against Women, the supervisory body under the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) adopted a General Recommendation, specifically dedicated to the gender-related dimension of DRR planning (CEDAW GR 37, 2018).

The connection between disasters and human rights is also highlighted in two other instruments prepared under the auspices of the UN. The Operational Guidelines for Protection of Persons Affected by Natural Disasters, 2006, prepared by the Inter-Agency Standing Committee (IASC) emphasizes that persons affected by natural disasters should enjoy the same rights and freedoms under human rights law without any discrimination (Ferris, 2014, p. 179). Though all human rights are equally important, the guidelines identified four groups of human rights in dire need of protection during disasters: (i) protection of life, security, physical integrity, and family ties; (ii) protection of rights related to the provision of food, health, shelter, and education; (iii) protection of rights related to housing, land and property, livelihoods, secondary and higher education; and (iv) protection of rights related to documentation, movement, re-establishment of family ties, expression and opinion, and elections. Another instrument, the Draft Articles on the Protection of Persons in the Event of Disasters, 2016, prepared by the International Law Commission (ILC) also acknowledges that serious human rights implications arise from disasters and affirms that “persons affected by disasters are entitled to the respect for and protection of their human rights in accordance with international law” (ILC Draft Articles, art. 5).

Due to the aforementioned interface between disasters and human rights, it is believed that application of IHRL can have an immense contribution to DRR planning; this topic will be highlighted in the next section.

Contributions of IHRL in DRR Planning

For an effective DRR planning, empowerment of relevant stakeholders (beneficiaries) and accountability of the actors involved in the process are crucial (da Costa & Pospieszna, 2015). Though the instruments on DRR encourage participation of relevant stakeholders in DRR planning and contain numerous guidelines for states to follow, they lag behind in ensuring empowerment of the beneficiaries and accountability of actors. IHRL can be an indispensable reference point in this context.

As discussed in section two, one of the important concepts under IHRL is the concept of right-holder and duty-bearer against each human right. The concept of right-holding carries with it the element of empowerment of the right-holders that can be ensured by observing three principles: participation, access to information, and nondiscrimination. Application of this standard of empowerment in DRR planning can be of great significance for its efficacy. Participation of the disaster-affected or disaster-prone population and other beneficiaries will warrant their full engagement and consultation in setting up and implementing new projects and plans of DRR. In the context of DRR, securing access to quality and essential information will enable the relevant stakeholders to make critical decisions regarding the preparation for, avoidance of, and protection in response to disaster threats (Forbes-Genadea & van Niekerka, 2017). Observance of principle of nondiscrimination will ensure that no one is discriminated while securing access to relevant support or in setting up relevant recovery programs, evacuation plans, etc. (Lane & Hesselman, 2017). This will also contribute to identifying, categorizing, and prioritizing the needs of individuals and communities affected by disasters (Lewis & Maguire, 2016).

As mentioned before, accountability of actors is vital for effective functioning of DRR plans, which is absent in DRR discourse. For securing accountability on the part of the state authorities, it is important that affected communities have access to grievance mechanisms that may be used to challenge the outcome of decisions affecting them and also when the authorities fail to prevent or reduce the risk of disasters (da Costa & Pospieszna, 2015; Ferris, 2014). Application of duty-bearer concept of IHRL will make the actors of DRR planning answerable for their decisions and conduct, and responsible for (potential) human rights violations (Lane & Hesselman, 2017). For ensuring accountability in DRR setting, Cubie and Hesselman (2015) recommended using IHRL supervisory mechanisms, which, in their opinion, would “open up international mechanisms of human rights accountability and oversight in the context of disasters, including the UPR process, State reporting, and individual and inter-State complaints mechanisms” (Cubie & Hesselman, 2015, p. 22).

Integration of IHRL in DRR planning can be useful in other respects as well. Incorporation of IHRL in DRR planning would ensure that affected people are not deprived of their fundamental human rights as the concept of right to life under IHRL permits no derogation and the states are not absolved of their responsibilities to ensure human rights even in situations of emergencies like disasters. The use of

IHRL standards designed for particular groups of people such as persons with disabilities and women–children in DRR planning would help to provide special attention to the needs of vulnerable and marginalized subgroups within the larger set of beneficiaries (Lane & Hesselman, 2017) and thus empower them. The multi-duty-bearer concept of IHRL can contribute to DRR planning as disasters include man-made disasters and often havoc caused by disasters increase due to inaction or negligence of different actors involved in the pre- and post-disaster events. Multi-duty-bearer concept, if incorporated, would make the nonstate actors involved in the DRR schemes responsible for their acts.

Conclusion

This chapter examines the potentials of using IHRL in DRR planning. DRR is a modern approach to dealing with disasters in a systematic way for reducing exposure to hazards, diminishing vulnerability of people and property, and other systems to hazards and improving preparedness to face adverse effects of disasters. However, the approach is not free from criticism. Major criticisms leveled against this approach are nonbinding nature of DRR instruments; lack of arrangement for empowering the relevant stakeholders in DRR planning; and absence of any accountability mechanisms on the part of the actors, primarily the states. The approach also lags in underscoring the importance of realization of human rights of the affected persons. On the contrary, IHRL develops a set of concepts, instruments, standards, and principles dedicated to the protection of human rights of persons in any situation, including disasters by ensuring empowerment of the right-holders and accountability of the duty-bearers. Accordingly, this study endeavors to point out the potential benefits of incorporating IHRL in DRR planning. It was found in this study that integration of IHRL can be useful to DRR planning in several ways such as IHRL concepts and principles can ensure both empowerment of the beneficiaries and answerability of the actors in a DRR planning. This integration can also guarantee fulfillment of human rights of the concerned stakeholders with special attention being paid to the needs of the vulnerable and marginalized sections among stakeholders.

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Nuclear Disaster: Assessing the Compliance of Global Nuclear Safety Regime in Bangladesh

129

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Contents

Introduction	1924
Compliance of International Safety Law in Bangladesh	1924
Other Potential Areas to Address	1929
Concerns Relating to Environmental Safety	1930
Conclusion	1931
References	1932

Abstract

Nuclear disaster is one of the most critical catastrophes to handle. It has massive, long-term, and transboundary impact on both human health and biodiversity. Although new technologies have been invented to minimize the risks of nuclear emergencies, yet there is no guarantee of zero accident. That is why most of the developed countries have reduced dependency on nuclear energy over the past couple of decades. Despite that, Bangladesh being a developing country, geo-climatically vulnerable to natural disasters and one of the most densely populated countries, initiated to launch its first nuclear-based power plant at Rooppur in 2023.

As a rapid growing economy, currently Bangladesh has huge demand of electricity, while the present government is trying to increase the production quickly through nuclear energy and decrease the dependence on gas and other fossils. Consequently, it has to take utmost care of international safety arrangements to produce electricity from nuclear source. A comprehensive emergency preparedness plan, a truly empowered regulatory body, and highest compliance of international nuclear safety laws are key to minimize the risks of nuclear disaster. Otherwise, any nuclear accident will bring unbearable distress not only in

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Bangladesh but also to its neighbors. Thus, this brief paper aims to assess and closely look into the compatibility of the existing legislative frameworks of Bangladesh in ensuring safety in nuclear power plants with the globally accepted standards.

Keywords

Nuclear disaster · Safety · International standard · Bangladesh · Compliance

Introduction

Nuclear disaster is most calamitous in nature among all others as it has huge long-term impact on health, environment, and economy. Also, it knows no boundary as radioactive contamination spreads by wind rapidly. As a result, nuclear power plant requires sophisticated technology coupled with implementation of internationally recognized safety measures to operate it safely. There are several other concerns regarding nuclear energy to produce electricity including overall cost-effectiveness of nuclear power project as it requires huge investment to construct safe power plant and needs continuous supervision for its operation. Furthermore, management of radioactive waste and spent fuel is another major headache to operate safe nuke power plant. Apart from these, consequence and impact of nuclear accident on the environment and human life are questioning the sustainability of it.

The International Atomic Energy Agency (IAEA) defines nuclear accident as “an event that has led to significant consequences to people, the environment or the facility. Examples include lethal effects to individuals, large radioactivity release to the environment, or reactor core melt.” Bangladesh is historically one of the most natural disaster-prone countries and nowadays equally vulnerable for man-made disasters. A nuclear disaster may bring intolerable sorrows and sufferings to the life of the mass people, while Bangladesh is not ready to bear the cost of it now. Thus, utmost care of international safety arrangements to produce electricity from nuclear energy is a must for a densely populated country like Bangladesh. A comprehensive emergency preparedness plan, a really empowered regulatory body, and highest compliance of international nuclear safety laws could combinedly reduce the risks of nuclear disaster.

Compliance of International Safety Law in Bangladesh

Nuclear energy industry necessitates comprehensive law and regulation because of its widespread, dangerous, damaging, and transboundary nature. Apart from technological advancement, up-to-date domestic legislation is also essential to ensure enforcement, accountability, and efficient use of nuclear energy. However, Bangladesh has just started constructing its first ever nuclear-based power plant at Rooppur; hence it needs extralegal effort to ensure highest level of safety and

security in accordance with the established international law and practice (Karim, 2018). Bangladesh has obligation under international law (i.e., the Non-Proliferation Treaty (NPT), the Convention on the Physical Protection of Nuclear Materials, the Treaty on the Non-Proliferation of Nuclear Weapons, etc.) to ensure peaceful and safe use of nuclear energy. Under the agreement between Bangladesh and IAEA, it shall establish and maintain a system of accounting for and control of all nuclear material subject to safeguard. Thus, strong domestic legislative framework in this regard can accelerate the burden of creating safe environment surrounding nuclear energy. It will not only protect the people working in the power plant but also protect the local inhabitant, economy, and environment as well.

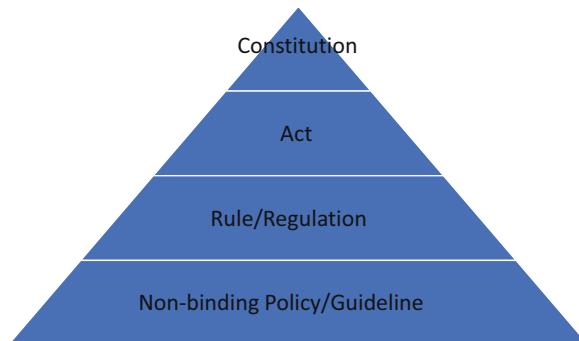
However, the IAEA suggests that every efficient and effective nuclear law must reflect the level and focus of country's nuclear program and it should ensure highest alignment and constancy among national nuclear legal systems notwithstanding the needs of domestic legislative systems and it must be compatible with a general legal and regulatory framework of the country (Stoiber et al., 2010).

According to the IAEA requirement, the nuclear energy laws of Bangladesh have four different levels, i.e., i) constitutional level, ii) statutory level, iii) delegated legislation, and iv) nonbinding policies and guidelines. The Constitution of the People's Republic of Bangladesh has conferred the legislative power to the House of the Nation (the parliament). Therefore, it is the parliament which can enact any law subject to the power conferred by the constitution. Albeit there is no particular mention of nuclear energy in the constitution, but the parliament can pass law relating to nuclear energy unless it goes inconsistent with the constitution. However, at the statutory level, Bangladesh has a good number of laws to deal with this sector, e.g., the Bangladesh Atomic Energy Commission Order 1973, the Bangladesh Atomic Energy Regulatory Act 2012, the Nuclear Power Plant Act 2015, and the Nuclear Safety and Radiation (Control) Act 1993 are mentionable among others.

In the third level, there are some delegated legislations as well (e.g., the Nuclear Safety and Radiation Control Rules 1997). Apart from these, there are also some nonbinding policies and guidelines (e.g., National Policy on Radioactive Waste and Spent Nuclear Fuel Management 2019, the Bangladesh Nuclear Energy Action Plan, the National Nuclear and Radiological Emergency Preparedness and Response Plan, etc.). So, it can be said that the structure of the Bangladeshi nuclear energy laws is apparently consistent with the IAEA given alignment as it fulfills the levels of laws (e.g., statutes, rules, nonbinding policies) suggested by the IAEA (Fig. 1).

The Nuclear Power Plant Act, 2015, is one of the crucial legislations in Bangladesh governing the nuclear power industry. Now, if we examine the compatibility of this law with the IAEA design of comprehensive nuclear law, then we can see that the objective and scope of the Nuclear Power Plant Act is clear from the preamble of this legislation that the act was legislated to constitute a company to establish and manage the Rooppur Nuclear Power Plant (RNPP) and other nuclear-based power plants in the country and to regulate matters concerning this. Therefore, it is evident from this legislation that the main purpose of enacting this law is to establish a company to manage and oversee the nuclear power industry in Bangladesh.

Fig. 1 Hierarchy of nuclear energy law in Bangladesh



Section 4 of the act empowers the Bangladesh Atomic Energy Commission (BAEC) to constitute a company, namely, the Nuclear Power Plant Company Bangladesh Limited, with prior permission from the government to act as an owner and operating organization of the RNPP and other nuclear power plants in the country. Consequently, the whole law emphasized on the formation of the board of directors, qualifications and disqualifications of the directors, duties of the managing director and other directors, meeting, annual report, and account and different company-related matters and disregards human and environmental safety. The company has no obligation to carry out an environmental impact assessment and present justification of building the nuclear power plant considering the economic, social, and other benefits or detriment to the health due to the radiation.

In addition, there is no mention of fixing the criteria for selecting a site to build a nuclear reactor. Also, there is no provision to consult with the local people or public participation before selecting the location of a nuclear power plant. Fullest public consultation and publication are vital before doing any sensible project like nuclear power plant.

Furthermore, there is no obligation on taking informed decision regarding all possible positive and negative impacts of a nuclear power plant under the law.

Although it is one of the statutory duties of the company to ensure radiation safety to protect the workers (U/S. 7(5)(k)), there is no mention about insurance to cover the workers in case of any radiation hazard occurring, while in India the court ordered in the *M K Sharma v Bharat Electronic Ltd* case to arrange proper insurance for the workers who are working in the sensitive area of the factory to protect them and to strengthen the safety measures at the cost of the employer. Regrettably, there is no such direction from the court in Bangladesh although section 99 of the Labour Act, 2006, makes group insurance compulsory for an establishment having more than 100 permanent workers. In fact, this provision pertaining to group insurance for workers remains in the text only; it has yet to become a reality (Mannan, 2013).

Albeit this piece of legislation focused on the emergency situation, it does not have any provision about the consequence of nuclear disaster. Also, it only suggests training for the concerned workers and technical persons, and neither has any

arrangement of basic knowledge circulation among the local inhabitants regarding any nuclear disaster, nor the company has any duty to form public awareness about nuclear disaster.

Moreover, it does not stipulate any liability assessment procedure in case of nuclear disaster. Hence, there is every possibility of escaping liability by any of the stakeholder. So, the law should address all the aspects of safe energy production from nuclear energy and the consequences of nuclear disaster. Additionally, enactment of rule and regulation under the law is necessary to detail the function and procedure of the company.

The Bangladesh Atomic Energy Regulatory (BAER) Act 2012 is another significant law in Bangladesh in terms of establishing an autonomous regulatory authority in pursuant to IAEA safety standards to ensure the health and safety of the plant workers and the public against any harmful effects arising from peaceful uses of nuclear energy in the country.

Pursuant to section 7 of the stated act, the government has established the Bangladesh Atomic Energy Regulatory Authority (BAERA) to fulfill the purposes (i.e., authorization, safety and security of radioactive materials, nuclear safety, radiation protection, physical protection, quality assurance, waste safety, emergency preparedness, nuclear liability, etc.) of this act. Nevertheless, according to the Nuclear Energy Agency of the Organization for Economic Co-operation and Development (OECD), “the fundamental objective of all national nuclear safety regulatory bodies is to ensure that, within their countries, activities related to the peaceful use of nuclear energy are carried out in a safe manner, in accordance with international safety principles and with full respect of the environment.”

Independence of the regulating authority and effective separation from any other body having interest in the nuclear energy sector is a fundamental requirement under the Convention on Nuclear Safety. However, the regulatory authority cannot be entirely separated from the government as the government is principally liable to ensure safety. The reason for independence of the regulatory authority is to confirm full compliance of safety measures without any sort of interference. In order to make it independent in decision-making, the regulatory body should have effective independence from governmental agencies, industries, and interest groups (INSAG-17 2003), which means impartial decision-making and enforcing power coupled with financial independence of the authority. Independence does not mean complete isolation; rather the regulatory body remains accountable for their action and decision, and it must be open and transparent.

In Bangladesh, the BAERA is the sole licensing authority to operate nuclear energy in the country. Hence, it should be properly empowered to grant license and revocation of the same without any sort of influence from any other governmental organ or anywhere else. Additionally, this authority is entrusted to appraise safety standards, protection from radioactive hazards, transportation and handling of spent fuel, waste safety, management, disposal, etc.

The BAERA has the authorization power, and the mentioned law determines the process of getting authorization from the BAERA and imposes certain duties on the authorization holder. However, internationally, public participation is mandatory

during the licensing process especially during the period of site selection (Bredimas and Nuttal 2007). Regrettably, there is no mention of public participation in anywhere during the process under the said act.

Further, there is question about the qualifications of the chairman and other members of the authority determined under the Bangladesh Atomic Energy Regulatory Act 2012. The qualification clause is very ambiguous and not clearly specifies their educational and professional requirements like: “the chairman and the members of the authority shall be appointed from among the persons having adequate qualification and experience in the field of management of atomic energy; provided that one member may be appointed from among the persons having qualification and experience in the matter of production and circulation of electricity” (S. 8).

According to the International Atomic Energy Agency guideline, the required qualifications and experience of the head (in this case the chairman) should have an MS in nuclear engineering with experience of minimum 15 years in progressively responsible positions in power plant engineering and specialized training of 1 to 2 years nuclear safety regulations, orientation in foreign regulations and other international codes of practice, safety guides, etc., whereas the directors of different divisions (in this case the members) should have MS in engineering (mechanical, civil, electrical, or nuclear) with experience of 10–12 years in the specified fields (Matin, 2014).

Hence, Bangladesh clearly not only neglects the basic qualifications of the people who will monitor the sector but also undermines the significance of a competent authority to regulate the whole industry. Hence, the act needs to be amended focusing on sustainability and objective analysis of the risk associated with nuclear disaster and fulfill the regulatory gaps.

The Bangladesh Atomic Energy Commission Act 2017 (which was actually the Bangladesh Atomic Energy Commission Order 1973) is another noteworthy and first legislation in the nuclear sector in Bangladesh. However, a commission was established under the said law just a couple of years after getting the independence for the promotion of the peaceful use of atomic power in the areas of food, agriculture, health, Medicare, environment, electricity and industry, the discharge of international obligations connected thereto, the undertaking of research, the execution of development projects involving nuclear power stations, and the generation of electric power threat. Thus, the Bangladesh Atomic Energy Commission (BAEC) is the principal body in the country to look after the whole uses of nuclear energy. However, the law mainly deals with the formation, functions, fund, etc. of the commission. Nevertheless, earlier the BAEC was acted as the licensing authority before the BAERA came into force. Hence, avoidance of power overlapping in case of license granting and clear demarcation of functions between these two regulatory bodies are necessary.

With the view to develop a legal framework, the parliament has passed the Nuclear Safety and Radiation (Control) Act in 1993, and later in 1997, the corresponding Nuclear Safety and Radiation Control (NSRC) Rule was formulated. Actually, these couple of legal instruments were introduced to manage the nuclear safety and radiation although when the NSRC Act was enacted, the plan to establish

nuclear power station was not on the table. As a result, this piece of law is not focusing matters relating to nuclear power plant; rather it emphasized on the industrial use of atomic energy, medical science, and other research happening at that time. These two laws deal with many provisions in the issue of licensing, enforcement, and strengthening the overall regulatory framework. However, the punishments suggested in this act are very weak which is impractical to apply in prevailing condition. That is why the BAER Act has been enacted subsequently to eliminate the deficiencies outlined in the former one and ensure nuclear and radiation safety in a more effective way (Haider et al., 2014).

Thus, it can be said that Bangladesh needs holistic and exhaustive legal framework to comply with internationally recognized safety standards as the present legal regime fails to fully comply with the IAEA guidelines. It is also important to finalize the IAEA Integrated Nuclear Security Support Plan (INSSP) to establish good governance for nuclear safety in Bangladesh.

Other Potential Areas to Address

The contract between the Bangladesh Atomic Energy Commission (BAEC) and the Russian company ROSATOM is not a settled value contract rather a cost in addition to the contract. Consequently, the Russian company gets the advantage of increasing the cost in addition to their net revenue to be consolidated into the agreed sum. In addition, the contract will not cover all of the fuel costs, operation and upkeep costs, and decommissioning and radioactive waste organization cost to the end of its operational life cycle (Karim, 2018). Moreover, according to the said contract, the risk is very high for Bangladesh as the government of Bangladesh has to reimburse the full loan amount with interests if in any event the RNPP is canceled or accidentally destroyed (Rahman, 2015). Hence, Bangladesh is clearly in weakening position in the contract and failed to negotiate properly with the government of Russia in this regard.

Nevertheless, Bangladesh has already experienced damages in its gas field and did not get compensation due to lack of proper legal framework. Thus, it should be more careful while dealing with nuclear energy as the destructive power of nuclear energy is numerous times greater than the earlier. However, the common law of tort might be helpful to create strict responsibility and get compensation for the accident arising out of negligent work. Nevertheless, Bangladesh doesn't have any tort law framework, and it needs to address this vacuum before the occurrence of any accident.

On the other hand, although Bangladesh is a state party to the Convention on Supplementary Compensation for Nuclear Damage 1997, unfortunately there is no civil liability law for nuclear damage in the country, whereas India has a similar type of law since 2010. However, India has enacted the law with the primary aim to give prompt compensation to the victims of a nuclear incident through a no-fault liability regime channeling liability to the operator and also on the state. Conversely, Bangladesh has currently no separate legal instrument like India to compensate the

victim of nuclear damage although it has some provision regarding liability behind nuclear incident and compensation in the BAER Act 2012 which is not sufficient if we consider the gravity and destructive nature of nuclear incident.

Establishment of a nuclear damage commission is essential under the law to assess the liability and handle issues relating to nuclear damage and compensation. Besides, the creation of a nuclear incident fund is urgent for the country to tackle any nuclear damage initially.

Concerns Relating to Environmental Safety

The topmost benefit of the nuclear-based power plant is that it has no visible CO₂ gas emission and this system is not responsible for global warming. However, still, there is heavy concern about nuclear power plant because of its unimaginable damaging power and longtime effect that can sustain decades after decades (Ramana & Mian, 2021). Also, it has transboundary impacts as air knows no boundary. Consequently, it shakes immensely the whole planet considering the safety issues, especially after the occurrence of the Three Mile Island (1979), Chernobyl (1986), Tokaimura (1999), and Fukushima (2011) incidents. Apart from economic viability, protecting the workers, concerned stakeholders, and public as a whole, preserving the environment from radioactive hazards and using the natural resources sustainably are two of the principal concerns expressed by the pressure group in Bangladesh regarding the nuclear power plant (Ramana & Mian, 2021).

Bangladesh is one of the most highly dense countries in the globe and already becomes a major victim of climate change. The land, air, agriculture, river, fisheries, etc. of the country are already affected by the result of climate change, and it is no longer ready to take another heavy ecological destruction arising out of nuclear pollution.

In addition, Bangladesh is a state party to the Climate Change Conference held in Paris (COP21) and a founding member of the Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants (CCAC). Hence, Bangladesh must fulfill its obligations and commitment given in global forum to save the earth from any kind of nuclear disaster. Nevertheless, both the government of Bangladesh and the ROSATOM (the RNPP project-implementing state company of Russia) have assured that the RNPP project will be implemented using the latest state-of-the-art nuclear technology and 3 + –generation Russian VVER-1200 reactors to be set up at the Rooppur which is regarded as safest across the world. Nonetheless, according to specialists, VVER uses U235 nuclear fuel which produces dangerous radioisotopes during operation (Islam, 2014).

Environmental impact assessment (EIA) is a crucial prerequisite before implementing a huge project like RNPP which Bangladesh had already done. Nevertheless, continuous monitoring of the environment is also essential during every stage of the project from the beginning to the end of the plant's life. However, public participation and consultation are significant during the EIA under the Aarhus

Convention. Nonetheless, the detailed EIA report was never made fully accessible to the public.

Aside from nuclear accident and radiation, there are a couple of more major concerns relating to nuclear power in the country – number one is the use of water from the river Padma and harmless disposal of spent fuel. The reason behind choosing this site for the RNPP was that it is situated beside the bank of the river Padma. However, the water flow and condition of the river don't remain the same while the government took the decision to build a nuclear power plant back in 1961. In the meantime, the scenario has been changed, while India had constructed the Farakka Barrage in 1975 in their part (the river named *Ganga* in India), which massively affected the water supply in the river Padma in Bangladesh including the Rooppur area. So, there is uncertainty of supply of water during the whole life period of the power plant. Again, nuclear reactor continuously needs water for cooling the system, and used water contains radiation which can abolish aquatic resources forever. Thus, using cooling water consciously and refining and preserving that used water protectively are mandatory.

The ROSATOM has assured that they will return back the spent fuel to Russia. Nevertheless, as Bangladesh is experiencing nuclear power station in a very high scale for the first time, there is also concern about the safe removal of spent fuel from the reactor and transporting it to Russia. Moreover, it is not clear how long ROSATOM will perform its duty, and if it is necessary for Bangladesh to dispose it off inside the country, then selecting a protective and reliable site for that disposal would be very challenging for Bangladesh because of its high population and scarcity of land. Furthermore, the Rooppur site is located smack dab on top of a potential earthquake fault line (Islam, 2014). Besides, cyclone, tornado, and various kinds of natural disaster are very common in Bangladesh that are also raising tension about the safety of the nuclear reactors.

Local inhabitants are the most vulnerable considering the safety concerns of the nuclear power plant. Although Rooppur is approximately 170 km northwest far from Dhaka, the whole country will not remain safe if any accident happens. It may even bring consequence for the neighboring nations as well. The effects of ionizing radiation are massive, and it can be deadly in a particular situation. However, in some cases, it might have longer consequences and needs time to expose the symptom. Even the slow exposure with radiation every day can cause sick health that causes shortening of life. That is why the making of an emergency shelter center, emergency treatment arrangement, etc. is necessary to protect the public.

Conclusion

Bangladesh suffers from a strong legal regime to operate reliable, safe, and sustainable nuclear energy. However, as Bangladesh has already proceeded progressively toward a nuclear regime in the country, there is no scope of overturn from there now. State should take care of every single money of the taxpayers and invest that money for the highest benefit of the country. Hence, Bangladesh should take the

abovementioned concerns sensibly, whereas prompt action is urgent to address those lacunas from the highest level.

Thus, this chapter argues a legal reform to strengthen and create an effective legal regime to operate safe NPP in Bangladesh. It requires a constructive approach to establish, maintain, and operate NPP. A holistic strategy is also essential for the management and disposal of radioactive waste. The country cannot achieve its goals without participatory development and preservation of the environment.

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COVID-19 Pandemic and Health for All

130

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Contents

Introduction	1936
COVID-19 Pandemic as a Disaster	1937
COVID-19, Public Health, and Vulnerable People	1939
Vulnerable People's Right to Health During Pandemic Under International Law	1941
State Obligations Toward the Right to Health During COVID	1943
States' Failure to Uphold Vulnerable People's Right to Health During COVID-19	1945
Availability, Accessibility, Acceptability, and Quality Healthcare	1945
Fulfilling Underlying Determinants of the Right to Health	1946
States' International Obligation to Assist	1946
A Rights-Based Approach to Disaster Management During COVID	1947
Conclusion	1948
References	1949

Abstract

A pandemic constitutes a public health emergency and biological disaster that grossly violates a range of rights including the right to health. This chapter examines the COVID-19 outbreak – the most recent and worst pandemic as a case that has been globally exacerbating existing infringements of this right while critically affecting vulnerable people. It argues that international law imposes a “strict” State obligation to realize and protect the right to health of the marginalized people during pandemics. Hence, States are bound to embrace a rights-based approach, particularly concerning the prevention and treatment of COVID-19. Such an approach entails a comprehensive acknowledgement and understanding of the right to health as an inalienable human right. It further imposes individual and collective State duties to adopt effective measures for facilitating the full realization of the right. Accordingly, after conceptualizing the COVID-19 pandemic as a disaster and its public health impact on the vulnerable people, this

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chapter first explores the right to health as a human right by examining key international law instruments. Second, it evaluates States' responsibilities to harness maximum available resources and to perform minimum core obligations for realizing the right of the disadvantaged people. It also examines States' extraterritorial duty to extend international cooperation in this context. The chapter lastly advocates a rights-based disaster management policy for COVID-19 that is particularly inclusive of the vulnerable people to facilitate their effective enjoyment of the right to health.

Keywords

Natural disaster · Biological disaster · Minimum core obligations · Progressive realization · Rights-based approach

Introduction

The COVID-19 pandemic, one of the worst disasters in history, has been impacting human lives at its core. Apart from the shocking number of lives lost, its overall human, economic, and social costs are staggering. Being "concerned both by the alarming levels of spread and severity and by the alarming level of inactions," therefore, at the beginning of the pandemic, the World Health Organization (WHO) declared a public health emergency of international concern requiring urgent state actions to combat COVID crises (WHO, 2020a). As it affects countries and people around the world, the UN Secretary-General cited COVID-19 as "a pandemic of human rights abuses" (Guterres, 2021).

While the COVID-19 pandemic has grossly affected every aspect of human rights, its impact particularly on the right to health of vulnerable people is deep and unprecedented. These people "face systematic exclusion and discrimination due to their age, disability, race, ethnicity, gender, income level, religion, caste or creed, gender identity, sexual orientation, and migratory status." Aspects of vulnerability also prevail in the lives and experiences of "individuals who are stateless, incarcerated, homeless, victims of environmental harm, or suffer from chronic disease" (Barron et al., 2021). Impacts of this pandemic whether direct or indirect negate the enjoyment of their right to health. The pandemic has exacerbated their existing vulnerability as being at the periphery of the power dynamics they have no means and capacity to realize their right. Further, their continuous invisibility to governments results in their limited or no access to the right to health (Barron et al., 2021).

The current chapter demonstrates that States have largely failed to protect vulnerable people's right to health during the COVID-19 pandemic. However, international law imposes tripartite obligations upon States to *respect*, *protect*, and *fulfil* the right to health like any other right. It argues that these obligations are rather strict being associated with the realization of the core content of the right to health. Accordingly, States' minimum core obligation is not subject to resource allocation and availability of resources. This understanding of States' obligation is particularly

vital in protecting vulnerable people's right to available, accessible, acceptable, and quality healthcare, services, and goods.

Unlike the articulation of the nature of the COVID-19 pandemic as an outbreak of infectious disease, its characterization as a disaster is little known and used. This chapter believes that conceiving COVID as a disaster informs about its severity and creates a possibility to adopt an effective rights-based disaster management approach to combat COVID crises. Hence, it first refers to the existing disaster research to examine the nature of the COVID-19 as a disaster. Next, to contextualize the research, it analyzes the public health impact of COVID on vulnerable people. Drawing on an analysis of the vulnerable people's right to health and the corresponding State obligations, it then evaluates the key concerns regarding States' failure to realize the right. To overcome the current challenges, the chapter contends that the adoption of a rights-based approach based on the principle of non-discrimination has the breadth to realize the vulnerable people's right to health during the pandemic.

COVID-19 Pandemic as a Disaster

Disaster denotes "a calamitous event or series of events resulting in widespread loss of life, great human suffering and distress, mass displacement, or large-scale material or environmental damage thereby seriously disrupting the functioning of society" (International Law Commission, 2016). While international law lacks clear guidance as to the application of this definition to the COVID-19 pandemic, the UN Security Council considers transnational health crises including pandemics and epidemics as explicit or implicit threats to the maintenance of international order (United Nations, 2020a). This characterization narrowly aligns with a key characteristic of disaster that catalyzes international disorder including social disruption. Specifically, pandemics like COVID-19 highlight that beyond the conventional arm conflicts endangering international peace and security, pandemics can threaten global order. It intensifies existing geopolitical tensions, allows actors to exploit vulnerabilities, and deteriorates humanitarian crises in conflict zones. It exacerbates indicators of violence including economic instability; distrust in public institutions; political hostilities; social inequality; hindered domestic, regional, and international peace efforts; etc. (See UN Doc S/RES/2532 (2020). Earlier the Security Council addresses transnational health crises in response to the HIV/AIDS epidemic as well as Ebola Outbreaks in West Africa and in the Democratic Republic of Congo. In the respective resolutions, the Security Council referred to its responsibility to the maintenance of international peace and security considering their implicit threat to the international order. See, respectively, UN Doc S/RES/1983 (2011), UN Doc S/RES/2177 (2014) and Doc S/RES/2439 (2018).)

However, this understanding of COVID-19 as a pandemic is inadequate as rather than referring to individual suffering it focuses on its interference with the maintenance of social order or international peace and security. Conversely, existing disaster research that provides a comprehensive definition of disaster can be

beneficial to understanding the nature of COVID-19. In this context, disaster constitutes a serious disruption of the social and community functioning resulting in immense human, material, economic, and environmental suffering which limits the affected people's ability to cope with its existing resources and mechanisms (Lopez-Ibor, 2006). Being a "severe, relatively sudden and frequently unexpected disruption," disasters remain beyond social control while affecting human lives from two levels (Sjoberg, 2006; The John Hopkins and Red Cross Red Crescent, 2008). At the individual level, they cause acute illness, death, as well as substantial economic and social loss, and at the community level, they result in mass death, damages to the means of livelihood, or displacement affecting the whole society (The John Hopkins and Red Cross Red Crescent, 2008).

Disasters are primarily categorized as natural and man-made, while the latter is sub-divided into six categories, such as (i) geophysical (e.g., earthquake), (ii) meteorological (e.g., storm), (iii) hydrological (e.g., flood), (iv) climatological (e.g., heatwave), (v) biological (e.g., epidemic), and (vi) extraterrestrial (e.g., meteorite or asteroid) (Centre for Research on the Epidemiology of Disasters, 2009). Thus, epidemics constitutes a biological disaster. While the list does not expressly include pandemics, a wide body of disaster research considers both epidemic and pandemic, such as SARS, Ebola, and recent COVID-19 outbreaks as biological disasters (Grigg, 2006). Pandemics are often characterized as biological disasters as they both share numerous characteristics. Like natural disasters, pandemics severely disrupt human lives by causing extraordinary social, psychological, and economic suffering (Sarukai & Chughati, 2020; Maison et al., 2021). Since a comprehensive analysis of damages caused by any disaster is a key to determining its nature, the following discussion particularly focuses on the human cost of COVID-19 as well as its economic and social impacts.

It is estimated that only in 2020, COVID-19 caused more deaths crossing the total number of over 1.2 million deaths caused by natural disasters in the past two decades. This is despite the fact those 20 years witnessed many catastrophic natural disasters, such as heatwaves in 15 European countries (2003); tsunamis in 12 Asian and African countries (2004) and Japan (2004); hurricanes in the USA (2005 and 2017); cyclone in Myanmar (2008); earthquakes in India (2001), Pakistan (2005), China (2008), Haiti (2010), and Nepal (2015); drought in Somalia (2010); and others (CRED and UN Office of Disaster Risk Reduction 2020).

As to the economic cost of COVID-19, the World Bank's Global Economic Report calculated that the world economy was lessened by around 4.3% in 2020, a downturn matched only by the depression and two world wars (World Bank Group, 2021). While COVID-19 has caused profound economic disruption to the world economy, developing countries suffer the most due to extreme income loss, increased inflation, lack of resilience to economic shocks, increased expenditure due to public health and other social measures, etc. By negatively impacting the poverty reduction efforts of these countries, COVID-19 has contributed to accelerating global economic inequality. Further to these direct economic costs, school closures and continued disruption to healthcare services have an indirect economic impact by disrupting the growth of human capital, especially among children and

vulnerable communities (World Bank Group, 2022). Globally, 1.6 billion students were affected due to school closures causing an estimated lifetime loss in earnings of 10\$ trillion (World Bank, 2020).

COVID-19 has profound social impacts by intensifying inequality, exclusion, and discrimination. Its social consequences include among others the exacerbation of domestic violence, disruption of educational facilities, and the rise of food insecurity among poor people. These are associated with psychological challenges such as the growth of global mental health crises including stress disorder, depression, anxiety, as well as other symptoms of distress, such as fear, denial, or anger (Saladino et al., 2020; Torales et al., 2020). While affecting all segments of people, it is particularly detrimental to the vulnerable and marginalized communities including the poor, elderly people, people with disabilities, children, and indigenous persons.

Due to these challenges, COVID-19 is conceived as a biological disaster that overwhelmingly affects every country and sector and touches every individual's life irrespective of their age, race, gender, or nationality, while affecting the vulnerable people as examined in the next section. The costs of the COVID-19 pandemic encompassing the total number of deaths, economic losses, and people affected are unprecedented to term it as an extreme biological disaster. To contextualize the research, the analysis below focuses on the public health impacts of COVID-19 on vulnerable people.

COVID-19, Public Health, and Vulnerable People

While having deep socioeconomic challenges, COVID-19 constitutes the most severe public health threat in a century (OECD and WHO, 2020). It constitutes “an extraordinary event which is determined to constitute a public health risk to other states through the international spread of disease and to potentially require a coordinated international action” (WHO, 2005). The identifiers of public health emergency of international concern are, therefore, “(i) the seriousness of the public health impact of the event, (ii) unusual and unexpected nature of the event, (iii) potential for the event to spread internationally, and/or (iv) the risks that travel and trade restrictions may result because of the event” (WHO, 2005). Thus, a determination of the extent of the impact of an event, particularly, on public health can validly justify the existence of a public health emergency. The categorization of COVID-19 as a public health emergency thus reflects the serious impact of COVID-19 on public health.

COVID-19 is phrased as a global public health emergency due to its high infectivity and mortality rate alongside its long incubation period. It has been posing deep negative impacts that encompass both direct and indirect effects on public health. The key to evaluating direct impacts is mainly an estimation of the total number of affected persons, deaths, and hospitalizations. As of 1 April 2022, WHO recorded 486,761,597 confirmed COVID-19 cases including 6,142,735 deaths globally (<https://covid19.who.int/>). This recorded number, however, understates the actual number. For instance, the recent estimate of 3 million COVID deaths by

WHO exceeds the reported 1.8 million COVID deaths in 2020 (WHO, 2022). Further, a systematic study states that the real number of lives lost to the pandemic from 1 January 2021 to 31 December 2021 is thrice the reported number totaling 18.2 million (Wang, 2022).

The direct health impacts of COVID-19 are compounded by its indirect effects including missed and delayed care for other medical conditions (Dimopoulos-Bick et al., 2021). Since its beginning, the pandemic has been disrupting the prevention and treatment of non-communicable diseases such as cardiovascular disease, cancer diabetes, and chronic respiratory disease as well as non-communicable diseases such as HIV, tuberculosis, malaria, and other tropical diseases. It has led to adding to a substantial number of death and years of lives lost by people with preexisting communicable and non-communicable diseases. While these people are already vulnerable to being extremely ill with the coronavirus, a significant number of them faced restricted or no access to care, surgeries, and other medical services due to increased COVID-19 hospitalizations as well as COVID-induced disruptions such as strict lockdown measures or hospital staff deployments to test and treat COVID cases (Núñez et al., 2021; Dimopoulos-Bick et al., 2021).

Another notable indirect impact of COVID-19 is the development of new mental health conditions and the exacerbation of the existing mental health crises. The WHO recognized the effect of COVID-19 to deepen the mental health crisis (WHO, 2020b). From March 2020 onwards, the global rate of anxiety and depression is heightened and even doubled or more than doubled in some countries. For instance, from March to April 2020, in Belgium, France, Italy, Mexico, New Zealand, the UK, and the USA, the prevalence of growth in anxiety levels was twice or more than twice than ever before (OECD, 2021). This is because COVID has induced a surge of negative factors contributing to poor mental health, such as financial insecurity, job losses, and fear as well as a reduction of the related positive factors including reduction of social connection, employment, and educational engagement and access to mental healthcare services and support networks (Dimopoulos-Bick et al., 2021).

Whatever be the impact of COVID-19, direct or indirect, and while it impacts everyone's life, vulnerable people face the highest health risk during the pandemic. This particularly includes poor people, people from minority and ethnic groups, children and adolescents, women, refugees, disabled people, and migrants. Despite the popular belief that rich countries witnessed more causalities of COVID-19, it is well documented that vulnerable people of both developed and developing countries are the worst victims of the pandemic. In some countries, for instance, the fatality rate of poor people is four times high than the rich. As of 19 April 2020, deaths of Black, Asian, and ethnic communities in England constituted 19 percent of an estimated 12, 593 hospital deaths despite they being only 15 percent of the overall population of the country (Barr et al., 2022). In the USA as well, from March to December 2020, the COVID death rate of Blacks and Natives was three to four times and of Latinx was two times higher than White Americans (Shiels et al., 2021).

Vulnerable People's Right to Health During Pandemic Under International Law

The recognition of the fundamental right to enjoy the highest attainable standard of health dates to the adoption of the 1946 Constitution of the World Health Organization. As the preamble articulates, “the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic and social conditions” (WHO, 1946). Accordingly, WHO’s Constitution provides a comprehensive definition of health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO, 1946). Hence, rather than a traditional biomedical understanding of health that concentrates on the physical expression of illness, WHO’s definition resembles health with wellness considering an individual’s physical, psychological, and social conditions (Farre & Rapley, 2017).

Drawing on the WHO’s Constitution, the Universal Declaration of Human Rights (UDHR) acknowledged the realization of necessary medical care and other determinants of health and well-being as the basis of public health. Specifically, article 25 of the Declaration recognized the right of every individual “to a standard of living adequate for the health and well-being of himself and the family, including food, clothing, housing and medical care, and necessary social services.” Unlike the WHO’s constitution that articulates the right to health as a distinct right, the UDHR drafts it as a component of the right to an adequate standard of living. Further, despite recognizing an interrelation between health and well-being, the UDHR does not consider them synonymous with each other.

Significant development of the right to health occurred due to the International Covenant on Economic, Social, and Cultural Rights (ICESCR). Article 12 of the covenant enshrines it as a separate and legally binding right. Under this provision, the right includes two distinct characteristics: first, it extends beyond the right to be healthy. Secondly, the right to health under the ICESCR refers to physical and mental health rather than only well-being. It constitutes an inclusive right that extends to access, firstly, to the determinants of health, such as safe water and adequate sanitation, an adequate food supply and housing facilities, healthy occupational and environmental conditions, and access to health education and information and, secondly, to timely and effective healthcare (CESCR, 2000). This extensive recognition of the right to health has been subsequently strengthened through several regional instruments (For instance, the European Convention for the Promotion of Human Rights and Fundamental Freedoms 1950, the American Convention on Human Rights 1969 and its Optional Protocol in the Area of Economic, Social and Cultural Rights 1988 (article 10, para 1), African Charter of Human and People’s Right 1981 (article 16), Additional European Social Charter 1961 (revised in 1996, article 11), and African Charter on the Rights and Welfare of the Child 1990 (article 14.1) address diverse aspects of the right to health).

Thus, international law while recognizing the right to health and outlining its content acknowledges vulnerable people’s right to health. The most common recognition of every individual’s right to health entails that vulnerable people,

regardless of their status, are entitled to the highest attainable standard of health. Specifically, articles 2.2 and 12.2 of the ICESCR reinforce the preamble of the WHO's constitution by stating that people's right to health is not affected by their "race, colour, sex, language, religion, political or other opinions, national or social origin, property, birth or other status." That means the recognition of the right is based on the principle of equality where no one including vulnerable people will be deprived of their enjoyment of this right. To illustrate the accessibility component of the right, the CESCR makes an explicit reference to vulnerable people by stating that "health facilities, goods and services must be accessible to all, especially the most vulnerable or marginalized sections of the population" (CESCR, 2020).

However, considering the vulnerability of specific groups of people to enjoy access to health, international law has adopted numerous conventions. For instance, the Convention on the Elimination of All Forms of Discrimination against Women enshrines the non-discriminatory right to access to healthcare, including reproductive health as well as underlying determinants of health such as housing, sanitation, electricity and water supply, transport, and communications that are critical to the enjoyment of the right (CEDAW, 1979). Likewise, article 24 of the Convention of the Rights of the Child recognizes the right of every child to access healthcare services including treatment of illness and rehabilitation of health. Other notable conventions to recognize the right to health of vulnerable people include the International Convention on the Rights of All Migrant Workers and the Members of their Families 1990 and the Convention on the Rights of Persons with Disabilities 2006.

Overall, the right to health of all forms including that of the vulnerable people includes, firstly, a recognition of the individual freedom over one's health as well as a right to protect health from any interference. Secondly, it entails recognition and realization of the underlying determinants of health, such as housing, social security, food, water, and sanitation. While the above discussion sheds light on these two elements, thirdly, by adopting the AAAQ model, CESCR illustrates that the existence of available, accessible, acceptable, and quality healthcare is a vital prerequisite to substantiate the right to health. The enjoyment of the right to healthcare, therefore, depends on the fact that adequate and efficient health services are existent (availability), and people can access and afford medical facilities without discrimination (accessibility). The health facilities and services are ethically and culturally appropriate for and respectful of people from diverse backgrounds (acceptability). Lastly, health services must be scientifically and medically appropriate and of a high standard (Quality) (CESCR, 2000).

However, to what extent the development of international law recognizing the right to health applies to a pandemic situation? The question bears significance due to the absence of, firstly, a convention on the vulnerable people's right to health during a pandemic; secondly, a reference to the right in two specific international documents including the 2005 *International Health Regulations* and the *Pandemic Influenza Preparedness Framework 2011* that provide guidelines prepares for outbreaks of infectious disease. A reference to article 12.2 (c) of the ICESCR is relevant here as it recognizes a right to prevention, treatment, and control of epidemic and

endemic amidst other diseases and corresponding State duties. As the CESCR recommends, State responsibilities entail “the creation of a system of urgent medical care in cases of accidents, epidemics, and similar health hazards, and the provision of disaster relief and humanitarian assistance in emergencies” (CESCR, 2020). The European Committee of Social Rights supports this by stating that the right to health provision (article 11) of the European Social Charter should guide States to prevent, control, and contain pandemic diseases (European Committee of Social Rights, 2020). General provisions on the right to health of international instruments that contain the right in all its forms and at all levels thus also address pandemic situations.

State Obligations Toward the Right to Health During COVID

In international law, States hold the primary responsibility to safeguard the right to health alongside its underlying determinants. The existence and scope of State duties are subject to the recognition of the corresponding rights. The full realization of the right to achieve the highest attainable standard of health amidst others is dependent on the “prevention, treatment and control” of threatening diseases, including epidemic and endemic diseases. This provision helps to locate State obligations in times of COVID, as particularly, the right to treatment requires ‘the creation of a system of urgent medical care in cases of . . . epidemics . . . and the provision of disaster relief and humanitarian assistance in emergency situations’ (CESCR, 2000). Thus, State parties should combat epidemic diseases by providing immediate medical care, relief, and assistance during epidemics.

States are subject to tripartite obligations to *respect*, *protect*, and *fulfil* to realize the right to health like other human rights with particular attention to the vulnerable people who have no or only limited access to enjoy the right. For instance, the duty to *respect* requires States to refrain from committing any direct or indirect infringement of the right to health. The duty to *protect* requires States to adopt necessary legislative, and other measures prevent to ensure equal access to healthcare services from third parties. Finally, the duty to *fulfil* requires States to recognize the right to health in their political and legal system and to adopt a national health policy outlining a detailed and practical plan to realize the right (CESCR, 2020). The duty to *fulfil* further includes the duty to *facilitate* requiring States to take affirmative actions to enable people to enjoy their right to health. States must *provide* certain rights if individuals and groups are unable to realize the right by their own means. The duty to *fulfil* also requires States to *promote* the right to health with appropriate measures to create, maintain, and restore public health (CESCR, 2000).

While the ICESCR focuses on the full realization of the right to health, the Covenant has subjected the above State duties to “progressive realization” considering the positive nature of the right and States’ resource constraints. States have “specific and continuing” duties to take actions “expeditiously and effectively” towards the full realization of the right. Any deliberate retrogressive measure against the right is impermissible unless a State proves that it has taken all reasonable steps

to realize it with the maximum use of its available resources (CESCR, 2000). The determinants of reasonableness relate to certain immediate State obligations that include, first, a commitment to ensure a non-discriminatory realization of the right; second, a duty to take “deliberate, concrete, and targeted” steps toward its full realization; and, third, a consideration of the disadvantaged and marginalized individuals and communities’ vulnerability (CESCR, 2000).

To implement such immediate obligations, States should guarantee the realization of the “meaningful content” of the right to health. They have a core obligation to realize the minimum level or essentials of the right, including essential primary healthcare. Even when core contents are resource-dependent, States should still prioritize their realization. According to the CESCR, such core obligations of States include providing access to (i) health facilities, goods, and services based on non-discrimination and with special attention to the disadvantaged segments of society; (ii) nutritious, adequate, and safe food; (iii) shelter, housing, sanitation, and safe drinking water; (iv) essential drugs; and (v) equitable distribution of health facilities, goods, and services (CESCR, 2000). A reference to these five core obligations is a key to outlining the content of the right to health and understanding the extent of State obligations in the context of COVID-19. For instance, since COVID-19 has intensified the existing inequalities by adversely affecting vulnerable people while guaranteeing non-discriminatory access to healthcare, States must specially consider the needs of these people (Montel et al., 2020).

The CESCR also listed certain obligations of comparable priority, which include the duty to (i) ensure reproductive, maternal, and child healthcare; (ii) provide immunization against major infectious diseases; (iii) take steps for prevention, treatment, and control of epidemic and endemic diseases; (iv) offer education and access to information on health; and (v) deliver effective training for health personnel (CESCR, 2020). Even though the obligations of comparative priority are vague as to whether they constitute core obligations or remain subject to progressive realization and resource scarcity (Forman et al., 2016; Tasioulas, 2017), the list is still beneficial to identify further aspects of State obligations toward the right to health. Following the duty to prevent and control infectious diseases, States should take measures for providing COVID vaccination or adopt the test and trace policy if the vaccine is unavailable. To perform the duty to provide education and access to information on health, States must regularly report on their progress to combat COVID by publishing authentic data on indicators, such as death rate, while ensuring people’s access to such information (Montel et al., 2020).

During pandemics, these State obligations toward the right to health are more critical (Mesquita et al., 2021). To protect public health in exceptional circumstances that pose “a serious threat to the health of the population,” international law allows States to derogate from certain obligations regarding other associated rights (ICCPR, 1966, United Nations Economic and Social Council, 1985). However, restrictive measures to protect the health of the population (such as mask-wearing, social distancing, and travel restrictions during COVID outbreak) that limit individual rights and liberty must be lawful, necessary, and proportionate. As the *Siracusa Principles* direct, any such measure should be (i) prescribed by and enforced under

the law, (ii) responsive to a legitimate objective of public interest (such as prevention of disease or injury), (iii) deemed necessary to reach that aim, (iv) the last resort and least intrusive means available to achieve the objective, (v) based on scientific evidence and non-discriminatory in application, and (vi) of limited duration, deferential to human dignity and subject to scrutiny (United Nations Economic and Social Council, 1985; Human Rights Committee, 2001). Overall, even when States derogate from certain obligations even in a state of emergency, the limitation on rights must not disproportionately impact the marginalized people. Accordingly, “emergency declarations based on the COVID-19 outbreak should not be used as a basis to target particular groups, minorities, or individuals” (OHCHR, 2020).

Beyond the state-centric paradigm of obligations, under the ICESCR, States have bound themselves to international cooperation for realizing the right to health like other socioeconomic rights. As the CESCR comments that during emergencies, States have a separate and collective responsibility to cooperate in disaster relief and humanitarian assistance by paying special consideration to the needs of the disadvantaged people. Further, states bear a joint duty to address the challenges of the highly transmissible diseases that cross borders. Developed countries have a responsibility to help poor and developing States in this regard (CESCR, 2020). The International Health Relations (IHR) 2005 specifies this duty in the context of public health emergencies by imposing obligations to assist other states to prevent diseases. Thus, States should “detect, assess and respond to public health emergencies; develop, strengthen and maintain public health capacity; and mobilize financial resources” (WHO, 2005).

States' Failure to Uphold Vulnerable People's Right to Health During COVID-19

As the human rights impact of COVID is widespread, any analysis of corresponding States' responses is broad. Following the discussion on the vulnerable people's rights and corresponding state duties, for a structured analysis, this section focuses on three determinants to examine States' failure during the COVID outbreak. The first two relate to the States' national obligation to realize the right to available, accessible, adequate, and quality healthcare as well as the right to fulfil the underlying determinants of health. Moreover, the last relates to the States' international obligation to assist.

Availability, Accessibility, Acceptability, and Quality Healthcare

Many countries have been facing challenges in realizing the availability, accessibility, acceptability, and quality of healthcare regarding the right to health during COVID-19. Let alone poor counties, in countries such as the USA, the UK, Italy, and Spain, the unavailability of essential medical care including diagnostic testing, ventilators, oxygen, and personal protective equipment (PPE) is evident. While the

right to health requires non-discriminatory access to healthcare services and goods, discrimination in healthcare settings grossly deprived marginalized people. For instance, a survey found that governments in the USA, the UK, Canada, and Ireland failed to provide access to PPE in residential institutions for disabled children (Disability Rights International et al., 2020). Evidence demonstrates that Indigenous Australians were largely excluded from the planning and implementation of the rollout (The Guardian, 2021).

Fulfilling Underlying Determinants of the Right to Health

COVID has severely impacted people's right to housing, social security, employment, food, water, and sanitation, the fulfilment of which are otherwise integral to realizing the right to health. Governments' frequent failure to fulfil these determinants in the public health emergency measures resulted in negating the right to health during the pandemic while intensifying existing vulnerabilities. Even governments' support measures provided inadequate attention to the vulnerable people's right to the underlying determinants of the right to health. For instance, in Lebanon, the government's failed food assistance plan and delayed financial aid program could not provide sufficient benefits to poor families (Human Rights Watch, 2020b). Stimulus packages in France, Denmark, the UK, and India failed to explicitly refer to the rights of the vulnerable people (United Nations, 2020). Particularly, the Indian government's economic package failed to address the needs of the migrant workers and informal sector employees (Human Rights Watch, 2020c). The Nigerian Stimulus Bill provided support only to the formal sector employers although 80 percent of the country's workforce is in the informal sector (Human Rights Watch, 2020a).

States' International Obligation to Assist

Despite the recognition of States' international legal obligation to assist other states during public health emergencies, devastating public health impacts of COVID-19 question the efficacy mandates of state collaboration (Bump et al., 2021). Countries' political considerations sometimes override their obligations to realize public health by creating favorable conditions through international cooperation resulting in the negation of necessary healthcare services. For instance, international sanctions debarred the Iranian government to secure essential medical supplies and protective equipment like PPE, respirators, test kits, and pharmaceuticals during the COVID-19 crisis (Karimi & Turkamani, 2021). Indicating the perils of the vulnerable people, the Country Director of the Relief International stated "the impact of COVID 19 on Iran was particularly harsh, as the country's economy was already under the pressure of sanctions. . . . This directly impacted the socioeconomic well-being of millions of families living in Iran negatively – both the Afghan refugee population, but also the host community" (Relief International, 2021). Further, against clear guidelines to ensure universal and equitable access to COVID vaccinations, many countries

choose to prioritize their national or regional interests giving rise to vaccine nationalism (Zhou, 2022).

A Rights-Based Approach to Disaster Management During COVID

As disasters grossly threaten the protection of human rights, international law provides normative standards outlining people's rights and States' duties. Hence the *Sendai Framework for Disaster Reduction* stresses the significance of adopting disaster management plans that can protect and promote human rights. As article 19 (c) of the Framework states, "managing the risk of disasters is aimed at protecting persons and their property, health, livelihoods and productive assets, as well as cultural, and environmental assets while promoting and protecting all human rights. . . ." Unlike the traditional "charity" or "needs" framework, a rights-based disaster management plan thus places human rights at its center (Boesen & Martin, 2007). The efficacy of the disaster management plan depends on its inclusion of human rights as the key content (Rice et al., 2017).

Particularly, by addressing the vulnerability of the marginalized people, this approach imposes core obligations upon States to realize their right to health. Overall, this recognition of the right to health is the "beacon" for States' responses to the COVID crisis requiring them to "prevent, treatment, and control" threatening diseases. Further, the AAAQ model indicates the key elements of the right to guide appropriate state actions for ensuring available, accessible, acceptable, and quality healthcare, services, and goods. Given the States' failure to realize these components of the right to health of the vulnerable people, the adoption of this framework in any domestic disaster management plan on COVID would be beneficial. This is because, first, it provides an understanding as to the extent of protection of the right to health, and second, it evaluates States' present response and preparation to realize the right. Particularly, "it helps frame the analysis and debate about how the right to health is guaranteed in the context of COVID-19 and it shows the extent to which countries are prepared to address future crises" (Toebes, 2020).

Further, a rights-based approach to disaster response contains plans and policies that enshrine cross-cutting human rights principles of equality and non-discrimination, participation, accountability, and transparency. Equality and non-discrimination imply that "everyone is equal in dignity and rights." Participation means "active, free, and meaningful engagement" of all individuals including vulnerable communities such as victims of disasters, women, minorities, and rural people. Accountability denotes the presence of a system that protects and promotes human rights through monitoring, review, remedies, and action. Transparency requires information sharing particularly with the affected people to guarantee their active and meaningful participation in the decision-making process. While the recognition of human rights constitutes the core of the rights-based approach to disaster management, the principles supplement its effective operation. Significantly, "the principle of non-discrimination and equality constitutes the key principle of the rights-based approach to health being the basic pillar of international human

rights law as enshrined in every human rights instrument with a commitment that no one is left behind" (Mesquita et al., 2021).

Incorporation of these principles of the rights-based approach to disaster management into the COVID disaster management plan, particularly, the non-discrimination principle, is crucial when the vulnerable people suffer acute discrimination. The principle when applied to the rights-based approach to pro-vulnerable COVID-19 management policy requires States to (i) provide non-discriminatory access to healthcare to all people, (ii) ensure an adequate healthcare system to provide non-discriminatory treatment, (iii) guarantee that public health measures address special needs of specific groups of vulnerable people such as persons with disabilities, (iv) increase the availability of COVID related physical and mental health issues, (v) allow adequate testing and treatment for COVID-19, (vi) ensure that implementation of public health directives does not become counterproductive to exacerbate vulnerability, (vii) address and protect the needs of persons with substance dependence by providing access to healthcare and safe supply of substance, and (viii) ensure that health service providers are accessible (Manitoba Human Rights Commission, 2020). Thus, the incorporation of the non-discrimination principle of the rights-based approach specifies extensive States' obligations toward the vulnerable people's right to health during the pandemic.

Apart from the recognition of the right to health and inclusion of principles, a right-based disaster management policy also requires international assistance to realize the right in question (Rice et al., 2017). Adopting this approach to disaster management requires that plans, policies, and responses concerning international assistance comply with States' duties as outlined in international law. It empowers the community as individuals to develop the capacity to combat future challenges through collaborative engagement and can affirmatively contribute to societal needs (OHCHR, 2013). International law, however, being deeply consent-based faces the challenge of non-cooperation or even inaction due to States' self-centric strategic behavior as informed by the prioritization of national interests over the global good. A holistic approach recognizing the role of the non-consensual mechanisms as well, like non-state actors including NGOs, businesses, and adjudications, therefore, can help in mitigating missing inter-state consent. By creating awareness, setting agendas, providing technical aid, etc., these actors can mitigate coordination problems (Aaken, 2016).

Conclusion

Devastating impacts of COVID-19 pandemic have revealed that the vulnerability of the public health system is not confined to State borders. Rather than being state-centric, the vulnerability is victim-centric as the protection of the marginalized people's right to health remains at the edge in both developed and poor countries due to deep exclusion and discrimination. States' gross and continuing failure contradicts their commitment under international law that outlines the scope of the right, corresponding domestic obligations to *respect, protect, and fulfil* the core of the

right as well as the international obligation to assist. An understanding of COVID-19 as a disaster is beneficial in this context as while reflecting on the severity of the pandemic, it requires States to shift their attention to the protection of the right to health of the vulnerable. An effective and adequate COVID disaster management plan, therefore, should enshrine a rights-based approach. While adopting the approach, particularly an emphasis on the overriding human rights principle of non-discrimination is crucial in this unprecedented time to realize the right to health of all including the vulnerable people.

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Climate Change and Disaster Management in Bangladesh

131

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Contents

Introduction	1954
Climate Change and Disaster Management Laws and Policies in Bangladesh	1955
Climate Change	1955
Disaster Management	1962
Bangladesh's Approach to Disaster Risk Reduction and Climate Change Adaptation	1969
Institutional Linkage	1970
Policy Gaps	1971
Inadequate Knowledge Sharing	1971
Lack of Mass Awareness and Mainstreaming	1971
Conclusion	1972
References	1972

Abstract

Climate change is expected to increase the severity and frequency of natural catastrophes, increase floods, and significantly influence crop yields, infrastructure, displacement, and development prospects, causing human and economic losses. Adapting to projected changes could help lower the risk of both climate change and catastrophes. Both climate change adaptation (CCA) and disaster risk reduction (DRR) strive to control hydrometeorological risks by reducing community susceptibility, increasing their resilience, as well as minimizing the consequences of climate-related disasters and associated risks following proactive and long-term approaches to disaster management. The promotion of a DRR

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management system has the potential to significantly enhance adaption to the changing climate and vice versa. As a developing country, it is extremely important for Bangladesh to consider how to tackle climate change and disasters in the long term for human welfare and sustainable development. Bangladesh has separate climate change and disaster management systems, with minimal synergistic approach between the two. Over the time, the country has moved swiftly with its legislative responses to climate change and disaster, but when it comes to DRR and CCA integration, things are still in the early stages with a slew of obstacles to overcome. This chapter presents Bangladesh's current legal and policy responses to climate change and disaster management, emphasizing existing DRR and CCA strategies and the challenges that remain as well as solutions that can be used to address them.

Keywords

Climate change · Disaster management · Bangladesh · CCA · DRR · Integration · Legislations · Policies

Introduction

Due to high population density and constrain of natural resources, the South Asian countries are highly exposed and susceptible to climatic change and disaster risk (Eckstein et al., 2021; Sammonds et al., 2021). Bangladesh as a coastal state and mega-delta is in the greatest threat of changing climate and disaster risks ranking seventh out of ten in the list of “Long Term Climate Risk Index: The 10 Most Affected Countries from 2000 to 2019” (Eckstein et al., 2021). The country is disaster prone for its geographic location, climate change and disaster hotspot, population density, limited resources, and previous vulnerability (Sikder & Xiaoying, 2014). In recent decades, Bangladesh is facing number of climate-induced disasters and extreme weather occurrences including protracted floods, super cyclone, tsunami, and excessive rainfall (World Meteorological Organization [WMO], 2021) of which flood is common, severe, and of increased vulnerability by causing harm to food stock and livelihoods (Ahmed et al., 2015). Only in 2020, 5.4 million are victim of floods in Bangladesh placing it among the top five countries in terms of flood disaster victims in the world (Statista, 2021).

Bangladesh has tolerated disasters and shown a proclivity to handle them. The early norms to deal with disasters were to control disasters rather to manage. The controlling strategy proved an unsuccessful attempt in two floods in 1987 and 1988 and one super cyclone Gorky in 1991 (Nasreen, 2021). The traditional reactive strategy has long continued with post-disaster aid efforts and substandard infrastructure development. In Bangladesh, the idea of disaster risk reduction (DRR) resulted in a shift from the post-disaster aid to pre-catastrophe management in order to mitigate disaster risks (Nasreen, 2021). Along with the latest global policy, the Sendai Framework for Disaster Risk Reduction (SFDRR) (2015–2030), preparedness, mitigation, response, and recovery

have regarded as successful elements of DRR mechanisms in disaster-prone countries including Bangladesh as well.

Bangladesh adopted legislations, policies, and plans separately for climate change as well as disaster management. The development of climate change policies and disaster management regulatory arrangement has been going under two distinct ministries in Bangladesh with limited collaboration (Haque et al., 2019). Bangladesh's legislative measures to deal with disasters also include climate change-induced disasters. Nevertheless, it has done a little for managing slow-onset climate change events or extreme weather events including global warming, melting of the glaciers in the Himalayas, sea level rising in the Indian Ocean, tropical cyclones and associated storms formed in the Bay of Bengal (Awal, 2015), and salinity intrusion in soil and water until recently (Human Rights Council, 2018).

The secretariat of the United Nations International Strategy for Disaster Reduction (UNISDR) outlined the key perspectives and approaches of DRR that might support adaptation strategies of climate change (Islam & Sumon, 2013). Alternatively, climate adaptation strategies could enhance DRR and in some cases prevent climatic events or extreme weather events. Where possible these two should be coordinated for a better DRR system (Djalante & Thomalla, 2012). Bangladesh has separate ministries for CCA and DRR, but their collaboration needs improvement (Ministry of Disaster Management and Relief [MoDMR], 2020).

This chapter critically examines Bangladesh's legislative framework, policies, and plans for climate change and disaster management, with a particular emphasis on DRR and CCA and their potential integration and governance. It concludes with several suggestions for integrating CCA and DRR. This chapter is structured into four sections: (1) Introduction, (2) Climate Change and Disaster Management Laws and Policies in Bangladesh, (3) Bangladesh's Approach to Disaster Risk Reduction and Climate Change Adaptation, and (4) Conclusion.

Climate Change and Disaster Management Laws and Policies in Bangladesh

Climate Change

Given the severity of climatic change and the threats it presents to Bangladesh, governments have implemented extensive legislative actions to address these long-term issues. The country's supreme law, however tacitly, addressed the subject of climate change. As part of the 15th constitutional amendment, Bangladesh inserted Article 18A which mandates that "the state shall endeavour to protect and improve the environment and to preserve and safeguard the natural resources, bio-diversity, wetlands, forests and wild life for the present and future citizens" (The Constitution (Fifteenth Amendment) Act, 2011). In addition, Bangladesh has already focused on addressing climate change concerns by passing legislation, policies (as shown in Fig. 1), and funding substantially in adaptation measures, setting specific climate change objectives as well as strategies.

Climate Change Laws and Policy Initiatives	
2002	National Strategy for Economic Growth, Poverty Reduction and Social Development
2005	National Adaptation Programme of Action (1 st NAPA)
2008	Bangladesh Climate Change Strategy and Action Plan (BCCSAP)
2009	Updated NAPA
2009	Updated BCCSAP
2010	The Climate Change Trust Act 2010
2013	Bangladesh Climate Change and Gender Action Plan
2015	Energy Efficiency and Conservation Master Plan up to 2030
2015	National Social Security Strategy (NSSS) of Bangladesh
2018	Delta Plan 2100
2018	Renewable Energy Policy
2019	National Action Plan for Clean Cooking, 2020-2030
2020	8th Five Year Plans (2020-2025)
2021	Mujib Climate Prosperity Plan up to 2030
2022	National Adaptation Plan of Bangladesh (Zero Draft)

Fig. 1 Year-wise climate change laws and policy initiatives. Note. Prepared by authors after studying climate change laws and policies adopted from 2002 to 2022

National Adaptation Programme of Action (NAPA)

National Adaptation Programme of Action (NAPA) is the country's early legal initiative on climate change at the domestic level. In accordance with the decision of the UNFCCC's COP7, the Ministry of Environment and Forests (MoEF) (currently, the Ministry of Environment, Forests, and Climate Change) formulated the National Adaptation Programme of Action (NAPA) in 2005, which was updated in 2009.

The purpose of Bangladesh's NAPA formulation was to provide a framework that guides the coordination as well as execution of adaptation measures through a participative approach and the promotion of synergies with relevant initiatives. NAPA 2009 depicted both the current effect of climatic variability and extreme occurrences, as well as the possible future susceptibility. In order to prioritize adaptation requirements and efforts, poverty reduction and livelihood security with a gender viewpoint have been selected as the guiding principle (Ministry of Environment and Forests [MoEF], 2009b). Furthermore, NAPA 2009 specified priority projects for development and execution in the near and medium term, including financial needs assessment; mainstreaming climate change into other sectors; improving the resilience of urban infrastructure and industry; investigating insurance

and other emergency preparedness solutions; incorporating climate change into national, sectoral, as well as spatial development plans; and land zoning design for climate change adaptation (MoEF, 2009b).

Bangladesh Climate Change Strategy and Action Plan (BCCSAP)

The Bangladesh Climate Change Strategy and Action Plan (BCCSAP) is currently the main national blueprint for addressing climate change and increasing capacity as well as resilience to its effects. It is a “knowledge strategy” (Ministry of Environment and Forests [MoEF], 2009a) based on NAPA (2005 and 2009), issued by the Ministry of Environment and Forests. Within 6 key areas, it lays out 44 programs that Bangladesh would pursue in the long, medium, and short term (MoEF, 2009a):

- (a) Food security, social protection, and health.
- (b) Comprehensive disaster management.
- (c) Infrastructure.
- (d) Research and knowledge management.
- (e) Mitigation and low carbon development.
- (f) Capacity building and institutional strengthening.

The government of Bangladesh has provided institutional arrangements to respond promptly to the climate change crisis, as well as to coordinate and promote national climate actions (MoEF, 2009a). The organizational structure for the climate change action plan is visualized in Fig. 2.

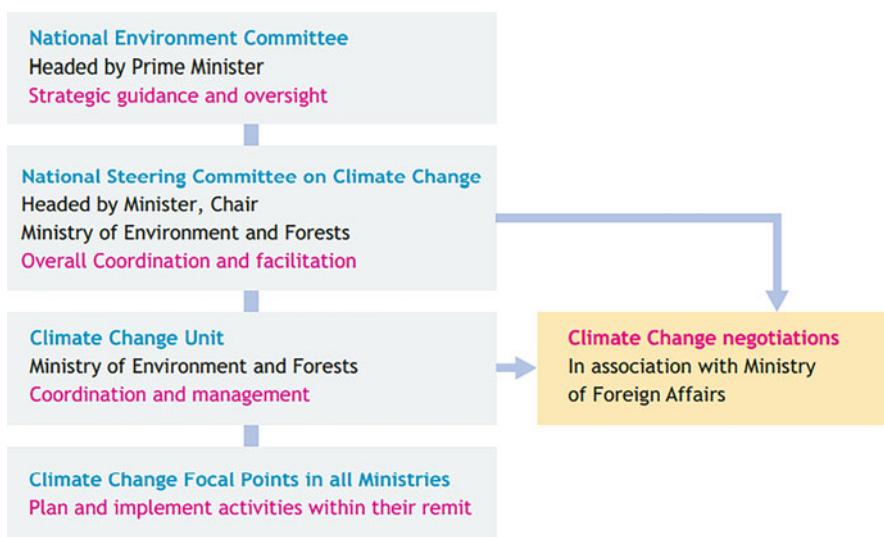


Fig. 2 Organizational plan for the climate change action plan. Note. From “Bangladesh Climate Change Strategy and Action Plan,” by Ministry of Environment and Forests (MoEF), Government of the People’s Republic of Bangladesh, 2009 <http://nda.erd.gov.bd/files/1/Publications/CC%20Policy%20Documents/BCCSAP2009.pdf>

The BCCSAP is being considered as part of the country's overall planning process. It was a 10-year initiative (2009–2018) that aimed to increase the country's ability and resilience to climate change issues. Although it is explicitly mentioned in the BCCSAP that it is a working document and that adjustments would be made from time to time as necessary by the corresponding sectoral agency (MoEF, 2009a), it has not been updated since the 2009 edition.

The Climate Change Trust Fund Act 2010

The government of Bangladesh (GoB) had considerable budgetary challenges in carrying out BCCSAP 2009. Rather than relying on the international community for funding, Bangladesh opted to take action with its own finances. This resulted in the establishment of two independent financial vehicles: the Bangladesh Climate Change Trust Fund (BCCTF) and the Bangladesh Climate Change Resilience Fund (BCCRF) (Rahman & Huang, 2019). The former is wholly funded by the government's own budget, whereas the BCCRF is made up of funding promised and contributed by development partners. The BCCRF had completed all of its projects and ceased operations in 2017 ("Global Climate Change Alliance Plus [GCCA+]," n.d.).

The Climate Change Trust Fund Act 2010 (CCTFA) was enacted to ensure that the benefits of BCCTF-financed projects reach the intended beneficiaries. It planned for establishing an initial budget of USD 100 million each year from 2009 to 2011. As per Sec. 10 (b) of the Act, 66% of its budget would be spent on implementing projects, which were given preference in the BCCSAP (The Climate Change Trust Fund Act [CCTFA], 2010). The remaining budget would be kept as a reserve for emergency. The interest earned on the deposit would be used to fund project implementation. Gradually, it grew into a fund of around USD 450 million, which financed 789 projects through May 2021 (Irfanullah, 2021b). The fund's overall direction and administration is overseen by a board of trustees, which is chaired by the minister of the MoEF, as stipulated in Sec. 9 (CCTFA, 2010). The majority of BCCTF-funded projects concentrated on the construction of physical infrastructure; however, the local residents whose lives were significantly impacted were not given a role in the planning or execution of the projects (Khan, 2022). In addition, this fund is experiencing a number of issues, including a decrease in the amount of money allotted to it, a lack of high-quality submissions, political clout in decision-making, as well as capacity restrictions (Rahman & Huang, 2019).

Bangladesh Climate Change and Gender Action Plan, 2013

Bangladesh Climate Change and Gender Action Plan (ccGAP) is one of the policy papers which has been prepared in accordance with the country's desire to empower, respond to the needs of women, and promote gender equality in the context of climate change (Ministry of Environment and Forests [MoEF], 2013). The transformational aspect of gender interventions is the core idea of the ccGAP. It has incorporated gender concerns into four of the BCCSAP's six core pillars (MoEF, 2013). This plan requires gender-sensitive evaluations and gender-responsive initiatives when addressing climate change since its objective is "to mainstream gender

concerns into climate change-related policies, strategies and interventions ensuring access to, participation in, contributions towards and benefits for the diverse group of stakeholders for the sustainable and equitable development of Bangladesh" (MoEF, 2013).

The Bangladesh Delta Plan 2100, 2018

Adopted in 2018, the Bangladesh Delta Plan (BDP) 2100 outlines three higher-level national targets, including the eradication of extreme poverty by the year 2030, reaching the upper middle-income level by the same year, and turning Bangladesh into a prosperous country beyond 2041 (General Economics Division [GED], 2018). Six specific goals are also included in the BDP 2100 to assist in achieving those higher-level goals. Even though each of the six specific goals can be either directly or indirectly tied to climate change, goal 1 of the BDP clearly refers to climate change, which is to "ensure safety from floods and climate change related disasters" (GED, 2018). The government intends to implement this 100-year plan in three phases: 2030, 2050, and 2100. In order to achieve the objectives, the BDP 2100 has identified six hotspots relying on hydrological conditions: Barind and drought-prone areas, Chattogram Hill Tracts, coastal zones, Haor and flash flood areas, river systems and estuaries, and urban areas (GED, 2018).

Nationally Determined Contribution (NDC)

Bangladesh has so far made three nationally determined contribution (NDC) submissions in order to meet its commitments under international climate agreements. The most recent one was in 2021, where Bangladesh prepared a 10-year implementation plan for the NDC spanning 2016–2025 to reduce growing GHG emissions and adapt to climate change (Ministry of Environment and Forests and Climate Change [MoEFCC], 2021). Acknowledging Bangladesh being a climate-vulnerable country, the present NDC includes adaptation component that summarizes past efforts and future goals. Furthermore, it pledged under the NDC to cut GHG emissions in three main sectors, namely, energy, industry, as well as transport, by 5% below the "business-as-usual" (BAU) emission level by 2030 or by 15% below the BAU emission level by 2030 if developed nations provide sufficient and suitable assistance (MoEFCC, 2021).

Bangladesh Country Investment Plan for Environment, Forestry, and Climate Change (CIP-EFCC) 2016–2021

Bangladesh Country Investment Plan for Environment, Forestry, and Climate Change (CIP-EFCC) 2016–2021, which was initiated in 2017, provided a strategic approach for planning and coordinating national as well as international investments in Bangladesh's environment, forestry, and climate change sectors. There are 14 coherent, coordinated investment programs identified under four pillars: (1) sustainable development and natural resources management; (2) reduction and control of environmental pollution; (3) adaptation, mitigation, and resilience to climate change; and (4) environmental governance, human, gender, and institutional capacity development (Ministry of Environment and Forest [MoEF], 2017).

The Mujib Climate Prosperity Plan 2021

The Mujib Climate Prosperity Plan (MCPP) is a five-themed approach that investigates the prospects and hurdles of socioeconomic growth, climate resiliency, and green opportunities. It alters Bangladesh's trajectory to resilience from vulnerability and eventually prosperity. BDP2100 is a key strategy in the Mujib Climate Prosperity Plan to expedite the process of coping with the effects of climate change (Irfanullah, 2021a). The MCPP acts as a link between different policies that are already in place to facilitate their acceleration and supplementation rather than replacing them. A few examples of policies that are now in effect are as follows: NAPA 2009; BCCSAP 3009; CCTF 2010; BDP 2100; 8th Five-Year Plans; Perspective Plan 2021–2041; Forest Investment Plan 2017–2022; Climate Resilience Program; Climate Fiscal Framework, for climate fiscal policy-making; and Country Investment Plan for Environment, Forestry, and Climate Change 2020–2025. However, compared to other policies, MCPP does not require the establishment of any operational institutions to oversee its execution.

National Adaptation Plan of Bangladesh 2022 (Zero Draft)

The development of a national adaptation plan (NAP) became an imperative necessity for Bangladesh to ensure a clear path forward for implementing BCCSAP. The zero draft of the NAP prepared by the MoEFCC was released for public comment on March 3, 2022. As stated in the zero draft, the vision of NAP is “reducing climate risks through effective adaptation strategies for fostering a resilient society, ecosystem and sustainable economic growth” (Ministry of Environment and Forests and Climate Change [MoEFCC], 2022). The NAP established six goals to achieve its vision:

- (a) Ensuring protection against climate change variability and induced natural disasters.
- (b) Developing climate resilient as well as smart agriculture.
- (c) Developing climate resilient infrastructures and smart cities.
- (d) Promoting nature-based solutions for communities' well-being and biodiversity conservation.
- (e) Integrating CCA into the planning process for good governance.
- (f) Ensuring transformative capacity building for adaptation.

To realize NAP's goals and vision, 22 adaption strategic actions and 52 programs are selected. Those adaptation strategies are based on nine guiding principles: (1) prioritization of crosscutting sectors; (2) country-driven, participatory, and gender inclusiveness; (3) top-down and bottom-up approaches; (4) promotion of horizontal and vertical integration; (5) synergy with international environmental agreements; (6) alignment of goals and objectives with national aspects; (7) inclusion of important proposals in NAP; (8) investment in adaptation from private sectors; and (9) financial integrity through monitoring, evaluation, and reviewing (MoEFCC, 2022).

The National Adaptation Plan principally concentrates on four priority theme areas such as agriculture and livelihood security, water resources, urban area, and drought and coastal zone and their subsectors. Institutional stewardship is critical to the successful execution of the National Adaptation Plan. Acknowledging the remaining inefficiency in BCCSAP, a multilevel institutional arrangement is proposed in the zero draft of the NAP comprising National Environment and Climate Change Council, headed by the prime minister; National Steering and Coordination Committee chaired by the minister, MoEFCC; National Executive Committee, chaired by the secretary, MoEFCC; Local Executive Committee, chaired by the district commissioner; and the technical Advisory Committee and Climate Change Wing of MoEFCC. Recognizing the importance of a legally enforceable instrument, the National Adaptation Plan (NAP) emphasizes several issues such as the drafting of the National Climate Change Act and its guidelines, revision of the Climate Change Trust Fund Act (2010) and rules, establishment of Local Adaptation Program of Action (LAPA), the Youth-Led Adaptation Plan (YLAP), and the Chattogram Hill Tracts Climate Action Plan (CHT-CAP) (MoEFCC, 2022).

Eighth Five-Year Plan (2020–2025)

With the goal of attaining sustainable development, the eighth Five-Year Plan (2020–2025) is organized around six interrelated key themes, the fourth of which is directly related to climate change and is titled “a sustainable development pathway that is resilient to disaster and climate change; entails sustainable use of natural resources; and successfully manages the inevitable urbanization transition” (GED, 2020b). In order to achieve the goal, the government intends to implement a broad range of environmental fiscal reforms, in addition to administrative reforms, to improve environmental performance. Such reforms include the following specific references to the climate change issue: (a) integration of climate change issues in planning and budgeting, (b) improving capacity of and increasing resources for the MoEFCC, (c) cutting fuel subsidies and adopting a green fossil fuel tax, and (d) coordination of the BCCSAP, NAP, CIP, and NDC with BDP 2100 (GED, 2020b).

Perspective Plan (2021–2041)

The recently adopted Perspective Plan (2021–2041) (PP2041) aims to build a robust environment and climate change funding strategy, focusing on different financing opportunities between the private and public sectors. The PP2041 environmental management strategy focuses on integrating environment and climate change into development plans (GED, 2020a). To pursue green growth strategy, the PP2041 intends to implement the following policies, initiatives, and organizational changes: (a) incorporating the environmental cost into the macroeconomic scheme, (b) putting the delta plan into action to boost climate resilience and minimize vulnerability, (c) reducing the pollution of water and air, (d) removing subsidies for fuel,

(e) imposing green tax on the consumption of fossil fuel, (f) levying taxes on the emissions produced by the industries, (g) preventing surface water contamination, and (h) study of geospatial specifics to make evidence-based decision (GED, 2020a).

Disaster Management

Disaster Risk Management Laws and Policies

Bangladesh has designed its comprehensive disaster management strategies based on the differences in catastrophe origin and impacts. Its present focus is on disaster risk reduction and mitigation (Mall et al., 2019). Despite of having a long history of disaster management, Bangladesh waited nearly 41 years since its independence to establish the state's legislative obligation to disaster management (Disaster Management Act [DMA], 2012). Table 1 depicts the country's disaster management legislations and policies along with international commitments in chronological order.

Table 1 Year-wise national and international disaster laws and policies adopted by Bangladesh

Laws and policies on disaster management	
1997	Standing Orders on Disaster
2005	United Nations International Strategy for Disaster Reduction: The Hyogo Framework for Action (2005–2015) (This framework is updated to Sendai Framework)
2006	SAARC Framework for Action (SFA) 2006–2020
2010	Revised Standing Orders on Disaster
2010	National Plan for Disaster Management 2010–2015
2011	Cyclone Shelter Construction, Maintenance, and Management Policy
2012	Disaster Management Act
2015	Sustainable Development Goals (SDGs) (2015–2030)
2015	Sendai Framework for Disaster Risk Reduction (SFDRR) (2015–2030)
2015	Disaster Management Policy
2015	National Debris Management Guideline
2016	National Plan for Disaster Management 2016–2020
2016	Policy Guideline of Management of Dead after Disasters
2019	Revised Standing Orders on Disaster
2019	National Strategy on the Management of Disaster and Climate Induced Internal Displacement
2019	Revised Standing Orders on Disaster
2020	National Plan for Disaster Management 2021–2025
2020	8th Five-Year Plan

Note. Prepared by authors after studying disaster-related laws and policies adopted from 1997 to 2020

The Standing Orders on Disaster (SOD)

The Standing Orders on Disaster (SOD) were the first policy interventions on disaster management, originally released in Bangla in 1997. Following then, the government updated it twice, once in 2010 and again in 2019, to reflect changing conditions. As an all-inclusive disaster management template, SOD is widely utilized as a pivotal document by all levels of government for disaster intervention and management process (Shammin et al., 2022). With each SOD update, the inclusion of new stakeholders expanded, and their duties, responsibilities, and tasks were defined in detail (Quader, 2020). In terms of comprehensively addressing the duties of all those stakeholders in each of the phases, the SOD 2019 was much ahead of the earlier ones. Furthermore, it has considered and adhered with the obligations promised in the international commitments such as Sendai Framework for Disaster Risk Reduction, Sustainable Development Goals (SDGs), and other relevant international agreements. Figure 3 illustrates key aspects of the three SOD adopted in Bangladesh to support disaster management and emergency response.

Cyclone Shelter Construction, Maintenance, and Management Policy 2011

The Ministry of Disaster Management and Relief (MoDMR) developed the Cyclone Shelter Construction, Maintenance, and Management Policy (CSCMMP) in 2011 to ensure effective usage of such cyclone shelters, which have previously been built, are being built, or will be built in coastal regions. The policy specified three types of cyclone shelters: college, higher secondary school/Madrasa cum multipurpose shelter, primary school cum multipurpose shelter, and multipurpose shelter (Ministry of Disaster Management and Relief [MoDMR], 2011). Under the CSCMMP, three management forums were established, each with its own set of duties for managing cyclone shelters, including local beneficiary communities, organizations, and the appropriate management committee (MoDMR, 2011). One of the most significant features of the CSCMMP is that it identified the necessary amenities that must be provided in the cyclone shelter, such as adequate light, air, water, food, and sanitation. However, prior research findings on disaster management demonstrated that such services in the shelter were in poor condition (Jahan, 2020).

Disaster Management Act 2012

The preexisting international laws on disaster risk reduction were a significant driving force for the enactment of a legislation on disaster management in Bangladesh at the national level. The Disaster Management Act (DMA) was enacted in 2012 as a primary legislative instrument to better organize, target, and reinforce disaster management efforts, as well as to provide guidelines for effective disaster management infrastructure (Mannan et al., 2021). This legislation embraced an all-hazard, all-risk, and all-sector course of action to disaster management, emphasizing risk reduction as a major aspect of disaster management alongside emergency response management, while also promoting sustainable development (Quader, 2020). According to Sec. 21, the Act assigned statutory responsibilities on minis-

SOD 1997	<ul style="list-style-type: none"> First disaster management policy intervention focused on conventional relief Assigned tasks and responsibilities for disaster management at every level to relevant bodies Outlined disaster management tasks based on different phases such as Normal Times, Alert and Warning, Disaster and Recovery Phases. Inclusion of limited number of stakeholders Priorities for policymaking centered on prevention, mitigation, preparedness, as well as catastrophe response.
SOD 2010	<ul style="list-style-type: none"> Transition to response to disaster risk reduction (DRR) from traditional relief response Addressed climate change challenges Inclusion of additional relevant stakeholders Outlined disaster management tasks based on two main categories: Risk Reduction and Emergency Response Emergency Response based on different stages such as Normal Times, Alert and Warning, Disaster and Rehabilitation Stage Considered issues concerning children, women, disabled, and the elderly Disaster Incident Management System with Multi-Agency Participation Outlined the Responsibilities of the Local Government Elected Representatives, Field Level Officials, and Humanitarian Organizations
SOD 2019	<ul style="list-style-type: none"> Added more types of catastrophe to the list while defining disaster Defined DRR Provided a set of DRM Guidelines to be prepared/updated Inclusion of a greater number of stakeholders Outlined disaster management tasks based on two main categories: Risk Reduction and Emergency Response Emergency Response based on different stages such as response preparedness stage, Alert/warning Stage, Disaster Stage, Rehabilitation, Reconstruction and Recovery Stage Provided Gender Responsive' Guideline for Disaster Management with a focus on Gender Sensitive Coordination, Gender Equality-Based Participation, Gender Transformational Initiatives, 'Gender Responsiveness' at Various Levels Taken into account contemporary international development on disaster such as SDGs, Sendai Framework

Fig. 3 Features of the SOD of 1997, 2010, and 2019. Note. Authors prepared the figure after studying SOD of 1997, 2010, and 2019. From “Standing Orders on Disaster,” by Ministry of Food and Disaster Management, Disaster Management & Relief Division, 2010 <http://www.nahab.net/wp-content/uploads/2018/03/SOD-.pdf>; “Standing Orders on Disaster,” by Ministry of Disaster Management and Relief, 2019 https://modmr.portal.gov.bd/sites/default/files/files/modmr.portal.gov.bd/policies/7a9f5844_76c0_46f6_9d8a_5e176d2510b9/SOD%202019%20_English_FINAL.pdf

tries, divisions, committees, and other organization for disaster management that were set out in the SOD. Several key provisions of this legislation include the president's authority to declare a distress zone and help and support for seniors, children, women, and people with disabilities, as well as the power for the requisition assets, such as service, houses, transport, or any other facilities identified as

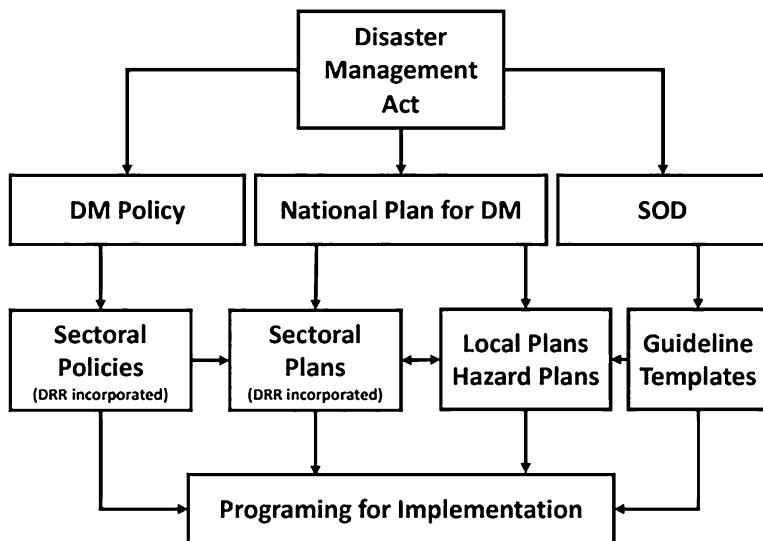


Fig. 4 Regulatory framework for disaster management in Bangladesh. Note. From “Bangladesh Disaster Management Reference Handbook,” by Center for Excellence in Disaster Management and Humanitarian Assistance, 2020 https://reliefweb.int/sites/reliefweb.int/files/resources/disaster-mgmt-ref-hdbk-bangladesh_1.pdf

emergency shelters (Disaster Management Act [DMA], 2012). The regulatory framework for disaster management in Bangladesh is visualized in Fig. 4.

Two distinct funds were created to carry out the Disaster Management Act's objectives: the National Disaster Management Fund and the District Disaster Management Fund (DMA, 2012). The Disaster Management (Fund Management) Rules 2021, adopted in accordance with the provisions of Sec. 32 of the DMA, is a significant recent addition to the instruments of disaster management policy governing the execution of such funds. If effectively implemented, it could alleviate several financial issues, such as contribution from individual people or agencies (Mannan et al., 2021).

To promote efficient planning as well as coordination of DRR and emergency response management, a set of interconnected organizations has been formed both at local and national levels (Quader, 2020). The Ministry of Disaster Management and Relief (MoDMR) was in charge of interministerial planning, coordination, as well as disaster response at the national level. Additionally, the government established a national council under Sec. 4 of the DMA and several disaster preparation committees at the union (local council), upazila (subdistrict), district, and national levels. As per Sec. 6 of the Act, the national council is entrusted with issuing required directives or consulting with relevant authorities and individuals in order to organize workshops and seminars to raise awareness on all pertinent disaster-related topics, operations, instructions, programs, regulations, rules, and policies.

Disaster Management Policy 2015

In 2015, the National Disaster Management Policy was devised in accordance with Sec. 19 of the DMA of 2012 to develop a new perspective on DRR as well as emergency management.

The policy provided a strategic framework for disaster management in Bangladesh and specified the country's national disaster management principles. Four principles guided the policy: comprehensive disaster management, public participation in disaster risk management, an emphasis on adaptation, and finally, the collection, sharing, and promotion of successful catastrophe efforts. The aim of this strategy is to reduce the risk of natural, environmental, and man-made disasters to levels that are humane and acceptable for people, particularly those who are disadvantaged and poor, and to create competent and effective emergency response systems to cope with large-scale disasters (Disaster Management Policy [DMP], 2015). In order to attain that aim, the policy devised hazard-specific strategies based on evaluations of Bangladesh's main catastrophe threats (DMP, 2015). It covers over 16 different kinds of catastrophes and presents tactics for each one in two phases: risk reduction and emergency response.

National Plan for Disaster Management 2021–2025

The National Plan for Disaster Management (NPDM) 2021–2025 is being regarded as the government of Bangladesh's "white paper" on disaster and related occurrence management. The NPDM has been in existence for 3 consecutive years 2010–2015, 2016–2020, and now 2021–2025. The first one, which ran from 2010 to 2015, was a result of the Hyogo Framework for Action (HFA) and the South Asian regional cooperation attempts (Mannan et al., 2021). The second NPDM focused on resilience, whereas the most recent one included a wide range of disaster management concerns. Natural and man-made hazards were included in the plan for the first time. It emphasized the need for national policies and programs to address increasing threats including climate change, drought, and desertification. An "all-hazard" or "multi-hazard" approach is used in this plan, which links hazard-specific actions to higher-level priority action plans (MoDMR, 2020). Furthermore, it is guided by the country's major strategic initiatives, such as Vision 2041, the Delta Plan 2100, and the eighth Five-Year Plan. The plan included four priority measures based on the state's circumstances and contemporaneous global initiatives. The new NPDM has many noteworthy features, including social inclusion as a foundational approach; a priority-level action plan; synergies between DRR and CCA; and a connection between DRR and sustainable development (Shammin et al., 2022).

National Strategy on the Management of Disaster and Climate-Induced Internal Displacement 2019

The government of Bangladesh has adopted National Strategy on the Management of Disaster and Climate-Induced Internal Displacement (NSMDCIID) with a particular emphasis on the people internally displaced as a result of disaster and climate threats. The plan used a rights-based approach, establishing a National Task Force on

Displacement, which would serve as the supreme decision-making authority for internal displacement caused by disasters as well as climatic threats (Refugee and Migratory Movements Research Unit [RMMRU], 2020). NSMDCIID has established a displacement management framework in accordance with the International Organization for Migration's migration management cycle in order to determine suitable interventions at various stages of displacement (RMMRU, 2020). It outlined four strategic responses including putting an end to displacement, relocation or resettlement, humanitarian relief and rights-based shelter and evacuation administration, and viable solution to displacement (RMMRU, 2020).

Institutional Arrangement for Disaster Management

The Ministry of Disaster Management and Relief is tasked with the primary responsibility for disaster risk management. This ministry is in charge of the development of policies, regulations, and legislation as well as the execution of DRM programs, including the monitoring and evaluation of their effectiveness (Ministry of Disaster Management and Relief [MoDMR], 2019). Table 2 lists the responsibilities of local and national DRM committees.

Table 2 Institutional committees and their responsibilities for DRM in Bangladesh

	Responsible bodies	Head	Key responsibility
National-level bodies	National Disaster Management Council (NDMC)	Prime Minister	Providing guidance on developing and reviewing disaster management policies and plans
	Inter-Ministerial Disaster Management Coordination Committee (IMDMCC)	Minister, Ministry of Disaster Management and Relief (MoDMR)	Implementation of NDMC/Government disaster management policies
	National Disaster Management Advisory Committee (NDMAC)	Chairman of Standing Committee, MoDMR	Recommend to the MoDMR on DRR, emergency preparedness, and humanitarian aid initiatives
	Earthquake Preparedness and Awareness Building Committee (EPABC)	Minister, MoDMR	Reviewing earthquake preparedness, awareness initiatives, as well as providing recommendations to appropriate bodies
	Chemical Disaster Management and Awareness Raising Committee	Secretary, Ministry of Industries	Reviewing existing chemical preparedness and awareness programs and providing recommendations for improvement
	National Platform for Disaster Risk Reduction (NPDRR)	Secretary, MoDMR	Coordinate among stakeholders to reduce catastrophe risk

(continued)

Table 2 (continued)

	Responsible bodies	Head	Key responsibility
	National Disaster Response Coordination Group (NDRCG)	Minister, MoDMR	Evaluating earthquakes and other mega-catastrophes to improve emergency response as well as methods and processes of early recovery
	Cyclone Preparedness Programme Policy Committee (CPPPC)	Minister, MoDMR	Developing strategic plan for the Cyclone Preparedness Programme (CPP)
	Cyclone Preparedness Programme Implementation Board (CPPIB)	Secretary, MoDMR	Providing suggestions for the CPP budget, human resource organization, and technical content
	Committee for Speedy Dissemination of Special Weather Bulletin/ Disaster Warning Message and Determining Strategy	Director General (DG), Department of Disaster Management (DDM)	Improving predictions and alerts for floods, landslides, flash floods, thunderstorms, precipitation, cold waves, etc.
	Focal Point Operational Coordination Group (FPOCG) Related Committee	DG, DDM	Recommending adequate coordination of operations of disaster management committees at national and local levels
	NGO Coordination Committee for Disaster Management	Secretary, MoDMR	Coordinating governmental and nongovernmental catastrophe preparedness, response, humanitarian relief, and recovery efforts
	Disaster Management Training and Mass Awareness Taskforce	DG, DDM	Guiding the formulation of disaster risk management training strategies and modules
	Fire Risk Management Committee	DG, DDM	Reviewing fire prevention and disaster awareness programs and providing suggestions to relevant agency
	Committee for Disaster Damage and Needs Assessment	DG, DDM	Coordinating all catastrophe damage and need assessments
	Forecast-Based Financing/ Action (FbF/A) Taskforce	Additional secretary, MoDMR	Assisting preparation of forecasts relying on early action methods by analyzing catastrophe level, trigger, and effect and coordinating with stakeholders

(continued)

Table 2 (continued)

	Responsible bodies	Head	Key responsibility
Local-level bodies	City Corporation Disaster Management Committee	Mayor	Preparation of contingency plans and conduct drills/ simulations for earthquakes, fires, chemical spills, building collapses, urban flooding, and waterlogging
	Divisional Disaster Management Committee	Divisional commissioner	Assisting the DDMC in formulating earthquake, fire, flood, and cyclone plans
	District Disaster Management Committee (DDMC)	Deputy commissioner	Preparation of comprehensive risk reduction plans and their implementation at the district level
	Upazila Disaster Management Committee	Chairperson, Upazila Parishad	Ensuring development and implementation of the union and upazila disaster risk-inclusive development plans
	Municipal Disaster Management Committee	Mayor	Undertaking pre-disaster preparedness, reviewing the status of DRR action plans with all sectors involved
	Union Disaster Management Committee	Chairperson and member of reserved women seat by rotation	Preparing action plans for reducing risk and increasing involvement of at-risk populations

Note. Adapted from “Standing Orders on Disaster,” by Ministry of Disaster Management and relief (MoDMR) Government of the People’s Republic of Bangladesh, 2019 https://modmr.portal.gov.bd/sites/default/files/files/modmr.portal.gov.bd/policies/7a9f5844_76c0_46f6_9d8a_5e176d2510b9/SOD%202019%20_English_FINAL.pdf

In reducing catastrophes and tackling the climate crisis, the government has shown a willingness to link climate change adaptation and disaster risk reduction (Nasreen, 2021). The following portion of the chapter discusses how Bangladesh has approached CCA and DRR, as well as the remaining barriers to integrating the two.

Bangladesh’s Approach to Disaster Risk Reduction and Climate Change Adaptation

Existing scholarships emphasized the need to integrate DRR and CCA to maximize resource efficiency and reduce duplication (Islam et al., 2020; Begum et al., 2014; Tearfund, 2008). Contemporary international agreements such as Kyoto

Protocol, the 2015 adoption of the Sendai Framework for Disaster Risk Reduction, and the Paris Agreement on climate change mandate increased coordination in climate and disaster risk reduction approaches to reduce vulnerability as well as enhance resilience (OECD, 2020; Intergovernmental Panel on Climate Change [IPCC], 2012). In most countries, however, climate change adaptation and disaster risk reduction are handled by different institutions and stakeholders resulting in overlapping and gaps in approaches and mechanisms (OECD, 2020). This is also true in Bangladesh.

Previously, Bangladesh has distinguished itself by being one of the first to design and adopt the National Adaptation Programme of Action (NAPA). Despite its widespread recognition, the NAPA has been criticized for its solitary adaptation approach. Presently, the Bangladesh Climate Change Strategy and Action Plan (BCCSAP), the Bangladesh Climate Change Trust Fund, and the NDC, 2016–2025, are the main initiatives for addressing CCA at the national level. Currently, the government of Bangladesh is on the cusp of adopting the NAP and has already released the zero draft. A formal institutional framework for implementing adaptation measures is recommended in the zero draft, and perhaps the final version will be even more explicit. Meanwhile, the Standing Orders on Disaster, the Disaster Management Act, the Disaster Management Policy, and the NPDM 2021–2025 are among the plans as well as policies in place to promote DRR. Bangladesh's progress on both frontier is promising in and of itself; nevertheless, when it comes to integration between the two, the country is confronted with a number of challenges:

Institutional Linkage

DRR and CCA have direct link with some aspects such as prevention strategies, building resilience, nonstructural measures, organization (both national and international), experts, agencies, and so on (Begum et al., 2014). It is not essential to collaborate on the dissimilar field of DRR and CCA; however collaboration of CCA and DRR might be done on particular disasters like floods and cyclones for effective resilience (Clegg et al., 2019). Coordination among institutions who govern DRR and CCA is essential to get a successful step forward to linking these two (Leitner et al., 2020). Despite this, their link is essential to demark who does what functions; understanding of their functions and taking approaches; improving opportunities; enhancing learning, functional efficiency, and efficacy; better use of resources; and a robust solution of the wicked issue of climate change (Leitner et al., 2020). In Bangladesh, there remains a lack of coherence in operational and technical aspects of CCA and DRR, despite the fact that potential coherence could be ensured in these areas (OECD, 2020). Local and regional institutions as well as the actors of CCA and DRR are working in complete isolation from one other when it comes to implementing their respective strategies (Islam et al., 2019).

Policy Gaps

Although the Sendai Framework for Disaster Risk Reduction (2015–2030) and the Paris Agreement provide a significant chance to strengthen cohesiveness across a broad range of policy sectors that are related to CCA and DRR, Bangladesh did not make enough use of this opportunity (OECD, 2020; Murray et al., 2016). Non-separation of legislation and policies addressing CCA, poor governance, and insufficient expertise and resources are making it hard to execute CCA measures in Bangladesh (Chowdhury et al., 2022). There is still a significant mismatch between CCA and DRR strategies, which are frequently governed by multiple departments with minimal or no coordination between them. To support and facilitate the identification of chances for coherence in CCA and DRR, Bangladesh is in dire need of policy integration (OECD, 2020). “Integration,” on the other hand, does not mean creating a unified policy framework but rather adopting a holistic approach to all policies related to CCA and DRR at the domestic level (Cubie & Natoli, 2022).

Inadequate Knowledge Sharing

Bangladesh lacks a suitable platform for exchanging information on CCA and DRR developments and progress. In order to better monitor the implementation of the SDGs, Bangladesh has built an online data repository system named “SDG Tracker.” However, there is data available on just one of the indicators (Indicator 13.1.1) connected to climate change. There is not one facility that has all of the relevant socioeconomic information, regional risk circumstances, and viable adaptation solutions in the national level. Thus a platform for DRR and CCA knowledge and tools which are more accessible to national climate change adaptation policy-makers and stakeholders are absent and urgently required. Furthermore, a lack of coordination awareness frequently inhibits the integration of DRR and CCA (Islam et al., 2019). The zero draft of NAP recommends developing knowledge management plans and platforms in order to appropriately assess knowledge availability, access, and interaction on CCA (MoEFCC, 2022). If developed, they could serve as useful platforms for exchanging information about existing as well as future CCA initiatives.

Lack of Mass Awareness and Mainstreaming

In Bangladesh, the implementing authorities, particularly those at the local level, are unfamiliar of the CCA and DRR processes, as well as the benefits of incorporating these two. In Bangladesh, there are national hotlines for disaster risk warning, in addition to a number of institutions such as the Water Resources Planning Organization (WARPO), the Center for Environmental and Geographic Information Services (CEGIS), and the Flood Forecasting and Warning Centre (FFWC), which offer research, databases, and guidance. Nevertheless, each of these institutions follows

its own set of governing policies and has a unique mission and vision to achieve. A system for sharing CCA and DRR statistics, data, and knowledge is needed to accelerate understanding and collaboration and assist stakeholders to discover, access, and use important content according to their requirement. The NAP zero draft mentioned websites, apps, national communication workshops, press conference, online training, webinar, talk shows, media coverages, policy briefs, infographics, flyers, and animated short videos as potential NAP communication media and tools (MoEFCC, 2022). In addition, a number of different communication materials are specified depending on the variety of targeted audiences and stakeholders. Some examples of these pieces include technical papers, reports, leaflets, infographics, policy briefs, web portals, workshops, seminars, webinars, public lectures, exhibitions, and social media (MoEFCC, 2022). If effectively implemented, it has the potential to raise widespread public understanding of climate change impacts and adaptation challenges.

Conclusion

Bangladesh is experiencing multidimensional challenges with present climate change impacts and frequent disasters. A peek at Bangladesh's climate change and disaster management strategies reveals that Bangladesh adopted many plans, policies, and laws to reduce disaster losses, be proactive about disaster management, and take long-term measures to protect itself from climate change. In many nations, risk reduction has been accomplished through coordinating CCA and DRR, which has so far been a successful endeavor. Recognizing the risk factors associated with both climate change and disasters, the government of Bangladesh adopted several forthcoming development objectives and policies, with some shortcomings in terms of attention on executing the policies, financing sources, knowledge sharing, as well as integrating disaster risk reduction and climate change adaptation. Although the existing available mechanism might provide some temporary assistance in mainstreaming specific concerns of CCA and DRR, there remains a dire need of a systematic approach to the exchange of knowledge about CCA and DRR endeavors. Furthermore, climate change and disaster management could benefit from holistic policy integration approach that improves the CCA and DRR measures. Regional cooperation, in conjunction with national initiatives for knowledge exchange and other cross-sectoral issues related to climate change and disaster management, might be of tremendous assistance in achieving greater success.

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Disaster Displacement and International Refugee Law: Locating Legal Protections in the Context of Climate Change Migration

132

Nafees Ahmad

Contents

Introduction	1978
DHD and the Analysis of IDMC Report 2022	1980
DHD Population: Socioeconomic Impacts and Other Challenges to IRL	1981
The Socioeconomic Impacts of DHD	1981
DHD Terminology Challenges	1982
Artificial Intelligence <i>Fait Accompli</i> and the Protection of the DHD People	1982
DHD and Global Human Rights Frameworks (GHRF)	1983
Fundamental Principles of IRL in DHD Scenarios	1984
Contextualizing the IRL Response and the Universality of the Principle of <i>Non-refoulement</i>	1985
Locating the Legal Protection Threshold of Global Compacts (GCs) in Complementing the Role of 1951 UNCSR with 1967 AP for the DHD People	1985
HIIIL and the Postulation of Protection Firewall Under CIL	1987
Conceptualization of the Normative and Non-derogable Human Rights of DHD People	1988
Ethical Dimensions of the IRL and the Future of the NDHR of the DHD People, CDMs, IDPs, and Climate Refugees Not Covered Under UNCSR	1989
Legal Protections in the Context of Climate Change Migration	1990
Conclusion	1991
References	1992

Abstract

The legal protections under international refugee law (IRL) in the context of disaster-driven human displacement (DHD) and climate change migration shifted from a comparatively profound academic bewilderment to a critical challenge of unparalleled proportions of international treatment of refugees and migrants. This shift manifests in developments at the global and regional levels. The 1951 UN Convention relating to the Status of Refugees (UNCSR) and the 1998 UN

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Guiding Principles on Internal Displacement (GPID) in 2018 underscored the greater than before legal and policy emphasis on internally displaced persons (IDPs). Further, following the 2016 New York Declaration for Refugees and Migrants, the legally nonbinding Global Compact for Safe, Orderly and Regular Migration (GCM) and the Global Compact on Refugees (GCR) were adopted by the UN General Assembly (UNGA) on December 19, 2018, signifying the most noteworthy international development relating to the DHD and climatically displaced migrants (CDMs) in the context of climate change migration. On the other hand, the emergence of artificial intelligence (AI) and its deployment in determining the DHD status has further queered the pitch for securing legal protection for the DHD people. I argue in this book chapter that the IRL needs to provide a complete response to the rights of the DHD population and CDMs. Still, its fundamental principles are relevant to realizing the legal protections of DHD people, CDMs, CMSs, and IDPs. I also examine the application threshold of GCR to the role of UNCSR with its 1967 Additional Protocol in addressing the legal protections of DHD people and climate refugees and how AI application presents new challenges to protecting the DHD population. Therefore, I will rummage through the hybridized interpretation of international law (HIIL) and postulate the idea of a protection firewall and bias-free and nondiscriminatory AI application under customary international law (CIL) to address the plight of such displaced people. How can AI secure resilience and relief for the DHD people? I advocate the HIIL argument and contextualize the universality of the principle of *non-refoulement* afresh to advance the legal protections for the DHD people worldwide.

Keywords

DHD · IRL · RAMS · *Non-refoulement* · Human rights · Protection gaps · Global Compacts · CDMs · Climate change migration · Customary international law

Introduction

A transnational, transcontinental, and global human mobility caused due to DHD has presented novel challenges under IRL. Today, the DHD population reaches record highs in an age of crowd-pleasing nationalism, impervious borders, and the othering of refugees. Simultaneously, climate change intensifies the frequency and intensity of life-threatening weather conditions, exacerbating factors that cause the DHD. However, the power struggles, military conflicts, and climate change disasters between states, peoples, and individuals have plagued humanity ever since it first appeared on this planet, leaving millions of people homeless and forcing them to look for shelter inside or outside of their country. So, the problem of the refugees, asylum-seekers, migrants, and stateless (RAMS) (Ahmad, Refugee Rights, and Health: The Impact of COVID-19 on Refugee Camps, 2020) is profoundly different today. The new and most repeated DHD recorded in 2021 happened in East Asia, the

Pacific, and South Asia, collectively constituting almost 80% (IDMC, 2022a, b) of the total DHD comprising rains, tropical cyclones, monsoons, and floods. China, the Philippines, and India were the most affected countries, and many displacements occurred due to preventive evacuations. Despite a moderate hurricane season in the Americas and not as much rainfall in sub-Saharan Africa, the Middle East, and North Africa, all three regions were affected by acute droughts and excessive temperatures, causing hundreds of thousands of DHD (Michael Berlemann, 2017). The arid conditions also ignited other death traps like wildfires, forcing DHD people to flee their homes (WOLTERS, 2019). Europe experienced weather extremes that triggered heat waves, wildfires, and heavy flooding, leading to more than 261,000 displacements, an increase equated to 2020.

Consequently, the human rights of the DHD persons have gained enhanced significance, and their human rights (Thielbörger, 2019) are required to be expanded, redefined, and reformulated. IRL's foundation is a humanitarian one; however, it is obvious that this foundation is terribly out of date for our day (Coady, 2002). Therefore, the DHD problem needs global political solutions as the disaster displacement in the context of climate change migration problem is a phenomenon of our age (Alison Heslin, 2018). People have been confronting forced migration due to disaster displacement (Forced migration or displacement, 2022), conflict (IDMC, 2022a, b), violence, human rights violations (IACHR, 2015), and persecution (Scott, 2020). Such a displaced population has reached more than 100 million for the first time in the history of DHD (UNHCR, 2022), and it is further likely to be accelerated (Sven Smit, 2022). The Internal Displacement Monitoring Centre (IDMC) has released its Global Report on Internal Displacement and reported that the aggregate registered number of internally displaced persons (IDPs) worldwide had reached 59.1 million by 2021, up from 55 million in 2020 (IDMC 2022a, b). However, 38 million internal displacements were recorded in 2021, with some people displaced multiple times (Koonthamattam, 2022). Moreover, the total internal displacements are pegged at 5 million in Ethiopia, the highest annual figure ever recorded for a single country (Davies, 2022). Similarly, internal displacements in the Democratic Republic of Congo, Afghanistan, and Myanmar have also been recorded unprecedentedly.

The leading driver of DHD is climate change (UNHCR, Climate change link to the displacement of most vulnerable is clear: UNHCR, 2021), and forced displacement is making the conceptual, normative, and institutional frameworks accountable for providing solutions (Cullen, 2020). Nevertheless, IRL's fundamental principles and purposes are relevant to envision the legal protections for the DHD people, CMSs, and IDPs (Scott, 2020). The DHD individuals confront the most significant protection gap as they do not cross international borders (Schrepfer, 2012) and are not recognized under the UNCSR. Therefore, DHD migrants require well-defined legal protection within the normative and institutional frameworks consisting of holistically formulated domestic policies, fixity of responsibilities of the national governments who deny humanitarian entry to the DHD people consistent with international monitoring, and enhanced accessibility to climate rights and freedoms.

DHD and the Analysis of IDMC Report 2022

Worldwide human mobility has been triggered due to DHD presenting significant challenges to the IRL framework. Simultaneously, climate change increases the pace of dangerous weather circumstances, worsening considerations that pander to the DHD and cladding the sensible execution of international law with more challenges. However, certain UN agencies and numerous concerned states have grappled with CMSs worldwide and sought its international resolution (Ionesco, 2019). This shift is visible in developments at the global and regional levels. Moreover, the UNCSR and the 1998 UN-GIPD in 2018 and beyond also accentuated the greater than before legal and policy stress on the IDPs within their homelands. The GCR and GCM have registered broad and overwhelming support while recognizing the new moral and political undertakings in the context of conventional DHD drivers and climate change migration factors. Climate disasters have been causing more internal displacement than conflict and war (Mahapatra, 2021). By the end of 2021, there were 38 million internal displacements, out of which 14.4 million resulted from conflict and violence, and disasters caused 23.7 million in 141 countries. The total number of IDPs was 59.1 million as of the end of 2021; 53.2 million came from conflict and violence, and disasters produced 5.9 million IDPs (IDMC, 2022a, b). Therefore, the global estimate of conflict and violence was the highest ever documented (14.4 million). However, individual countries, including Ethiopia, the Democratic Republic of the Congo (DRC), and Afghanistan, recorded all-time highs. Many communities repeatedly fled as conflict frontiers shifted. Disasters sparked more than 60% of the internal displacements documented worldwide in 2021 (IDMC, 2022a, b), and more than 94% were the outcome of climate-induced hazards like storms and floods (López, 2015). The hurricane season in the Pax Americana and rainy seasons in Afro-Asia and sub-Saharan Africa were less severe, partly explaining why figures were lower than in 2020 and 2019 (Portal, June 2022). Drought in several regions triggered 240,000 displacements (IDMC, 2022a, b) and fuelled other hazards such as wildfires (Merzdorf, 2019) that forced people to flee. In DRC, in May 2021, the Nyiragongo volcano (OCHA, 2021) erupted, generating more than 599,000 disaster displacements (IDMC, 2022a, b) that turned out to be the highest figure for a geophysical calamity in a single year.

In countries like Myanmar, Somalia, South Sudan, and Syria, disasters and conflict collided (Reliefweb, June 2022), triggering many new and repetitive displacements. Present insecurity in Iraq and Syria forced many IDPs to flee for a second or third time. In reality, frequent displacements recorded in these countries were regular movements meant that the number of IDPs at the end of 2021 (IDMC, 2022a, b) did not establish any significant change. The intercommunal conflict generated 1.3 million internal displacements across 24 countries (IDMC, 2022a, b), mostly in sub-Saharan Africa. However, the assessment of displacement caused due to criminal violence remains challenging.

Nonetheless, 5.9 million people survived internal displacement due to disasters at the end of 2021 across 84 countries and territories (IDMC, 2022a, b). Afghanistan, China, and the Philippines had the highest figures, accounting for over 3 million.

Most of the people were still displaced by Afghanistan's disasters and were forced to flee their homes before 2021, the majority by drought and floods that have affected Afghanistan since 2018. According to the housing destruction data (IDMC, 2022a, b), both China and the Philippines are significantly affected by typhoons that cause widespread devastation of this type. However, such evidence is exceptional as there often needs to be more follow-up on the figures of displaced people after a disaster hits. This makes it problematic to appreciate the magnitude and nature of protracted displacement triggered by disasters and climate change impacts. Hurricanes Eta and Iota left 1.9 million people internally displaced across several countries in Central America in 2020 (IDMC, 2022a, b). Still, no follow-up assessments were carried out last year, which has limited the understanding of the duration of displacement following such storms.

DHD Population: Socioeconomic Impacts and Other Challenges to IRL

The DHD population has presented innumerable novel challenges in the first quarter of the twenty-first century that has brought out the ugliest challenges such as popular nationalism (Bruin, 2022), closed borders (Helene Benveniste, 2020), the othering of refugees (Hiraide, 2022), stymied immigration (McAdam, 2011), socioeconomic impacts (Salgado-Gálvez, 2018) of DHD migration, intensification of life-threatening weather conditions (Jakobsson, 2021) due to climate change, and declined economies. DHD vulnerability is at the core of IRL, and IHRL also offers a regulatory framework, so to talk of AI in the context of IRL may appear disturbing as a minimum. The challenges of potentially integrating algorithmic decision-making (ADM) and machine learning into global migration governance and policy (GMGP) have across-the-board repercussions for the IRL.

The Socioeconomic Impacts of DHD

The DHD generates specific requirements for the IDPs, government agencies, the humanitarian sector, and host communities. The economic impact of internal displacement worldwide was more than \$21 billion (IDMC, 2022a, b) in 2021. The estimate includes the price of providing every IDP with funding for their housing, health (DavidCantor, 2021), education, security, and compensation for their loss of income after 1 year of their displacement, as reported (Ekezie, 2022) in humanitarian response plans. In economic terms, the average impact in every year of DHD per IDP is about \$360, culled from the data from 18 countries, and the amount ranges from \$90 in Colombia to about \$710 in Libya (IDMC, 2022a, b). The disparity arises from divergences in the wants level across DHD populations and the projected expenses meeting them. The global Covid-19 pandemic and ongoing conflicts and disasters (IDMC, 2022a, b) have worsened food insecurity among IDPs (WFP, 2022) and swelled their dependence on humanitarian aid. In Libya, almost 77,000 IDPs were

projected to be food insecure and need food assistance in 2021, up from 17,000 just before the pandemic (OCHA, 2021). Therefore, the DHD crisis changes the demographical settings in a geopolitical entity and emasculates economic stability and human development.

DHD Terminology Challenges

The DHD people fleeing natural calamities caused due to natural disasters and remaining in their home countries must be regarded as the “DHD persons” (for international protection) and “CDMs” (for municipal protection), because terms “evacuees,” “disaster victims,” and “refugees” make the concept of IDPs baffling and limited to people displaced by violence (Agier, 2020) who are treated as per the 1998 UN-GPID. The conflict-driven and disaster-driven displacements are not the same and cannot be included in the definition of the IDPs. There needs to be clarity concerning its definition. Therefore, I propose that such people may be addressed as “disaster refugees,” “climate refugees,” “environmental refugees,” “migrants,” “refugees,” “internal circumstantial migrants (ICMs),” and “divinity-induced migrants” (DIMs) at the international level and “CDMs” in the context of municipal law. The DHD people do not fulfill the refugee definition requirements under the UNCSR and remain outside the mandate of the UNHCR even though the term “climate refugee” has gained visibility and popularity in common academic parlance. However, the UNHCR prefers “persons displaced in the context of disasters and climate change” (Verdier-Jouclas, 2019). Human rights defenders and civil society institutions approach the expression with the intent to initiate a debate. Therefore, I propose the usage of “DHD” for dedicated humanitarian assistance.

Thus, it is time to adopt a comprehensive additional protocol to the UNCSR on the rights of the DHD, and all people in migration must come under the humanitarian mandate of the UNHCR without any distinction as to which individuals qualify for international protection and how the nation-states should respond to the changing climate. Therefore, recent advances such as constructing border walls and fencing with electric currents have also problematized the humanitarian protection landscape worldwide.

Artificial Intelligence *Fait Accompli* and the Protection of the DHD People

AI, especially machine learning (ML), has been mapping disaster risk reduction (DRR) and predicting the impact of extreme weather conditions. AI raises a few questions: What benefits does AI present? What are the AI challenges, and how should these challenges be addressed? And how can AI provide important information to the DHD people, stakeholders, and policy-makers? To realize the potential of

AI for DRR and formulate an AI for DRR strategy, there is a need to respond to these questions and collaborate to apply AI to DRR challenges. The AI industry is growing at an incredible pace. Nation-states around the world are competing to win “AI Supremacy.” Major geopolitical entities advocate that the nations that will come out on top in AI will be “the ruler of the world.” Companies are investing upfront billions of dollars in acquiring the most significant market stake. Simulations demonstrate that by 2030 about 70% of companies will have adopted some AI technology (Bughin, 2018). The ADM technology and AI application must be well equipped to frustrate any bias, prejudice, inequality, and discrimination against the DHD people during their status determination, which is only possible if legitimate and efficient mechanisms are programmed based on public trust and protection for human rights with algorithmic transparency. One of the national governments’ top political priorities is to devise an AI policy framework to respond to global human rights standards transgressions (Kavanagh, 2019). Ethical AI practices for coordination, information, and interpretation of the above human rights of DHD and CDMs are obligatory for the nation-states and all stakeholders. ADM technologies require a human face with a human-centric HIIL approach to visit the existential crises of the DHD people.

However, prognostic analytics, biometric corroboration, automated credibility assessments, and ADM are technologies that could have utility for decision-making administration for the DHD people. Therefore, the implications for accountability, legitimacy, transparency, and human rights (Kaplan, 2019) demand an appropriate and sensible schedule for crucial deliberation regarding the potential impact of present and future AI technologies on RSD. Such challenges have further exacerbated the problems of DHD persons while making the practical implementation of IRL problematic. For example, in the DHD crisis, AI can identify damage and assess the reconstruction cost with its specifically developed algorithm that will reduce the time by conflating data from satellite, geospatial, and weather predictions. However, AI challenges to human rights have to be perceived and holistically responded to, as the consequences it creates might be extraordinarily profound and volatile. The progress of AI technology is very rapid, while the law remains slow, and it cannot manage AI with the same speed. Therefore, nation-states and individual entities need to invest more efforts in AI research and development while formulating policies and laws governing AI technology to protect the human rights of the DHD people.

DHD and Global Human Rights Frameworks (GHRF)

Many countries have been grappling with the DHD people, IDPs, CDMs, and climate refugees outside the IRL protection framework. The contemporary IRL protection framework is confronted with a twofold challenge, i.e., national security narrative and human rights narrative. Thus, today UNCSR is a pillar of the international refugee protection framework that is more balanced but less diversified in the

present circumstances. The human rights of the DHD persons, the CDMs, and the RAMS are legal concepts that demand the resolution of their fundamental human needs and vulnerabilities in CMSs. Therefore, the law of state responsibility must be expanded to incorporate the protection of the DHD persons, the CDMs, and the RAMS following the institutional convergence of the GCR and GCM.

Fundamental Principles of IRL in DHD Scenarios

The fundamental principles of IRL emanate from a range of universal and regional human rights treaties, the rules of CIL, and the ever-developing norms and standards in the practice of states and international organizations like the Office of the United Nations High Commissioner for Refugees (UNHCR). Further, the UNCSR is the core basis of IRL along with 1967 Additional Protocol (UNCSR-AP). Primarily, these two instruments establish the principles of refugee protection and command that forcibly displaced people must not be compelled to return to their homeland or territory where their lives, liberties, and rights are imperiled contrary to their will and volition. The principle of *non-refoulement* sets out the duties of RAMS and the responsibilities of states toward them. In the second part of the twentieth century, an individual was recognized as the subject of international law with dignity, integrity, and liberty under the IHRL framework. The UDHR (Universal Declaration of Human Rights) and IHRL core treaties provide the principles of protection for RAMS, DHD people, and other displaced persons (ODPs) that may be put as:

- *The right to have rights*
- *The equal and across-the-board-treatment and nondiscrimination*
- *The right to leave, return, and access to territory*
- *The right to protection of life in camps, settlements, and collective shelters*
- *The right to livelihood and good health*
- *The right to have states' human rights obligations, the rights against racism, stigma, and xenophobia*
- *The right to information*
- *The right to protection of privacy*
- *The right to belong, the right to border justice, the right to gender equality*
- *The right to have fair enforcement of immigration law*
- *The rights of labor workers*
- *The rights of marginalized groups/minorities*
- *The rights and their limitations*

These protection principles apply to DHD populations across geopolitical jurisdictions as the displacement makes them vulnerable and victims at par with RAMS. The HIIL approach and basic structure of international law (BASIL) premise have to facilitate the fiscal accrual benefits from AI application while upholding the shared values and democratic spaces of liberal societies.

Contextualizing the IRL Response and the Universality of the Principle of *Non-refoulement*

The IRL protection regime established for refugees, RAMS, or IDPs has failed to extend protection to CDMs (Ahmad, 2019). Thus, the potential requirement for fresh expression and protection arrangements for DHD needs consideration. The soul of IRL is the principle of *non-refoulement* that sustains it and determines its efficacy and applicability in conflict, violence, DHD, and beyond. But it begs a challenge to guarantee respect for the principle of *non-refoulement*. Nevertheless, the substantive spirit of the principle remains non-polemical. But, unfortunately, the DHD persons are deprived of their liberty and detained and repatriated to their country of origin. These obligations challenge the state practice of granting an individual the right to access the refugee status determination (RSD) procedures.

In the context of *non-refoulement*, the existence of a DHD crisis matters. Still, the DHD crisis cases are implicitly qualified to invoke the principle of *non-refoulement* under IHRL and IHL, and issues of extra-territoriality may be more relevant for the DHD people as they also find themselves in refugee-like situations. Generally, the DHD-affected states do not appreciate the practical pragmatics of the principle of *non-refoulement* and deny access to RSD procedures before a competent tribunal. Even UNHCR may not be available to aid. Advise DHD persons due to the exclusion clauses of the UNCSC as these clauses do not protect those who committed crimes against humanity and peace (Note on the Exclusion Clauses EC/47/SC/CRP.29, 1997). Still, these exclusion clauses must be extended to the DHD people. However, the principle of *non-refoulement* should not have been confined to IRL or refugees alone, as it is also present in IHRL, IHL, and customary international law (CIL) as a safety valve. In the DHD crisis, human rights IOs are not performing but attend only to specific places and cases. States have been resorting to diplomatic assurances to dodge their obligations under the principle of *non-refoulement*. National courts play a central role in preserving and defending the principle of *non-refoulement*. Further, the courts must also identify its limits, scope, and constitutive elements to determine the interplay between IHRL, IHL, and any criminal responsibility issues and the role and limitations of diplomatic assurances. For instance, Article 3 of the ECHR prohibits torture and inhuman or degrading treatment or punishment and enforces positive obligations on states, including the obligation of *non-refoulement* that has been underscored by the European Court of Human Rights (ECtHR) in *Soering v United Kingdom*, Application no. 14038/88 and *Chahal v United Kingdom* (22414/93) [1996] ECHR 54.

Locating the Legal Protection Threshold of Global Compacts (GCs) in Complementing the Role of 1951 UNCSC with 1967 AP for the DHD People

The Global Compacts on Refugees and Migrants are embedded in the IHRL and reiterate the states' commitment to respect, protect, and fulfill all IHRL envisioned

obligations. The Global Compacts are shifting from vertical legal protection to the DHD, CDMs, and RAMS and their families to horizontal legal protection. Thus, to address the unprecedented increase in forced displacements worldwide, these two Global Compacts (GCs) are primarily designed to provide for but are not limited to:

- Complementing the existing IRL framework with common pathways
- Strengthening the multilateral response architecture
- Reimagining the principles of international cooperation, responsibility-sharing, and international solidarity with the states hosting the DHD, CDMs, and RAMS
- Engrafting the principles of non-regression and nondiscrimination across all stages of the migration circle to get rid of all forms of discrimination, including racism, intolerance, and xenophobia against the DHD, CDMs, and RAMS and their families

UN Global Compact on Refugees

GCR was designed to provide a mechanism for humanizing international responses to displacement based on the principle of *non-refoulement*. But unfortunately, almost 4 years later, refugee rights defenders opine that progress and commitments need to be faster on the part of the international community (Osborn, 2021). The objective of the UN-sponsored GCR is fourfold: to lessen pressure on host countries, increase refugee self-reliance, enhance access to third-country resettlement, and support conditions in refugees' countries to return in safety. Therefore, I perceive the GCR as consistent with the HIIL approach as the "Re-engagement with Multilateralism," expanding the trajectory of solutions and supplementing the present trends of cooperation and in tune with BASIL doctrine as "Multi-alignment with Constitutionalism" to protect the rights of DHD, CDMs, and RAMS and their families and free the nation-states from their orbit of international relations imperatives, diplomacy choices, and foreign policy priorities. GCR is a protection equalizer and functions as a safety valve without a legally binding treaty obligation on the states. Re-engagement with Multilateralism bolsters the GCR principles of international cooperation, responsibility-sharing, and international solidarity with the DHD, CDMs, and RAMS hosting states.

It is advocated that the GCR's paragraphs 61 and 63 should be read in combination for bridging the protection hiatuses to extend the legal protection to the DHD people in the context of climate change migration. Paragraphs 61 and 63 contemplate the inherent powers of the RSD officials of the states to emplace the mechanisms to identify the international protection requirements of individual protection claims, RSD processing for large refugee movements, and group-based protection (UNHCR, ExCom Conclusions No. 103 (LVI) (2005) (s) and 96 (LIV) (2003), 2018). The GCR envisaged a quadrennial review framework Global Refugee Forum (GRF), under which states and stakeholders meet to deliberate about the best practices to achieve the aims of the GCR. The GCR has a subdivision called "Comprehensive Refugee Response Framework" (CRRF), which implements the wide-ranging humanitarian protection measures applicable to specific situations

involving large movements of RAMS. The same must also be available to the DHD persons and CDMs.

UN Global Compact on Migrants

GCM is regarded as a discovery and initiative to respond to the people's disaster-driven displacements and climate change migration. In the moral sense (Kälin, 2018), it addresses the plight of the people confronting droughts, earthquakes, floods, rising sea levels, and the negative impacts of climate change and other disasters. It promises to function on the vision of guiding principles such as common understanding, shared responsibilities, and unity of purpose within the cooperative framework envisaged in the 2016 New York Declaration for Refugees and Migrants. GCM is the first intergovernmental LNB agreement with an HRBA approach, expressed as a whole-of-government approach and a whole-of-society approach. With these principles, GCM tends to accomplish 23 objectives and associated commitments and explicitly makes a moral statement about the DHD migrants. For example, Objective 2 addresses the factors of migration in its sub-headline relevant to disaster-driven displacement, environmental degradation, and climate change migration. It demands measures to "develop adaptation, mitigation, and resilience strategies" to DHD and the negative impacts of climate change-induced erosion of habitable conditions. Further, Objective 21 entails a commitment to respect the prohibition of the return of migrants to conditions of irreversible harm and invokes the principle of *non-refoulement* relevant for the DHD people. However, the provisions relating to the implementation and follow-up are a vital part of the GCM that remains in oblivion. I perceive this impugned part inadequate without the HIIL approach allowing GCM to have "Re-engagement with Multilateralism" for capacity-building mechanism based on the "International Migration Review Forum" (IMRF) under paragraph 49.

HIIL and the Postulation of Protection Firewall Under CIL

The DHD people and CDMs constitute an essential category among all the variations of human displacement in the context of climate change that remains beyond human control. To address and respond to the concerns of the DHD community, I employ the HIIL approach based on the postulation of a protection firewall embedded in the rubrics of CIL. I encapsulate the HIIL approach with BASIL (basic structure of international law), the doctrine that (Ahmad, Refugees, and Algorithmic Humanitarianism: 2021) I theorize as:

- A compendium of dynamic principles governing judicial relations among human beings, nation-states, international institutions, and organizations based on the HRBA drawing upon non-derogable dignity, inalienable diversity, and immutable distinction of global human life by ensuring the absolute human existence consistent with *jus cogens*, *non-refoulement*, and CIL.

- HIIL approach straddles the ontological arguments culled from the therapeutic hermeneutics of the ambit of IRL, IHRL, IHL, CIL, ICL, IML, and CCL entrenched in the HDC (Hybridized Dynamic Constitutionalism). The HDC argument is based on the values such as the international rule of law, multiculturalism, democracy, judicial institutionalism, etc.

Thus, the HIIL approach, in tandem with the BASIL proposition, can accomplish the human dignity of the DHD people in the context of climate change migration. The amplitude of the dignity of the DHD persons constitutes and defines the province of human rights known as “All human rights for all” and “the world is one family,” which have relied on the liberal and expanded lingual construction of human rights securing full human dignity to the DHD global humanity.

Conceptualization of the Normative and Non-derogable Human Rights of DHD People

Conceptualizing the normative and non-derogable human rights (NDHR) of the DHD people and non-derogable obligations of states to protect those NDHR of the DHD persons is a difficult task. For a long time, protecting the NDHR of DHD persons has received extremely scant normative, legal, and institutional attention (Hoffman, 2009). The conceptual framework of the IRL has to respond to the normativity of the protection gaps violating the rights of the DHD refugees not covered by the UNCSR. The concerns of the DHD population across the world and their human rights trepidations regarding displacement victims who have not received sufficient legal protections relating to the following rights and CMDs that include but are not limited to:

- The right to life with human dignity
- The right to *non-refoulement*
- The right to protection of refugeehood
- The right to food security and healthcare
- The right to dignified livelihood opportunities
- The right to equality of treatment on the grounds of humanitarian assistance, caste juxtaposition, ethnic mistreatment, racial integration, and religious identity
- The right to nondiscrimination in matters of poverty and vulnerability
- The right to safety of personhood and personal integrity in refugee camps
- The right to gender parity in matters of sexual abuse and gender-based violence
- The rights of elderly, differently abled, and physically and mentally challenged people
- The rights of forced relocated people to hostile territories
- The rights against human trafficking and conscription of children in armed forces
- The rights to durable solutions under IRL in locations of displacement
- The rights under GCR and GCM undertakings and understandings
- The rights of complementary legal protections under IRL, IHRL, IHL, CIL, IML (international maritime law), ICL, CCL, etc.

Living with climate change is bound to transform human existence in inimical ways that are likely to be insurmountable (O'Brien, 2022). The upsurge in DHD will likely generate massive displacements that will change the global perception of DHD people. The DHD people are regarded as refugees and IDPs uprooted due to conflict and persecution. By 2050, the climate change vortex of drought, heat waves, wildfires, hurricanes, and floods will produce a 250 million DHD population. However, the UN and IDMC are on the same page in expressing their inability to prognosticate the nature of the DHD, whether permanent or temporary.

Ethical Dimensions of the IRL and the Future of the NDHR of the DHD People, CDMs, IDPs, and Climate Refugees Not Covered Under UNCSR

The DHD people, CDMs, IDPs, and climate refugee flows are the corollary of dangerous and deleterious socioeconomic and geopolitical permutations among many nation-states. Irrespective of the causes of displacement, the most significant pain in one's life is to have been displaced from their ancestries, heritages, and pedigrees that are fallible, fallacious, and fatal. To uproot people from their land of origin amounts to deprivation of fundamental rights and freedoms that include but are not limited to:

- The right to usual life
- The right to housing memory
- The right to historical culture
- The freedom to feel belongingness
- The right to the immemorial neighborhood
- The right to cross-cultural and multicultural bonds
- The right to perennial socialization
- The right to human interdependence
- The right to classic climate
- The right to geopolitical predilections
- The right to diversity and identity
- The right to be consulted in economic modules
- The right to participate in community development
- The right to good governance
- The right to the rule of law
- The right to socioeconomic development
- The right not to be displaced

These are not merely rights but go beyond the rubrics of rights as inalienable entitlements, basic bonds, and natural claims. Thus, a holistic understanding of the NDHR of the DHD people under contemporary IRL must be rejigged to ensure its pragmatic future.

Legal Protections in the Context of Climate Change Migration

A context of mounting evidence of the negative impacts of climate change on the human rights of the DHD persons and CDMs has necessitated the potential legal protection framework because the concerns of the UNHCR are presently rooted in the UNCSR refugee definition (UNHCR, Collection of International Instruments and Legal Texts) which states that a refugee is an individual who:

[...] owing to a well-founded fear of persecution for reasons of race, religion, nationality, membership of a particular social group or political opinions, is outside the country of his nationality and is unable or, owing to such fear, is unwilling to avail himself of the protection of that country, or who, not having a nationality and being outside of the country of his former habitual residence as a result of such events, is unable or, owing to such fear, is unwilling to return to it.

The reasons for climate change force people and trigger their involuntary migration by crossing international borders that are not the relevant reasons for seeking refugee status as per UNCSR definition. The refugee definitions in regional instruments like the 1969 OAU Convention Governing the Specific Aspects of Refugee Problems in Africa and the 1984 Cartagena Declaration on Refugees (CDR) are possibly more receptive to including the DHD persons. The OAU Convention considers individualized persecution and people who flee “owing to external aggression, occupation, foreign domination or events seriously disturbing public order,” according to Article 1(2). Thus, the victims of climate change repercussions caused due to human-induced intervention can qualify as refugees under the CDR. Further, the CDR protects victims of natural disasters if they cross international borders due to massive human rights violations.

Presently, there are no benchmarks or models for determining migration’s voluntariness or forcedness to protect them under the GPID. In 2009, the Parliamentary Assembly of the Council of Europe (CoE) made Recommendation 1862 (Europe, 2012) for applying GPID to DHD people. In 2004, the US Agency for International Development (USAID) supported the GPID for DHD persons and CDMs. USAID recognized the usefulness of the GPID framework for the IDPs but encouraged their application to the victims of natural disasters. In 2009, African Union adopted the legally binding Convention for the Protection and Assistance of Internally Displaced Persons in Africa aka Kampala Convention founded on GPID and requires states to assist and protect the IDPs due to natural calamities, climate change, or human-made disasters (Beyani, 2011) despite its inherently weak enforcement. Therefore, the lack of legally binding international instruments for DHD persons who have crossed international borders ultimately impelled several European countries to amend their asylum laws. However, a legally binding second additional protocol to the UNCSR for addressing the plight of the DHD people and CDMs must be adopted with the HIIL approach within the BASIL province. Thus, the DHD persons, CDMs, and other displaced persons (ODPs) constitute a specific class of people in the context of

their sufferings and deprivation, and their following human rights have been neglected by their governments, and the same must also be attended to:

- *The right to have human rights*
- *The right to legal identity*
- *The right to have the law*
- *The right to ethical livelihood*
- *The right to social security entitlements*
- *The right to migrant status determination (MSD)*
- *The right to inclusion*
- *The right to consular access and protection*
- *The right to the application of R2P*
- *The right to recognition*
- *The right to have legal protection*
- *The right to have the response*
- *The right to consultation*
- *The right to information*
- *The right to institutional help*
- *The right to special needs*
- *The right to reintegration*
- *The right to resettlement*
- *The right to rehabilitation*
- *The right to the family reunion*
- *The right to preventive measures*
- *The right to humanitarian pro bono aid*
- *The right to safe pathways*
- *The right to training in disaster management*
- *The right to monitor rights implementation*
- *The right to choice of the host community*

The UNSCR and its 1967 Additional Protocol constitute the core subject matter of the IRL regime. But IRL suffers the worst fate of human rights rhetoric: it is trivialized by the hypocrisy of governments. The legal mandate of the UNHCR is that neither the country expelling refugees nor potential states of refugees are under any obligation even to permit the UNHCR to operate in their territories.

Conclusion

The legal protections under the IRL framework for the DHD populations have presented an unprecedented critical challenge to the robustness of international law. Legal protections for the DHD people lack the fundamental principles relevant to realizing the NDHR of the DHD people stranded in the CMSs. The GCs should

have been adopted as a second additional protocol to the UNCSR or a legally binding international treaty. These GCs would have genuinely worked as a firewall under the CIL and strengthened the universality of the principle of *non-refoulement* afresh to advance the legal protections for DHD people worldwide. In addition, converting and adopting the 1998 GPID and 2009 Kampala Convention as a legally binding international treaty could be a viable solution with the HIIL approach to cover the NDHR of the DHD people. The UNHCR is, unfortunately, a creation of governments, and the contributions of these donor governments ultimately determine the budget of the UNHCR that influences their protection agenda. Thus, the UNHCR should get autonomous status within the present jurisdiction of the UN General Assembly. The DHD is a global phenomenon and requires global governance to palliate it with global tools. The GCR must institutionalize the responsibility for protecting refugees and the DHD worldwide and prioritize its execution based on the HIIL, equity, and responsibility-sharing toward the RAMS before the GRF meeting in 2023.

On the technology front, the democratic supervision of the AI structures regarding the development, design, and deployment of AI must be implemented. The AI application must frustrate any bias, prejudice, inequality, and discrimination that is only possible if legitimate and efficient mechanisms are programmed with high sensitivity for the DHD people. Thus, the mechanisms and universal legal protections for the DHD people, the CDMs, the RAMSs, and the ODPs under IRL need fundamental reform to ensure a comprehensive approach.

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Protecting Civilians During Armed Conflicts: An Appraisal of States' Obligations from an International Law Perspective with Special Reference to Sri Lanka

133

Wasantha Seneviratne

Contents

Introduction	1996
Legal Framework Governing Armed Conflicts	1997
An Appraisal of Core Legal Principles Regulating Armed Conflicts	1998
Difference of Regulation Based on Classification of Armed Conflicts	1998
International Obligations of States for Protecting Civilians	2000
Civilian Protection in International Armed Conflict Situations	2001
Civilian Protection in Non-international Armed Conflicts	2002
Armed Conflict of Sri Lanka	2003
International Scrutiny of Sri Lanka's State Obligations	2004
Resolutions Adopted by the UN Human Rights Council on Sri Lanka	2004
Sri Lankan Endeavors for Compliance with UNHRC Resolutions and the Challenges	2006
Conclusion	2007
References	2008

Abstract

Resorting to armed conflicts is a human-made disaster. Sovereign states are under an obligation to apply relevant principles governing armed conflicts to minimize the ravages of such disasters, to provide effective remedies, and to rebuild their societies. International humanitarian law (IHL) provides rules to protect civilians and civilian objectives in armed conflicts. This research aims at examining the international obligations of states as established by IHL to protect civilians from the ravages of armed conflicts with special reference to Sri Lanka. Sri Lanka

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experienced a protracted non-international armed conflict, which spanned over three decades. Since the cessation of hostilities, the international community, particularly the UN Human Rights Council (UNHRC), is scrutinizing whether the government of Sri Lanka has effectively discharged its international obligations during the war, specifically based on the alleged human rights and humanitarian law violations committed against civilians. UN Human Rights Council has adopted several resolutions, which require the government to address the accusations and to foster transitional justice. This research analyzes relevant legal principles, practical situations, and responses of the international community, in particular the resolutions adopted by the UN Human Rights Council on Sri Lanka to assess international and domestic legal responses regarding the protection of civilians during Sri Lanka's armed conflict. Key findings reveal that the frequent changes of governments, their policies, and strategies have impeded addressing the disaster effectively. Failure to adopt necessary enabling legislations and the disinclination to allow international mechanisms to probe into the alleged incidents weaken the defenses of Sri Lanka. This research recommends that diligent discharge of international obligations and upholding rule of law would provide a sustainable solution to Sri Lanka's human-made disaster.

Keywords

Civilians · International obligations · Sovereign states · Armed conflicts

Introduction

Armed conflicts, being a grave humanitarian catastrophe, inflict serious impact on human lives, such as deaths and grievous hurt to the body and properties including other physical, psychological, and emotional harm. Among those affected categories of persons, civilians are more vulnerable than others due to the conduct of hostilities in armed conflicts because they do not get directly involved in the conduct of hostilities. Due to the devastating impact of wars on civilians, their properties, and other civilian objectives, it is important to analyze the consequences of armed conflicts on them and the adequacy of the existing legal framework in such scenarios from a legal perspective in order to address gaps and to propose effective laws and policies to provide appropriate preventive and mitigatory strategies and remedies and also to punish the perpetrators of such crimes with required severity.

In the above backdrop, the main objective of this book chapter is to examine the impact of the ravages of armed conflicts on civilians and the obligations of sovereign states with particular reference to Sri Lanka, from an international law perspective. Any armed struggle has inevitably produced tragic consequences in general as well as on the protection of civilians in particular, from the beginning to post-war situations. Sovereign states are under an obligation to apply relevant rules, principles, laws, and customs governing armed conflicts to address the consequences of such disasters

diligently, to provide effective remedies, and to rebuild their societies. International humanitarian law provides rules to protect civilians and civilian objectives in armed conflicts. This book chapter is limited to discussing relevant norms and principles of public international law, humanitarian law, and human rights law and to producing an appraisal of the applicable legal principles with special reference to the international obligations of Sri Lanka to protect civilians in situations of armed conflicts.

Sri Lanka suffered from a protracted non-international armed conflict, which spanned over three decades. Since the cessation of hostilities, the international community has been scrutinizing whether the government of Sri Lanka has effectively discharged its international obligations, during and after the war, particularly to probe into the alleged human rights and humanitarian law violations committed against civilians. The UN Human Rights Council has adopted several resolutions, (UN Human Rights Council resolutions 19/2 of 22 March 2012, 22/1 of 21 March 2013, 25/1 of 27 March 2014, 30/1 of 1 October 2015, 34/1 of 23 March 2017, 40/1 of 21 March 2019 and 46/1 of March 2021 on promoting reconciliation, accountability and human rights in Sri Lanka) requiring the government to address the accusations, to provide effective remedies, and to foster transitional justice. To appraise the legal responses of Sri Lanka under its international obligations, this research analyzes relevant international legal principles and the ground-level situation of Sri Lanka.

Legal Framework Governing Armed Conflicts

International humanitarian law (IHL) is the specialized legal regime that regulates conflict resorting to warfare. It attempts to come to a compromise between military necessity and humanity in times of armed conflict with a view of lessening the harmful effects of armed conflict. It restricts the use of force in war in two ways: with the use of measures to protect civilians as they do not participate directly in the armed struggle and the combatants who are not able to fight anymore and by limiting certain methods and means of combat to the amount required to accomplish the military objectives of resorting to war. Thus, the objective of armed conflicts is constrained to the purpose of weakening the fighting capacity of the adversary (Marco Sassoli, 2011). IHL is mainly comprised of the rules stipulated in treaty law, customary international humanitarian law (CIHL), and case law jurisprudence developed through international, regional, and domestic courts and other tribunals. Geneva Conventions (GCs) of 1949 and their first and second Additional Protocols (APs) of 1977 are the main international legal instruments which regulate the armed conflicts, whereas the customary international humanitarian law (CIHL) rules codified by the International Committee of the Red Cross (ICRC) provide further protection. IHL rules seek to “establish minimum standards of humanity that must be respected in any situation of armed conflict” (Melser, 2016). Hence, this body of law provides universally accepted principles to mitigate the adverse impact of armed conflicts, which is one of the worse forms of human disasters.

An Appraisal of Core Legal Principles Regulating Armed Conflicts

Core principles of international humanitarian law (IHL) include “principle of distinction” and “principle of proportionality” among others and are crucial in mitigating the unnecessary sufferings produced by the ravages of armed conflicts (Melser, 2016). The underlying legal doctrines in these two principles are well embedded in both the treaty law and CIHL. The protection of the “persons who are either not at all directly participating in the hostilities and the ones who do not do so any longer are guaranteed in the principle of distinction. It always necessitates the involved parties to an armed conflict to distinguish between the civilian population and combatants and between civilian objects and military objectives and accordingly shall direct their operations only against military objectives” (Marco Sassoli, 2011). The St. Petersburg Declaration, Preamble, has recognized that “the only legitimate object, which States should endeavour to accomplish during war is to weaken the military forces of the enemy.” Additional Protocol I Article 51(1) and CIHL Rule 1 stipulate that “[t]he civilian population and individual civilians shall enjoy general protection against dangers arising from military operations.” According to these principles, civilians and civilian objectives cannot be the direct target of military operations under any circumstances and, if do so, is a serious violation of IHL. Article 8 of the Rome Statute of International Criminal Court defines such violations as war crimes.

The other most important principle of IHL is the principle of proportionality. According to this principle, “the use of force and the resulting destruction must not be disproportionate to the objective and to the military advantage sought” (Marco Sassoli, 2011). As Melser explains, “where the infliction of incidental harm on civilians or civilian objects cannot be avoided, it is subject to the principle of proportionality” (Melser, 2016). Thus, as Melser emphasized “those who plan or decide on an attack must refrain from launching, or must suspend, any attack which may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated” (Melser, 2016). This principle is included both in the treaty law and CIHL. For example, Additional Protocol (AP) I Articles 51(5)(b) and 57(2)(a)(iii) and (b) and CIHL, Rules 14, 18, and 19, give effect to the principle of proportionality.

Both these principles strive to protect civilians from direct attacks as well as from being subject to collateral damages. Therefore, it is important to pay utmost concern to safeguard innocent civilians, their properties, and other civilian objectives such as schools, markets, hospitals, places of worship, etc. However, the contemporary armed conflicts provide ample evidence that these principles are least respected, and as a result, more than ever the civilians are severely affected.

Difference of Regulation Based on Classification of Armed Conflicts

International humanitarian law does not articulate uniform rules for all types of armed conflicts. It classifies armed conflicts in accordance with the definitions

stipulated in the treaty law and customary law and applies different rules accordingly. IHL categorizes armed conflicts as falling into two types: international armed conflicts (IACs) and non-international armed conflicts (NIACs). Treaty law, in particular, the Geneva Conventions of 1949 and Additional Protocol I of 1977 to the Conventions provide extensive protection to the victims in IACs. Alternatively, less protection is provided for the victims of NIACs (Stewart, 2003) as stipulated in Article 3 common to all four Geneva Conventions of 1949 and Additional Protocol II of 1977. This discriminatory application of rules is criticized by scholars stating that this characterization is “arbitrary, undesirable, difficult to justify, and that it frustrates the humanitarian purpose of the law of war in most of the instances in which war now occurs” (Stewart, 2003). As a result, the civilians who are affected by the ill consequences of NIACs are having less protection under IHL treaty law, but the customary laws have not maintained the same distinctions as of the treaty law thereby providing similar protection under its rules in the two types of armed conflicts. It is noteworthy because the pains, sufferings, losses, and many such adverse impacts of armed conflicts cannot be treated differently just because they have happened in a different context.

Common Article 2 of the Geneva Conventions defines “international armed conflicts as conflicts between two or more sovereign States.” The applicable laws to such types of armed conflicts are the 1899 and 1907 Hague Conventions, the four Geneva Conventions of 1949 (except for Article 3 common to the conventions), first Additional Protocol to the Geneva Conventions of 1977, customary principles of international laws, and the case law jurisprudence developed through international courts and tribunals. Although the Geneva Conventions do not offer a similar definition to non-international armed conflicts, Common Article 3 of the GCs imposes a strong obligation “to protect civilians and other categories of people who should take no active part in the hostilities, including members of armed forces who have laid down their arms and those placed hors de combat by sickness, wounds, detention, or any other cause.” According to Common Article 3, “they should be treated humanely in all circumstances, without any adverse distinction founded on race, color, religion or faith, sex, birth or wealth, or any other similar criteria.” However, Common Article 3 does not provide a definition of armed conflicts not of an international character and thus leaves it for interpretation. This lacuna is filled through case law jurisprudence and the Article 1 of Additional Protocol II of 1977. As cited in paragraph 70 of the decision in the Prosecutor v. Dusko Tadic, it was decided that “On the basis of the foregoing, we find that an armed conflict exists whenever there is a resort to armed force between States or protracted armed violence between governmental authorities and organized armed groups or between such groups within a State” (Prosecutor v. Dusko Tadic, 1999). Moving beyond this definition, Article 1 of Protocol II requires “This Protocol, which develops and supplements Article 3 common to the Geneva Conventions of 12 August 1949 without modifying its existing conditions of applications, shall apply to all armed conflicts which are not covered by Article 1 of the Protocol Additional to the Geneva Conventions of 12 August 1949, ..and which take place in the territory of a High Contracting Party between its armed forces and dissident

armed forces or other organized armed groups which, under responsible command, exercise such control over a part of its territory as to enable them to carry out sustained and concerted military operations and to implement this Protocol.” The protracted armed conflict that occurred in Sri Lanka could be defined both under Article 1 of Additional Protocol II and the judicial interpretation given in the Tadic judgment, as an armed conflict not of international character because it happened within the territory of Sri Lanka between the government armed forces and an organized armed group, named, the Liberation Tigers of Tamil Eelam LTTE.

International Obligations of States for Protecting Civilians

States undertake international obligations under treaties as well as by contributing to create customary laws through their state practices and *opinio juris* (accepting those practices as law) (Evans, 2010). Obligations are respected in good faith, which is spelled out through an important maxim of international law, namely, *pacta sunt servanda*. This maxim requires the states, which expressed their consent and accepted that international rule/s are bound, to discharge their obligations without fail.

Legal principles governing situations of war are found in treaties, customary laws, case law jurisprudence, and in scholarly works. Historically, involvement of civilians was less in the conduct of hostilities. Combatants who were directly involved in warfare were considered legitimate targets of their rivalries unless the combatant happened to lay down their arms and placed in the status called *hors de combat*. As outlined above, “the principles of distinction and proportionality” strongly require the protection of civilians because “they do not directly participate in warfare” (Melser, 2016). Therefore, civilian should not be the target of any war and their lives should be spared. However, if the civilians are determined to participate directly in armed conflicts, they will lose their protection provided under the applicable rules of IHL. “The concept of direct participation in hostilities (DPH) refers to conduct which, if carried out by civilians, suspends their protection against the dangers arising from military operations, for the duration of their direct participation in hostilities, civilians may be directly attacked as if they were combatants” (Melzer, 2009).

The Fourth Geneva Convention relative to the protection of civilian persons of 1949 dedicates its provisions to the protection of civilians in the context of international armed conflicts. “For the purposes of the principle of distinction in IAC, all persons who are neither members of the armed forces of a party to the conflict nor participants in a levée en masse are civilians and, therefore, entitled to protection against direct attack unless and for such time as they take a direct part in hostilities” (Melzer, 2009). This convention lucidly provides protection for civilians under three situations: civilians who are trapped in IACs as aliens, citizens in occupied territories, and detained as interns by the enemy powers. In NIACs civilians are protected under Common Article 3 and Additional Protocol II of 1977. In addition to this

extensive coverage of protection afforded under the treaties, they are further protected by customary rules of IHL.

Civilian Protection in International Armed Conflict Situations

Fourth Geneva Convention as well as the customary IHL rules prohibit the “use of civilians as a human shield to protect certain areas or installations, usually of military importance, from enemy attack” (Rule 97, Customary International Humanitarian Law Rules, Henckaerts, 2005). The “collective punishment of civilian’s measures aimed at intimidating or terrorizing the civilian population, pillage, hostage-taking, and reprisals against civilians are also forbidden” (Fourth Geneva Convention, Article 33). Articles 14 and 15 of the Fourth GC and Articles 59 and 60 of Protocol I include very important provisions to set up safety zones such as demilitarized zones, no-fire zones, etc. during the armed conflicts in order to protect civilians with the consent of both sides. The primary objective of said provisions is to protect the civilian population as a whole or groups of especially vulnerable people. During armed conflicts, it is important to provide particular attention and protection to the wounded and sick soldiers, children, disabled persons, elderly persons, etc. These provisions are particularly important for their protection to be guaranteed.

Additional Protocol I of 1977 devoted a lengthy section on the protection of civilians in IACs. Article 48 imposes a basic rule that require “the Parties to the conflict to make a distinction between the civilian population and combatants and between civilian objects at all the times” as a mandatory requirement “in order to ensure respect for and protection of the civilian population and civilian objects.” Accordingly, belligerent groups should unleash their attacks only against military targets, not against the civilians or their properties and other civilian objects. Unfortunately, this is a frequently violated rule in times of war, and as a result, the disastrous situation of such conflicts is aggravated. Article 50(3) helps to resolve matters of doubts by stipulating that “in case of doubt whether a person is a civilian, that person shall be considered to be a civilian.” These are noteworthy provisions to guarantee the protection of civilians in conflicts and to mitigate the disaster they undergo.

Article 51 guarantees the protection of the civilian population by stipulating strong provisions. This article claims that “the civilian population and individual civilians shall enjoy general protection against dangers arising from military operations” (Article 51). Also, “civilians should not at any event be the object of attack. Acts or threats of violence with the purpose of spreading terror among the civilian population are prohibited.” To achieve the desired purposes, any indiscriminate attacks are prohibited. For example, as explained in Article 51(5)(a), it is prohibited to treat “separated and distinct military objectives” as a “single military objective in an area where civilians are concentrated, or civilian objectives are present.” In such a situation, the disaster to be happened will be countless as well as a serious violation of humanitarian law principles. Also, Article 51(5)(b) prohibits attacks which may not be directed against the civilians but is expected to “cause incidental loss of

civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated” (Article 51(5)(b)). Article 51(6) prohibits “reprisals against the civilians or civilian population.” Important provisions are laid down to protect cultural property and other important objects and religious places. Accordingly, it is outlawed to “commit any acts of hostility directed against the historic monuments, works of art or places of worship which constitute the cultural or spiritual heritage of peoples” (Article 53). Salutary provisions are incorporated in Protocol II to protect the things which are vital to the existence of the civilians. Article 54 protects civilians from starvation by prohibiting to make them starve to achieve military targets. Accordingly, attacks cannot be unleashed to destroy objects, essential for civilians for their survival, such as their harvest, farming lands, livestock, reservoirs used for irrigation and consumption purposes, etc.

The above provisions in the treaty law and customary law aim at protecting civilians from the adverse impacts of armed conflicts. War being one of the gravest forms of disasters, it is crucial to protect not only civilians and their properties but also the environment that they live in. For example, Article 35(3) prohibits “to employ methods or means of warfare which are intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment.” This provision required the protection of environment for safe living of civilians, among other benefits.

Civilian Protection in Non-international Armed Conflicts

In the context of NIACs, Article 3 common to all the Geneva Conventions requires the state actors as well as the non-state actors to provide protection to “persons taking no active part in the hostilities, including members of armed forces who have laid down their arms and those placed *hors de combat*.” This is salutary because in an NIAC situation the responsibility of protecting the civilians, among other responsibilities, has extended to dissident armed groups who has taken up arms to fight against state armed forces and other military groups. Additional Protocol II of 1977 also provides protection to civilians through its provisions although they are few in number.

Article 13 of Protocol II provides important provisions to mitigate the sufferings of civilians due to armed conflicts escalating within the territorial boundaries. In this regard, “the civilian population as well as individual civilians shall not be the object of attack or should not be subjected to acts or threats of violence to spread terror among the civilian population” (Article 13(2)). Article 14 of this protocol provides protection to the civilian objects which are essential to their existence. The protocol also prohibits making the civilians starved as a method of warfare. It includes the protection of their harvest, husbandry, and other resources necessary for their survival. These cannot be destroyed to achieve the military objectives of the warring parties. In Sri Lanka, the last debacle was designated as “humanitarian operation” as the aim of which was to rescue a water reservoir called *Mavilaru*, which has been

used by civilians mainly for their consumption and agricultural purposes, from the insurgents, who captured it to achieve their military objectives. Article 15 protects “the works and installations containing dangerous forces such as dams, dykes and nuclear electrical generating stations.” These objects would be turned/used to be military objectives due to the very nature of the armed conflicts. However, if such objects are attacked, the resultant damage could lead to “severe losses” to the civilians and their properties, as the attack may lead to the release of “dangerous forces” such as heavy water flows, electricity, and other energy sources in their full power with no control to stop.

It could be concluded that although the principles relating to the civilian protection are less detailed in Protocol II than in Protocol I, the fundamental aspects of civilian protection are guaranteed by Common Article 3 of four Geneva Conventions and the above discussed provisions in Protocol II.

Armed Conflict of Sri Lanka

Sri Lanka underwent a disastrous period with an escalation of violent activities in the northern province of the country since the late 1970s. It eventually transformed into a civil war situation. The armed rivalry was between “the armed forces of the government of Sri Lanka and the Liberation Tigers of Tamil Eelam (LTTE)” led by its leader Velupillai Prabhakaran, protracted for about 26 years. A war of three decades caused all types of damages to the society. The war claimed the lives of several thousands of people. In 2010, the UN Secretary General, Ban Ki Moon, appointed a panel of experts to investigate the alleged violations committed during the conflict. The committee is known as “*Darusman Committee*” and the report produced by the committee was designated as the *Darusman* report. The report was published in 2011, which included serious allegations against the armed forces of the government of Sri Lanka claiming that they committed those in the last phase of the war. The report claimed that the alleged violations are against the civilians who got trapped in the war-torn area (*Darusman, 2011*). The government of Sri Lanka denied the statistics included in this report as incorrect at several domestic and international forms. According to the *Darusman* report, more than 40,000 civilian were killed because of the war, which Sri Lanka has refused to accept.

The armed conflict in Sri Lanka was non-international, although India got involved in it through the adoption of a bilateral treaty named Indo-Lanka Peace Accord of 1987 between India and Sri Lanka during the regimes of Mr. Rajiv Gandhi, the then prime minister of India, and Mr. J.R. Jayewardene, the then executive president of Sri Lanka, to end the violent hostilities (Samarasinghe, 1988). However, this was not a successful endeavor. It facilitated India to intervene into internal crisis and to send a peace-keeping force to Sri Lanka and to encourage the government of Sri Lanka to introduce a power sharing mechanism by adopting the 13th amendment to the Constitution of 1978. The 13th amendment introduced two salient features to the constitution: it established the system of provincial councils (Chap. XVIIA, Articles 154a to 154t) to share power between the central

government and the nine provincial councils and made Tamil language also an official language along with Sinhala language (Article 18(2)).

Sri Lanka being a state party to the four Geneva Conventions of 1949, it is bound by Common Article 3 of the conventions, as it is the one and only article which regulates the non-international armed conflicts. Therefore, the state is obliged to protect the civilians as stipulated in Common Article 3. However, Sri Lanka is not a member state to Additional Protocol II of 1977. Nevertheless, as several of the provisions of this protocol is considered as embodying customary laws, it is argued that Sri Lanka is obliged to respect those customary laws (Seneviratne, 2019).

International Scrutiny of Sri Lanka's State Obligations

After the cessation of hostilities in May 2009, Sri Lanka has been subject to several international queries regarding the armed conflict, particularly about the tragic plight of civilians who were severely affected by the war.

Resolutions Adopted by the UN Human Rights Council on Sri Lanka

In 2009, the 30-year long internal armed conflict ended. Since then, the Human Rights Council has been urging the government of Sri Lanka to commence a wider discourse with all the stakeholders to restore peace, harmony, and stability in the country and to build up trust among different ethnic groups who believe that they are discriminated on the grounds of their ethnicity, religion, and language. More than a military solution, what is required is to find a lasting political solution to create a conducive environment for all the people in Sri Lanka to live in harmony. The need to protect and promote human rights and human dignity has been reiterated in the resolutions adopted by the Human Rights Council since 2009 to the present. The resolutions adopted by the UN Human Rights Council (UNHRC) are varied in nature. They are on/against/shared by Sri Lanka requiring the authorities to promote “reconciliation, accountability, and human rights” in Sri Lanka (UN Human Rights Council, 20012–2017). Most notable resolutions are the UNHCR 19/2 of 22 March 2012, UNHCR22/1 of 21 March 2013, UNHCR 25/1 of 27 March 2014, UNHCR 30/1 of 1 October 2015, UNHCR 34/1 of 23 March 2017, and the UNHCR 40/1 of 21 March 2019 on promoting reconciliation, accountability, and human rights in Sri Lanka. (All of these Resolutions are titled as on promoting reconciliation, accountability and human rights in Sri Lanka)

The UNHCR Resolution 25/1 of 27 March 2014 (UNHRC Resolution A/HRC/25/1) required the government “to monitor the human rights situation in Sri Lanka and to continue to assess progress on relevant national processes, to undertake a comprehensive investigation into alleged serious violations and abuses of human rights and related crimes by both parties in Sri Lanka during the war.” This resolution further required the UN High Commissioner for Human Rights “to undertake a comprehensive investigation into the alleged serious violations and abuses of human

rights and related crimes by both warring parties in Sri Lanka during the war period covered by the LLRC Report.” Based on the mandate received, in 2015, the Office of the United Nations High Commissioner for Human Rights issued a comprehensive report on Sri Lanka (UNHRC, 2015). It included an assortment of key findings of the probe undertaken by the Office of the United Nations High Commissioner for Human Rights into the “alleged serious violations and abuses of human rights and related crimes during the armed conflict in Sri Lanka.”

In 2014, then president, Mahinda Rajapaksha, who officially declared the end of the armed conflict of Sri Lanka, called a presidential election, 2 years ahead of the scheduled time. However, he was defeated by Maithripala Sirisena, the common candidate formed by the opposition political parties. President Sirisena formed a new government with the help of opposition political parties in 2015. The international community developed hopes that this new government that came into power would take tangible steps to mitigate the damage caused to Sri Lanka and to the civilians and their properties due to the war. The report of the high commissioner contained several recommendations to the new government to set up a hybrid court comprised of domestic and international adjudicators to probe into the “alleged violations of human rights and humanitarian law committed by the parties during the armed conflict.” Accountability was highlighted as the key to fostering reconciliation and in rebuilding the devastated society (UNHRC, 2015). President Sirisena too was not successful in fulfilling the requirements of the UNHRC resolutions. Maintaining political stability of the country continues to be a daunting challenge in the country. In the presidential election, held in 2019, the Secretary of the Defense Ministry during the war period, Gotabhaya Rajapaksha, was elected as the executive president of Sri Lanka. Despite furthering the pledges made by the previous president and the government to the international community and to the UNHRC, the new president and his government maintained a negative approach toward the accountability issues. The stance of the new government was to deny any kind of international monitoring or investigation. Instead, they promised to solve the pending issues using domestic legal and institutional frameworks. The Minister of Foreign Affairs declared the position of the government in 2021 at the annual sessions of the UNHRC (Press Release, President's Media Unit, 2021). President Gotabhaya Rajapaksha and the prime minister of his government, Mahinda Rajapaksha, had to resign from their positions in 2022 due to the severe public pressure that outbroke in the forms of nonviolent protest marches, etc. for several months from March to June 2022, which came to know as “public struggle-Aragalaya” (Ranaraja, 2022).

The above discussion revealed that in spite of certain steps taken by the government of Sri Lanka in the aftermath of the armed conflict, several requests made by the UN HRC remain unfulfilled. Every year, the UNHRC and the UN High Commissioner for Human Rights consider the situation of the country and make requests to fulfil Sri Lanka’s obligations. The inability to do so has created a severe havoc in Sri Lanka. The resignation of powerful executive president and the prime minister, both are from the same family and credited for war victory due to the intolerable public outcry, is the best example for the impact of this failure. Sri Lanka is facing a severe economic crisis due to bad governance and inability to probe and address past

violations, specifically the allegations based on wartime human rights and humanitarian law violations. The above discussion reveals that the changes of governments, their policies, and strategies have adversely impeded addressing this human disaster effectively. Failure to adopt necessary enabling legislations and the disinclination to allow international mechanisms to probe into the alleged incidents have weakened the credibility of Sri Lanka before the international community. Continuous reminders coming through the UNHRC resolutions evince it. Therefore, it is essential for the government of Sri Lanka to discharge of its international obligations diligently and to take all the necessary actions and measures to uphold rule of law in the country to guarantee its people including the war-affected communities and civilians that it works to foster transitional justice and to provide a sustainable solution to Sri Lanka's human-made disaster. Also, the state, which too face or have faced similar situation, should use the case of Sri Lanka as a precedent to be obliged to fulfil their sovereign obligations without fail and to uphold rule of law, good governance, and democracy for their people.

Sri Lankan Endeavors for Compliance with UNHRC Resolutions and the Challenges

The protection of civilians is an undeniable obligation of the government in power in any context including situations of armed conflicts. Therefore, the government of Sri Lanka should not be able to refrain from duly discharging its responsibilities undertaken under international law. The reports submitted by the United Nations High Commissioner for Human Rights in 2021 and 2022 on Sri Lanka to the UNHRC reveal the salutary steps by the government of Sri Lanka taken so far. The Office on Missing Persons (OMP) endeavored to find out the fate of the missing persons and is in the process of preparing a list of missing persons with the support of several stakeholders in the country. Another crucial step was the establishment of the Office for Reparations (OR), which also is attending to its mandate and has handled a number of claims thus far. The Office for National Unity and Reconciliation (ONUR) too is in progress in its mandated work. The National Human Rights Commission is working to protect and promote human rights situation in the country (A/HRC/51/5: Situation of human rights in Sri Lanka - Comprehensive report of the United Nations High Commissioner for Human Rights, 2022).

In the 2022 report, the High Commissioner for Human Rights is deeply concerned about the unprecedented economic crisis that Sri Lanka is facing currently and noted the broad-based public protest movement that demanded a change of government and the call for accountability and deeper reforms. The commissioner urged “the new Government to embark on a national dialogue that would advance human rights and reconciliation and to carry out the deeper institutional and security sector reforms needed to prevent the recurrence of violations of the past” as “victims of past human rights violations continue to wait for truth, justice” (A/HRC/51/5: Situation of human rights in Sri Lanka - Comprehensive report of the United Nations High Commissioner for Human Rights, 2022).

Despite the pledges made by the present government to the UNHRC and to the international community, the country is seriously affected with several other disasters in the aftermath of the war, allegedly due to the mismanagement of public property, corruption and lack of good governance, victimization, nepotism, and favoritism. Currently it is designated as an underdeveloped country although it had been ranked as a middle-income country. Sri Lanka is undergoing a serious economic crisis at present induced by a political crisis, due to the bad governance by the different political regimes in power during and after the armed conflict of Sri Lanka. Therefore, it is stated that the unfulfilled obligations of Sri Lanka have to be addressed sooner than later. The government should meet its international obligations specifically based on the requirements made by the international community to protect the rights of people in the country, who are the aggrieved parties of the past occurrences.

Conclusion

This book chapter dealt with the issue of state obligations in light of applicable international legal principles and provisions with regard to the protection of civilians affected by the ravages of armed conflicts, who live in the jurisdictions of those sovereign states, and to provide effective remedies for their salvage and to rebuild the societies ravaged by armed conflicts. It mainly examined the relevant international humanitarian law principles under treaty law and customary law, which provide crucial provisions to protect civilians, their properties, and other civilian objectives in times of armed conflicts. The main objective of the work was to evaluate the international obligations of states established by IHL to protect civilians from the ravages of armed conflicts, with special reference to Sri Lanka. This chapter also attempted to explore whether the government of Sri Lanka has effectively discharged its international obligations during and after the war, specifically based on the alleged human rights and humanitarian law violations committed against civilians. It discussed UN Human Rights Council resolutions on Sri Lanka, which required the government to address the accusations and to foster transitional justice. In that light, relevant legal principles and the UNHRC resolutions were assessed above. In this backdrop, the author wishes to suggest the following recommendations.

It is of utmost importance for sovereign states to duly discharge the international obligations undertaken by them. The government of Sri Lanka should work cooperatively with the international community rather than taking arbitrary decisions with regard to fulfilling its international obligations. Probing into the allegations against the parties to Sri Lanka's armed conflict, based on the accusations made by several parties about wartime violations, is crucial. This can be done within the premises of the domestic criminal justice system as Sri Lanka has proved its capacity within the present structures in the past with independent actions, decisions, and outcomes. However, political intervention should be completely avoided to prevent undue influences on the administration of justice. Access to justice should be guaranteed adhering to the established principles of natural justice. Right to a fair trial of all the parties should be met.

The community of states should help the country to come out of the challenging situation faced by the country by extending their friendly hands without marginalizing Sri Lanka, which was heavily affected by the three decades of prolonged armed conflict, tsunami disaster, and the Covid-19 pandemic situation. Now the country is facing a serious economic crisis. People are suffering immensely from the issues of shortages of fuel, gas, food, etc. This situation produces continuous disaster to the country. Therefore, further sanctions or embargoes will lead to the weakening of the country in many respects.

The government also should commit to protect the rights of its citizens, guaranteed in the constitution and other laws of the country, without any discrimination. The right to equality of all should be guaranteed as required in Article 12 of the Constitution. Sri Lanka is a multicultural country, in which diverse communities with different ethnic, religious, and linguistic identities are living. Minority communities are generally of the view that they are discriminated against by the government allegedly influenced by the ethnic and religious majority. They demand equal treatment of all the citizens of the country without being marginalized. Therefore, it is important to establish appropriate mechanisms to redress their justifiable grievances. The civilians who are affected as victims, directly or indirectly, by the ravages of war, should be given a fair hearing, and their grievances should be attended immediately. Their right to know the truth should be effectively satisfied through proper means.

Fostering transitional justice to the war-affected society is very crucial. Remaining issues of transitional justice should be addressed according to a proper plan without any political motives. Appropriate homegrown mechanisms should be established to offer appropriate reparations to the needy people whose lives and properties are affected due to the armed conflict. A pledge of non-recurrence of past disasters is particularly important for Sri Lanka. All citizens should be able to live freely and happily in this multicultural society.

The constitution of the country is currently subject to revision. A draft constitution was prepared by a nine-member special expert panel (SEC) appointed by the previous president, who resigned from his position due to severe public pressure and agitation. The 21st amendment to the current constitution is adopted and is better than the 20th amendment in terms of reducing the arbitrary powers of the post of executive presidency. The new constitution is expected to provide a strong basis to guarantee the protection and promotion of human rights and dignity of all, along with robust and accessible redress mechanisms. With due diligence and action, Sri Lanka will be able to address the most devastating disaster effectively that it faced in the past three decades.

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Corporate Responsibility to Protect Human Rights: Evaluating the Legal Framework of Bangladesh in Light of International and Regional Standards

134

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Contents

Introduction	2012
The UN Guiding Principles on Business and Human Rights	2013
History	2013
Basic Principles	2013
UNGPs in the Context of Disasters	2014
Bangladesh's Commitments Under International Law	2015
The 2013 Rana Plaza Disaster	2016
Making a Case for Corporate Responsibility Under the Legal Framework of Bangladesh in the Context of Disasters	2017
Fundamental Rights Under the Constitution	2017
Conclusion	2020
References	2021

Abstract

The present legal framework of International Disaster Law derives authority largely from traditional international law instruments such as treaties or customs. Cross-cutting areas of international law are also of interest in this respect, particularly the nexus of International Human Rights Law and International Environmental Law wherein the focus remains squarely placed on state actors and their respective obligations. However, in Bangladesh, notable incidents of fires and building crashes in factories and work establishments resulting in massive deaths and injuries have brought to forefront the question of corporate human rights responsibility in relation to disaster. Furthermore, the COVID-19 pandemic has caused and continues to cause concerns regarding workplace

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conditions, safety, and a range of worker rights, particularly in the RMG sector. In light of these circumstances, this chapter measures the national legal framework against the UN Guiding Principles on Business and Human Rights and other contemporary shifts in the international perspective on corporate human rights responsibility. Lastly, drawing from the analyses as well as regional and international best practices, this chapter tries to provide recommendations to further ensure corporate human rights responsibility in disaster management.

Keywords

Corporate responsibility · Business and human rights · Disaster Law · Bangladesh

Introduction

The past decade in the economy of Bangladesh has been marked by remarkable growth, increase in inflow of Foreign Direct Investment (FDI), and rise in Gross Domestic Product (GDP) (UNCTAD, 2018). A significant portion of the country's economic growth is attributed to the RMG Sector (UNCTAD, 2018). However, as a backdrop to these tremendous success stories, concerns regarding working conditions of workers, particularly with regard to wage, working hours, and workplace safety, have persisted. Most notably, the Rana Plaza tragedy of 2013, where a factory collapse led to 1134 reported deaths and several thousand non-fatal injuries, set off rippling effects within and outside Bangladesh and is considered a significant point in time when it comes to issues of workplace safety, worker rights, and corporate responsibility. The global response to the Rana Plaza Tragedy and its ensuing effects clearly indicate the need for increased vigilance towards ensuring compliance of businesses, both local and international, to the local legal standards that touch upon human rights. It has also catalyzed the growing attention to the need for adhering to international standards on labor and human rights, among others, in the sphere of business.

More recently, the COVID-19 pandemic has led to massive loss of employment; disruption in global supply chains has resulted in reduction or denial of wages. The exacerbated conditions have sparked protests, and allegations of anti-trade union activities by employers in dealing with these upsurges were reported. Particularly, there have been incidents of fires at factories, hospitals, etc., resulting in deaths and injuries. While the work to unearth the exact impacts of the pandemic is ongoing, it is undeniable that it has had widespread, and at the same time, differentiated impacts on the lives of the people, bringing to fore the role that the state has played in its interaction with businesses at times of natural and human-induced crises. Therefore, the responsibilities of businesses during disasters and situations of crises and the state's functions in regulating compliance with these responsibilities need to be evaluated in light of international standards and regional practices.

The UN Guiding Principles on Business and Human Rights

History

Traditionally, international human rights framework has always been state-centric – although the rights and entitlement under the Universal Declaration of Human Rights (UDHR) have been set as a common standard that every “individual and organ of society” shall strive to achieve, the subsequent promulgation of the International Covenant on Civil and Political Rights (ICCPR) and International Covenant on Economic, Social and Cultural Rights (ICESCR) centers on the state as the primary duty-bearers when it comes to upholding human rights (Nolan & Baumann-Pauly, 2016). However, despite the focus on state responsibility to “respect, protect and fulfill” human rights, it is uncontested that business enterprises significantly impact the lives and rights of the people. Bangladesh’s colonial past and the role that the British East India Company has had in shaping its history remains a strong example in that regard. The concern and need to regulate corporate conduct is therefore reflected in international legislative history as early as 1974 in the efforts to promulgate the UN Draft Code of Conduct on Transnational Corporations. The efforts continued, and in 2000, the UN Global Compact encouraged business enterprises to voluntarily incorporate its 10 principles under four broad categories – human rights, labor standards, environment, and anti-corruption. In parallel, efforts to formulate the UN Draft Norms on the Responsibilities of Transnational Corporations and other Business Enterprises with regard to Human Rights continued, but were met with criticisms on grounds that they placed far more extensive responsibilities on corporations than they did on states (Nolan & Baumann-Pauly, 2016). The debates surrounding the draft Norms led to the appointment of a Special Representative of the Secretary-General on human rights and transnational corporation and other business enterprises (SSRG). In 2005, John Ruggie was appointed as the SSRG, and it was his efforts that resulted in the 2011 Guiding Principles on Business and Human Rights (UNGPs). The UNGPs expand upon three main pillars or principles. These are (i) state’s duty to protect against human rights abuses by third parties, including businesses, (ii) corporate responsibility to respect human rights, and (iii) need for more effective access to remedies.

Basic Principles

The first pillar focuses squarely on state responsibilities and reiterates its obligations which are already established under the “respect, protect and fulfill” framework of international human rights law. The second pillar reiterates the business enterprises’ role in respecting human rights – it encompasses the business enterprises’ obligations under national laws, and ensuring respect for international standards, particularly those set out in the International Labor Organization (ILO) core conventions and the standards of international human rights as laid out under the Bill of Rights. It also refers to prevention and mitigation of human rights abuses, and to avoid

causing, or contributing to human rights violations. The third pillar emphasizes on effective access to remedies, and refer not only to judicial remedies, but also to non-judicial remedies, some of which may be provided and regulated by non-state actors, including the business enterprises themselves.

UNGPs in the Context of Disasters

The UNGPs lay down, in general terms, obligations of corporations in preventing and mitigating adverse human rights impacts which may occur through their activities. These would generally be extended to situations of disasters. Logically, corporations would be required to abstain from acts that result in deterioration of environment or which would lead to natural disasters. Most notably, adherence to international labor standards of workplace safety would be directly connected to disasters which fall under occupational hazards.

Furthermore, when due to its activities, disasters and hazards occur, corporations would be required to mitigate and address human rights impact of such disasters. Furthermore, although the UNGPs do not expressly mention situations of disasters, they broadly envision contextually differing needs and corresponding requirements of compliance. For instance, the Commentary to Principle 23 of the UNGPs states the following:

Some operating environments, such as conflict-affected areas, may increase the risks of enterprises being complicit in gross human rights abuses committed by other actors (security forces, for example). Business enterprises should treat this risk as a legal compliance issue, given the expanding web of potential corporate legal liability arising from extraterritorial civil claims, and from the incorporation of the provisions of the Rome Statute of the International Criminal Court in jurisdictions that provide for corporate criminal responsibility.

In addition, corporate directors, officers and employees may be subject to individual liability for acts that amount to gross human rights abuses. In complex contexts such as these, business enterprises should ensure that they do not exacerbate the situation. In assessing how best to respond, they will often be well advised to draw on not only expertise and cross-functional consultation within the enterprise, but also to consult externally with credible, independent experts, including from Governments, civil society, national human rights institutions and relevant multi-stakeholder initiatives.

Although the first paragraph draws from Rome Statute and relies on situations of conflict as an example, it may be argued that this is for illustrative purpose as the Principle itself deals with “Issues of Context,” and addresses, in broader context, the need for business enterprises to ensure highest commitment to international recognized standards of human rights even when there is a possibility that some operating environments, or contexts may make it more complex to do so. Moreover, there is also emphasis on differentiated needs of specific groups which is of relevance. For example, paragraph 3 of the commentary to Principle 12 of the UNGPs states:

Depending on circumstances, business enterprises may need to consider additional standards. For instance, enterprises should respect the human rights of individuals belonging to specific groups or populations that require particular attention, where they may have adverse human rights impacts on them.

This would directly apply to situations where any specific population or group is affected by a disaster in which a contribution of the business enterprise can be made out. More broadly, the UNGPs acknowledge differentiated needs of vulnerable groups such as women, children, and indigenous communities, which is also a theme pertinent for situations of disasters as disasters result in evidently disproportionate impacts on vulnerable groups.

Bangladesh's Commitments Under International Law

Bangladesh is a signatory to most of the international human rights instruments, such as the International Covenant on Civil and Political Rights (ICCPR); the International Covenant on Economic, Social and Cultural Rights (ICESCR); United Nations Convention on the Rights of Child (UNCRC); Convention on the Elimination of all forms of Discrimination Against Women (CEDAW); and United Nations Convention Against Torture (UNCAT). It has also ratified most of the ILO core Conventions. As of March 2022, it is signatory to all the fundamental ILO Conventions, i.e., the Forced Labor Convention, 1930 (ILO Convention no. 029); Freedom of Association and Protection of the Right to Organize Convention, 1948 (ILO Convention No. 87); Right to Organize and Collective Bargaining Convention, 1949 (ILO Convention No. 98); Equal Remuneration Convention, 1951 (ILO Convention No. 100); Abolition of Forced Labor Convention, 1957 (ILO Convention No. 105); Discrimination (Employment and Occupation) Convention, 1958 (ILO Convention No. 111); Worst Forms of Child Labor Convention, 1999 (ILO Convention No. 182); and the Minimum Age Convention, 1973 (ILO Convention No. 138). Among these, only the Minimum Age Convention, 1973, has not yet come into force and will be in force from 22 March, 2023. More relevant for occupational hazards and safety, Bangladesh is party to the Workmen's Compensation (Occupational Diseases) Convention, 1925 (ILO Convention No. 18); Equality of Treatment (Accident Compensation) Convention, 1925 (ILO Convention No. 19); and Protection against Accidents (Dockers) Convention, 1932 (ILO Convention No. 32), among others. As such, Bangladesh is under international obligations to translate international human rights standards and labor standards into its domestic laws and regulations. Needless to say, the rights encompassed in these instruments, for example, right to life, right to health, right to property, and right to work, are all severely impacted in situations of disasters and, as such, are intricately related to the business and human rights principles (De Guttry et al., 2012).

Therefore, it stands that in formulating its national laws, regulations, and policies which regulate corporate activities, Bangladesh has obligations to ensure consistency with international standards. This would have multifaceted implications for the present topic: for example, Article 11 of the CEDAW requires state parties to take all appropriate measures to eliminate discrimination against women in the field of employment, and more specifically requires states to ensure “The right to protection of health and to safety in working conditions, including the safeguarding of the function of reproduction.” The obligations under the ILO Conventions such as ILO Convention no. 87 and ILO Convention no. 98 require the state to enact laws that ensure the right to collective bargaining and to prevent anti-trade union practices and discrimination at workplaces.

The 2013 Rana Plaza Disaster

In 2013, the collapse of the Rana Plaza, resulting in 1134 reported deaths of workers, made it one of the largest industrial disasters in history. The commercial building had been operating without heed to building and safety standards, and its collapse and the massive number of deaths and injuries sent shockwaves across the world, triggering a series of legislative and policy actions, not only within the legal landscape of Bangladesh, but also on the wider global supply chain. The Alliance for Bangladesh Worker Safety was initiated by stakeholders from Northern American apparel industries, and the Accord for Fire and Building Safety in Bangladesh was led by stakeholders from the European Union. Both the Alliance and Accord undertook a range of measures to improve the working conditions in the apparel sector. These measures included safety inspections in factories, monitoring the progress or remedial/corrective measures by factories, providing safety trainings, resolving safety complaints by workers, etc. Both agreements have resulted in measurable improvement to workplace safety standards in the apparel sector. Aside from the involvement of the apparel industries, international organizations and NGOs played a significant role in bringing about reforms. The Bangladesh Labour Act, 2006, was amended in response to the advocacy led by these groups, in 2013, 2015, and 2018, respectively. The 2013 and 2015 amendments were largely focused on formulating a more comprehensive framework for workplace safety. Amendments also brought about changes to the provisions on trade unions aimed at ensuring a conducive environment for collective bargaining, to the provisions on labor disputes in order to facilitate timely disposal of cases, etc. Besides, litigations were initiated against the factory owners on charges of corruption and murder, and a writ petition was filed against four concerned ministries for the failure to comply with an earlier court decision directing the establishment of a building code enforcement agency. These proceedings have not resulted in tangible outcomes, with the criminal proceedings against the building owner still unresolved. Compensation has been provided to victims through private arrangements supervised by the ILO.

Making a Case for Corporate Responsibility Under the Legal Framework of Bangladesh in the Context of Disasters

Fundamental Rights Under the Constitution

The Constitution of Bangladesh provides for fundamental rights under Part II of the Constitution. These rights include right to equality and non-discrimination (Article 28); right to protection of law (Article 31); right to life and personal liberty (Article 32); right to freedom of movement (Article 36); and right to property (Article 42) – these rights can and are often impacted by situations of disasters. Economic and social rights such as right to food, right to health, and right to environment, which are most clearly and directly affected by disasters, are not incorporated in the Constitution as fundamental rights; rather, an obligation is placed upon the State to ensure, or endeavor to ensure these as fundamental principles of state policy (FPSPs). The FPSPs are not judicially enforceable. However, the interpretations of courts have brought some of these rights within the overarching right to life. For example, courts have concluded that the right to livelihood forms part of the right to life in a case arising out of eviction of slum dwellers. In similar vein, courts have decided that right to health could be a part of right to life and may be violated in situations where health services are offered at exorbitant fees. Right to healthy environment was interpreted to be an integral part of right to life in a case arising out of flood action plans which was anticipated to have adverse environmental impacts.

The Constitution also allows aggrieved individuals, or any person representing an aggrieved group which itself may be unable to seek remedy, to come before the Supreme Court to seek remedy for violation of fundamental rights. Although the traditional view has been that fundamental rights may be enforced as against states only, growth of judicial activism in the area has resulted in successfully upholding fundamental rights as against third parties who function in the “public domain.” This creates a pathway to bring businesses before the courts for human rights violations.

Labor Laws

Bangladesh Labor Act, 2006, and the Bangladesh Labor Rules, 2015, regulate labor laws. Export Processing Zones (EPZ) Labor Act, 2019, regulates labor laws within the EPZs. The Bangladesh Labor Act was originally enacted in 2006 with a view to consolidating all existing laws and regulations on labor laws. It was subsequently amended in 2013 in the aftermath of the Rana Plaza disaster. The 2013 Amendment aimed to increase the standards of workplace safety, provisions on fire safety, minimum wages, etc. The Act was again amended in 2018, which introduced provisions on anti-trade union activities and discrimination and introduced penalty for the same.

Under the labor laws, companies are required to ensure workplace safety and prevent occupational hazards. Labor inspectors are required to inspect factories and industries to ensure compliance with the safety standards. Workers are entitled to compensation in case of accidental injuries, and their families are entitled to compensation in case of accidental death at workplace. Dispute resolution mechanisms

arising out of accidental injuries, or deaths, are to be heard by the Labor courts, and appeals are heard by the Labor Appellate Tribunals. As of 2020, there are 10 labor courts in Bangladesh, which has been noted as being inadequate to handle the volume of cases. Furthermore, the inspection mechanism is not robust and instead of being risk-based is motivated by economic factors (ILO, 2020). As a result, while the law touches upon business's obligations in preventing and compensating for disasters such as occupational hazards and disasters such as building collapse, fire, etc., the implementation of the laws remains a challenge.

Environmental Laws

Bangladesh has enacted several environmental legislations which have a bearing on corporate responsibility in natural or man-made disasters. The primary legislation is the Bangladesh Environment Conservation Act, 1995, under which the Bangladesh Environment Rules, 1997, have been enacted. These two laws set out the category of industrial establishments and the requirements for the industries to obtain an "Environment Clearance Certificate." Industries may also be required to undertake Environment Impact Assessment, or EIA. These responsibilities are relevant in risk reduction stages of disaster management. The laws also lay down prohibitive provisions against activities that pollute environment. Section 17 allows aggrieved communities to file a case for compensation before the Environment Courts for harm resulting out of non-compliance with the Act and Rules. Arguably, when disasters occur due to corporate violation of the environmental rules, communities may seek remedy from the Environment Courts. However, the remedy has to be sought through the Director General of Department of Environment and communities do not have direct access to courts.

Disaster Management Laws

(i) The Disaster Management Act

The primary disaster-management legislation is the Disaster Management Act, 2012, which defines a disaster as:

"Disaster" means any of the following events caused by nature or man-made or climate change, the extent and severity of which affect the life, livelihood, normal life, resources, property and environment of the people including cattle, birds and fish in the affected area, causing such damage or suffering to such an extent that the population's own resources, capabilities and capabilities are not sufficient to deal with it and which requires relief and any kind of outside help, such as: -

- (i) *Cyclones, hurricanes, tornadoes, tidal waves, abnormal tides, earthquakes, tsunamis, excess rainfall, droughts, floods, river erosion, coastal erosion, drought, excessive salinity, excessive arsenic pollution, landslides, landslides, landslides, landslides, Heatstroke, cold sores, chronic waterlogging, etc.;*
- (ii) *Explosions, fires, shipwrecks, major train and road accidents, chemical and nuclear radioactivity, fuel oil or gas leaks or any other genocidal event;*
- (iii) *epidemic-causing disorders, such as pandemic influenza, bird flu, anthrax, diarrhea, cholera, etc.;*

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- (iv) *Infections by bio-derived or bio-infectious, including infections of harmful microorganisms, toxins and inanimate objects;*
 - (v) *inefficiency or damage to essential services or disaster prevention infrastructure; and*
 - (vi) *any unusual event or accidental mishap that causes extensive loss of life and property;*
- (Section 2(11), Disaster Management Act, 2012)

The definition is broad and non-exhaustive, but its illustrative examples capture the kinds of disasters that have had significant impacts on the lives of people, such as fires, explosions, accidents causing extensive loss of lives, public health crises like epidemics and pandemic, etc. As mentioned in the introduction, these disasters have significant involvement of business enterprises. Although the Disaster Management Act, 2012 primarily focuses on the formation and functions of the National Disaster Management Council and the District Disaster Management Committees (government organs tasked with disaster management activities and reduction, prevention, awareness, response, relief and rehabilitation stages), Section 49 of the Disaster Management Act, 2012, states:

(1) If a person intentionally or negligently, without taking appropriate preventive measures, causes an environmental catastrophe which causes a disaster and results in loss of life, property, establishment or business of any other person or organization, the aggrieved person or organization may file a suit in the appropriate court for recovery of compensation from that person or organization.

(3) If a suit for compensation is filed under sub-section (1), the court may, considering the evidence, order the payment of compensation equal to the actual loss or any other amount as the court considers appropriate.

This Section indirectly creates a negative responsibility upon corporations (Section 2(19) of the Disaster Management Act, 2012, defines “person” to include “where applicable, any company, or association of persons”) to refrain from “intentional or negligent” acts which cause environmental catastrophe or disasters and results in loss of lives, property, etc. It also allows a judicial mechanism for individuals to seek remedy in the form of compensation for loss.

(ii) National Disaster Management Policy, 2015

The National Disaster Management Policy, 2015 has been enacted pursuant to Section 19 of the Disaster Management Act, 2012, with a view to ensuring good governance in disaster management, and to ensure transparency and accountability of concerned stakeholders. Paragraph 4.2 of the National Disaster Management Policy, 2015 specifically addresses the role of businesses. It states that the government shall ensure coordination with business associations such as Federation of Bangladesh Chambers of Commerce and Industries (FBCCI), Bangladesh Garment Manufacturers and Exporters Association (BGMEA), Bangladesh Textile Manufacturers and Exporters Association (BTMEA), and Bangladesh Knitwear Manufacturers and Exporters Association (BKMEA) in order to encourage businesses to take independent measures of disaster risk reduction within their businesses. It also states

the government shall encourage businesses to participate in disaster response as part of its Corporate Social Responsibility (CSR) activities. Although this points to government acknowledgment of the importance of businesses as stakeholders in disaster risk reduction and response, the Policy only creates a responsibility on the part of the state and does not translate to any binding obligations on the part of corporations.

(iii) Standing Orders on Disaster (SOD), 2019

The SOD are enacted under the Disaster Management Act, 2012, with a view to delineating the roles and responsibilities of all concerned stakeholders at every stage of a disaster. The SOD lay down the organization of disaster management committees at local government levels and include the requirement of having one representative of local business groups in the committees. This can be a way to incorporate business interests and responsibilities within implementation of disaster management policies. Furthermore, particular businesses, such as businesses in the telecommunication, businesses in the petroleum sector, etc., have specific roles within the SOD. For example, under clause 5.2.16.1, mobile phone companies are required to coordinate with Bangladesh Telecommunication Regulatory Commission (BTRC) in sending early warning messages speedily to local people. Under clause 5.2.20.2, construction companies are required to coordinate with Urban Development Directorate (UDD) to receive required training for appropriate mechanisms in developing resilience. Under 5.2.50.1, companies and suppliers of petroleum products are required to coordinate with Bangladesh Petroleum Corporation (BPC) to ensure availability and distribution among the affected communities.

Conclusion

Bangladesh's labor laws, environmental laws, and disaster management laws touch upon the responsibilities of corporations to prevent and mitigate disasters. However, there are several gaps in its laws and policies which prevent the effective implementation of the principles of corporate responsibility. Firstly, the law and policy framework on disaster management barely explores the role to be played by private corporations in incidents of disaster; in particular, the aspect of industrial disasters in which responsibility may be attributed to the corporations themselves has not been properly addressed. Furthermore, the laws are fragmented, and do not provide a comprehensive guidance on the growing issue of the multifaceted impacts of industrial disasters. Moreover, existing laws have poorly structured framework on providing compensation; some, such as the Bangladesh Labour Act, 2006, provide a scheme of compensation which is largely inadequate and does not provide scope for judiciary discretion, and environmental laws such as the Bangladesh Environment Conservation Act, 1995, require for complaints to be brought to court by first applying to the Director General of the Department of Environment. Poor implementation of relevant laws resulting out of inadequate inspection, case backlogs in

courts, etc. is further exacerbated by the socioeconomic conditions of the affected communities. Furthermore, different stakeholders across ministries and divisions are entrusted with specific responsibilities, and there is a need for greater coordination. The SOD are a starting point from which the stakeholders can come together and create a holistic policy framework on ensuring corporate responsibility to reduce, prevent, and respond to disasters. In short, the following recommendations may be made:

- Amending the Disaster Management Act, 2012, to provide a comprehensive framework for seeking compensation by victims of disaster and formulating procedural rules and guidelines for the proper implementation of the same.
- Updating existing environmental laws to improve public access to judicial redress and strengthening the scope of local communities' access to the Department of Environment.
- Providing proper training to Labor Inspectors on safety standards and revamping the existing criteria of safety inspection to properly evaluate workplace safety standards.
- Establishing the requisite number of Labor Courts which are adequately staffed for timely disposal of labor disputes.
- Tackling corruption at all stages of inspection, governance, and judicial proceedings to ensure transparency.
- Providing safety and skills trainings to workers and communities in order to improve awareness at all levels, and coordinating with international organizations and NGOs if necessary.
- Formulating corporate governance policies on Environment and Safety (E&S) standards.
- Incentivizing the adoption of environmentally sustainable technology by providing advantages to compliant companies.

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Humanitarian Relief in the Time of Covid: 135 The Law and the Reality

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Contents

Introduction	2024
Secluded and Waiting: Issues of Access	2026
International Humanitarian Law: A Way Out?	2030
Conclusion	2033
References	2035

Abstract

Historically, the focus of humanitarian efforts has been on providing food, clean water, and healthcare support in areas locked in armed conflicts – as such essential ingredients of life are often rendered inaccessible for the people in such regions. However, recently, the Covid-19 pandemic has ravaged the world, bringing new dimensions and challenges to international humanitarian efforts. The added difficulty of the pandemic in regions that are already suffering from armed conflicts feeds off into a vicious cycle. On the one hand, the hostile activities and accompanying displacement of the people fuel the spread of Covid as social distancing and isolation continue to be distant dreams. On the other hand, the conflicts and international-level Covid restrictions severely hamper humanitarian access to the affected regions. In this way, without appropriate medical help via relief efforts, the situation continues to get worse.

Against this backdrop, this chapter analyzes what, if any, solutions international humanitarian law can provide to this peculiar problem. It begins with an understanding of how Covid-19 has impacted selected regions that were already facing a humanitarian crisis when the pandemic started. The next section explores the issue of humanitarian access in these regions in the aftermath of the pandemic,

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including the extent to which relief efforts have been undertaken there and the challenges regarding the same. Then, the chapter delves into the various aspects of international humanitarian law that are applicable in this scenario, which may provide a way out of these challenges. The final section suggests ways forward from the issue based on its legal and practical contexts.

Keywords

Humanitarian workers · Humanitarian relief · International humanitarian law · Covid relief

Introduction

The phrase “humanitarian crisis” describes a particular scenario where, due to a particular event or a number of succeeding events, the health, safety, and well-being of a large group of people are being affected. There is no single cause from which a humanitarian crisis must originate – it may rise from natural disasters, wars and armed conflicts, health emergencies, or even other man-made issues (*What Is a Humanitarian Emergency?*, n.d.). But overall, to be dubbed as a “crisis” or “emergency,” the scope of the problem must be so vast that it overwhelms the available arrangements and resources of the community (*What Is a Humanitarian Disaster?*, n.d.). Combining all of these different facets, the UNICEF has adopted a definition of humanitarian crisis that provides that it is “any circumstance where humanitarian needs are sufficiently large and complex to require significant external assistance and resources, and where a multi-sectoral response is needed, with the engagement of a wide range of international humanitarian actors” (*Scope of CCC's*, n.d.). Moreover, this definition also highlights that there is no set threshold of at what point a problem would be considered a crisis – as the resources and capacities of every country to deal with the issue would vary greatly. However, overall, such an event “threatens the lives and well-being of large numbers of a population and requires extraordinary action to ensure their survival, care and protection” (*Scope of CCC's*, n.d.).

In this context, the Covid-19 pandemic has certainly highlighted and exacerbated the existing deficiencies in public health and governance structures throughout the world. In several nations, the public health emergency, that is, the pandemic, has resulted in a humanitarian crisis in itself (United Nations, 2021). However, the situation turns out to be infinitely more complex when it impacts a nation or community that is already ravaged by a humanitarian emergency. Due to the existing vulnerabilities in such populations and difficulties related to access, the pandemic and the ongoing crises have fed into each other in a cycle, gradually causing the situation to worsen (Dahab et al., 2020; Essar et al., 2021). Currently, throughout the world, there are multiple situations unfolding that may be deemed as humanitarian crises – each with its own distinct emergency situations and problems. This chapter takes into account two of the worst humanitarian emergencies before the human race

right now, Afghanistan and Syria, along with an event closer to home, the crisis faced by the migrant laborers of India in 2020.

The humanitarian crisis in Afghanistan finds its origins several years ago, and it has been dubbed as a “complex emergency,” as well as the “largest humanitarian crisis” due to the various origins and increase in severity of the crisis through the years (*Complex Emergencies: FAO in Emergencies*, n.d.; Subcommittee on Near East Asia, South Asia, Central Asia and Counterterrorism, 2022). Against a backdrop of war, internal conflicts, and climate change emergency, the country has been trapped in a cycle of severe poverty that has been worsening through the generations. For the past several years, US and NATO troops had been stationed in the area with the purpose of maintenance of peace. However, once they were withdrawn in 2021, the country officially fell under the governance of the extremist Taliban group (Essar et al., 2021). On top of these severe human rights violations, food crisis is a major problem in the Afghan context as the majority of the nation is suffering from malnutrition and starvation (UN News, 2021). Additionally, since 2020, the country has been going through multiple waves of the pandemic, with the current number of total confirmed cases standing at 170 thousand and 7.5 thousand deaths (World Health Organization, n.d.). While these numbers may seem low, they are likely to be highly inaccurate due to the low testing capacity and unreliable infrastructure and tracking mechanism of the nation (United Nations Office for the Coordination of Humanitarian Affairs, 2021).

The crisis in Syria has a similar backdrop as the Afghan crisis and has been going on for more than a decade. The root of the event can be found in the Syrian civil war that started in 2011. While the nature of crisis in Afghanistan was one of hunger, in Syria, it is a refugee crisis. It is estimated that more than 6.6 million Syrian citizens had to flee the country since 2011, and an additional 6.7 million were displaced within the country (UN Refugees, 2021). While the global community has been proactive in granting asylum to these refugees, due to an overburdening of the system in the neighboring nations, for the displaced citizens, life has not improved drastically. Most of them live in poverty, without prospects of education, employment, or returning home (UNICEF, n.d.). It is estimated that currently more than 13 million Syrian refugees are in need of humanitarian assistance, which includes 3 million disabled people. For this population, the primary areas where humanitarian aid might be needed are related to poverty and unemployment. The pandemic has sharply exacerbated the existing crisis as the number of people requiring humanitarian assistance rose from 11 million in 2020 to 13 million in 2022 (UN Refugees, 2021). Moreover, the refugee population who are living in camps or other such temporary housing also remain vulnerable to frequent outbreaks of Covid.

Usually, humanitarian crises are characterized by a breakdown of law and order in the concerned nation as in the presence of a healthy governance mechanism the government would step in to mitigate any possible crisis to the fullest extent. However, the scenario was strangely different in India, when the 2020 migrant laborers’ crisis occurred. Unlike the Afghan or Syrian crisis, it was initiated not by a war or other aggressive event, but the policy enacted by the government itself. In March 2020, with a strict nationwide lockdown being implemented throughout

India, the brunt of the situation was borne by the migrant laborers, the daily wage workers employed in a state other than their home state. With factories, construction work, and almost every other avenue of employment effectively stopped, the migrant laborers did not have any source of income, thus, were unable to sustain themselves in the alien cities (Sharma, 2020b). This led to an event that is aptly described as “The Exodus,” where the migrant laborers began a journey back to their home states, thousands of kilometers away, on foot (Barhate et al., 2021). While there is no official data available on how many migrant workers took this journey and how many perished on the way, the fact that they had to walk cross-country without stable access to food, water, and shelter indicates that the number was in hundreds or, possibly, thousands (Elsa, 2020; Warsi, 2020). This population also comprised of several vulnerable sections – pregnant women, children, and the elderly (Sharma, 2020b). Given the lack of access to even the basics of life, it is more than likely that Covid safety and social distancing were far from their minds, which further exacerbated the spread of the disease in the migrant worker community, as well as in their hometowns (Sharma, 2020a).

While these are only three instances of crises, there are several other humanitarian emergencies happening throughout the world, where millions of people have been doubly devastated by the pandemic as well. However, an exploration of these three crises, which are highly different in their nature and context, will underline the primary and common barriers to providing humanitarian relief to such populations. Under this backdrop, the subsequent section in this chapter describes the context of the three crises in Afghanistan, Syria, and India, and analyzes the barriers preventing access to humanitarian relief in these regions. The penultimate section explores the problem from an IHL perspective and discusses how the various international law customs and instruments can be applicable in this context. The conclusive section sums up the findings of the chapter, while highlighting how the effective operation of these instruments to mitigate the issue is thwarted by various ground-level barriers.

Secluded and Waiting: Issues of Access

Humanitarian crises or emergencies are characterized by an existing scenario, where the concerned national government is unable or unwilling to provide the required assistance to its citizens. While the International Bill of Human Rights does not explicitly identify the right to receive humanitarian aid, considering that the basics of life such as food, shelter, and health, education are guaranteed to all people throughout the world (Universal Declaration of Human Rights, 1948), it can be argued that it is the responsibility of the global community to uphold these rights for the relevant populations when the concerned national governments have failed (Jakovljević, 1987). This spirit of help is extended by the international community with due respect to the sovereignty of the concerned nation as the OECD defines the humanitarian assistance as aid extended to “save lives, alleviate suffering and maintain human dignity during and in the aftermath of crises” (Organisation for Economic

Co-operation and Development, 2012), which is provided in natural disasters and other emergencies, “in accordance with the basic humanitarian principles of humanity, impartiality, or neutrality” (United Nations General Assembly, 1991). Thus, in instances of severe violation of the human rights of large groups of people, it is considered as an established custom of international law that humanitarian assistance must be provided by the global community (Dinstein, 2018). This custom was further solidified through the Geneva Conventions and Protocols as well, though its scope is limited to situations of armed conflict. However, historically, humanitarian aid has been provided by the international community in other scenarios such as natural or man-made disasters as well (Macalister-Smith, 1985).

While Afghanistan has been the site of a decades-long humanitarian emergency, the situation has perhaps never been more dire than it currently is. Data from the latter half of 2021 shows that 19 million people in Afghanistan are suffering from acute food insecurity, which is expected to reach 22.8 million by March 2022 (Food and Agriculture Organization & World Food Programme, 2021). While, on the one hand, severe food shortage continues to be a problem in the nation, on the other hand, it is ravaged by the pandemic. On top of this crisis scenario, since 2021, with the withdrawal of the US and NATO troops, the Taliban governance has made the situation exponentially worse. It has been identified by the Food and Agricultural Organization that providing humanitarian aid in Afghanistan is essentially “a matter of life and death” for millions of people – and without intervention from the international community, it will turn into a humanitarian catastrophe (UN News, 2021).

It is not that the international community is unwilling to lend a helping hand to the millions of starving Afghans. Currently, the United States and EU are the largest contributors toward humanitarian relief in Afghanistan, with the United States providing 30% and EU providing almost 25% of the total funding (Financial Tracking Service, n.d.). In the aftermath of the pandemic and the Taliban crisis, additional support has been pledged by the international community as well. Regarding the pandemic-related medical supplies as well, a number of nations, including India, have provided Afghanistan with millions of vaccine doses to ensure that the rampage of Covid in the nation can be curbed to some extent (Laskar, 2022; *Statement by NSC Spokesperson Emily Horne on the United States Providing Additional Humanitarian Assistance to the People of Afghanistan, 2022*). However, several practical and specific barriers make it extremely difficult to ensure that the aid will reach its destination and be efficiently utilized. The primary problem in this context is to ensure that the humanitarian relief will reach the intended victims of the problem and not the currently ruling Taliban group, who would misuse the same to further their extremist agenda. The problem is exacerbated by the fact that the primary mode of access in Afghanistan is through roadways. Commercial flights are extremely rare, and it is difficult for international aid to reach them through air routes (Menon, 2022). Moreover, with the change in government and the collapse in the banking system of the nation, providing financial support to the economy is challenging as well. To counter these problems to some extent, the humanitarian

workers at the international level have been requested to work “independently and securely,” so that the aid efforts may be kept out of the hands of the Taliban group. Pleas have also been made to the Taliban to ensure unfettered humanitarian access to the nation, so that the vulnerable people of the nation may be saved from a terrible fate (Madhani, 2022; *Statement by NSC Spokesperson Emily Horne on the United States Providing Additional Humanitarian Assistance to the People of Afghanistan, 2022*). Still, access and efficiency-related problems continue to hinder potential humanitarian efforts in the nation.

The situation is highly similar for the Syrians as well as for the internally and externally dispersed refugees. On the one hand, the community is ravaged by an extreme scarcity of food and basic social services, and, on the other hand, the pandemic has highlighted the lack of medicines, oxygen, emergency treatment, and other healthcare facilities. With the healthcare infrastructure in the nation almost broken down by the hundreds of attacks, the existing infrastructure was already not enough to meet the basic needs of the population – and it is almost useless in the face of a pandemic (“Coronavirus in Syria,” n.d.; “Health System Overwhelmed in Northern Syria in Most Severe COVID-19 Outbreak Yet,” n.d.). More than 70% of the existing healthcare workers have also fled the country, ensuring that the internally and externally displaced populations are helpless in the face of this crisis (*Syria Anniversary Press Release, 2020*).

While the international community is willing to undertake humanitarian efforts, the primary difficulty related to providing relief in Syria remains the problem of access. Initially, there were multiple border crossing points to Syria that were sanctioned by the UN to ensure that aid could reach all the parts of the country – even the citizens living in active conflict zones. However, due to opposition from several states before the United Nations Security Council, most of these crossing points were closed, and currently, only one point of access remains to the nation (Lederer, 2020). The Bab al-Hawa crossing point from Turkey was initially kept open for only a year, starting from July 2020, which has now been extended for a further 1 year (*Security Council Resolution 2585: The Situation in the Middle East, 2021*). However, considering that currently more than 11 million people including nearly 5 million children in Syria require humanitarian assistance – one access point is highly inadequate to mitigate their healthcare and otherwise basic needs (“Security Council Extends Use of Border Crossing for Humanitarian Aid into Syria, Unanimously Adopting Resolution 2585 (2021),” n.d.; *Syria Anniversary Press Release, 2020*).

In the context of India’s migrant laborer crisis, the scenario was highly different than the other two. On the one hand, the crisis was characterized by not a breakdown of law and order, but by a calculated move from the government itself. This pretext, combined with the fact that there were no official facts and figures regarding the “exodus,” led to a relative ambience of ignorance and apathy in the international community about the issue (Barhate et al., 2021). For that reason, the thousands of workers and their families who were not supported by the nation regarding food, shelter, transport, or medical assistance in their long and arduous journey, resulting

in countless deaths, remain largely unreported in the international community. While the UN took note of the issue and urged the Indian government to “treat [the] migrants with respect” and to show “domestic solidarity and unity . . . to ensure no one is left behind in this time of crisis” (UN News, 2020), without the migrant laborer issue being recognized as a crisis in the international context, there was no humanitarian relief provided by the other nations. Moreover, it is also debatable that in the presence of an active and robust Indian government, whether any effort toward humanitarian relief would have been appreciated, or whether it would be seen as an encroachment toward the sovereignty of the nation. Thus, it is unsure what specific access-related problems could have arisen for any potential humanitarian relief efforts in this context.

On top of the existing access-related issues that already existed in these crisis regions, the pandemic also introduced a number of new and unprecedented challenges in terms of the same. To begin with, most humanitarian organizations faced a massive deficit in funds as a great percentage of the funds and supports that were earmarked for humanitarian relief by the international community had to be redirected to contain the crisis at home. This resulted in several such organizations being compelled to pause various key operations, being able to provide only “life-saving assistance” in most cases (Iyer, 2020). This meant that any kind of humanitarian relief that was not directly and immediately connected to a life and death scenario would be put on the backburner.

However, on a more ground-level scale, the primary problem related to humanitarian relief during the pandemic has been that of access. Considering that for many months since 2020 most of the world was under significant travel and transport restrictions, measures that are still continuing in several countries to this day, ensuring that humanitarian workers and aid can reach the affected regions has been difficult. With lockdowns, mandatory social distancing, and lack of transport, many international organizations were unable to reach the regions where people depend upon international aid for the basic necessities of life. Regarding humanitarian access, Syria was categorized as the highest level of constraints, at “extreme constraints,” while Afghanistan was at the next possible level of “very high access constraints,” and India at the following level of “high access constraints” (Brubaker et al., 2021). Even dedicated flights from the UN or other international organizations were denied access or were highly restricted. While the aspect of limiting humanitarian assistance to life-saving situations could be justified, taking into account the pandemic perspective and to curb further spread of the virus, there was no agreement among the different nations and organizations as to the scope of the phrase “life-saving” (Brubaker et al., 2021). Such a difference in opinions resulted in most of the humanitarian relief to be dependent on the national and local branches or organizations, who could undertake domestic interventions without the same level of practical barriers as international bodies. However, the national and local-level bodies were not capable of bearing the brunt of the full force of the problems as in ordinary situations they are highly reliant on international cooperation.

International Humanitarian Law: A Way Out?

With regard to humanitarian relief and humanitarian access, as the name itself suggests, the most relevant legal sector would be International Humanitarian Law. This branch of legal system originated from rules and codes that would regularly be followed during war, and to this day, modern IHL includes various age-old customary provisions. However, the origin of modern IHL that is applicable in a multilateral context can be traced to the Geneva Conventions of 1949 and its three Additional Protocols.

While prior to the Geneva Conventions efforts had been made to consolidate the already existing international customs related to warfare, the need for a comprehensive international legal instrument was felt most crucially in the aftermath of the two world wars, which brought unimaginable horrors for people all around the world (Dörmann, 2003). The four Geneva Conventions that were enacted in 1949 were Convention for the Amelioration of the Condition of the Wounded and Sick in Armed Forces in the Field, the Convention for the Amelioration of the Condition of Wounded, Sick and Shipwrecked Members of Armed Forces at Sea, the Convention relative to the Treatment of Prisoners of War, and Convention relative to the Protection of Civilian Persons in Time of War (Convention (I) for the Amelioration of the Condition of the Wounded and Sick in Armed Forces in the Field, 1949; Convention (II) for the Amelioration of the Condition of Wounded, Sick and Shipwrecked Members of Armed Forces, 1949; Convention (III) Relative to the Treatment of Prisoners of War, 1949; Convention (IV) Relative to the Protection of Civilian Persons in Time of War, 1949). Two Additional Protocols to the Conventions were adopted in 1977 – the Protocol relating to the Protection of Victims of International Armed Conflicts and the Protocol relating to the Protection of Victims of Non-International Armed Conflicts (Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I), 1977; Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of Non-International Armed Conflicts (Protocol II), 1977). The final Additional Protocol, enacted in 2005, relates to the Adoption of an Additional Distinctive Emblem (Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Adoption of an Additional Distinctive Emblem (Protocol III), 2005).

The primary principles of IHL are focused on the fact that even during warfare unnecessarily cruel or inhumane acts may not be done toward any nation. The standards that are applicable toward enemy civilians, in this context, are much higher than the enemy forces (Dörmann, 2003). Essentially, the Geneva Conventions and their Additional Protocols are Treaties among the different nations, which means that for the state parties of each of the documents it is binding as international law. Among the countries in question, all three countries – Afghanistan, Syria, and India – are parties to all the four Geneva Conventions (Convention (I) for the Amelioration of the Condition of the Wounded and Sick in Armed Forces in the Field, 1949; Convention (II) for the Amelioration of the Condition of Wounded, Sick and Shipwrecked Members of Armed Forces, 1949; Convention (III) Relative to the

Treatment of Prisoners of War, 1949; Convention (IV) Relative to the Protection of Civilian Persons in Time of War, 1949). Among the Additional Protocols, Afghanistan is a party to the first two, Syria is a party to the first one, and India is not a party to any of them (Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Adoption of an Additional Distinctive Emblem (Protocol III), 2005; Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I), 1977; Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of Non-International Armed Conflicts (Protocol II), 1977). However, even beyond these treaty laws, there are a number of customary rules of International Humanitarian Law that hold great importance in the global community. While IHL is largely concerned about warfare and the ethicalities of the same, humanitarian relief and access find an important place therein (Henckaerts & Doswald-Beck, 2005).

The principle of safety and protection that must be accorded to humanitarian relief and personnel is an established one in the context of international humanitarian law. While formulating the rules of customary international humanitarian law, the International Committee of Red Cross has identified under Rule 31 that “Humanitarian relief personnel must be respected and protected” and under Rule 32 that “Objects used for humanitarian relief operations must be respected and protected” (Henckaerts & Doswald-Beck, 2005). These principles lie on the core belief that no attack or destruction may be launched over the selfless humanitarian relief force, which can provide a country ravaged by war or other such disasters with a helping hand. The ICRC recognizes that these rules are established as a “norm of customary international law,” which has been developed via state practice. The question of humanitarian access, in this context, is more directly dealt with by Rule 55, which states that “the parties to the conflict must allow and facilitate rapid and unimpeded passage of humanitarian relief for civilians in need, which is impartial in character and conducted without any adverse distinction, subject to their right of control,” and Rule 56, which provides that “the parties to the conflict must ensure the freedom of movement of authorized humanitarian relief personnel essential to the exercise of their functions” (Henckaerts & Doswald-Beck, 2005).

These principles of customary IHL are also highlighted in the four Geneva Conventions and their Additional Protocols. Article 23 of the Fourth Geneva Convention provides that the concerned state must provide free passage to all consignments related to healthcare, essential food, and clothing (Convention (IV) Relative to the Protection of Civilian Persons in Time of War, 1949). Similar sentiments are echoed through the 1977 Additional Protocol I as well. In the Additional Protocol I, under Article 17, it has been provided that the aid societies must be permitted “to collect and care for the wounded, sick and shipwrecked, even in invaded or occupied areas,” and the state parties shall “grant both protection and the necessary facilities” to them – even if the concerned region or area comes under the control of an adverse party (Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I), 1977). Related to humanitarian relief objects, Article

70 provides that in areas without adequate resources “relief actions which are humanitarian and impartial in character and conducted without any adverse distinction shall be undertaken” (Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I), 1977). Moreover, the state parties must take “relief actions which are humanitarian and impartial in character and conducted without any adverse distinction shall be undertaken” (Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I), 1977). These relief consignments must also be protected and distributed in a rapid and efficient manner. Under Article 71 as well, it has been provided that “relief personnel may form part of the assistance provided in any relief action, in particular for the transportation and distribution of relief consignments,” and that “such personnel shall be respected and protected.” Moreover, the state parties must, “to the fullest extent possible, assist the relief personnel . . . carrying out their relief mission” (Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I), 1977).

Another international law instrument that has a significant indirect impact on humanitarian relief efforts is the 1998 Rome Statute of the International Criminal Court. As the name itself suggests, this statute governs the jurisdiction and working of the International Criminal Court. The statute, under Article 7, denounces extermination as a crime against humanity, and this crime is defined as “the intentional infliction of conditions of life, *inter alia*, the deprivation of access to food and medicine, calculated to bring about the destruction of part of a population” (Rome Statute of the International Criminal Court, 1998). This means that cutting off access to life-saving humanitarian efforts may be classified as extermination under this context. Moreover, hampering humanitarian relief missions is also prescribed as a war crime under Article 8, which provides that “intentionally directing attacks against personnel, installations, material, units or vehicles involved in a humanitarian assistance or peacekeeping mission” is a serious violation of international laws and customs (Rome Statute of the International Criminal Court, 1998). While among the three countries, only Afghanistan is a party to the statute, the nature of the Rome Statute is such that it is binding even on nonparty states, if they undertake such serious international crimes.

Thus, there are several international humanitarian law principles that provide for the humanitarian missions, and their personnel and objects must be respected, protected, and facilitated. The Articles related to the same, as enshrined in the Fourth Geneva Convention, would be applicable against all three countries of Afghanistan, Syria, and India (Convention (IV) Relative to the Protection of Civilian Persons in Time of War, 1949). The relevant provisions from Additional Protocol I will be applicable against Afghanistan and Syria (Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I), 1977). However, as a part of customary

international law, the principle of impeded humanitarian access holds great value over all the nations (Henckaerts & Doswald-Beck, 2005). The provisions of the Rome Statute in this context would surely be binding on Afghanistan as a party under the same; however, nonparties such as Syria and India may also be brought under its purview in case of violations (Rome Statute of the International Criminal Court, 1998). Notably, while several legal provisions already exist in the context of humanitarian relief and access, the problem essentially relates to effective implementation.

A better implementation process might solve the critical problems of hunger, poverty, and unemployment of the population of Afghanistan, Syrian refugees, and Indian migrant workers – by curing or reducing the difficulties related to humanitarian efforts. For example, the protection-, safety-, and access-related issues in Afghanistan can be mitigated with effective implementation as the principles apply toward adversary groups also, including the Taliban (Convention (IV) Relative to the Protection of Civilian Persons in Time of War, 1949; Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I), 1977; Food and Agriculture Organization & World Food Programme, 2021). Similarly, in Syria, as the lack of access points is impeding humanitarian relief efforts (Lederer, 2020), the relevant principles can be implemented to ensure effective and unrestrained access. In the Indian context, it was a dual problem of lack of humanitarian efforts, as well as an indirect restriction of access due to underreporting lack of transparency in data. However, not only can this scenario be covered under the access-related provisions of IHL, but it may also be seen as a crime of “extermination” under the ICC statute (Convention (IV) Relative to the Protection of Civilian Persons in Time of War, 1949; Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I), 1977; Rome Statute of the International Criminal Court, 1998). Overall, on a global scale, the Covid-related restrictions that are unnecessarily constraining essential humanitarian relief efforts may be reduced via the applications of these provisions.

Conclusion

It is an undisputed fact that the access-related problems can be removed or, at the very least, reduced, through the application of the relevant International Humanitarian Law principles. Even considering the fact that not all the states are parties to all the Additional Protocols, the four Geneva Conventions that most states around the world are parties to, combined with the Rome Statute, are enough to facilitate significantly better humanitarian support in the crisis-addled regions. This support would ensure that not only the current starving and/or displaced populations of countries like Afghanistan, Syria, and India, but also the future generations of these nations, would be able to live and grow up in a secure and stable world. With the

essentials of life, such as food, clothing, shelter, and healthcare provided for, there would be a significantly better scope for appropriate mental and intellectual development (Madhani, 2022; Barhate et al., 2021; Lederer, 2020).

However, the current primary problem in this context is indisputably connected to the pandemic. While both Afghanistan and Syria had access-related problems beforehand, they could still be circumvented to some extent by applying the relevant legal principles. But they were exacerbated manifold by the Covid-19-related restrictions (Lederer, 2020; Menon, 2022). On the other hand, India's migrant laborer crisis was a direct result of the same. The restrictions that were applied in both the domestic and international contexts in these nations were mostly in line with various international law principles, along with instruments of public health law, such as the 2005 International Health Regulations (International Health Regulations, 2005). However, in such cases, when the humanitarian relief efforts began to be subsided under the pressure of these restrictions, the focus moved elsewhere and any related concerns were swept under the carpet. While in some cases the informal principle that only life-saving humanitarian efforts would be allowed were applied, this is not an international established principle. There was also no consensus as to which efforts would be deemed as "life-saving," and how that categorization may be made (Brubaker et al., 2021; Iyer, 2020). Moreover, considering that the pandemic is now proving to be a continuing public health crisis, it is getting considerably dangerous to delay or pause humanitarian relief efforts for indefinite periods of time.

Essentially, the problem of humanitarian relief or access in the context of Covid is that of balancing of interests. Considering that international law is formulated from treaties or customs with a decided voluntary aspect to it, in such contexts of double crisis, the question remains as to which of these instruments would have precedence over the other. However, the fact remains that an answer to such dilemmas must be formulated, and soon. In the absence of the same, a continuation of the current Covid-19 crisis or the emerging of a new one would hamper the already battered humanitarian efforts across the world to an irrecoverable extent.

What may be helpful in this context is perhaps a clarification of the scope of international humanitarian law and humanitarian relief efforts. As of yet, the IHL instruments do not provide any categorization or hierarchy of different kinds of humanitarian relief efforts that may be undertaken for various disasters. While an exhaustive list of all kinds of crises would be a difficult task, a tier-based categorization of the different kinds of disasters may be done, perhaps based on their range of impact – on territory, population, or time. This categorization would lay the groundwork for the balancing of conflicting interests and would provide a starting point regarding which relief efforts may be classified as life-saving and would have precedence over other interests – health or otherwise. Considering the ease of spread of global-level crises in the current climate, be it a health disaster or a nonhealth one, it cannot be expected that for each of them, other essential relief efforts would take a back seat. Thus, the states' cooperation in clarifying the existing gray area, perhaps in the form of another Additional Protocol, would go a long way toward ensuring the basics of life for millions of vulnerable people.

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International Humanitarian Law to Address the State Responsibility for the Management of Civilian Casualties in Post-War Situation

136

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Contents

Introduction	2040
Civilian Casualties as a Result of War	2041
State's Responsibility for the Protection of Civilian Property Under IHL	2044
Nature of State Responsibility v Armed Forces' Responsibility Under IHL	2046
State Responsibility for Reparation Under IHL	2047
Is Compensation Enough for Post-War Casualty Management as a Form of Reparation?	2048
Burden Sharing Responsibility as a Logical Solution	2050
A Change in Calculation of Compensation as a Solution	2050
Conclusion	2050
References	2051

Abstract

Civilian casualties or crises are a very usual and common aftereffect of an armed conflict either international or non-international. The amount of such war-driven casualty often becomes far higher than any other damage. The effect of such damage continues for a long time even after the conflict comes to an end and creates manifold and long-term negative impacts on the lives of the human population as well as environment in post-war situations. The responsibility of the conflicting state for creating civilian casualty by its armed forces under international humanitarian law only remains limited to or considers situations of the conflict to determine the amount of compensation. The post-war management responsibility is still not attached to a conflicting state complained against under the existing international humanitarian law (IHL) framework or any general principle of international law. Evidently, the victim states indeed are often financially unable to restore their situations. It therefore seems to be very crucial

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to attach individual responsibility to the conflicting states for post-war management of civilian casualties. Moreover in case of non-international armed conflict, a cooperative state responsibility is warranted. This chapter is an attempt to test the probability of how this responsibility issue could be addressed under the existing legal framework of IHL or under existing state responsibility regime established by general principle of international law. In the accomplishment of such a study, an in-depth analysis of state responsibility regime articulated by IHL for the protection of civilian properties and natural environment is relied upon in association with factual references to the post-war management of humanitarian crises in all previous era to the extent they are deemed to be fit.

Keywords

Civilian casualties · International humanitarian law · State responsibility · Reparation · Compensation

Introduction

Civilian casualties are the very usual and common aftereffects of a war which is a man-made disaster (Somasundaram, 2006; Irwin, 2014). The amount of civilian casualties caused in war out of the destruction of civilians' properties and natural environment in particular becomes far higher than any other damage. It continues for a long time even after the conflict comes to an end and generates manifold and widespread negative impacts on the lives of the human population, for their restoration and rehabilitation. It puts the war-ravaged states to shoulder the burden of huge amount of financial costs for the purpose of reconstruction activities, stumbling further more development and welfare activities for their citizens. The incidents of the Second World War and Iraq war of recent past evidence the extent of states "sufferings" in afterwar situations. The Second World War created long-lasting bad consequences to the states engaged in conflict affecting humans and their properties, the real cost of which could not be exactly statistically estimated, but said to be immense and uncountable. The worth-mentioning incident is atomic bombardment on two cities of Japan creating horrific destruction of everything with long-lasting effects borne by Japan alone years after years. As a consequence of war, both in Western and Eastern Europe, the devastation rate was vast. For example, France suffered a total amount of money equivalent to three times of its annual national income; in Great Britain about 30 percent of the homes were destroyed or damaged; and in Poland 30 percent of its buildings and 60 percent of its academic and scientific research institutions and government and public administration infrastructures and facilities were destroyed (Britannica, n.d.). The war in Iraq destroyed about \$230 billion of infrastructure (Committee on International Security Studies, 2002). It is often seen, considering the destruction of civilian properties and natural environment as a war crime for the breach of laws and customs of war established by the international humanitarian law (IHL), only the individuals are prosecuted in

the courts or tribunals and tried for their offences. The conflicting states are not held responsible for compensation for the damage caused and usually this is not invoked by the prosecuting states. The criminal tribunals indeed do not have jurisdiction determining the civil liability of the states for such damages caused by their armed forces. The claim could be litigated with the ICJ or any arbitral forum for violation of state responsibility under the IHL treaty principles. The IHL treaty principles dealing with state responsibility for taking all cares and precautionary measures so that civilian casualties involving civilian lives, abodes, properties, and natural environment do not happen are well articulated. Holding responsibility for a conflicting state out of the acts of the armed forces done in excess of military necessity is limited to war situations only and that is all for the determination of amount of responsibility. The IHL frameworks do not address the state's responsibility for post-war management or minimizing civilian casualties in a victim state. Nor so far the issue is concerned, the jurisprudential development occurred through the verdicts of the courts. The evident reality is often the victim states are found financially unable to restore their situations, for reconstructing their damaged infrastructure requiring huge amount of ultimate costs. An individual burden sharing or cooperative responsibility requirement may be attached to the offending states, thus making the restoration or rehabilitative programs of victim states easier. This chapter decides to examine how this responsibility proposal could be addressed logically under the existing legal framework of IHL or existing responsibility regimes established by general principles of international law. Doing such a work requires considering the interpretive approach of responsibility regime of IHL for the protection of civilian population and their properties during war with factual references to the post-war crises management in all previous times. Hence, for the accomplishment of this work, the author intends to address a few damage scenarios borne by the war-ravaged countries along with an in-depth critical analysis of the state responsibility for the wrongful acts of its armed forces leading to civilian casualties in respect of their properties, abodes, and all means of survival.

Civilian Casualties as a Result of War

Despite the strong prohibition by the laws and customs of war, the modern world has witnessed the disastrous impacts of attacks on civilian population and properties since the beginning of the last century. Attacks on civilian population and properties in different wars have resulted in the loss of many human lives unnecessarily, massive displacement of people, destruction of uncountable amount of civilian amenities, and widespread damage to social services and infrastructure. In an armed conflict-induced disaster summary sheet, it has been attempted to show that both international and internal armed conflicts create direct and indirect impacts on livelihood and food security (such as loss of food stock, crop yields, and livestock, loss of farms and fisheries tools, damage to irrigation channels, loss of labor forces), healthcare services (such as damage and destruction of hospitals and healthcare centers, poor water and sanitation and hygiene conditions, and disruption of health

assistance systems), shelter (such as damage and destruction of houses and buildings, destruction of natural resources used to rebuild shelter), water and sanitation services, education systems and facilities, electric generation systems, etc. (ACAPS, 2012).

The account of horrific disastrous incidents of the Second World War is not statistically accurately discernable. A study on only money loss of the countries in Europe shows an estimation of more than \$1,000,000,000,000, although this figure is not considered to be representing the human casualties and miseries, deprivation, and sufferings, damaged economic life, or sheer physical destruction of property (Britannica, n.d.). However, on a particular note, it has been shown that the destruction level of physical structure has gone far beyond the First World War. France found its total cost at an amount equivalent to three times more than France's national income (Ibid). Belgium and the Netherland's damage rates were almost same as their resources (Ibid). The destruction of homes and abodes in Great Britain was estimated to be about 30 percent, while in France, Belgium, and the Netherlands about 20 per cent (Ibid). A very vulnerable situation occurred to agriculture in these occupied countries. The huge amount of loss and damage of agricultural facilities and livestock used for farming, the shortage and crisis of machinery and fertilizers, and the drain on manpower created economic fragility in a wider scale (Ibid). Internal transport systems suffered immensely due to the destruction or confiscation of rail cars, locomotives, and barges, and the bombing of bridges and key rail centers (Ibid). The total economic conditions of the continental European countries came to a verge of collapse by the end of 1945 (Ibid). In a specific statistic, it has been shown that 70 percent of industrial infrastructure in Europe was destroyed (Pilisuk & Rountree, 2008). The estimated damage to property in the then Soviet Union either full or partial covered the destruction of 1710 cities and towns, 70,000 villages/hamlets, and 31,850 industrial establishments (The New York Times, 9 February 1946, Volume 95, Number 32158). It is noted that some countries such as Germany and Soviet Union came out of economic fragility sooner, but the UK, by contrast, was in economic ruin and experienced economic decline after war for decades to follow (Emadi-Coffin, 2008).

The devastation scenario was also worse in Eastern Europe. In Poland, 30 percent of its building structures as well as 60 percent schools, scientific institutions, and public administration facilities were damaged (Britannica, n.d.). The destruction also covered 30–35 percent of its agricultural property and 32 percent of its mining resources and electrical powers and industries (Ibid). According to a report, in Yugoslavia, 20.7 percent of its dwellings were destroyed (Ibid). In the Far East Asia, the devastation in Japan through atomic bombardment on its two cities, Hiroshima and Nagasaki, is the most unforgettable horrific incident in the world history. The wide range of human and property and environmental damage covers almost 70 percent of all, and particular statistics on every damaged entity appears to be impossible to be presented here in this chapter (Ibid). It is noteworthy that even the land became unable to grow plants for several consecutive years. The construction or restoration of these two cities in Japan took a long time after the end of war, burdening huge economic expenditure on it.

In recent times, the direct and collateral damage out of the 5-month-long US-led Iraq invasion in different cities of Iraq was immense, and the reconstruction process is still ongoing after the end of war. The damage rate could be assumed with few instances. The petroleum industry accounted for the 95 percent of Iraq's export earnings (Human Rights Watch, 1991). Iraq's oil industries and infrastructure suffered major loss and became the worse victims of the US and its allied forces' air strikes. It was reported that by the end of the war, all power-generating plants went out of function except two; the generating amount was reduced to less than 4 percent of the pre-war output of 9000 megawatts (*Ibid*). The destruction of electric-generating plants led to the wide-scale disruption of agricultural production and food distribution, thereby gravely affecting the healthcare system, water supply, and sewage treatment (*Ibid*). The air attacks also damaged civilian food warehouses, dairy product plants, water treatment facilities, agricultural sector facilities, and a veterinary-vaccine manufacturing facility. The repair cost for damage from air strikes to roads, bridges, electrical-generating plants, oil refineries, and other facilities amounted to \$200 billion (*Ibid*). Iraq spent not less than \$160 billion for its reconstruction and rehabilitation activities in the 1980s (*Ibid*).

In Yugoslavian war, NATO-led air strikes for about 4 months in 1999 destroyed 78 industrial sites and 42 energy installations and infrastructure (20 chemical and petrochemical installations that had the capacity of around 70 percent of oil processing) in the Federal Republic of Yugoslavia during the Kosovo crisis causing dangerous substance that pulled all component of air such as air, water, and soil (Committee on the Environment, Regional Planning and Local Authorities, 2001). These pollutant elements created a long-term negative impact on people's physical conditions and quality of lives in the said region. The serious environmental damage extended to several other countries of Southeast Europe such as Greece, Hungary, Albania, Bulgaria, Romania, Ukraine, and the former Yugoslav Republic of Macedonia (*Ibid*). The amount of forestry destroyed by fires was almost 250 hectares including several thousands of agro-lands that turned unfit and unusable on account of contamination or physical destruction (*Ibid*).

One of the most devastating wars that ended in the 1970s of the last century was the Vietnam War which caused immense human, environment, and economic costs. This war was characterized by the fact that it was fought for civilians, by civilians, and among civilians where the US fighter planes dropped seven millions of tons of ordnance, three times bigger than their acts in including napalm and chemical defoliants. The effects resulting from wide-scale bombardment by American forces not only involved deaths of humans from both sides but also caused devastation of cities, buildings, infrastructure, farmland, and vegetation (Alpha History, n.d.). This also led to human loss and material devastation in neighboring countries such as Laos and Cambodia. The physical devastation was so grave that it caused years of famine and sufferings in Southeast Asia. Huge arable land was poisoned with defoliant or drenched with napalm or diesel leaving some areas unfit for farming (*Ibid*).

State's Responsibility for the Protection of Civilian Property Under IHL

The protection of civilian lives and properties during an armed conflict has always been emphasized in IHL. Since the beginning of the twentieth century, the development of principle of “military necessity” as a legitimate ground for conducting hostilities by the conflicting states or entities established a restrictive approach for them in order to protect civilian lives and objects. (See The ST Petersburg Declaration, 1868, Paragraph 5 and Preamble. It is stated that “the only legitimate object which States should endeavour to accomplish during war is to weaken the military forces of the enemy.” See also Convention Respecting the Laws and Customs of War on Land (1899).) In the similar manner, the principle of distinction between combatants and noncombatants as well as military and civilian objects was developed to serve the said purpose. The IHL treaties throughout the last centuries underscored the need for the protection of civilian lives and properties and more or less addressed through establishing principles in treaty laws. They culminated into a comprehensive regime-building for that purpose, first through the adoption of the Geneva Convention IV of 1949 (The Geneva Convention IV of 1949 is titled as “Geneva Convention Relative to the Protection of Civilian Persons in Time of War of 12 August, 1949”) and then Additional Protocol 1 to the four Geneva Conventions of 1977. The Additional Protocol 1 focuses specifically on the protection of the civilian population and properties with the delineation of state responsibility during the armed conflicts. As regards the protection of civilian population and their objects, this Protocol recognizes the principle of distinction along with addressing the grounds of protection and thus establishing principles exclusively intended for the protection of civilian objects such as protection of objects indispensable to the survival of civilian population (See Additional Protocol 1 to the Geneva Conventions of August 12, 1949, Articles 48, 51, and 54), protection of natural environment (*Ibid*, Article 55), protection of cultural properties (*Ibid*, Article 53), and protection of work installations containing dangerous forces (*Ibid*, Article 57). This Protocol also prescribes an obligation for the parties to the conflict to undertake precautionary measures constantly “to save the civilian population, civilians and civilian objects” (*Ibid*, Article 57).

As regards state responsibility under this Protocol, it has been stated that the High Contracting Parties should ensure respect for this Protocol in all circumstances’ (*Ibid*, Article 1). The phrase “ensure respect” implies a conflicting state’s obligation to undertake necessary measures to prevent the breaches of obligations under this Protocol by its armed forces (Crawford & Pert, 2015). The Protocol reaffirms the basic rule of distinction creating obligation for the parties. The parameters of such obligation have been established by Article 80 of the same. Article 80 (1) provides that “... the Parties to the conflict shall without delay take all necessary measures for the execution of their obligations under ...this Protocol.” (See Additional Protocol 1 to the Geneva Conventions of August 12, 1949, Article 80 (1).) Paragraph 2 of the article states that “...the Parties to the conflict shall give orders and instructions to ensure observance of... this Protocol, and shall supervise their execution” (*Ibid*, 80 (2)). Article 86 (1) of the Protocol also deals with state’s responsibility as it states

that “...the Parties to the conflict shall repress grave breaches, and take measures necessary to suppress all other breaches” of this Protocol which result from a failure to act when under a duty to do so (*Ibid*, Article 86 (1)). All these principles in a similar manner have established state responsibility that may apply to the issues relating to the protection of civilian properties. The treaty-based principles indeed impose the responsibility upon a conflicting state to prevent the occurrence of such violations by its individual armed forces during the situations of armed conflict. So it is inferred from the text of the principles that the omission or negligence in this respect makes a state party engaged in conflict responsible for the violation.

The customary principle of IHL establishes the attribution of responsibility to a conflicting state out of an act done by an individual member of the armed forces or in other ways. Rule 149 determines a state’s responsibility for the breach of IHL attributable to it, and the breach may be committed by its organs, including its armed forces; by persons or entities it empowered to exercise elements of governmental authority; by persons or groups acting in fact on its instructions, or under its direction or control; and by private persons or groups which it acknowledges and adopts as its own conduct (The International Committee of Red Cross, [n.d.](#)). This customary principle determining state’s responsibility may apply to the protection of civilian lives and properties both in international and non-international armed conflict. Under this customary rule, responsibility for violations of IHL may be attributed under four different situations, each and every of which is also supported by the national and international case laws. If looked for particular reference such as for liability of a state for the acts of its armed forces, in the judgment of Eichmann in 1961, the Israeli District Court of Jerusalem attributed the wrongful acts committed by the accused person to Germany as its own “acts of state” (*Attorney General v. Adolf Eichmann*, [1961](#), p. 20). In the *Distomo Case* in 2003, the German Federal Supreme Court observed that the states become internationally responsible for the acts committed by their armed forces during hostilities (*Prefecture of Voita v Federal Republic of Germany*, [2004](#)). In the judgment of the Furundzija case in 1998, the International Criminal Court for the former Yugoslavia (ICTY) held that a state is responsible for the behavior of its armed force (*Prosecutor v Anto Furundzija*, [1998](#)). The ICTY also held a similar view in its judgment on Appeal in the *Prosecutor v. Tadic Case* (*Prosecutor v Dusko Tadic*, [1995](#)). The act of the armed forces during the conflict is deemed to be the act of the states on the premise that they are the de jure organ of the state. The basis for the attribution of the responsibility toward state is the actor’s direct or indirect agency of the state. The state’s responsibility for the all acts of its armed forces has inference from the ILC’s Articles of State Responsibility for Internationally Wrongful Acts, 2001, as Article 7 reads: “[t]he conduct of an organ of a State [...] shall be considered an act of the State under international law if the organ, person [...] acts in that capacity, even if it exceeds its authority or contravenes instructions.” The ILC comments that the international humanitarian law exemplifies the draft article. (The International Law Commission, *Commentary on the Draft Articles on the State Responsibility for Internationally Wrongful Acts 2001*; see for more explanation Marco Sassoli ([2002](#)).)

It is drawn from all above with regard to the state's responsibility that state becomes liable for civilian casualties and damages of their properties as well as natural environment. However, the responsibility of the state by nature differs from the individual responsibility of the members of the armed forces for their own acts.

Nature of State Responsibility v Armed Forces' Responsibility Under IHL

The responsibility a state incurs because of its breach of any kind of international law principles derived either from treaties or international customs is civil by nature which is remedied by reparation. In a report on the *Spanish Zone of Morocco Claims*, Judge Huber said: "If the obligation in question is not met, responsibility entails the duty to make reparation" (*Great Britain v. Spain, 1924*). Here the phrase "obligation in question" means obligation under international law. In the judgment of *Chorzow Factory* (1927), the PCIJ said: it is a principle of international law, and even a general conception of law, that any breach of an engagement involves an obligation to make reparation. Article 91 of the Additional Protocol recognizes the responsibility of a party to the conflict in the form of compensation for its own violation or any violation that may attributable to it for the acts of its armed forces (*Germany v. Poland, 1927*) (this will be discussed in the following section in detail).

The violations of IHL principles by the members of the armed forces give rise to international criminal responsibility. The members of the armed forces become responsible either individually or on the basis of command responsibility requiring trial by either domestic or international criminal tribunals. All the Geneva Conventions of 1949 including Protocols, 1977, have listed respectively the acts of grave breaches which are defined in international criminal law as international crimes such as genocide, crimes against humanity, war crimes, etc. (See the Geneva Convention I, Article 50; the Geneva Convention II, Article 51; the Geneva Convention III, Article 130; the Geneva Convention IV, Article 148; Additional Protocol 1, Article 85 (3).) According to Article 85 (3) of the Additional Protocol 1 to the Conventions, attack on civilian populations and their property including cultural properties and natural environment is an international crime (Article 85 (3) of the Additional Protocol 1 has designated certain grave breaches which constitute "war crime" according to Article 8 of the Rome Statute of International Criminal Court as war crime). The members of the armed forces of conflicting countries may be prosecuted for their acts causing the destruction of the civilian properties on the ground of international criminality.

In view of the difference of the character of responsibility, the same jurisdiction cannot be invoked or applied for determining their degree of responsibility and awarding punishment or declaring the amount of reparation. It is obvious since the time when the trial of international crimes formally started, no criminal tribunal yet held a state responsible for the crimes done by their armed forces or nationals during the armed conflict, rather the criminal tribunals dealt with the trial and declaring punishment of perpetrators of grave breaches of IHL (i.e., whether genocide or

crimes against humanity). The claim for compensation to the opposition state party to conflict can only be made by an injured or victim state through the process of litigation in an international civil court such as ICJ. The litigation cannot be proceeded with by a national of an opposition conflicting state. As per the general principle respecting state responsibility, a state becomes responsible for violations of international law in a manner to other states who suffer. In *Phosphates in Morocco* case, the PCIJ affirmed that with the commission of an internationally wrongful act by a state against another state, international responsibility is established “immediately as between the two states” (*Italy v. France*, 1938). The historical harsh reality is the international criminal cases have been lodged with internationally designated tribunals since the Nuremberg Trial and are still lodged with International Criminal Court (ICC) against the individual perpetrators for their violations of IHL principles constituting different international crimes, but in parallel no case remained to be seen lodged with ICJ or any other tribunal or forum claiming reparation for its violations attributable to it.

State Responsibility for Reparation Under IHL

There are different forms of reparation established by ILC’s Articles on State Responsibility, namely, restitution, compensation, or satisfaction. Article 34 of the Articles provides that “full reparation for the injury caused by the internationally wrongful act shall take the form of restitution, compensation or satisfaction, either singly or in combination” (See ILC’s Articles on State Responsibility for Wrongful Acts (2001), Article 34).

As regards restitution, it is stated that provision for restitution is to establish the situation that existed before the wrongful act was committed (*Ibid*). The article provides for restitution with a condition that this “is not materially impossible” and “does not involve a burden out of all proportion to the benefit deriving from restitution instead of compensation.” The explanation given in the Commentary on the Articles is that the restitution simply may mean to involve the conducts of the release of persons wrongly detained or the return of property wrongly seized, but can also be more complex act, and that restitution comes first on priority basis among the forms of reparation (International Law Commission, 2001). In case of the protection of the cultural property, the restitution as a means of reparation has been recognized as an obligation for parties to conflict. The First Protocol to the Hague Convention for the Protection of Cultural Property provides that State must prevent the exportation of cultural property from occupied territory (The First Protocol to the Hague Convention for the Protection of Cultural Property (1954), Paragraph 3). This also obliges the occupying State to return cultural property if exported (*Ibid*, Paragraph 3).

There are many instances that the form of restitution has been applied through the process of bilateral agreements among the countries. A number of agreements concluded after the end of the Second World War for the restitution of the property that had been stolen, seized, or confiscated. (For example, Paris Agreement on

Reparation from Germany (1946), The Convention on the Settlement of the Matters Arising out of the War and Occupation (1952).) In the afterwar situations, many countries adopted different measures for the restitution. Hungary's Military Manual provides that after the end of a conflict, the cultural and requisitioned objects belonging to civilians must be returned (The Hungary Military Manual, 1982) Germany in 1991 accepted the same rule about the requirement of the return of cultural property. This happened at the end of Iraq's occupation over Kuwait (The International Committee of Red Cross, Rule 150 Reparation <<https://ihl-database.icrc.org>> accessed 14 April 2022).

The current IHL treaty texts do not incorporate "restitution" as a mode of reparation for the damage caused out of violations or breaches of IHL principles in any manner whatsoever. Instead, only compensation has been recognized as only means under IHL for the violations of IHL principles. Article 91 of the Additional Protocol 1 states that "[a] Party to the conflict which violates the provisions . . . of this Protocol shall, if the case demands, be liable to pay compensation" (See the Additional Protocol 1 to the Geneva Conventions of August 12, 1949, Article 91). The obligation for compensation is a long-standing customary rule that has been spelled out in numerous postconflict bilateral arrangements. According to the ILC Articles, compensation is preferred where restitution does not work. The Commentary explains that "restitution, despite its primacy as legal principle, is frequently unavailable or inadequate. . . The role of compensation is to fill gaps so as to ensure full reparation for damage suffered" (International Law Commission, *Great Britain v. Spain*, 1924).

Another form of reparation is satisfaction. According to Article 37 of the ILC Articles, satisfaction is applied where the purpose of reparation cannot be made by other two forms such as restitution and compensation (ILC's Articles on State Responsibility on State Responsibility (2001), Article 37). Satisfaction considers the principle of "proportionality" to the injury caused (Ibid). Satisfaction is generally understood as a means for removing the loss or damage caused to the victim state.

It is indicated earlier that only "compensation" has been recognized as a form of reparation for loss or damage caused by the breach of state obligation or by an act done by any state agent. The restitution and satisfaction are not introduced in the framework of IHL, although recognized by the general principle of international law. However, apart from bilateral agreements during armed conflict, in consideration of damage or loss, the competent courts may exercise their discretion to give any rule for reparation either through restitution or satisfaction on the basis of the demand.

Is Compensation Enough for Post-War Casualty Management as a Form of Reparation?

The obligation to compensate on the basis of demand refers to the monetary compensation that seems to be an appropriate means to remedy all losses and damages caused to the opposition without any distinction between vanquished and victor. But the problem is the calculation or computation of the total damage or

destruction caused to the civilian property or natural environment as their consequences continue years after years posing burden upon the victim states. The once most recognized “Hall principle” of compensation is based upon the market price of the lost or damaged properties. This formula has been criticized immensely because the market price-based damage calculation often becomes unable to consider all potential consequences a victim may suffer. Particularly in case of war situation, the amount of compensation for environmental damage affecting human, animal, or plant health and lives cannot be duly calculable because there arise many types of unforeseen expenditure for restoration. In Yugoslavian war, a report reveals that the scale and long-term environmental damage necessitate special measures, with monitoring and rehabilitation programs both in Yugoslavia and neighboring countries, and this involves a huge amount of unforeseen expenditure. (The Regional Environmental Centre for Central and Eastern Europe, ‘Assessment of the Environmental Impact of Military Activities during Yugoslavia Conflict’ (Preliminary Findings, June 1999).) Sometimes, it is seen that the victim state or states do not have the equipment or institutional capacity to carry out long-term monitoring and implementing measures needed to localize the consequences of the conflict. In case of infrastructure damage the restoration of which takes a long time, the market-based damage calculation suffers the same problem. Additional funding is needed to resolve the problem, because the disposal of debris from building or bridges, accumulation of rubbish and household waste, and the arrangement of equipment and organization for the rehabilitation of healthcare activities are usually borne by the victim states and the calculation of compensation if demanded cannot address or include these additional charges. So the compensation obligation under IHL framework does not suffice to carry out the afterwar civilian disaster management.

In addition, other two forms of reparation may not be deemed to be instrumental in a successful post-war disaster management resulting from the damage and destruction caused to civilian properties as well as natural environment. However, these two methods suffer some kinds of restriction in terms of application and also definitional lacuna. The concept of “restitution is a gain-based remedy” that is very much used to the things of small amount and private ownership. The legal and customary development so far with regard to restitution has been confined to return of cultural property, even owned by the private individuals. Clause 3 of Article 37 of the ILC Articles on State puts limits on the application of “satisfaction” as it states that “satisfaction shall not be out of proportion to the injury and may not take a form of humiliating to the responsible state” (ILC’s Article on the State Responsibility for Wrongful Acts (2001), Article 37 (3)). Accordingly, through the use of satisfaction method alone, post-war disaster management seems to be unlikely, even impossible.

Against the said backdrop, the author recommends two things for a successful management of civilian casualties in post-war situation. Firstly, alongside the compensation as under Article 91 of the Additional Protocol 1, inclusion of a “burden sharing” responsibility may be an effective solution (The Additional Protocol 1 to the Geneva Conventions of 1949 (1977) article 91). Secondly, through an authoritative explanation in the text itself, the meaning of “compensation can be extended to

rehabilitative scheme or program taken by claiming war-ravaged country.” To say clearly, the process of calculation of compensation not only is limited to the cost of losses and damage but also includes the potential and unseen expenditure for rehabilitation or restoration.

Burden Sharing Responsibility as a Logical Solution

Burden sharing responsibility may seem to be significant as a solution for post-war management of civilian casualties. The proposed “burden sharing responsibility” is a modified expression of “burden and responsibility sharing” taken under “Global Compact on Refugee” by the United Nations. The program is mainly intended to ease pressure on host state of refugees and enhance refugees’ self-reliance. The rationale for this is often the host state of refugees finds itself unable to provide duly economic and other international support to the refugee as an obligation due its economic constraint and lack of availability of required logistics. A similar situation is often seen for a war-ravaged country for its reconstruction and post-war disaster management as indicated in the above sections. Against such a backdrop, with the state’s obligation for compensation, an addition of “burden sharing responsibility” may be just and logical.

A Change in Calculation of Compensation as a Solution

The calculation process based on market price cannot be useful to remedy the injury of continued and widespread character as discussed in the section above. It indeed considers the existing losses and damages to the victim country. Therefore, compensation obligation might have coverage of post-war rehabilitative program and thus be a logical solution for war-induced uncountable civilian disaster management.

Conclusion

The chapter was an attempt to examine the probability of establishing a responsibility regime under IHL for states for the management of war-driven civilian casualties in the post-war time. A threadbare discussion and analysis reveal that under the current IHL, a state is only obliged to compensate the victim state for all losses or damages to it caused by its armed forces. The market-based compensation that is often used is thought to be insufficient for the successful post-war disaster management due to its inner lacuna relating to process of calculation of the amount of compensation. In view of this, the author has recommended two proposals that introduction of a burden sharing responsibility principle and bringing a change into the process of calculation of compensation may pave the way for successful post-war management of civilian casualties.

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Part XI

Administrative Initiatives and Best Practices



Disaster Management: Administrative Initiatives and Best Practices

137

R. L. S. Fernando

Contents

Introduction	2055
Summary	2060
References	2060

Abstract

The theme of Disaster Management: Administrative Initiatives and Best Practices of the book titled “International Handbook on Disaster Research” consists of ten research articles related to various stages of the disaster cycle reflecting pre- and post-disaster phases in relation to the South Asian context. All papers in this section are based on qualitative research methods using both primary and secondary data sources. The first part of this chapter presents an overview of these studies, and the latter part of the chapter discusses administrative initiatives and best practices in disaster management providing guidance for a better way to prepare for possible disasters and respond to them as quickly and effectively in all stages of the disaster management cycle.

Keywords

Administrative Initiatives · Best Practices · Disaster Management

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Introduction

Disaster research could be undertaken similarly to social science research. As disaster research are involved in multidisciplinary field, qualitative, quantitative, and mixed methods could be undertaken in the same way as in the social science research. Disaster research are being extensively undertaken descriptively with qualitative research methods. But quantitative studies with advanced statistics and rigorous analysis of disaster research could also be undertaken to test the hypotheses. The aftermath of disasters could also be conducted but may have several challenges as this involves human subjects; however, these kinds of research need to be reviewed systematically and qualitatively under the existing ethical guidelines for disaster research by using the constant comparative method (Mezinska et al., 2016). Thus, disaster research could be conducted using multi-method research approaches.

Among the chapters of this section, a study titled “Paradigm Shift in Disaster Management: Bangladesh Experience” (Chap. 118) authored by Haque argues that disaster management is a paradigm shift, because disaster management involves several activities including disaster risk reduction, smart early warning systems, emergency response, fast evacuation, transfer to the safety of a cyclone shelter, and adoption of pre-disaster and post-disaster plans. With the use of secondary data sources and qualitative research methods, this chapter recommends various policy guidelines adopted by the government, interagency collaboration, community participation in disaster management, and disaster governance to reduce the disaster impact of Bangladesh.

Another titled “The Use of Earth Jurisprudence Against Anthropogenic Marine Environmental Disasters in Sri Lanka” (Chap. 116) written by Edirisinghe emphasizes the necessity of deviating from the legal frameworks which keep the protection of human interests as its core objective. By taking a case of the worst maritime environmental disaster called “MV X-Press Pearl,” a Singaporean containership, the chapter analyzes how earth jurisprudence can be used to protect the oceans and ocean species in Sri Lanka from anthropogenic maritime disasters and to reduce the damage. Using the black letter approach and international and comparative research methodology referencing to several countries in drawing lessons for law reforms, the chapter provided guidance to protect the Sri Lankan oceans for more than the instrumental values that they hold.

The next chapter titled “Making Those Accountable for Man-Made Natural Disasters: A Critical Appraisal of the Law with Special Reference to Sri Lanka” (Chap. 115) authored by Konasinghe and Thilakarathna attempts to design a liability regime for those who either directly or indirectly contribute to the creation of natural disasters. The authors argued that the existing legal system fails to impose pecuniary liability upon those who either directly or indirectly contribute to the creation of natural disasters and that the use of the “polluter pays” principle is inadequate at times since all harm that is caused to the environment cannot be rectified with compensation. Hence, this study suggested awarding exemplary damages, shifting the burden of proof upon the exploiters of natural resources to prove such exploitation does not cause or aid in the creation of natural disasters, and environmental

taxation should be better utilized in making this novel concept a reality for environmental protection and governance.

Another chapter titled “Capacity Building at the Level of Community to Reduce the Risk of Natural Disasters: A Study on the Indian Scenario” authored by Akanksha Shukla and Subrat Kumar Mishra examines the strengths and weaknesses of the Disaster Management Act of India enacted in 2005. Using qualitative research methods of data collection of both primary and secondary information on disaster scenarios in two blocks of Bhadrak district of Odisha state, the study highlights the necessity of building the capacity of rural local bodies to implement schemes for economic development and social justice to minimize the effects of natural disasters on a sustainable basis. The latter part of this chapter proposes recommendations for building the capacities of these institutions to integrate disaster risk reduction planning to improve coping strategies of local communities to manage climate-related hazards as capacity building measures of the local community to improve the disaster risk resilience index of the respective area.

The next chapter titled “Drought, Food Insecurity, and Gender Relations in Selected Districts in India” (Chap. 139) authored by Basanta Kumar Sahu analyzes multiple impact of drought focusing on household food insecurity, drought coping, food insecurity, occupational changes, intra-household risk sharing, and gender relations in some drought-affected districts in India. Using the primary data from 179 sample households with a questionnaire, direct interviews, and focus group discussions in four villages and using Coping Strategy Index (CSI), the chapter revealed that poor households have to follow varied food arrangements and occupational changes in response to drought impact and follow both “labor smoothing” and “consumption smoothing” strategies to manage food scarcity which are neither effective nor gender neutral and also offers some region-specific policy actions to improve drought risk governance and management to improve gender equity.

Another chapter titled “Good Governance Strategies for Disaster Management and Risk Reduction” (Chap. 140) chapter authored by Pallavi Sinha Das also uses qualitative research methods with secondary data to examine the Disaster Management Act 2005 in India and highlighted the governance structure that aids the enactment and administration of public policies along with sustainable livelihoods which are conducive to a country’s economic and social development and condenses the vulnerability to disasters. The study emphasized that disaster mitigation machinery needs to be equipped and organized in advance to minimize the post-disaster effects.

The next chapter titled “Climate Change Disasters and Impact on Women in South Asia” (Chap. 141) written by Garima Sangwan and Debahuti Brahmachari examines the complex interplay of gender and climate change disasters. With the use of qualitative research methods with descriptive analysis based on secondary data, the chapter discusses various dimensions of gender inequality and climate change disasters to understand the impacts of climate change disasters on women and emphasizes gendered disaster management and a comprehensive disaster management approach that needed to highlight the gendered impact of such crises. The

research tries to sum up proactive strategies as recommendations that the state should embark upon both as long-term and short-term goals.

The next chapter titled, “Women and Domestic Violence During the Covid-19 Pandemic in India” (Chap. 140) authored by Rahila Sikandar, emphasizes domestic violence and its impact on women during the Covid-19 pandemic. The study presented five cases using primary data in the form of interviews and content analysis. The author argued that crimes against women and children have increased during the pandemic; the executive, the legislature, and the judiciary should pay immediate consideration to domestic violence during the pandemic by providing counselling and other services.

Another chapter titled “Cities and Climate Change: Responding to the Impacts of Water-Related Disasters in Sri Lanka” (Chap. 154) authored by Deepthi Wickramasinghe and others examines the impacts of water-related disasters in Sri Lankan cities. Using qualitative research methods with secondary data and related literature review, the study revealed that many coastal cities have faced the impacts of floods and droughts, while inland urban areas have exhibited more impacts from landslides and discussed challenges in managing water-related disasters. This study sheds light on how cities could prepare for rising impacts of climate change and disasters and urged to adopt “environmentally smart” solutions to make cities disaster-safe and disaster-resilient places.

The final chapter titled “Unsung Climate Heroes: Women Protecting Land, Environment, and Livelihood in Odisha” (Chap. 144) by Annapurna Devi Pandey explores how women correct man-made climate change and protect the environment in India. Based on the longitudinal ethnographic fieldwork based on three villages in India with the use of case studies during 2016–2022, the study revealed that rural and indigenous women in Odisha led a struggle to preserve endangered forests, mountains, rivers, and other vital natural resources. This study presented several life experiences of grassroots organizers and activists intimately connected with their land and described how their lives and livelihood have been crippled by development projects contributing to global warming. These women in rural and tribal regions provide lessons to create new insights for a stable and sustainable future, and their initiatives proved necessary grounds for self-empowerment essential to the democratic process for the inclusion of women in policy-making.

All these chapters are related to various stages of disaster management, and the most of the studies have analyzed the impact of disasters in which policies and laws required in the areas of disaster management are highlighted. Disaster risk management helps to reduce the risk of potential disasters that mainly consist of the pre-disaster stage and post-disaster stage.

Best practices of disaster management provide guidance to prepare for possible disasters and respond to them as quickly and effectively in all stages of the disaster management cycle including prevention, mitigation, preparedness, response, and recovery. Mitigation and preparedness are involved in the pre-disaster stage, and response and recovery with rebuilding are involved in the post-disaster stage.

Disaster prevention refers to measures taken to eliminate the root causes that make people vulnerable to disaster (Transitional Government of Ethiopia (TGE),

1993, as cited in Sena & W/Michael, 2006). Multiple strategies including raising awareness about potential hazards and how to address them, educating the public about how to properly prepare for different types of disaster, and installing and strengthening prediction and warning systems are required to reduce the impact of disasters and increase the resilience of the community (Tulane University School of Public Health and Tropical Medicine, 2021). Better communication and coordination are also important in all phases of disaster management.

Disaster mitigation is a continuing effort of emergency management aiming to reduce the impact disasters may have on people, property, and the environment. The Hyogo Framework for Action (HFA) is the first global strategy to provide a detailed work plan for different sectors and actors to work on disaster risk reduction, and the Priority Action 3 of the HFA demands a global call to governments and others to use knowledge, innovation, and education to build a culture of safety and resilience at all levels (Zhoud et al., 2014). Prevention and mitigation strategies should be based on risk assessment and can be considered in relation to land use planning and building codes, providing essential infrastructure, structural works, and appropriate management and protection of landscapes and the environment (Queensland Government, 2021). Providing disaster insurance to protect people's belongings and relocating or evacuating people from disasters could also be recommended.

Disaster preparedness needs a well-prepared plan and implementation of these plans with better communication and coordination to face potential disasters that will help to ensure fast and effective response efforts. Disaster preparedness plans should identify organizational resources, designate roles and responsibilities, create procedures and policies, and organize activities that improve disaster preparedness (Tulane University School of Public Health and Tropical Medicine, 2021). To enhance the effectiveness of the disaster plans, the needs of the communities that may be exposed to possible disasters have to be identified in advance, and also the capacity building of disaster management teams including volunteers and other stakeholders is needed. As observed, improving disaster preparedness and at the same time enabling better disaster prevention and climate adaptation remain key challenges for sustainable development (World Bank, 2022).

Disaster response and recovery strategies and actions are involved in the post-disaster period. Disaster relief is immediate support that is required to provide basic human needs such as food, water, and shelter, and disaster recovery is focused on restoring survival for improving the quality of life. Before implementing disaster response and recovery strategies, disaster response plans should be informed and communicated to all stakeholders using relevant organizational structures (UNDRR, 2021) that help to reduce the damage of the disasters leading to the resilience of the victims and post-recovery. Implementing the post-disaster strategies needs strong government intervention in collaboration with volunteer groups, the private sector, and NGOs. During and immediately after an emergency, disaster management focuses on delivering help and interventions that can save lives, safeguard health, and protect buildings, animals, and community property. Following an initial response, efforts are required to support communities to rebuild emotionally, economically, and physically, and these rebuilding efforts are needed in the areas of

housing, survival methods, infrastructure, education, and health (Tulane University School of Public Health and Tropical Medicine, 2021).

Summary

Disaster management is a continuous, integrated, and holistic process in which any initiation should be done by the government that needs to implement strategies in disaster risk management in collaboration with the private sector, NGOs, and volunteers in the process. The ten articles in this section presented theoretical and practical scenarios in relation to the pre- and post-disaster phases of disaster management in relation to the South Asian context. The latter part of the chapter presented best practices and initiatives in disaster management. All these articles in this section are based on the qualitative research methods, but disaster research also could be taken with the quantitative research methods with the hypotheses testing that is lacking in this section. More comprehensive studies are required, using multi-methods of research in the disaster management field, in future research that could be considered in developing better strategies for disaster management.

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Capacity Building at the Level of Community to Reduce the Risk of Natural Disasters: A Study on the Indian Scenario

138

Akanksha Shukla and Subrat Kumar Mishra

Contents

Introduction	2062
Review of Existing Frameworks on Community-Level Disaster Risk Resilience	2063
Study Area, Objective, and Methodology	2064
Analysis and Discussion	2067
Institutional Setup to Manage Disasters at Local Level	2067
Constraints at the Community Level in Managing Hazards	2069
Capacity Building as a Tool for Disaster Risk Reduction	2071
Conclusion and Way Forward	2075
Reference	2076

Abstract

The enactment of the Disaster Management Act of India in the year 2005 has been a paradigm shift in the approach to disaster management in India. The act envisages reducing the risk of natural disasters by equipping the local communities and their institutions with the necessary skills and capacities to manage these kinds of situations. Gram Panchayat is the institution of local self-government at the village level; Article-243-G of India's Constitution endows them with the necessary powers and responsibilities to prepare plans for economic development and social justice. The chapter based on the study in one of the most disaster-prone states of India highlights the need of building the capacity of rural local bodies to implement the schemes for economic development and social justice to

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minimize the effects of natural disasters on a sustainable basis. On the basis of collection of secondary information on disaster scenario in two blocks of Bhadrak district of Odisha state, individual interview and focus group discussions with 500 members of disaster-affected villages as a part of Participatory Learning and Action exercises conducted in the Gram Panchayats covered under the study, the chapter suggests that building capacities of these institutions to integrate disaster risk reduction planning with the Gram Panchayat Development Plan is critical in improving the coping strategies of local communities to manage climate-related hazards. It was also observed that capacity-building measures at the community level improve the disaster risk resilience index of the respective area.

Keywords

Hazard · Vulnerability · Disaster resilience

Introduction

Disaster in common parlance is known as series of events, which gives rise to casualties, damage, and loss of properties, infrastructures, environment, essential services, or means of livelihood on such a scale that is beyond the normal capacity of the affected community to cope with. Disaster Management Act, 2005, of India defines disaster as “a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man-made causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area” (MoHA, GoI, 2011).

The United Nations Office for Disaster Risk Reduction defines a disaster as a hazardous event, phenomenon, substance, human activity, or condition that may cause loss of life, injury or other health impacts, damage to property, loss of livelihoods and services, social and economic disruption, or environmental damage. Disaster is often associated with the risk of negative consequences of a hazard that is natural or man-made. Hence to minimize the risk of hazards, enhancing the capacity of the local community is critical to address the vulnerabilities associated with natural disasters (UNDRR, 2015).

The National Policy on Disaster Management 2009 (NPDM) of India also lays utmost emphasis on disaster preparedness at the level of the local community and their institutions like Gram Panchayats, self-help groups, youth clubs, etc. The policy further recognizes the role of these institutions in the process of preparedness and response to natural disasters as they are quick to respond to any hazards due to their proximity to the local community. During the pre-impact phase, their role is crucial in early warning, hazard mapping, vulnerability assessment, and evacuation process. The involvement of these institutions is also highly essential in the rescue, relief, and response processes including care for domestic animals and managing the

distribution of relief to affected communities. During post-disaster phases like rehabilitation and reconstruction, the policy outlines the need for planning at the level of Gram Panchayat for the construction of hazard-proof houses, roads, bridges, canals, water reservoirs, power transmission lines, etc. with the participation of affected communities. Community-based disaster management (CBDM) by its very nature also demands a decentralized bottom-up approach with the involvement of local bodies considering the diversities and vulnerabilities at different levels. Gram Panchayats and other local bodies need to actively engage with “at-risk communities” for identification, analysis, treatment, monitoring, and evaluation of disaster risks in order to reduce their vulnerabilities (NDMA, MoHA, GoI, [2009a, 2009](#)).

Review of Existing Frameworks on Community-Level Disaster Risk Resilience

The Sendai Framework for Disaster Risk Reduction, 2015–2030, has been recognized globally as the first major agreement that provides member states with concrete actions to safeguard the gains of development by reducing the risk of disasters. The Sendai Framework succeeded the Hyogo Framework of Action (HFA), 2005–1015, for building resilience on nations and communities against potential risks associated with natural as well as human-induced disasters. The Sendai Framework outlines seven targets, out of which four of them emphasize understanding the disaster risks and building the capacities of multiple stakeholders to be resilient to all kinds of hazards. According to the framework, disaster risk management must be based on understanding the disaster risk from all dimensions of its vulnerability such as exposure to risks, capacity, and characteristics of hazards. This know-how can be effectively applied to assessing the disaster risk, its prevention, preparedness, and response mechanism. It further prioritizes strengthening the disaster risk governance at every level, viz., global, regional, national, and microlevels for minimizing the adverse effects of hazards. Disaster risk governance calls for collaboration and partnership at every level by empowering community-level institutions. The framework also agrees upon public and private investments in disaster risk prevention and reduction through structural as well as nonstructural measures which are essential to enhance the economic, social, health, and cultural resilience of persons and communities. The framework recognizes the need to strengthen disaster preparedness and response measures in anticipation of a growing number of hazards. The recovery, rehabilitation, and reconstruction phases were considered critical by each of the participating countries to “build back better” by integrating disaster risk reduction into development planning. In a nutshell, the Sendai Framework focuses on the adoption of measures to address multiple dimensions of disaster risk like exposure to hazards, vulnerability, and capacity in order to prevent the creation of new risks, reduce existing risks, and increase resilience ([United Nations, 2015](#)).

Experiences across the globe have also shown that disaster risk reduction measures are successful when the participation of people is ensured at each stage of

managing hazards. Since the community is the first responder to disasters, failure to understand the risk behavior and culture of the local community leads to poorly designed preparedness measures. Disaster recovery and relief responses which do not directly involve the affected communities have greater risks of providing inappropriate and unsustainable forms of assistance, whereas the involvement of community-level institutions promotes self-reliance. Hence it has been widely recognized to involve the local community that promotes self-reliance and emergency management plans that meet local needs, circumstances, and challenges involved therein. Organized communities are also better equipped with respect to the mitigation of hazards based on their earlier experiences, available indigenous knowledge, wisdom, and innovation. A community-level focus facilitates better-prepared institutions on the ground so that there would be a much lesser impact of disasters in terms of loss and casualties (ADPC, 2006).

Section 22 (2)(i) of the Disaster Management Act, 2005, of India stipulates enhancing awareness, education, and training at the ground level with the participation of the local community to manage various natural disasters. It also emphasizes contemplating suitable measures to prevent, respond, and mitigate disasters in the long run. Section 30 (2)(xii) of the act facilitates training and awareness at the community level for the prevention of natural disasters with the support of elected representatives of local self-governments (LSGs), officials of departments working at the cutting edge, and functionaries of nongovernment organizations (Ministry of Law and Justice, GoI, 2005).

India's National Policy on Disaster Management, 2009, lays special emphasis on disaster preparedness at the community level since they are placed at the center of disaster response and preparedness. The policy mandates capacity-building initiatives like training and mock drills of vulnerable sections with the participation of primary stakeholders leading to their empowerment. The policy also gives due recognition to community-level institutions in the matters like animal care and managing relief operations as part of the disaster response mechanism. In the reconstruction phase, the policy clearly outlines the need for owner-driven repair, retrofitting, and construction of houses. It has also prioritized training for developing community-based disaster management systems for the specific needs at the local level in view of regional diversities and multi-hazard vulnerabilities in Indian scenario (NDMA, MoHA, GoI, 2009a, 2009).

Study Area, Objective, and Methodology

A study was undertaken in ten disaster-prone Gram Panchayats of Bhadrak district of Odisha to explore the effectiveness of capacity-building initiatives at the level of rural local bodies in improving the disaster risk resilience of communities at the local level.

Bhadrak is a coastal district of Odisha located in the east coast of India and prone to climate-related hazards like flood at regular intervals. The district is also



NB-Blocks covered under the study have been marked with arrows

Fig. 1 Study areas. (Source: www.bhadrak.nic.in)

vulnerable to cyclones due to its proximity to the Bay of Bengal and comes under damage risk zone-B (vb-50 m/sec) due to high-speed wind (Fig. 1).

The district also witnessed severe damage during the 1999 super-cyclone. The district experienced three major droughts during 2010–2019 which led to 45364.31 hectares of crop loss and damage to food grains. There are reports of other hazards like heat waves, thunder storm, lightening, fire accidents, snake bite, etc. that are also experienced in the district at regular intervals (DDMP, Bhadrak, 2019).

Bhadrak being the district prone to multiple natural hazards in the state of Odisha as part of the east coast of India was selected for the study. The study was undertaken in two blocks of the district prone to natural hazards like floods and cyclone at regular intervals. Basudevpur and Chandabali were the blocks where the study was carried out. As these two blocks, i.e., Basudevpur and Chandabali of Bhadrak district, are situated on the coast of the Bay of Bengal, the villages lying within 1.5 kilometers of the coast are also highly vulnerable to tsunami, one of the deadliest natural disasters. The Indian Meteorological Department (IMD) of the government of India has identified 17 and 24 villages in the Basudevpur and Chandabali blocks, respectively, which are vulnerable to tsunami (DDMP, Bhadrak, 2019) (Fig. 2).

Since all the Gram Panchayats of these two blocks are prone to both floods and cyclones, five Gram Panchayats from each block were selected at random for the purpose of the study with the following objectives:

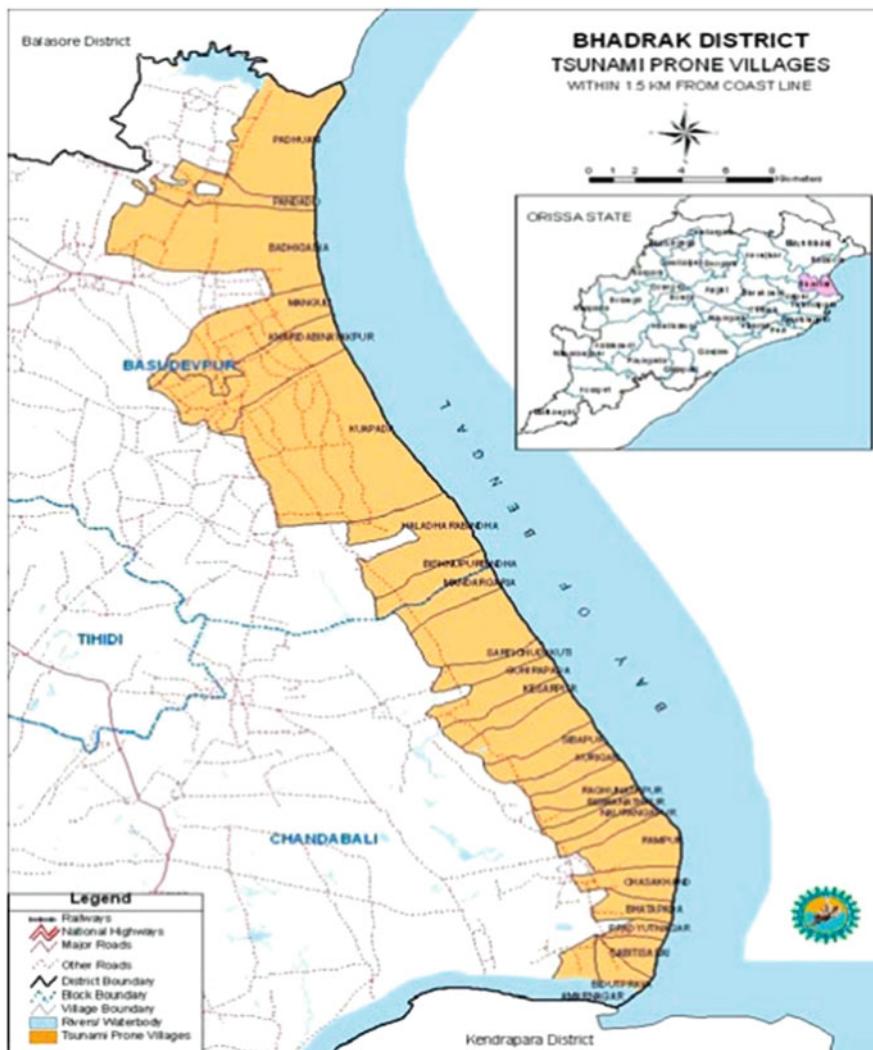


Fig. 2 Tsunami-prone villages in the study area. (Source: www.bhadrak.nic.in)

- (i) To study the institutional setup in the disaster-prone Gram Panchayats of the regions vulnerable to multiple hazards.
- (ii) To know the constraints experienced by the rural local bodies in managing natural disasters at the village level.
- (iii) To explore the effectiveness of capacity-building initiatives being undertaken at the level of Gram Panchayats for improving their disaster risk resilience.

In addition to the collection of secondary data pertaining to managing natural disasters at the level of the community by the Gram Panchayats, Participatory

Learning and Action (PLA) as a qualitative research tool was used to have an in-depth understanding of the situation on the ground by involving community-level institutions and other stakeholders from local community.

A wide range of participatory tools like transact diagrams, mobility maps, livelihood analysis, preference ranking, and focus group discussions were organized in all the ten Gram Panchayats during the course of the study. The participation of current and past elected representatives of Panchayati Raj Institutions, members of self-help groups, and villagers was ensured during the process by the research team as facilitators. The data collected from the two blocks were analyzed statistically by applying the maxima-minima method, and a composite Disaster Resilience Index (DRI) was developed taking into consideration three parameters related to managing disasters like creation of disaster-resilient infrastructure under different flagship programs like Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), person-days of employment provided under the flagship programs meant for the rural areas, and the number of people rehabilitated with disaster-proof houses and land development activities to withstand natural disasters.

Analysis and Discussion

Analysis of the study comprised of the following three parts in tune with the study objectives:

- (i) Institutional setup to manage disasters at the local level.
- (ii) Constraints at the community level in managing hazards.
- (iii) Effectiveness of capacity-building measures in managing disasters.

The findings under each part are presented in the following.

Institutional Setup to Manage Disasters at Local Level

As per the provisions of Sect. 3 of the Disaster Management Act, 2005, the National Disaster Management Authority (NDMA) has been constituted at a national level to prepare policies, plans, and guidelines to manage disasters in India. NDMA also coordinates at the national level to implement the plans and guidelines as well as timely response to various disasters.

In line of NDMA, State Disaster Management Authorities (SDMAs) have been constituted in each state as per the provisions of Sect. 14 of Disaster Management Act, 2005, of India which is mandated to discharge the responsibilities of laying down policies, plans, and guidelines and reviewing the measures for preparedness, mitigation, relief, and capacity building, etc. pertaining to managing disasters. Odisha State Disaster Management Authority (OSDMA) coordinates with all the line departments and district administration to prepare, manage, and mitigate different kinds of disasters.

As per Subsect. (1) under Sect. 14 of the DM Act 2005 of India, District Disaster Management Authority (DDMA) has been constituted in Bhadrak district of Odisha state which is chaired by the Collector-cum-District Magistrate of the district. The president of zilla parishad, i.e., district panchayat, acts as the ex officio co-chairperson of DDMA. The additional district magistrate functions as ex officio chief executive officer of DDMA, whereas other district-level officers like the superintendent of police, project director of District Rural Development Agency (DRDA), chief district medical and public health officer, executive engineers of irrigation and rural development, and deputy director of agriculture department act as members of the DDMA. DDMA functions in accordance with the guidelines issued by the Odisha State Disaster Management Authority and NDMA as a coordinating body at the district level to implement all measures in managing disasters. The DDMA is responsible for the following responsibilities relating to disaster management:

- (i) Prepare disaster management and response plan and ensuring the implementation as well as monitoring of disaster-related activities at the district level.
- (ii) Identify vulnerable areas for different kinds of disasters at the district level and ensure prevention and mitigation measures through different line departments at the district level.
- (iii) Review the preparedness and capability at different levels required for responding to disaster situations.
- (iv) Organize, coordinate, and facilitate specialized training programs leading to the capacity building of officers and employees of different departments, nongovernment organizations, local authorities, elected representatives of local self-governments, and workers as well members of the community engaged in preparedness, rescue, and disaster mitigation measures.
- (v) Ensure early warning and dissemination of disaster-related information to the public.
- (vi) Review development plans of different departments and facilitate necessary provisions in their plan for the prevention and mitigation of disasters.
- (vii) Ensure disaster-resilient standards in the construction of buildings as well as the infrastructure of different departments in the district.
- (viii) Identify places and buildings that can be utilized for the purpose of relief camps and centers for shelter in the event of natural calamities or pandemic situations with arrangements for water supply and sanitation.
- (ix) Establish stockpiles of rescue and relief materials and ensure their availability at short notice.
- (x) Ensure involvement of nongovernment and welfare organizations working in the district for managing disasters.
- (xi) Ensure proper systems of communication and carry out mock drills at regular intervals.
- (xii) Perform other functions as deemed necessary to manage disaster situations as per the instruction of the state government.

There are also local crisis management groups at the block and Gram Panchayat level like block-level emergency operation centers headed by the block development officer and village disaster management committees to look after preparedness, rescue, relief, and long-term mitigation of disasters. National Disaster Response Force (NDRF) and Odisha Disaster Rapid Action Force (ODRAF) at the national and state level, respectively, facilitate the community in minimizing causalities, restoration of communication systems, quick deployment of personnel and equipment, etc. The Revenue and Disaster Management Department of the government of Odisha is also responsible for providing immediate relief to the people affected by various calamities like floods, droughts, cyclones, hailstorms, earthquakes, fire accidents, etc. The department also ensures early warning, preparedness, rescue, relief, rehabilitation, and restoration aspects in collaboration with DDMAs and different departments.

At the village and Gram Panchayat level, there is provision for the constitution of the team from the community for early warning, evacuation, shelter management, rescue, and relief operations.

Constraints at the Community Level in Managing Hazards

During the process of conducting Participatory Learning and Action exercises in the Gram Panchayats covered under the study in Bhadrak district in Odisha, responses of local community and their institutions like elected representatives of Panchayati Raj Institutions, members of self-help groups, and others were captured through focus group discussions and preference ranking as major tools.

Although it has been globally recognized that minimizing the risks of disasters would yield results when community-based disaster management is effectively rolled out, the following are the constraints to involving local community and their institutions in managing disaster situations.

Mobilizing the Community for Disaster Preparedness

Though the Disaster Management Act of 2005 and National Policy on Disaster Management of 2009 lay special emphasis on community-based disaster preparedness, the cutting-edge functionaries of field-level government departments and elected representatives of Panchayati Raj Institutions have not succeeded to the desired extent to convince the local community on understanding risks associated with natural and human-induced disasters. As part of the PLA exercises, focus group discussions were organized with 500 members of the local community to ascertain their level of understanding on various aspects of community-based disaster management after a series of discussions and awareness programs organized under the banner of District Disaster Management Authority.

Table 1 and Fig. 3 depict the responses of 500 primary stakeholders of the areas covered under study on their understanding of various aspects of community-based disaster management.

It can be seen from the table and figure that the local community has some degree of awareness on warning about various natural hazards, especially floods and

Table 1 Community-level understanding of disaster management

Aspects of disaster management	Level of understanding			
	Fully	Partially	Nil	Total
Hazard and vulnerability assessment	122 (24.4)	231 (46.2)	147 (29.4)	500 (100)
Warning system	211 (42.2)	88 (33.4)	122 (24.4)	500 (100)
Time and resource planning	67 (13.4)	101 (20.2)	332 (66.4)	500 (100)
Gender-sensitive approach	123 (24.6)	88 (17.6)	289 (57.8)	500 (100)
Inclusion of disadvantage groups	86 (17)	122 (24.4)	293 (58.6)	500 (100)

NB-Figures in the parenthesis indicate the percentage of the total

Source: Field study

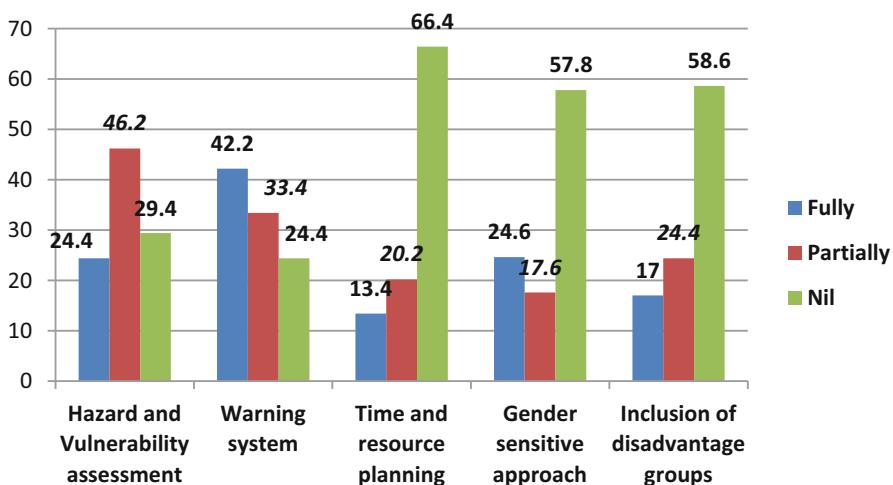


Fig. 3 Responses on understanding level of local community (*in percentage*). (Source: *Field study*)

cyclone. Forty-two (42) percent of the respondents have opined that they could know the forecasting, prediction, and preparedness measures with respect to the nature, intensity, and timing of disasters from electronic and social media, whereas 33 percent of them have these kinds of awareness to some extent. Similarly on the front of vulnerability and hazard assessment, identifying the vulnerable areas, community, and infrastructure susceptible to higher, moderate, and minimum risk is fully understood by 24 percent of the respondents, whereas 46 percent of them opined to have a partial understanding. Even 29.4 percent, i.e., around one-third of the members of the local community, do not have any idea about assessing the hazards and vulnerabilities associated with their localities in the case of any disaster event. Though

planning for timing, resources, and addressing the need of women, elderly people, physically as well as mentally challenged persons, children, and other marginalized groups, 57–66 percent of the respondents do not have any idea about these aspects. Lack of proper understanding on disaster risks, preparedness, and mitigation measures contributed to less mobilization of the local community in the process of managing disasters.

Disaster Risk Governance

Disaster risk governance plays a key role in the process of managing disasters at the community level. It was ascertained during the course of the study that disaster risk governance at the level of departments like revenue, disaster management authorities, and other bodies of the government involves the communities at the time of evacuation to safer places, whereas community-level planning seldom takes place during rescue, rehabilitation, and long-term mitigation measures. Community-level involvement on technical and legal aspects have been very low leading to local communities and their institutions, by and large, depending upon government departments to respond to disasters. It was also observed during the course of interaction with cutting-edge government functionaries and elected representatives of Gram Panchayats that since there are no operational modalities for convergence among different departments to address the pressing issues like poverty eradication, nutrition, drinking water, sanitation, school education, maternal and child health, the welfare of senior citizens, and investing in structural measures such as road, bridges, cyclone centers, culverts, public buildings, etc., there is hardly any scope for community-based institutions like Gram Panchayats, self-help groups, youth clubs, etc. to be involved in long-term mitigation measures, projects, and programs. The institutional mechanism available at the level of the community like Gram Panchayats is not also empowered enough to negotiate with different departments to implement their flagship programs for disaster-resilient structural and nonstructural measures.

Capacity Building as a Tool for Disaster Risk Reduction

After the enactment of the Disaster Management Act of 2005, institutions have been created and strengthened to equip the departments, local bodies, and community-based intuitions to build their capacity to reduce the potential risks associated with natural as well as human-induced disasters.

At the national level, National Institute of Disaster Management (NIDM), New Delhi, is the apex institute under the aegis of the Ministry of Home Affairs, government of India, which acts as the nodal center for the capacity building, training, research, documentation, and policy advocacy in the areas of disaster management. The institute provides support for capacity building to all the national- and state-level agencies responsible for managing the risks of disasters. National Disaster Response Force (NDRF) builds the capacities of disaster management personnel and first responders at the level of the community by way of organizing mock drills for rescue and evacuation during disaster situations. The National

Table 2 Institutions mandated for training and capacity building in India

Level	Institutions
National	National Institute of Disaster Management (NIDM)
	National Disaster Response Force (NDRF)
	National Institute of Rural Development and Panchayati Raj (NIRDPR)
State	State Disaster Management Authorities (SDMAs), Administrative Training Institutes (ATIs), and State Institutes of Rural Development (SIRDs)
	State Disaster Response Forces (SFRFs)
District and below	District Disaster Management Agencies Authorities (DDMAs), government departments, and nongovernment organizations (NGOs) dealing with disaster management

Source: Compiled from the websites of NDMA and other ministries

Institute of Rural Development and Panchayati Raj (NIRDPR) caters to the capacity-building needs of rural areas with a focus on community-based disaster management, livelihood security during disaster situations, and integrating disaster management plan with Gram Panchayat Development Plan (GPDP).

After the enactment of the Disaster Management Act in the year 2005, all states of India have State Disaster Management Authorities, and these bodies cater to the capacity building of multiple stakeholders dealing with disaster management by collaborating with other training institutes and nongovernment organizations. Many of the states have their own Disaster Response Forces (SDRFs) that organize mock drills at the level of the community for rescue and evacuation during disaster situations. Administrative Training Institutes (ATIs) and State Institutes of Rural Developments (SIRDs) also organize training programs leading to the capacity building of government departments and community-based organizations on various aspects of disaster management.

The district-level agencies like District Disaster Management Authorities (DDMAs) and other line departments are responsible for capacity building at the Gram Panchayat level through awareness generation and organizing training programs on disaster preparedness, planning, rescue, evacuation, relief measures, and long-term mitigation of disasters by integrating disaster management into the development planning.

Table 2 depicts the institutional architecture at different levels in the Indian scenario to deal with disaster management.

In order to know the effectiveness of capacity-building measures, interaction was made with the elected representatives of Panchayati Raj Institutions and community-based organizations as well as members to local communities in two blocks of Bhadrak district in Odisha state. Chandabali and Basudevpur were the blocks where the study was conducted.

Table 3 indicates the number of training programs and awareness campaigns on various aspects of disaster preparedness, management, and mitigation measures to village disaster management committees, elected representatives of Panchayati Raj Institutions, and members of community-based organizations like youth club and self-help groups in two blocks covered under the study during the two time periods,

Table 3 Capacity-building measures in two blocks of Bhadrak district in Odisha

Block	Chandabali		Basudevpur	
Year	Training and awareness programs	Participants covered	Training and awareness programs	Participants covered
2015–2016	18	1765	22	2322
2020–2021	65	6456	49	5022

Source: Field study

i.e., 2015–2016 and 2020–2021. It is clear from the table that in the year 2015–2016, Basudevpur of Bhadrak district in Odisha had organized more training programs and awareness campaigns on various aspects of managing disasters to local communities and their institutions than Chandabali block of the district. Basudevpur was also well ahead of Chandabali block in building the capacities of more participants who belong to the locality and are considered to be the primary respondents in managing disasters.

The impact of these two measures over two different time periods was analyzed based on three parameters to improve the resilience of local community to natural disasters experienced in their areas. The parameters are creation of disaster-resilient infrastructure under different flagship programs like Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), person-days of employment provided under the flagship programs meant for the rural areas, and number of people rehabilitated with disaster-proof houses and land development activities to withstand natural disasters like flood and cyclone that regularly hit these two blocks.

Based on the data collected on the above three areas, Disaster Resilience Index (DRI) for the rural areas was computed by applying the following formula widely known as a maxima-minima method in statistical terms.

$$\text{DRI} = (\text{Best Value} - \text{Observed Value}) / (\text{Best Value} - \text{Worst Value}).$$

DRI is the composite index by factoring all the above parameters. It can be seen from Fig. 4 and corresponding table that Chandabali block's Disaster Resilience Index has almost improved to 80 percent when compared to two different time periods, i.e., during 2015–2016 and 2020–2021, whereas Basudevpur block has shown marginal improvement to the extent of 28 percent. Though Basudevpur's Disaster Resilience Index was more than Chandabali block of Bhadrak district in Odisha in the year 2015–2016, the former has outperformed the latter in the year 2020–2021 which may be attributed to the more frequent capacity-building measures to community and their institutions at ground level.

Figure 5 plots normalized values on other indicators such as the livelihood index, land use, and productivity index of Chandabali block which has shown substantial improvement in disaster resilience from 2015–2016 to 2020–2021. It is clear from the figure that the block has performed well in all indicators like person-days of wage employment provided per household, percentage of women self-help groups linked with credit with income-generating activities, number of user groups formed for integrated management of natural resources, drought-proofing measures,

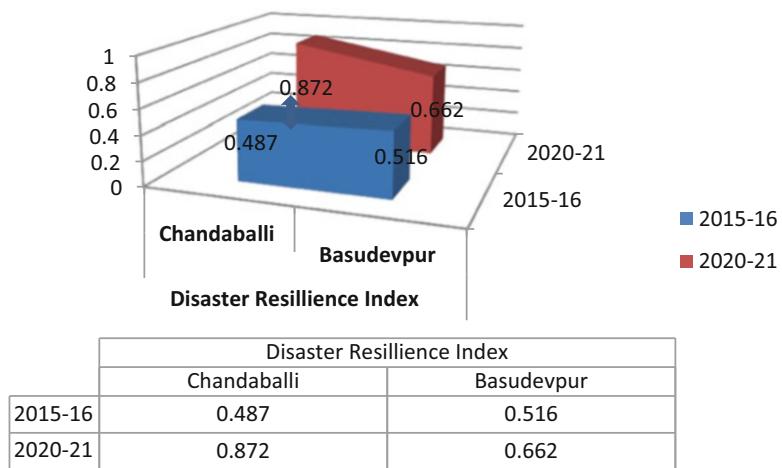


Fig. 4 Disaster Resilience Index of two study blocks. (*Source: Calculated on the basis of field-level data*)

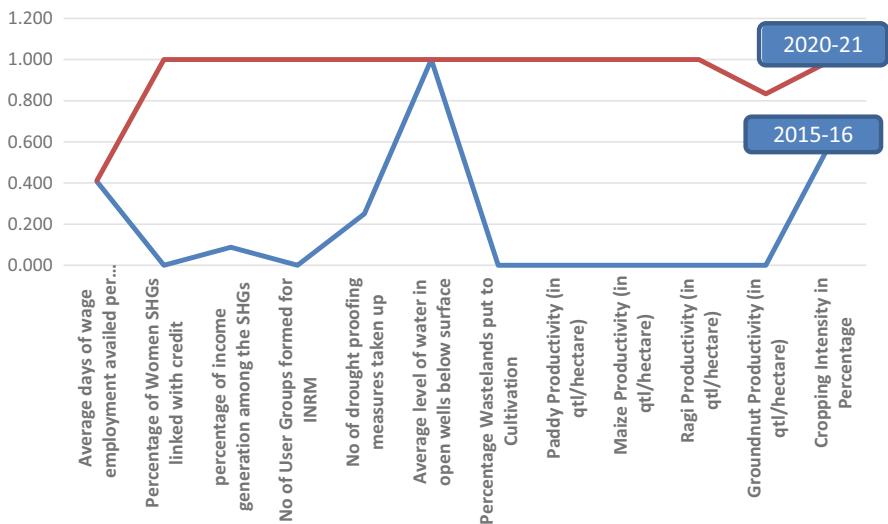


Fig. 5 Normalized values of livelihood, land use, and productive index in Chandabali block of Bhadrak district (2015–2016 and 2020–2021). (*Source: Plotted based on field study*)

productivity per hectare of land, water availability, and other parameters over the period during 2015–2016 to 2020–2021. These improvements attribute to the increased number of programs on training and awareness with relatively higher intensity.

Hence, analysis of information on capacity activities which includes training programs and awareness campaigns at the level of community infers that these

measures contribute to enhance the abilities of individuals, communities, and their institutions to adapt to and recover from hazards and shocks without compromising the long-term prospects of development. The improvement in Disaster Resilience Index of local community in two disaster-prone blocks of Odisha on the parameters like access to wage employment, credit linkage of women self-help groups (SHGs), drought-proofing measures, increase in crop productive, water level and cropping intensity, etc. justifies the need for capacity-building measures at the level of local community to cope with natural hazards effectively.

Conclusion and Way Forward

The enactment of the Disaster Management Act in the year 2005 has been a paradigm shift toward the approach to disaster management in India with the focus on risk reduction through developing skills and capacity of the local community and their institutions. The initiative of the National Disaster Management Authority with the nomenclature “Community-Based Disaster Risk Management (CBDRM)” is a path-breaking step in reducing the risks of various natural and human-induced disasters in which preparing a village disaster management plan is one of the indispensable components. The CBDRM approach provides a platform for the local community to evaluate their own risks in managing disaster situations based on their own capacity and experience. The rationale for building the capacities of community-based institutions is based on the assumption that since the community is the real sufferer and first responder to any kind of disaster, they need to be equipped with the skills for developing coping mechanisms and strategy to reduce the impact of the disaster. It is therefore imperative to appreciate the local knowledge and resources available at the community level, and investment may be made in community-based institutions to withstand the hazards. Leadership development at the community level can be possible through a chain of trained cadres for them to harness the resilience of the community to deal with exigencies. Greater involvement of community-level institutions like Gram Panchayat, village disaster management committees, self-help groups, youth clubs, etc. will ensure collective responsibilities during emergency situations. Hence the activities for disaster risk reduction need to go along the capacity building of local communities in the areas of hazard mapping, vulnerability assessment, and risk reduction measures considering them as proactive stakeholders for the same. Furthermore, it is not only the major disasters like earthquakes, cyclones, and flood that destroyed lives and livelihoods, accumulated losses from drought, landslides, and heavy rainfall also contribute to a large extent to enhance vulnerabilities at the local level for which investment in community-based disaster management assumes significance. Article 243-G of the 73rd amendment of the Indian Constitution also mandates Panchayati Raj Institutions (PRIs) to prepare plans for economic development and social justice. Therefore, it is imperative to equip these institutions to mainstream disaster risk reduction activities into the Gram Panchayat Development Plan (GPDP) and the plans of urban local bodies (ULBs). The risk reduction measures planned at the local level need to be supported with

resources from existing flagship programs and area development grants. The capacity building of elected representatives of PRIs, ULBs, members of village disaster management committees, and other community-based institutions will play a lead role in making plans on the ground for risk mitigation.

The findings of the study conducted in two blocks of a disaster-prone district in Odisha state also infer that capacity building of community-based institutions in the form of training programs and awareness campaigns contributes to improving the disaster resilience of primary stakeholders. Though the sample size of the study area is too small to arrive at the conclusion that capacity building is the driving factor to cope with disaster situations, further study needs to be carried out on enforcing regulatory measures and effective management of various phases of disaster management like preparedness, planning, evacuation, rescue, and rehabilitation which are also the other contributing factors to improve the disaster resilience in the ground. The capacity-building aspects need to be studied in more disaster-prone states with a larger number of respondents. Nevertheless, of these limitations of the study with small sample size and non-consideration of other important parameters, capacity building of community and their institutions contributes to coping with the adverse effects of disasters and minimizing the risk. In order to identify other factors contributing to reduce disaster risk, there is a need for further research on institutional preparedness at different levels such as availability of infrastructure, access to technology, resources, and skilled personnel.

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Drought, Food Insecurity, and Gender Relations in Selected Districts of India

139

Basanta Sahu

Contents

Introduction	2078
Methodology	2080
Drought Impacts and Household Risk Coping	2083
Drought and Change in Household Occupations in Study Areas	2086
Household Drought Coping and Consumption Strategy	2087
Coping with Drought: Household Consumption Strategies	2092
Conclusion and Policy Suggestions	2095
References	2096

Abstract

It is not easy to achieve the development agenda 2030 (SDGs) without addressing the issues relating to weather-induced human hardships such as droughts that pose multiple threats and risks to sustainable development. The recurrence of drought is evident with increasing frequency, severity, and duration, which can further expand food insecurity, poverty, inequality, and other adversities among the poor, women, and weaker sections in semiarid and backward dry areas. The present chapter is a modest attempt to understand and analyze the impact of drought in general and rising stress on gender relation in particular due to the recurrence of droughts. Droughts not only augment socioeconomic costs but challenge the risk coping capability of the weaker sections.

Using primary data collected from a total of 179 sample households using the questionnaires, direct interviews, and focus group discussions in four sample villages two each from Odisha and Gujarat, the study areas, the chapter analyses the multiple impacts of drought with focus on household food insecurity, drought coping, food insecurity, occupational changes, intra-household risk sharing, and gender relations in some drought affected districts of India. Details about methods

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followed for data collection and analysis are presented in the chapter. Using the coping strategy index (CSI) based on four broad groups such as dietary change; augmenting short-term food availability; decreased numbers of family members; and rationing food consumption, the chapter highlights household food consumption strategy in regional contexts.

The findings of the chapter show that poor households have to follow diverse food arrangements and occupational changes in response to drought impact and follow both “labour smoothing” and “consumption smoothing” strategies to manage food scarcity which are neither effective nor gender neutral. The chapter offers some region-specific policy actions to improve drought risk governance and management which would reduce gender inequality.

Keywords

Drought risk coping · Food Insecurity · Gender relation · India

Introduction

It seems difficult to meet the new development agenda 2030 (SDGs) without addressing the issues relating to weather-induced human hardships, such as droughts, which pose various threats and risks to sustainable development. Though droughts are recurrent events in the recent past with widespread and lasting impacts at the individual, household, community, sub-national, and national levels, they are often underestimated. Multiple costs of droughts especially in dry and backward areas are disproportionately borne by the poor, weaker sections, women, and other vulnerable groups (UNDRR, 2021). While recurrence of droughts with increasing frequency, severity, and duration is evident, it has potentials to augment food insecurity, poverty, inequality, and vulnerability across groups and regions. While major factors of drought are often rooted in the complex interactions of economic, political, social, environmental, and technological systems, drought-induced adversities and scarcities can have diverse impact that can vary with social groups and in different development scenarios.

Droughts can generate complex and multiple costs that affect lives, livelihood, and ecosystem but it was mostly underreported. The impact of drought on household food security, resources use, gender relations, and human development may vary across regions and social groups. Global estimates of the costs of droughts offer only partial accounts due to complexity and multiplicity of drought impacts with its widespread and cascading nature. The GAR Special Report on Drought 2021 (UNDRR, 2021) explored the major drought-induced risks that include exposure to hazard, vulnerability, and growing risks posed by climate change. About 1.5 billion people have been affected with economic losses of at least \$124 billion across the world during last two decades. Similarly, the effect of droughts on India's gross domestic product is estimated to be about 2–5% of GDP per annum, even though contribution of agriculture to India's GDP substantially declined in the recent years.

(Gadgil & Gadgil, 2006). One of the major impacts of drought is the growing water scarcity¹ that affects a sizeable portion of the population as about one fifth of the world's population live in areas of physical scarcity, and many people are approaching this situation. About one quarter of the world's population face economic water shortage (FAO, 2012).

Abnormally dry and long weather conditions in arid and non-arid regions are common in recent years. But drought is beyond aridity or water scarcity and all droughts are not disasters. Drought can have a range of direct and indirect impacts across regions and groups, which are not easy to measure and understand. Adequate clarity and understanding about drought impacts and drought coping at the household and community levels are important from regional development policy perspective to prevent and mitigate the risk of droughts.

It is therefore imperative to understand and address complex nature, pattern, costs, and other impact of droughts in different regions and how different groups respond to drought or manage drought-induced risks. According to FAO, about 84% of the economic losses was due to climate-related disasters and about 86% of loss and damage reported was due to droughts (FAO, 2015). Mostly land-based activities, including crop production, was the most affected subsector, accounting for 42% of total agricultural losses, followed by livestock production of 36%. Under this condition, nature and the pattern of water supply and management and water uses may considerably influence the livelihood and food security of the rural poor and farming households. Unfortunately, growing irregular and uneven rainfall, poor irrigation network, overuse and overdependence on groundwater resources, and lack of water-retaining structures in many parts of India aggravate the situation in agriculture and rural areas, which remain critical during drought (UNDP, 2013). It may lead to regional perpetuation and rising drought vulnerabilities, agrarian crisis, and other problems. Since farming, crop selection, land and water management, and input arrangements are traditionally undertaken by male members and role of women was not given much importance, gender inequality in drought affected areas is expected. Interestingly, rising participation of women in agriculture in recent years with recurrence of drought is also evident.

The main objective of this chapter is to make a comparative analysis of drought in different contexts, focusing on scarcity, during drought, of food, water, crop production, employment, income, etc., at the household level. Effort has been made to highlight household drought coping strategy and gender relations in different contexts in India where both recurrence of drought and implementation of drought policy measures have drawn considerable attention in recent years. With almost similar drought policy regimes in India, it would be interesting to study at the household and community levels food consumption, occupational changes, land holding, resource uses, migration, borrowing, etc., and to understand regional and group specific differences in drought coping mechanism, risk sharing, and gender

¹ Water scarcity is defined as the point when annual water supplies drop below 1000 m³ per person, and below 500 cubic meters is called as "absolute scarcity."

equity. It is presumed that a drought situation becomes intense and hazardous in dry and backward areas than developed irrigated areas when basic entitlements like food and water demands are no longer met and the local people become vulnerable with their diminishing capacity to cope with drought-induced scarcities.

Under drought situation poor households often confront multiple shortfalls (production, income and consumption expenditure) and make different adjustments in consumption, resource use, livelihood practices, and risks coping strategies. Given the different household and local situations, these adjustments, may or not always be effective and gender neutral. The present chapter discusses drought situations and household drought coping responses in different drought affected regions of India. Two districts from Odisha and two districts from Gujarat were selected to capture regional and group-specific variations in household drought coping. It may be noted that variations in quantum and distribution of rainfall and incidence of droughts in India have been reported both in low rainfall states like Gujarat (annual average rainfall 350–750 mm) and high rainfall states like Odisha (annual average rainfall 700–1500 mm). But the nature and impact of drought may vary across states in India subject to natural factors, local development condition, and public policy interventions.

The present chapter aims at to analyze drought-induced risks and household risk coping practices in different regional and group contexts using both high and low rainfall regions and in both tribal and non-tribal areas with focus on food security and gender relations. Given the diverse local condition, it is also discussed and argued whether household drought risk coping measures are effective and gender neutral. Some specific objectives of the chapter are given below.

- To discuss different aspects of drought situations and household risk coping and risk sharing in different regions.
 - To analyze whether household responses to drought-induced shortfalls (food, water, employment, fodder, etc.) vary across region and groups and remain gender neutral.
 - To discuss local policy interventions, drought risk governance, and management in the study areas.
-

Methodology

Gender is one of the important dimensions of the intra-household allocation of resources, and the factors that affect the distribution of resources within the household particularly during any distress period like drought or other weather-based calamities (Agarwal, 1997). However, the links between household risk coping with drought, food insecurity, and gender relations though crucial is not discussed at the regional level, which is important from policy perspective (Quisumbing, 2003; Quisumbing & Smith, 2007).

Resource-based area approach has been followed to understand and compare diverse drought risks across social groups and region on the scale of development

parameters. Primary field surveys at household and community level were conducted in the sample study areas to collect relevant information. Survey areas were selected primarily based on (a) drought occurrence (moderate to severe droughts), and (b) nature of food crop production and other land-based activities, (c) major source of water supply, (d) incidence of labor migration and other factors crucial for food and livelihood security. To capture the diverse impact of drought household response, local drought adaptation practices in two different states (Gujarat and Odisha) and four districts (two each from both of states) were selected based secondary data and information gathered from the local key informants like teachers, community leaders, government officers, etc. Both tribal (dry, backward, and remote) and non-tribal areas (irrigated and developed) areas were considered to compare region and group-specific drought conditions, food security, water management, risk coping behavior, and gender relations at the community and household level. Total of 197 households from four sample villages (one each from dry and tribal area and irrigated non-tribal areas in both states) were identified on the basis of district profile, first-hand information from local informants. The major source of water, cropping intensity, and remote location; local common resources (forest, community land and water bodies, etc.), and public assets (road, community centers, canal/well etc.); structure of occupation; villages size; nature of irrigation and cropping pattern, drought proofing and other public development program were the criterion for selecting sample villages.

A stratified random sampling method was followed to select sample households for detail survey. Land holding size, non-land resource holding, cropping pattern, nature of occupation, female workers, borrowings, labor migration, participation in local public programs, and other socioeconomic factors were considered while shortlisting sample households (around 40–60 households per villages). Data on total 179 household were finalized for analysis. Household-level information on food consumption, employment, asset holding, out-migration, women workers, public food provision, and participation in public welfare programs, etc., collected by direct individual interviews and focus group discussion (FGD) methods. Household consumption smoothing, labor use, and household risk coping was given importance to discuss whether shortfalls of food, water, and other basic entitlements during drought are different and gender neutral across regions and social groups. Household data were collected through direct interviews with head or a senior member of the sample households using suitable questionnaires. Focus group discussion (FGD) with villagers were conducted with priority on participation of females.

In the study areas, some features of drought, water scarcities, adaptations, and other local practices were found worth noting and it helped in better comparison between both tribal and non-tribal areas. Some important features like type of drought areas, sources of irrigation, local drought adaptation practices, and water uses in the study areas are given in the Table 1. Size, castes, and other details of the surveyed households are also specified in the Table 1. It may be noted that caste-wise distribution of sample households shows relatively higher share of weaker sections in both of the states. However, higher proportion of ST in Gujarat (45%) and other

Table 1 Features of study areas and sample households

Districts	Taluka/block/regions	Drought area type	Regions	Type of irrigation	Sample households (HH) in nos. (Figure in brackets are in %)				
					Gen	OBC	SC	ST	Total
Odisha									
Bolangir	Turekala (Tribal)	DPAP	Tribal	Community (Pani-Panchayat)	4	10	3	17	36
Kendrapada	Rajnagar (non-tribal/ coastal)	DPAP	Coastal	Community (Pani-Panchayat) canal, river	8	17	7	2	32
Total					12	27	10	19	68
<i>(18) (40) (14) (28) (100)</i>									
Gujarat									
Surendra Nagar	Lakhtar (Non-tribal – inland)	DDP	Inland	Well	9	28	24	50	52
	Panchmahal	DPAP	Tribal	Well	6	18	16	12	59
Total					3	10	8	38	111
<i>(8) (25) (22) (45) (100)</i>									

Source: Field Survey (2019)
Gen general caste, *OBC* other backward caste, *SC* schedule caste, *ST* schedule tribe

backward castes (OBC) in Odisha (40%) who are more likely to be land poor and food insecure during droughts is evident from the data presented in the table given below.

Drought Impacts and Household Risk Coping

Drought has been progressively costly and climate-related disasters in many parts of India, irrespective of nature and the quantity of average rainfalls. Broadly, drought is associated with scarcity of water, food, fodder, employment, and other basic entitlements but at different intensities. On the other hand, preexisting vulnerabilities within a community or in any areas can be exacerbated in the event of drought that could further push a sizeable portion of total households into poverty, food insecurity, and abiotic stress in dry and backward areas. Since both direct and indirect drought impacts were evident in the study areas, it would be interesting to study the variation in drought risk and household risk coping on the scale of local development, resource use, and public policy intervention. Some important features and household response to drought reported in the study areas are discussed here based on primary field data collected and compiled from field surveys.

It may be noted that Odisha and Gujarat both continue to experience frequent drought situations in recent years with varying intensity and severity. Odisha experienced more frequent drought and water scarcity with very high level of water resources endowment such as high average annual rainfall about 1400 mm and crisscrossed by numerous rivers and rivulets unlike other states. Gujarat is usually a water scarce state having much lesser average rainfall (about half of the average annual rainfall of Odisha) and in recent years the state has been experiencing a rising incidence of drought situations. However, many public policy initiatives including active local water management and watershed programs are found in operation in Gujarat. While there are some similarities between the two states in terms of occurrence and impact of droughts, proportion of tribal population, dominance of peasant farming, migration of rural labor, new water institutions, rising participation of female in agriculture, etc., overall, people's perception and response to drought were found to be different in both states.

Policy interventions to counter drought adversities and to provide alternate water supply like individual pond renovation, watershed development programs, small irrigation projects, deepening tube well, and encouraging people's participation in drought proofing measures are found at present in both the states. Implementation of group water management initiatives like *Panipanchayatin* Odisha (Sahu, 2008) and community water management and development programs in Gujarat are well known among policy makers and analysts. However, some fundamental issues of management, distribution, and water uses remain unaddressed and they continue to be biased against land poor, women, and other weaker sections who are worst affected in case of drought. Abysmally low participation and representation of women in water management and distribution are found in both of the states, yet

Table 2 Drought impact in study areas (responses of sample households in %)

States	Areas	Loss of food crops yield	Crop failure at cropping different stages	Shortage of fodder	Water scarcity for non-crop activities	Total
Odisha	<i>Tribal</i>	97.1	2.9	0.0	0.0	100
	<i>Non-tribal</i>	63.4	20.2	4.9	10.1	100
Gujarat	<i>Tribal</i>	48.9	46.6	12.2	12.2	100
	<i>Non-tribal</i>	45.3	45.2	22.4	17.1	100
All		55.5	26.3	10.0	8.0	100

Source: Field Survey (2019)

their perceptions and drought coping priority are found to be different across the study areas.

Data provided in the Table 2 show some key aspects of household level perception and priority in a drought situation, which can have various impacts on household decision making and risk coping. Regional and group-specific variations are also evident in our data that are often missed out in usual drought policy interventions and analysis. Shortage of food and failure of food crops production are considered as major consequences of drought on households, especially in Odisha where better resources endowment and multiple sources of water exist unlike a water-scarce and food-deficit state like Gujarat. It shows that there are some inter-state differences in drought perception, priority, and policy interventions, which could influence drought risk governance and management.

It may be noted that both food crops yield and area are important for household food security in a drought-prone area where the provision of controlled water supply, nature, and type of irrigation are crucial to reduce crop loss at least during critical period such as crop plantation, flowering, and grain-formation stages. From our data it was reported that more than half of the total respondents experienced shortfall in food crop output during drought in both the states but worse in the tribal areas of Odisha. A rising female work participation and out-migration of labor during drought was common in the study areas but more pronounced among the land poor households and in dry, backward, and tribal areas. It shows high level of drought-induced vulnerability among land-poor tribal households and supports the argument of rising feminization of agriculture often debated in the literature. Under this condition, an inadequate and unequal access to land and water resources may accentuate gender relations in drought-prone regions. This is also supported by the trend of shift in household farming and other activities to the female members as their male working members migrate out during drought in search of avenues elsewhere. Hence, dry and backward areas are more likely vulnerable to drought situation in the absence of adequate and effective drought intervention and preparedness.

Shortages of food emerged as the single most household hardship during drought, which is further explained by crop failure, reduction in household expenditure on

food, out-migration of major working members, etc. It may be noted that loss in crop production due to drought is found in all study areas but more pronounced in Odisha and in the tribal area largely due to sharp fall in crop yield in the absence of critical water supply to crop at flowering and grain formation stages. On the other hand loss of household employment during drought seems partly compensated by participation in public employment provision like MGNREGA and seasonal non-farm activities. Rural workers seem resilient to local low-wage employment as farm and non-farm interlinks are crucial for productive local avenues. Inadequate productive farm employment and income during drought and the growing non-farm activities in the study areas may be a case of distress-driven non-farm sector, which is mostly residual in nature (Vaidyanathan 1986) as many poor cannot afford to remain unemployed. In this context, households in Odisha were found to be more stressed than their counterparts in Gujarat, which can have adverse impact on household risk coping and gender relations. Similarly, deteriorating health issues during drought were reported across study areas. About one fifth of households in Gujarat, mostly among women and in non-tribal areas, reported major health problems during drought.

Drought risk is a function of three major factors such as hazard, exposure, and vulnerability and drought impact is a function of its frequency, duration, and severity that depends, to a large degree, on the rate of exposure of the affected groups (UNDRR, 2021). Household vulnerability refers to the capacity to anticipate, cope with, and prevent shortfalls in household and individual well-being, and recover from the adversities. Hence, the nature and strength of household coping capacity and the ability to adapt to the changing conditions in the long term are important yet it may vary across groups and regions. The primary household level data presented in the Table 3 indicates some important aspects of drought-related risks and

Table 3 Drought-induced major issues in study areas

Major Issues	Odisha		Gujarat		All	
	Tribal	Non-tribal	Tribal	Non-tribal	Tribal	Non-tribal
Shortfalls in food crop	74	49	33	12	51	30
Health problems	58	65	52	62	54	64
Out-migration of labor	19	00	22	12	19	9
High unemployment	11	12	2	0	6	6
Water shortage for daily use	55	35	52	60	51	42
Shortfall in HH income	77	83	62	60	67	72
Fall in skill-based activity	0	5	4	9	2	7
Fall in food expenditure	60	17	22	38	42	23
Rise in indebtedness	30	20	10	20	20	19
Liquidation of assets						
All response (%)	100	100	100	100	100	100

Source: Field Survey (2019)

vulnerability explained in terms of range and intensity of drought impact and household responses in regional and group contexts.

Regarding range and intensity of drought impact an average estimate of loss in major crop yield during drought was found in the range of 63–97% in Odisha, which is double of that in Gujarat but the range of crop failure was found to be almost similar in both the states. As expected, decline in farm income was sharper during drought mainly due to the reduced labor demand. Since they could not afford to remain unemployed, many poor pushed themselves into undertaking any possible avenues without considering the level of earning and work conditions. A sharp rise in non-farm activities and large out-migration of labor in the study areas during drought implies poor household coping strategies just to compensate the total drought loss in crop output, income rather improvement in household capability and welfare. This may affect household gender relations. Similarly, household shortfalls in food production and consumption and managing this during drought were found to often outpace other critical issues like postponement or reduction in spending on health, education, and social events. Many tribal households (about 45%) in Odisha reported major health problems during drought, mostly among the women, which is often not given much importance even during normal period. Hence, it is possible that household priority for expenditure on food might outpace their health expenses, particularly for women.

On an average, the decline in food expenditure is lesser in Odisha than Gujarat, which does not necessarily imply that households in Odisha were better off than their counterparts in Gujarat (see data presented in Table 3). This is because many poor households do not have any specific food expenditure plan, rather they have to manage food consumption shortfalls with variety of local food arrangements such as food collection from forest, community food supply, and other sources depending on availability and access. While household food consumption smoothing issues are evident in the study areas, rising food price and liquidation and forced sale of household assets during drought were also reported in the study areas. It not only implies the vulnerability of the poor and weaker sections during drought but it also reaffirms the perception and understanding of drought beyond water scarcity and loss of crop output and farm income.

Drought and Change in Household Occupations in Study Areas

Household resource allocation and occupational changes often indicate household risk coping behavior. Households under any stress condition may reallocate its labor and resources such as family labor, land, non-farm assets, livestock, savings, etc., to manage income flows, expenditures, consumption smoothing, crop output, and returns to assets. In this regard, household may change its labor use and occupations as common household strategy in terms of changing major occupation, undertaking multiple new occupation, increasing average working hours and numbers of works, more women and children entering into labor market, participating in seasonal off-farm activity, out-migration, etc. There can be demand-driven or distress-driven

occupational change subject to the nature of local condition and household risk capability, resource endowment, and other factors. To better understand the effects of household resource allocation and occupation diversification during drought, here focus is on analyzing changes in household income-earning activities. For better understanding and analysis of the changes in household occupation on gender, we focused on some local area-specific activities undertaken by sample households. Some notable drought-induced occupational distribution and changes in both tribal and non-tribal areas, which are more or less concentrated on scarcity of water, food, and employment, are presented in the Table 4. Since farming household largely depend upon land and water-based activities, many younger male workers found migrated out of village during drought period due to limited scope for local avenues. In this regard change in household occupations in the rural economy is rational but it could push female members into such land-based activities. This trend was found in Odisha where decline in agricultural wage labor and cultivators was also reported. As expected, it was more pronounced in tribal areas where forest-based activities were reported to be restricted and declining in recent years.

Household's distress occupational diversification also found in the study areas varies across occupations and regions. It shows decline in animal husbandry and livestock activities where participation of females were higher than males. Major household drought coping strategies found in the study areas are occupational diversification, labor migration, and feminization of low productive land-based activities. Household as a decision-making unit needs to change its occupations and allocation of resource as a part of household risk coping strategies particularly during distress period, but it may not always ensure betterment of all family members. It may not be gender neutral as women share more work burden, bad working conditions, low income, and their personal well-being might compromise during stress period like drought. In this context, difficulties in accessing and basic resources like land, water, seeds, credit, and markets by women, lack of preparedness, and poor capability could further aggravate gender relations at the household and community level.

Household Drought Coping and Consumption Strategy

Data presented in the Tables 5 and 6 show another critical aspect about household drought coping in the study area that is mobility of household major occupation or activity over period. Broadly, the data indicates that farming as the sole source of livelihood for rural households is declining, much faster in Odisha, where issues of employment and income are more challenging compared to the areas in Gujarat where avenues in both farm and non-farm sector is better. It may be noted that about 30% of sample households in Odisha reported change in their primary/major occupation from farming to other activities as compared to 20% households in Gujarat. The data in the Tables 5 and 6 also show the distribution of household who changed their principal occupations into other occupations during the given period to capture the occupational mobility due to drought, water scarcity, and food security. For

Table 4 Distribution of major workers by occupations

	Base year – 2005 (Workers in Nos)		During survey years (Workers in Nos)		Change in major occupation of workers (in %)	
Sources of HH income	Odisha	Gujarat	Odisha	Gujarat	Odisha (column1- column3)/ column1	Gujarat (column 2-column 4)/ column 2
	(1)	(2)	(3)	(4)		
<i>Tribal region</i>						
Crop cultivation	60	82	87	94	-45.0	-14.6
Dairy and livestock	1	17	5	19	-400.0	-11.8
Non-farm employment	3	4	1	2	66.7	50.0
Farm wage laborer	4	24	15	18	-275.0	25.0
Skill-based activity	3	24	2	10	33.3	58.3
Regular salaried job	3	3	0	2	100.0	33.3
Retail/wholesale trading	2	2	0	1	100.0	50.0
Caste-based activities			2	2		
Local forest- based activities	1	1	15	8	-1400.0	-700.0
Labor migration	72		22		69.4	
Total	149	156	149	156	0.0	0.0
<i>Non-tribal region</i>						
Crop cultivation	58	46	64	60	-10.3	-30.4
Dairy and livestock		16	2	18	-400.0	-12.5
Non-farm employment	1	10	0	8	100.0	20.0
Farm wage laborer	2	33	17	24	-750.0	27.3
Skill-based activity	5	4	1	2	80.0	50.0
Regular salaried job	8	4	1	2	87.5	50.0
Retail/wholesale trading	5		0	2	100.0	
Caste-based activity		4	2	3		25.0
Forest-base activity			0	0		
Labor migration	10	2	2	0	80.0	100.0
Total	89	119	89	119	0.0	0.0

Source: Field Survey (2019)

example, out of total 30% households, Odisha which moved out of farming as a major occupation, 18% household reported migrated out and 5% joined other non-farm activities, 3% engaged in livestock, and 2% joined as farm wage labor, which are usually low productive and low return land-based activities. It appears that HH occupational mobility as a drought coping tool may be opted for but it may not ensure reduction of drought risks unless there is a better income and employment from new occupation like labor migration, which seems not remunerative for unskilled labor and after adjusting the cost of migration. On the other hand, in Gujarat, out of 20 households who moved out of farming reported engaged in diverse occupations and only 4% of them migrated out. Similarly, about 65% household in Odisha and 45% in Gujarat were found to have moved out of rural manufacturing as these activities are no more remunerative or viable as a major source of living. Interestingly, a sizeable portion of the households who moved out of manufacturing as their major occupation preferred to migrate out in both of the states.

It appears that a substantial portion of rural households who changed their major occupation over a period reported migrated out of their village followed by other non-farm activities. On the other hand, as high as 75–90% of household who already involved in labor migration continued with migration as their major source of earning and employment. Some households preferred to shift to other non-farm activities as major occupations, which are mostly seasonal and less remunerative such as traditional caste-based activities, petty trading, and rural artisans, which shows demand for these activities exist in rural areas. In contrast to Odisha, about two thirds of households in Gujarat continue with their respective occupations except for rural manufacturing and artisans. It indicates that, with better farming activities, local condition, and a prospect of labor migration, a progressive diversification of household occupation can be better drought risk coping measure, which seems missing in Odisha. This is important from a policy perspective that drought policy interventions need to be in enhancing capability and improving local condition for better risk reduction and management than few reactive short-term drought relief measures.

It is worth noting that, except for regular services, most of the households in farming and migration in Odisha were found to not have changed their primary occupation mainly due to limited income and employment options and opportunity. Two more important activities such as livestock and trading and business in Gujarat had not changed by the household because these activities are highly remunerative, employment-intensive. On occupational mobility, a general trend that emerges from the data is that occupational shifts are from farming to labor migration and from labor migration to other non-farm activities.

Looking at the nature and pattern of household occupational changes discussed above, local agriculture and the level of development could play the role of key growth motors that can support in drought risk reduction. Poor farming households with subsistence farming, poor irrigation, recurrence of drought, and poor drought management in Odisha may face more food insecurity and other drought-induced

Table 5 Mobility in major household occupation/activity in Odisha

Activities	Nos of Households (HH)		Households (in %) reported Major Occupational Changes		Manufacturing/ artisan	Trading and business	Caste- based services	Regular services	Migration	Other non-farm Activities
	(Base Year -2009-10)	Farming	Farming	Farm wage	Livestock					
Farming	62	70	2	3		2			18	5
Farm wage	35	3	45	1				1	33	17
Livestock	21	3	3	33	1	2			43	14
Manufacturing/ artisan	26			35		5		3	37	20
Trading and business	12	1	1			45		1	35	17
Caste-based services						1	35	1	35	28
Regular services	7					2		88	7	3
Migration	43					8		75	17	
Other non-farm activities	3					12		4	20	64
Total HH	68									

Source: Field Survey (2019)

Table 6 Mobility in major household occupation/activity in Gujarat

Activities	Nos of households (HH) (Base Year -2009–10)	Households (in %) reported major occupational changes)						Other non-farm activities			
		Farming	Farming	Farm wage	Livestock	Manufacturing/ artisan	Trading and business	Caste- based services	Regular services	Migration	
Farming	105	80	2	6			2			4	6
Farm wage	56	1	74	4			1			12	8
Livestock	30	7	3	70			4			6	10
Manufacturing/ artisan	26	2	2	55			5			3	15
Trading and business	18					88				2	2
Caste-based services	15			2	2		2	65		17	12
Regular services	14								100		
Migration	33						10			90	
Other non-farm activities	17			2	4	7		4	18	65	
Total HH	III										

Source: Field Survey (2019)

miseries unlike their counterparts in Gujarat with relatively better local conditions, farming options, and income and employment options.

Coping with Drought: Household Consumption Strategies

We have explored the household coping strategy in terms of changing consumption coping strategies presuming subsistence farming of food crops is predominant among sample households. Any production loss may result in major adjustments in the household food balance including fall in quantity and quality of consumption. Our field data presented in the Table 7 provide evidence that support shortfall in household food consumption has direct fallout of decline in food crop failure, loss of farm income, and hence increasing dependence on market for food purchase unless local public food provisioning is not adequate, affordable, and timely. Another important aspect of household food consumption strategy during stress period is to manage both quantity and quality of food items. Many households reduce their normal food intake during drought situation and more in case they buy food from markets. Household food consumption smoothing (Morduch, 1995) seems constrained by their food consumption coping strategy during drought. Both the number of meals per day and the quantity consumed per meal found reduced in case of some sample households. The nature and extent of decline in household food consumption in study areas are presented in the Table 7, which also explains some important aspects of household food consumption behavior and risk coping mechanism. Other aspects of household adjustments in food consumption highlighted in the Table 7 are the nature and extent of the quality and quantity of food intake variations, regional and group-specific changes and incidence of alternate food arrangements. Though these household food consumption adjustments are very much evident across study areas and related to income, employment, and consumption shortfalls, they may not be gender neutral. With noticeable level of food and water scarcity, decline in land- and livestock-based activities, limited mobility, and

Table 7 Changes in household food consumption (in %)

Decline in food consumption	Extent of decline HH food consumption	Odisha		Gujarat		All	
		Tribal area	Non-tribal area	Tribal area	Non-tribal area	Tribal area	Non-tribal area
Quantity	<i>Marginal (<5%)</i>	86	25	56	14	69	19
	<i>Average (5–15%)</i>	14	75	39	65	28	70
	<i>High (>15%)</i>	0	0	4	19	2	9
Quality	<i>No change</i>	0	0	1	2	0	1
	<i>Marginal (<5%)</i>	86	8	10	10	44	9
	<i>Average (5–15%)</i>	14	92	31	46	25	69
	<i>High (>15%)</i>	0	0	47	3	26	16
	<i>No change</i>	0	0	4	5	2	2

Source: Field Survey (2019)

inadequate access to and use of assets, many poor women in drought affected areas were found suffering from malnutrition, underemployment, and growing unpaid work burden during drought that deteriorated women's health.

Relative measures of decline in quality and quantity of food consumption during drought in the study areas are present in Table 7. As expected, marginal to average decline in quantity of food consumption was very high among tribal households in Odisha whereas sharp decline in quality of food consumption is visible in Gujarat. Less and irregular food intake can lead to diet imbalance and health issues; the impact of adjusting in quality of food consumption is not very clear from our data. Reduction in consumption of higher value food such as milk and milk products, oil, fish, egg, meat, etc., reported among non-poor, can have adverse consequences on health especially for women and children. However, it does not make much difference among the low income and the poor who occasionally consume these high-value food items even during the normal period. Interestingly, there was a shift in regular food grain consumption, mainly from maize, millet, and bajra to wheat and rice in tribal areas because these grains were available under drought reliefs, public distribution system, and food for work programs in which wage payment was in terms of kind (wheat/rice). On the supply front, food production loss leads to reductions in the quantity sold, the quantity of seed kept for the subsequent year, and the quantity stored for future use. Similarly, because of rampant labor out-migration, the conventional practices of food grain storage, food exchange, and regular food crop production reduced in recent years.

The data presented the Table 8 show the intra-household food consumption adjustment reported in the study areas with visible gender inequality. Regarding the question "who faced bigger drop in food consumption in the household," almost all people responded positively but the trend was more in tribal pockets and among women. Most of the female members of family are the first who opined about food consumption shortfalls followed by the male members and others. Within households, a sizeable portion of the total members viewed a high degree of decline in food consumption in tribal area unlike in non-tribal areas where the level of reduction in food consumption was low.

Regarding household food consumption strategy and its impact on gender, the data present in Table 8 show that there is a disproportionate amount of consumption shortfall was adjusted by female members who usually sacrifice food, as social practice, in favor of the working male members and children. About one third of women found reduced their regular food intake substantially during drought. However, this trend was true for the males and tribal regions that imply the nature and extent of local food shortage. Gender inequality in allocation of food within household is partly explained by increased reduction in consumption among the poor and partly by the social and traditional customs and practices as mentioned earlier. Decline in household food consumption in terms of both quantity and quality supports the presence of distress-driven household drought coping behavior. This also supports the finding of earlier studies on gender inequality in food access and intake, better share of boys over girls in food and education, and female disadvantage in food and health care (DeRose et al., 2000; Gittelsohn, 1991). Unlike the findings

Table 8 Trends in intra-household food consumption (%)

State/district	Odisha and Gujarat	Decline in quantity of food consumed (in % of HH)			Decline in quality of food consumed (in % of HH)			
		marginal (<5%)	average (5–15%)	high (>15%)	Total	marginal (<5%)	average (5–15%)	high (>15%)
Non-tribal								
	<i>Male</i>	11	13	12	12	24	27	26
	<i>Female</i>	30	36	33	33	23	28	36
	<i>Boy child</i>	11	27	20	17	18	15	17
	<i>Girl child</i>	11	36	30	29	22	15	17
	<i>Others</i>	16	8	0	13	13	16	12
Tribal								
	<i>Male</i>	31	26	23	26	28	26	25
	<i>Female</i>	33	27	37	34	32	28	25
	<i>Boy child</i>	9	16	15	15	10	16	16
	<i>Girl child</i>	13	17	23	16	22	16	20
	<i>Others</i>	14	13	11	13	8	13	14
								13

Source: Field Survey (2019)

of other studies that analyze food consumption at aggregate household level, the present study finds intra-household food inequality at the individual level to highlight gender differences in food consumption.

Conclusion and Policy Suggestions

In conclusion, recurrence of drought and its adversities very much exist in regions irrespective of the level and nature of rainfall, water resources, and poor farming households; women, tribals, and other weaker sections are the worst affected across regions in India. The nature and extent of drought varies across regions and groups in terms of loss of crop output, farm employment, livestock, and return to land-based activities. As a result, household's drought coping strategy varies from occupational changes, reallocation of family labor and assets, labor migration, distress sale, food consumption adjustment, etc., which do ensure gender inequality. Though impacts of drought are complex and multiple in nature it goes beyond water scarcity, crop failure, and income loss. To cope with drought households, several strategies can be followed, such as, change in occupation, consumption adjustments, expenditure adjustment, multiple borrowings, distress sale, overdependence on forest and forest products, out-migration, reliance on public relief support, etc. Resource-poor households in dry backward and tribal areas use conservative risk coping practices that could have long and lasting effects, which further affect household resource use, risk coping ability, and intra-household gender relations. Women share a disproportionate burden of workload and hardships, arranging food and adjusting food consumption during drought, and face adverse intra-household gender relations, which are often missed out in general policy debate, discussion, and analyses.

Our findings support the view that many poor household in semiarid and dry areas continue to share higher work burden with poor occupational mobility and low or no access to resources and avenues such land, water, credit, technology, and market. At the household level, distress occupational changes, labor migration, food consumption adjustment, informal borrowings, distress sales, etc., were found mostly used as household ex-ante drought coping strategies with regional and group-specific variations, which are not gender neutral. Local food production, agriculture, controlled water supply, better access and use of resource, access to inputs and market, particularly by the women, are crucial to strengthen household risk coping ability in in drought-prone areas.

From policy perspective, it is critically important to understand the local conditions and incorporate drought-proofing measures as an integral part of rural and agricultural development plans. Since households under distress situation often rely more on their female members for "labour smoothing" and "consumption smoothing" that may result in wider intra-household gender inequality, suitable gender-sensitive public policy should be designed to address regional and group-specific issues, which may be different at the national and subnational level. Better policy coordination and integration of drought policy with local development initiatives

and gender development policies may be effective to counter drought-induced adversities and gender inequality.

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Good Governance Strategies for Disaster Management and Risk Reduction 140

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Contents

Introduction	2098
Literature Review	2101
Significance of Governance in Disaster Management	2102
International Strategies for Disaster Governance and Risk Reduction	2102
Case Study of Disaster Governance	2107
The Current Mechanism for Disaster Management in India	2108
Suggestions	2109
Conclusion	2110
References	2110

Abstract

Disasters are sudden, catastrophic, and unfortunate events that cause human and financial damage, destruction, and devastation. Disasters also impede ongoing and impending development projects, and the impacts – outputs and outcomes – vary from geography to geography. Major reasons, as the literature suggests, are due to diversities and differences in the climatic and geospatial conditionalities which lead to the difference in the degrees of vulnerabilities caused to the physical environment and to the human resources. Given the capriciousness and unpredictability of the disasters, the states and the disaster mitigation machinery or communities to manage disasters need to be equipped and organized in advance, to minimize the postdisaster effects. To overcome these stages in process of disaster management to minimize the economic, social, or geographical loss, governance should play a vital role with the 3Es, i.e., efficiency, effectiveness, and economic mitigation process, which in the process helps to synchronize political, economic, and administrative activity in the management of disaster.

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This chapter tries to focus on the country's Disaster Management ACT 2005 and laterally three international conferences on Disaster Management which have highlighted the fact that governance structure aids the enactment and administration of public policies along with sustainable livelihoods which are conducive to a country's economic and social development and also, on the other hand, condenses the vulnerability to disasters. This chapter used secondary data that deliberate for sustainable governance structure, and development accountability, participation, predictability, and transparency are the key features.

Keywords

Good governance · Risk minimization and mitigation · Disaster preparedness

Governance, as defined by UNDP (1997) is “the exercise of political, economic, and administrative authority in the management of a country’s affairs at all levels. It comprises mechanisms, processes, and institutions through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations, and mediate their differences. It encompasses all relevant groups, including the private sector and civil society organizations.”

Introduction

Disaster governance has traditionally been understood as a risk reduction strategy that has a split responsibility between local, state, and national institutions and was alienated in bureaucratic hierarchies. However, because of little or no interaction among civil society, governmental organizations, NGOs, or corporate entities, it can just be seen as risk governance which talks about disaster or emergency management of the people. Disaster governance framework should reflect the broader guidelines of the legal and institutional framework of the society of which they are part, which helps to create a receptive atmosphere for vigorous disaster risk reduction by mobilizing the political drive and simplifying the inclusive participation and involvement of the various stakeholders to ensure that political, social, and economic priorities are on the basis of agreement in society; also the point of view of the marginalized and most vulnerable section of the society are perceived in the decision-making process. Although the research in the field of disaster management overtly emphasizing governance is very little, the present chapter focuses on the efforts taken up at the national and international level for indoctrinating governance as part of a “Disaster Risk Reduction.”

The key questions addressed are as follows: At national and local levels, what are the key driving forces which have changed the disaster risk governance characteristics over the period of time?

How the International Framework Has Influenced Disaster Risk Reduction in India and What Are the Outcomes of Its Confluence with Governance?

The objective of the chapter is to understand the positioning of disaster governance on the broader framework of the environment, disaster management, resilience, and preparedness in relation to the present system of disaster governance which revolves around the social, economic, and political factors that impact government measures. It also talks about the importance of governance in disaster management and its gradual development in India and in an international setting with reference to major international strategies such as IDNDR and the three major conferences which include Yokohama Strategy (1994), Hyogo Framework (2005), and Sendai Framework (2015); also few of the case studies will help to answer the key research question that how this framework has set a uniform standard for the disaster risk reduction across the globe with the help of integrated and inter-woven efforts at all levels and of all the stakeholders.

Disasters and human civilization have always coexisted, but as technology advanced and developed, various permanent infrastructures had been built over time. This materialist development has caused a rift between people and nature, which has increased the risk of disasters. Averting these and foreseeing their occurrence at some of the geographical locations are beyond scientific explanation too. As per the definition given by the National Disaster Management Institute of India (NDMI), “disaster is an event or series of events, which gives rise to casualties and damage or loss of properties, infrastructure, environment, essential services or means of livelihood on such a scale which is beyond the normal capacity of the affected community to cope with. Disaster is also sometimes described as a catastrophic situation in which the normal pattern of life or ecosystem has been disrupted and extra-ordinary emergency interventions are required to save and preserve lives and or the environment.”

The United Nations (1987) defined disasters as “A serious disruption of the functioning of a community or a society causing widespread human, material, economic and environmental losses which exceed the ability of the affected community/society to cope using its own resources.” Disasters have constantly been there, and human beings have coexisted with them at the same point of time though they have tried to overcome the situation frequently, but these extreme events either natural or man-induced have exceeded the endurable scale causing massive damage to human life, property, and natural environment within or beyond certain time limits, paralyzing daily life (Waldman, 2019). Avalanches, forest fires, and landslides are very frequent in the Himalayan region of the country; almost 90% of the land mass of the country is prone to disaster. The disasters directly affect economies, agriculture, food security, water, sanitation, the environment, and health conditions every year all around the world. And therefore, disasters have become one of the solitary major concerns for most of the developing and underdeveloped nations (World Bank, 2010). Different hazards because of the varying levels of physical damage caused to infrastructure and agriculture with their direct and sometimes indirect implications have led to the development of disaster management because disasters not only result in loss of shelter but also create adversities, lack of food availability, temporary loss of a source of income, and interruption with socioeconomic activities; such instabilities have their psychological and social magnitudes

which are difficult to replace; nevertheless, some of the losses may be redeemable and compensated by developing systematic disaster management.

In 2005, the “Disaster Management Act (DMA)” was passed by the Government of India for the “efficient management of disasters and other matters connected to it.” This Act proposed the formation of the National Disaster Management Authority (NDMA) which will be headed by the Prime Minister of the country, the NDMA is authorized to formulate disaster management strategies and coordinate and implement these policies and plans for ensuring judicious and effective recourse for the catastrophe. These plans will act as the guiding principle for policies and programs of the central and state to form their respective policies with the prior approval of the same. The National Executive Committee (NEC) is the policymaking committee of the NDMA, which is deputed to guide the NDMA in the execution of responsibilities and guarantee compliance with the guidelines issued by the Central Government. District Disaster Management Authorities (DDMAs) are deputed at the District level and have the primary responsibility of developing, coordinating, and approving plans in accordance with the strategies laid out by the NDMA. SDMAs (State Disaster Management Authorities), headed by the Chief Ministers of the states, will frame policies for DM in the state in accordance with the framework suggested and at the same time will approve the plans in accordance with the strategies laid out by the NDMA.

The ACT is framed on the idea that losses related to the calamity need to be minimized, and are more important than an arrangement of relief and rehabilitation; subsequently, the structure of DM also assures training and development of officers and employees for effective management of disasters in the country and correspondingly will give measures for carrying out respite, restoration, and rebuilding activities in the disaster-hit areas and will prepare DM Plans in harmony with the guidelines of the NDMA, SDMAs, and DDMAs. Specific institutional development in the form of the National Institute of Disaster Management has assisted in the front line and sustenance of an all-inclusive and unified approach toward DM. A shift can be seen from the “relief-centric” response to a “proactive prevention,” “mitigation,” and “preparedness-driven” approach for the conservation of development and to minimization of loss of life and property.

Disaster management and risk reduction in India have their own gaps, including the lack of a declaration of disaster-prone areas, despite the Disaster Management Act performing the principal role of addressing the gap. The officials need to take the initiative as this categorization can benefit policymakers to shape policy in such a way that it helps in mitigating the damages that will be caused because of the catastrophe. The Act indicates that disasters are a sudden incidence, but the matter of fact is that they can be progressive in nature as well. For instance, epidemics like dengue and tuberculosis and the recent pandemic of Covid-19 are disasters despite conventional definitions as thousands of lives are lost to it, but we are still not able to develop an effective mechanism for the same. Disaster management guidelines are under review after the recent pandemic; hopefully it improvises the changes to overcome the drawbacks of the present arrangement and not oversee the

much-valued role that civil society, private enterprises, and NGOs can play together in making a better and safer India.

Literature Review

De Silva et al. (2021) discusses the community-based knowledge which has protected communities over the period of time on the basis of the generations-based knowledge and experience suitable for their community, by the observations based on the hazard's occurrence and the local resources available to them. Does the chapter talk about how community-based knowledge addresses international policies on DRR? And what is the contribution of community-based knowledge to current DRR practices? The chapter also discusses how community-based knowledge and DRR are important contributing factors for sustainable development and in spite of that, there is a gap in integrating these procedures into practice. The chapter highlights that supplementary research is required to expand and develop the system for the incorporation of community-based knowledge and DRR for sustainable development.

Nowell et al. (2018) discussed the suitable mechanism for governance structure in disaster response and at the same time how to structure disaster risk reduction so that it resolves the need for quick response at ground zero with coordination among the various stakeholders. A centralized coordination is required suitable for quickly changing conditions. The authors identified four key factors for effective governance response to disaster reduction and preparedness: (a) quick response to shifting circumstances, (b) managing dispersed data, (c) two-way synchronization, and (d) developing cooperative plans. Lastly, the authors propose that the structure should be neither extremely cohesive nor strictly central. Relatively, it is best categorized as a balance between the center and state just as the federal structure of the country.

Mayer (2019) discusses the importance of disaster resilience as a guiding archetype for the advancement of disaster risk reduction and sanctioning disaster recovery through investment in local communities, developing local capacities to the changing environment and developing it sustainably by paying attention to generation-old knowledge in effect and eminence to national and international programs. Nevertheless, there are a lot of gaps between the theoretical and operational mechanism for enhancement of community capacity for resilience; the chapter elucidates how disaster researchers and experts are theorizing and perceiving the thought of community disaster resilience.

Smith et al. (2009), the authors, discuss about the mitigation of the probable disasters that challenge human civilization in the new epoch and suggest an evidence-based approach to disaster management which again highlights the community involvement. The authors have tried to identify the series of adversities and measures over the period of three decades and have theorized the outcome for highlighting the governance act in the same.

Significance of Governance in Disaster Management

The subsequent step after disaster management, to make it more effective, is good governance; its implementation at every stage can lead to desirable results for DM. Disaster governance is considered a synchronized system in which collaborative efforts of several organizations are brought under one umbrella to resolve the issue that outspread beyond the horizon of any single organization (Ansell & Gash, 2007). Emerson et al. (2012) define the concept of collaborative governance as “the processes and structures of public policy decision-making and management that engage people constructively across the boundaries of public agencies, levels of government, and/or the public, private and civic spheres in order to carry out a public purpose that would be challenging to be accomplished” as it should spread across the predisaster, transdisaster, and postdisaster periods that are intended to diminish the impact and fatalities related with the catastrophes arising from natural or man-made causes for the disasters. Governance plays a very important role in various disaster phases; disaster susceptibilities can be reduced through predisaster arrangements, e.g., risks and susceptibility valuations; infrastructure guidelines; construction code development, implementation, and execution; cautioning arrangements; and academic and mock-drill plans. Post-disaster actions comprise of short- and long-term retrieval plans, and at the same time preparation and execution throughout catastrophe retrieval of involving designs to diminish forthcoming calamity fatalities and endorsing sustainability ideas. Governance measures and significant players’ contribution naturally vary throughout these disaster stages, adding to the difficulty of governance. Risk-recovering initiatives, such as insurance and reinsurance, are a few of the important components of disaster governance.

Disaster governance can be added advantage to comprehend institutional measures concentrating at the supervision of natural or man-made hazards or probable hazards, which pursue to decrease susceptibilities and contacts during predisaster times, and provisions related to mitigation and rehabilitation after the disaster has taken place and managing the consequences of disastrous events. According to Burton and others, safer constructions can be carried out by combining a variety of changes the first can be to avoid construction in disaster-prone areas and design the architecture in such a way that it becomes disaster safe. In order to reduce the impact of the calamity, preplanned construction and training of the community members for disaster response, and developing early warning systems for the protection of the population should be the priority (Burton et al., 1993).

International Strategies for Disaster Governance and Risk Reduction

The very first global breakthrough for making disaster management part of development procedure and policymaking appeared in the form of the International Decade for Natural Disaster Reduction (IDNDR); a decade in the 1990s was designated for the same. IDNDR aims at the capacity development of every nation

in order to mitigate the effects of disaster in an effective and efficient manner; for this, they aim to have adoptive technical and scientific progress along with suitable guidelines for existing plans and technologies in order to bridge the gap between knowledge and its implementation for decreased loss of life and assets (UN, 1987).

However, in spite of the passion and understanding of the importance of the IDNDR, most of the nation faced economic and logistic challenges to implementing the plan in the ground reality; therefore, the IDNDR was not of great success, but still it managed to make people understand that the disasters are not just acts of God but they can be managed in more efficient and effective manner with development of science and technology and national and international cooperation and efforts. IDNDR played an important role in letting countries erecting daunting systems for disaster management. For instance, in India, by the end of IDNDR, a High-Powered Committee (HPC) was set up in (1999) to review the issues related to disaster. In fact, the present Disaster Management Act 2005 of the country owes its origin to the HPC report. The Yokohama Strategy and Plan of Action for a Safer World was the forerunner in this area which was adopted in the year 1994 succeeding the UN World Conference on Natural Disaster Reduction (NDR), held in Yokohama, Japan. It is the preliminary document deliberating the policies at the transcontinental level for research, training, and preparation for disaster prevention, and mitigation of disaster impact.

Yokohama Strategy offers a set of ideologies based on which disaster risk reduction strategies should be planned, rendering to the international world of the mid-1990s. It advocates the development of a global culture for the involvement of local actors in risk management practice and developing a community-embracing capacity building, and self-sufficiency by allocating adequate resources, valuing community experience for disaster risk reduction, and ensuring that the plans are in safe hands. It especially emphasized improving survival techniques so that the community has a mechanism that not only helps them to cope with the disaster but also helps in recovering from disaster impacts. It has also highlighted the importance of identifying and connecting the centers for the research in a particular area in order to enhance the prevention, reduction, and mitigation activities in a more scientific manner; media has to play a more constructive role by updating vulnerable communities for disaster reduction. The strategy emphasized that in the second half of the decade community-based approach needs to be adopted so that the vulnerable or marginalized sections can be benefitted from improved risk monitoring and better communication of forecasts and warnings. It has also highlighted how it can be achieved by encouraging the mobilization of community resources, political commitment by legislation and policy-making on and for risk reduction and prevention programs, deliberation and authority to the local-level government officials for safety measurements, strengthening institutional capacity, considering support of the NGOs for people's involvement developing disaster resistance infrastructure, and last but not the least international communities should provide assistance for developing nations to establish measure and techniques for disaster prevention and reduction within the prevailing resources and in alignment to the subregional, regional, and national policies. The knowledge and experience of the local people

were taken into consideration to allow an easy and fast recovery process. The succeeding decade of the 2000s completely changed the outlook of the way disaster risk reduction was specified, by increasing its competence in hazard preparedness and inhibition by better governance rather than emphasizing coping and relief interventions; likewise, improved governance methods also included people's involvement which was given major consideration (Baudoin & Wolde-Georgis, 2015).

Apart from, this Yokohama Strategy has also emphasized activities at regional, subregional, and international levels, particularly through bilateral and multilateral cooperations for the development of training programs and exchange of technical knowledge and understanding for human resource development, mutual assistance, and joint agreement programs. It has also suggested the extrabudgetary resources be provided for the implementation of the strategy; they have encouraged voluntary contributions from national and international organizations and private organizations, and government should be encouraged to prioritize the importance of disaster management. Last but not least, a review conference on natural disaster reduction should be held at the end of the decade to map out the activities that need to be undertaken in the twenty-first century for the disaster reduction programme. Establishing and developing the early warning system as a priority for the subregional, regional, and national levels will enable more effective warning dissemination. Dissemination of information, transparency, and taking feedback for the assessment of the work at the various levels are a few of the indicators which reflect a good governance approach in the Yokoyama strategy.

Later, the world Conference for Disaster Risk Reduction was held in Kobe, Hyogo, Japan, in January 2005; it was unconsciously held in the aftermath of the Indian Ocean tsunami in 2004, which created mayhem to the lives and livelihood of millions of people; at the same time, it has created consciousness regarding natural disasters, their hazards, and their grave impact not only on humans but also on the environment. The result of the Hyogo Framework for Action 2005–2015 (HFA) is perhaps the utmost important international declaration promulgating the concept of disaster risk reduction. The first decade of the twentieth century was shifting its concentration from disaster to increased focus on risk preparedness in which governance had a major role to play. The Hyogo framework for action was adopted as part of the International Strategy for Disaster Reduction; it was the first plan of its type which has not only talked about disaster reduction but has also deliberated exhaustive progressions needed for the reduction in disaster risks in various sectors and of different scales across the globe.

The Hyogo frame for Action (HFA) has a robust prominence on disaster preparedness and prevention, rather than on response and recovery which was emphasized during the earlier decades of disaster planning. HFA signifies five priorities for action and suggests the importance of community involvement. These are:

- a) Risk reduction should be a national and local priority along with the support of the institutional framework: For this purpose, it proposed the conception and establishment of nationwide unified disaster risk reduction mechanisms, so that

responsibilities can be designated from the national levels to the local levels to enable smooth functioning and coordination across sectors. Categorizing the details and uniqueness of local risk patterns and predispositions, decentralization of authority, responsibilities, and resources should be done in such a manner that maximum risk reduction is possible.

- b) Recognition, assessment, and monitoring of calamity for enhancing early warning system: Government at all levels must develop, update, and disseminate information which must include risk maps, records on disaster occurrence, and statistical evidence related to impacts and losses; on a regular interval, this will empower policy-makers to evaluate the influence of calamities on social, economic, and environmental settings and plan accordingly. Developing early warning systems which contemplate the demographic setting, gender, cultural background, and livelihood structures of the target population along with the training on how to understand and act upon early warning will be superlative for effective operations by disaster managers and other decision-makers.
- c) Culture of safety and resilience needs to be built with integrated knowledge, innovation, and education: For this, easy and accessible information related to relevant traditional practices, Indigenous statistics, and cultural inheritance should be tailor-made for different target populations keeping into consideration their social and cultural factors which should be disseminated specifically to high-risk areas, so that they are encouraged and empowered to take actions which result in decreased destruction and also develop resilience. Enclosure of disaster risk reduction information in the academic program at all levels and use of supplementary methods for disseminating information and educating youth and children for disaster preparedness and resilience.
- d) Reduction of primary risk factors: This includes calamity hazards because of changing socioeconomic and environmental settings, the effect of threats related to ecological events, and climate change, which are discussed in the development of policies and strategies which should include post- and predisaster situations. Food security needs to be promoted particularly in drought-, flood-, and cyclone-prone areas as an important factor for ensuring the resilience of communities. Sustainable construction is needed of basic infrastructures like schools, health centers, hospitals, drinking water, communication, power supply, and transportation so that they are resilient to disasters.
- e) Reinforcing catastrophe readiness for operational response: The effects and loss of life and assets because of adversity can be abridged if authorities and individuals in the communities are up-to-date and equipped with early warnings and disaster management capacities (UNISDR, 2005).

“Hyogo framework has emphasized native knowledge and considered cultural tradition as one of the key indicators to develop information appropriate for ‘target’ audiences” (UNISDR, 2005, p. 9). It has also highlighted the importance of “inclusion of gender and marginalized section perspective” which was further reviewed in the midterm review report of HFA. HFA as one of the initiatives for promoting a higher participating method in DRR and increased collaboration among local

governments and communities would help support DRR planning at a larger scale (Mercer et al., 2008).

The third world conference on Disaster Risk Reduction was the Sendai Framework which emerged out of inferences from the prior two conferences. In contrast to the previous frameworks, it was presented with 15 years of the time line for DRR across the globe. Sendai has specifically conferred the accountability of DRR on the national government with active and enthusiastic participation from regional and local government and has emphasized the significant role of communities. The Sendai Framework is the foundational document in the present setup providing the inclusive and integrated framework for DRR with the fine strategy for carrying necessary changes in the setting of disaster management practices across the world. Sendai Framework prioritizes the implementation of the DRR Program.

Understanding disaster risk: It must be ensured that technical information in disaster risk calculation, development, and application of plans and strategies should have a cross-sectoral approach which must be custom-made to suit the local area and should have an integrated approach of local tradition, Indigenous knowledge, and practices (UNISDR: Activity I, p. 11).

Strengthening disaster risk governance to manage disaster risk: community representatives with training in disaster risk management and familiarity with the relevant legal frameworks should be given the proper duties and responsibilities. Likewise, community participation should be taken into consideration for the development of such laws so that their support can be easily established during its implementation (UNISDR: Activity f, p. 13). Providing appropriate financial and governing support to local authorities to enable them to take the initiative to collaborate and coordinate with civil societies, communities for native peoples, and communities for migrants in disaster risk reduction at the local level (UNISDR: Activity H, p. 14).

Investing in disaster risk reduction for resilience: To enhance the economic, social, cultural, and health resilience of citizens, communities, and the environment as well as their assets, public-private partnership for investment in disaster risk prevention and reduction through structural and nonstructural measures are critical (UNISDR: Activity J, p. 17).

“Build Back Better” must be the motto of recovery, rehabilitation, and reconstruction: The sturdy rise in disaster risk and the teachings from the previous hazards specify the necessity to additionally support calamity readiness for response, taking actions in advance for catastrophes, along with disaster risk reduction and preparedness by guaranteeing effective response and recovery forces at all levels and in suitable numbers. Gender equitability and universal accessibility for response, recovery, rehabilitation, and reconstruction are key approaches, and this can be done only by empowering women and persons with disabilities (UNISDR: Activity K, p. 18).

The Sendai Framework (SF) has set tangible and quantifiable targets on a uniform basis to be accepted by countries across the globe. It aims to fulfill certain targets by 2030: significantly reducing financial loss because of the calamity which affects the global gross domestic product, substantial reduction in mortality rate and number of

people affected by disaster by 2020–2030, and lowering the rates by an average of per 100,000 in comparison to the years 2005–2015. By 2030, there will be a considerable decrease in the destruction of essential health and educational infrastructure (UNISDR, 2015). Sendai framework has tried to bring all the countries under one umbrella so that considerable changes can be seen in the life of the people across the globe and no country is left behind when disaster management is talked about.

Case Study of Disaster Governance

In continuation to the above conferences for disaster risk reduction, let us study how far India has adopted them and tried to implement them as per the Disaster Management Act 2005. Orissa, situated on the coast of Bay of Bengal in the eastern-most part of India, is a natural disaster-prone state; because of its demographic setting, it has very often witnessed hurricanes, and torrential rainfall which causes floods, and hence it is nick-named as “disaster capital” of the country. Hitherto, its two coastal villages Venkatrapur in Ganjam district and Noliasahi in Jagatsingpur district have been acknowledged as “Tsunami Ready” in August 2020, by the UNESCO-Intergovernmental Oceanographic Commission. Subsequently, India has become the first nation in the Indian Ocean Region to achieve recognition for such a high level of preparedness and resilience at the local level for disaster risk reduction (The Hindu, 2020).

Odisha has recently been in news flash for setting an example of the way it has managed to cope with the natural disaster that has struck its coastline. Community-based disaster management is the very core of its disaster management and risk reduction approach, and they have highlighted this aspect as also one of the central themes in the State disaster management plan (OSDMA, 2017). This is because of the fact that any type of disaster community is the first to face the heat and to respond to the situation at the same point of time. Also, the government can easily employ the Indigenous knowledge of the local community for disaster risk reduction as highlighted in the Hyogo and Sendai Framework of Action as one of the aspects of good governance where people’s participation is given the highest importance for the citizen-oriented government.

People’s participation in the disaster management activity is not the only part of community awareness, but empowering them with efficient training from governmental and nongovernmental agencies and dynamic teamwork, which not only includes members from NDMA but also community workers and people’s participation, plays a very important role. Past experiences are given special references while framing policies and programs for disaster management; in the Super Cyclone witnessed by Odisha in the year 1999, more than 10,000 people lost their lives, and therefore as a lesson from this ill-fated experience the state has felt the need to build an adaptable cyclone shelter in the coastline of 480 km; the shelter had been equipped with all the basic services which are required during the emergencies such as community kitchens, life-saving equipment, and announcement vehicles;

subsequently, it helps the affected people to be at one safe place and along with their community members which is emphasized in the Sandia framework activity I (Manorama, 2019).

As per previous research and past records of the tsunami, authorities have recognized 328 villages where seawater has flowed up to 1.5 km inside the village; these records have helped them to develop preparedness plans accordingly. The villages Venkatraipur in Ganjam district and Noliasahi in Jagatsingpur district have been vowed “Tsunami Ready” under the Indian Ocean Tsunami Ready Programme of IOC-UNESCO based on people’s participation (The Indian Express, 2019).

In the recent disaster of Amphan in West Bengal, the state has proven its efficiency in implementing evacuation operations through the community outreach program. It was one of the strongest cyclones recorded in the Bay of Bengal in which around 200,000 people were evacuated immediately after warnings were dispensed by the Indian Meteorological Department and refurbishment works were also commenced on a priority basis so that by the time the hurricane approached the West Bengal coastline most of the electrical repair work had been done (India Today, 2020). Also, Odisha post-Amphan survey report by the steering committee states that community involvement is one of the best practices adopted by the Odisha government in disaster management.

Odisha government has already set a preceding example in super cyclone Fani in 2019, where they have targeted “zero causality” and carried out history’s biggest evacuation operation in which evacuees were accommodated in over 4000 shelters in which 800 are specially designed to survive cyclones (Business Standard News, 2019). Another such success story of Odisha is Cyclone Phailin which struck in 2013 when approximately one million people were evacuated. After the calamity Phailin, the UN acknowledged Odisha’s preparation for disaster as a “global success story” and announced that Odisha will be used as a model for other states (TOI, 2013). As the World Bank puts it, “Odisha has a good community outreach system through which people can be contacted on time. There is a network of 450 cyclone shelters and each shelter has a maintenance committee trained in rescue and relief activities. Through a network of these shelters and committees, the state has involved the entire community making it easy to disseminate warnings and evacuate people” (World Bank Report, 2019). Odisha has already set an example to the rest of the world for no loss of life and the least materialistic and social loss; community participation is most significant which has been set as a standard in international strategies.

The Current Mechanism for Disaster Management in India

In the last two decades, disaster management policy of India has shifted its focus from respite and restoration efforts to all-inclusive management of catastrophe. This new strategy combines predisaster issues of preparedness, prevention, and mitigation, as well as postdisaster issues of response, recovery, and reconstruction. New initiatives, such as making people aware of disaster risk reduction in the development process, making people’s participation relevant through education and

awareness programs at all levels, and employing innovative technologies for disaster forecast and severity, have improved India's alertness for each phase of disaster management. The above-discussed case studies clearly answer the research questions asked at the very being of the chapter. Involving various stakeholders and community participation with their age-old methods and experience assorted with the latest technology delivered results that are set up at various national and international standards for the benign survival of humans and nature. Correspondingly, governance plays a vital role to join forces at all levels of the government and various stakeholders for preparedness and resilient disaster risk reduction which was impossible to find in India before NDM Act 2005.

Though substantial accomplishments have been made in postdisaster response, recovery, and rebuilding, there are still arduous encounters in diminishing the danger because of forthcoming disasters and unsustainable development going around, especially in suburban areas. Unsafe building construction practices in hastily growing urban and suburban areas are India's greatest challenge for disaster management. A major earthquake in any of these India's compactly populated cities in seismic zones would be disastrous in terms of mortalities. Bhuj earthquake of 2001 is one such example. Climate change has extensive consequences for the management of disaster risk in India, as the occurrence and intensity of landslides, flash floods, cyclones, storms, droughts, and cyclones have increased; they are expected to rise further in coming decades.

In addition to this, one area of India's disaster management that is obviously lacking in knowledge is the management of man-made or non-natural disasters, which the current global situation necessitates. Integration and planning at the international level, mainly after 9/11 and 26/11, query unnatural disasters as a priority. The other unnatural disasters that have been discussed universally are the hazardous outcomes of the Nuclear-powered, and Biochemical (NBC) Combat. Henceforward, unnatural disasters become of grave importance for India to be addressed in the upcoming time. The requirement of the present time is to frame out a collective method for inclusive disaster management encircling prevention, preparedness, response, and recovery.

Suggestions

Some of the initiatives which should be part of the disaster management program for sustainable growth are the following: disaster management policy should include plans to shield the utmost susceptible segment of the community such as people below poverty line, females, kids, aged-people, and physically challenged people. The mechanism should be such that lessons learned must be transferred from preparedness and mitigation to management amid societies. In the circumstance when we all are well aware of the fact that catastrophes do not come within lines, these should be managed through enhanced regional cooperations for mutual benefit. Public investment must be encouraged for risk reduction. Determining local vulnerabilities, estimating the likelihood of damage as a result of the adversity, and

incorporating those vulnerabilities into preparations for unforeseen events, insurance, self-insurance, and taxation also expenditure plans should be flexible for speedy allocation of funds. Lastly, extremism is a serious challenge to Indian security which government needs to address to maintain governance and accountability.

Conclusion

Afore stated discussions lead us to conclude that the three international frameworks indicate toward major development for disaster risk reduction in which priority is given to partnerships and involvement of relevant local stakeholders, and communities are widely recognized as an important constituent for the successful development and DRR plans and approaches. The three frameworks treated local communities as esteemed partners with Indigenous expertise who can provide custom-made solutions for the disaster risk; the case study of Odisha can be the best example to prove the fact that how important it is for the community to participate along with other stakeholders. Alignment of national disaster management policy with the three international frameworks is important as these serve as guidelines to direct the flow of funding and the implementation of projects in a specific field, and it would help to develop international policies and agendas for disaster risk reduction.

The author has highlighted the fact that aspects of good governance can only be implemented if the various guidelines given by the international framework are taken into consideration, for example, scientific development, dissemination of disaster data, analysis report for disaster-related risk and damage, early warning signs, and many more. The social and economic loss and lives of people can only be saved when they are well informed about the upcoming unfortunate event. An increase in finance flows at the local scale and, overall, improvement in the bottom-up participatory process within international DRR frameworks are a few of the important aspects which need to be considered by all the nations. With the change in the climatic conditions, it becomes more pivotal that the disaster risk reduction policies are aligned with the sustainable development goals of the UN so that a safer place for the next generation can be passed on.

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Climate Change Disasters and Impact on Women in South Asia

141

Garima Sangwan and Debahuti Brahmachari

Contents

Introduction	2114
South Asia, Climate Change Disasters, and Gender: The Interplay	2115
Theorizing Gender and Climate Change Disasters	2116
Disaster Management Laws and Conventions: Need for a Gendered Approach	2120
Missing Link	2121
Way Forward: Conclusion	2123
Recommendations	2123
Limitations and Future Research	2124
Annexure	2124
References	2125

Abstract

Climate change is a defining threat and an intricate challenge to peace and security in the twenty-first century. The impacts of climate change differ for various regions, communities, classes, etc. The people who belong to the marginalized communities and vulnerable regions are the ones who are the worst affected. The chapter highlights the impacts of climate change disasters on one of the most vulnerable regions, South Asia. Given its geography, low-lying coastal areas in the region are at an immense risk of submergence. Cyclones, drought, and irregular weather patterns have been taking a toll in this region. The impact of climate change is more severe on women, because of poverty, their dependence on threatened natural resources, different roles, etc. Gender norms and limited adaptive capacities aggravate the experiences of such disasters on women sharply.

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With 70% of the world's poor being women, the disproportionate impact of climate change exacerbates gender inequality.

The purpose of the chapter is to examine the complex interplay of gender and climate change disasters. The chapter attempts to analyze what are the reasons that make women's position susceptible to climate change disasters in general and in the South Asian region in particular, what makes South Asia one of the most vulnerable regions exposed to climate change disasters, and why there is a need for a gendered approach toward disaster management laws and conventions. The chapter aims to reiterate the need to invest in representative, participatory, proactive, and holistic approaches with a gender-sensitive outlook. In this regard, qualitative research methods with descriptive analysis have been used. The literature and narratives available related to various dimensions of gender inequality and climate change disasters have been reviewed to understand the differential impacts on climate change disasters on women. The need to have gendered disaster management has been highlighted. No comprehensive disaster management approach should neglect the gendered impact of such crises. The research tries to sum up with proactive strategy recommendations that the state should embark upon both as long-term and short-term goals.

Keywords

Climate change · Disaster · South Asia · Gender · Laws

Introduction

Climate change is a defining threat and an intricate challenge to peace and security in the twenty-first century. "Climate change is a 'crisis multiplier' that has intense implications for international peace and stability" (UNSC, 2021). The impacts of climate change are horrendous for us all. However, given the socioeconomic and geographic factors, these impacts are worse for certain regions and groups of people. In the given context, South Asia as a region is the most vulnerable to such climatic challenges and shocks. "About 14% of the region's urban population, totalling about 400 million, live in coastal and major river delta areas that are 10 metres or less above sea level" (Asian Development Bank, 2021a, b).

Given its geography, along with its socioeconomic and political conditions, the situation is worse for people in the South Asian region. Deep-rooted inequalities arising from caste, class, religion, and ethnicity persist in the region and are further complicated by severe gender-based discrimination.

Prevalent gender gaps, social norms, and patriarchal values hinder the mitigating and adaptive capacities of women while facing the impacts of climate change disasters. Notwithstanding the challenges, women have played an extremely crucial role in fighting climate change disasters. It is in the region's interest to tap on this resource in battling climate change. And against this backdrop, the chapter intends to explore and discuss the international conventions on disaster management, laws, and

mitigation policies of South Asian nations through the gender prism. The chapter is divided into three segments: the following section will discuss the vulnerability of the South Asian region to climate change disasters and its interplay with gender. The next section aims to theorize gender considering the climate change crisis. The international laws and policies to mitigate climate change disasters through a gender-sensitive approach will be discussed next and lastly concluding with some recommendations and way forward.

South Asia, Climate Change Disasters, and Gender: The Interplay

The South Asian region is a point of convergence owing to its “vulnerabilities to climate-sensitive diseases, dependence on climate-sensitive livelihoods, projected levels of crop decline in the region, and high rates of poverty and malnutrition” (Patel et al., 2019). “The region is living through a ‘new climate normal’ in which intensifying heat waves, cyclones, droughts, and floods are testing the limits of government businesses, and citizens to adapt and these challenges are only likely to get worse” (Schafer & Roome, 2021). As a region, it is home to some of the world’s countries that are most vulnerable to climate change. According to an estimate by the World Bank, climate change could push “62 million South Asians below the extreme poverty line by 2030” (World Bank, 2020). “More than half of all South Asians, or 750 million people in the 8 countries – Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka – were affected by one or more climate-related disasters in the last two decades” (World Bank, 2022).

The intensity of adverse impacts of climate change disasters are graver on certain sections of society who are already marginalized in terms of the resources they have, social oppression they face, and the minimal role they play, while participating in policy- and decision-making, i.e., their bleak political representation. Climate change is rightly understood as the crisis multiplier in reinforcing already existing socioeconomic and political cleavages. Such sections of society have their own delicate position in the process of disaster management.

“Among all forms of marginalization, gender inequalities between men and women, and boys and girls demand special attention” (Banu, 2016). Women are particularly at risk when it comes to climate change. This impacts women disproportionately during different extreme events. “In South Asia, women find themselves in subordinate positions to men, dependent socially, culturally and economically” (*ibid*). They are by and large kept out of the decision-making processes, their mobility is restricted, and more importantly they are under the threat of constant abuse from their own family members, especially males. “Son preference has economic, social and religious utility, while daughters are seen as an economic liability because of the dowry system” (Fikree & Pasha, 2004). The role that cultures, prevailing norms and values, and attitudes play in the abysmal condition of women across the South Asian region leads to shaping up attitudes in “intra-household health and education outcomes” toward women (Banu, 2016).

There are significant disparities across the South Asian region which makes it behind every other region across the globe, only slightly better than the Middle East and North Africa according to the Global Gender Gap Report 2021 released by the World Economic Forum (WEF, 2021). “The limited adaptive capacities arise from prevailing social inequalities and ascribed social and economic roles that manifest themselves in differences in property rights, access to information, lack of employment and unequal access to resources” (Parikh, 2006). “For instance, in the 1991 Bangladesh cyclone, among the victims who died were mostly women and the reasons which came out in further reports were their restrictive mobility, the majority among them lacked the ability to swim in flood emergencies” (Rahman, 2013). There are certain skills which are taught to men only advertently.

Women beneath subjugation of the patriarchal mindset of people and lack of say in family affairs tend to lose autonomy over decision-making even in matters of direct concern for them. And in the aftermath of such disasters, their say fades into what is important for the family. For instance, “after the 2004 Tsunami, women who had lost all of their children, or male children in some cases, were subject to severe trauma and harassment” (Bhadra, 2017). A lot of instances were reported where “women who had previously undergone tubectomies were surgically recanalized to re-enable conception and childbirth” (*ibid*). This discrimination and gender gap impedes the disaster management process at every stage. The needs of the women are often debased in comparison to their male counterparts during times of disaster. These disparities limit the access to resources and agency for women who suffer due to climatic disasters. The intensity of the impacts of climate change on women is noteworthy due to its wide array, the “domains of agriculture, livelihood, food security, both physical and mental health, water and sanitation in the South Asian region” (Patel et al., 2019).

Theorizing Gender and Climate Change Disasters

In the previous section, an attempt has been made to highlight the intricate relationship and implications of climate change disasters on women. Along with this, it tries to highlight the resilient role played by women during situations of climate change disasters. “Pre-disaster vulnerabilities among women play a major role in determining the impacts of disasters” (Bhadra, 2017). Preexisting, structural gender inequalities denote that women and girls are affected in a different manner in comparison to men and boys. These vulnerability and defenselessness of women increase, often due to their lower socioeconomic group and status and more so in the South Asian region given the huge gap in literacy, job opportunities, etc. Therefore, to this, their preparedness, evacuation, response, recovery, and death get impacted. The reason for this vulnerability and susceptibility can often be tracked down to the roles that females hold in society and existing gender and cultural norms where they are born and live their lives, the duties they carry out, the clothing they wear, the way they are expected to behave, and so on and so forth. There exists a compounded discrimination which finds its basis in the fact that women’s susceptible positions prior to the

disaster have indeed led to their exclusion from relief activities, leaving them poorer and more vulnerable, while pushing them to the dangers related to climate change and resource scarcity.

These impacts of disasters increase the magnitude of preexisting development issues and are not merely dependent on the “natural hazard” as part of environmental calamity per se. In fact, “gender inequalities are informal institutional responses to climate; women are underrepresented in governing agencies, and climate policy can negatively affect groups of women” (Pearse, 2017).

- *Lack of equality:* Unequal treatment of men and women with respect to the opportunities given to women in social, economic, and political spheres results in the differentiated impacts of climate change disasters on women. “A meta-analysis of reports on disasters in 141 countries found that higher death rates for women were directly linked to their level of economic and social rights as compared to men” (Neumayer & Plumper, 2007). In contrast to this, in the societies where both have equal rights, the differences in a number of deaths on the basis of sex are less. Also, according to the report of the Asian Development Bank on “Gender-Inclusive Legislative Framework and Laws to Strengthen Women’s Resilience to Climate Change and Disasters,” improving women’s economic standing both directly and indirectly reduced the human cost of disasters (ADB, 2021a, b).
- *Gender, the social construction:* “The social construction of women’s ‘vulnerability’ and ‘virtuousness’ reinforces static ideas about fixed gender roles, or worse, reinforces the perception that women are intrinsically defenceless and closer to nature” (Sondhi, 2020). For instance, women usually have the responsibility to take care of their family members before themselves, especially the children and senior citizens. These forced expected caregiving responsibilities to women often impede their own ability to evacuate during times of such disasters. The same notion is also reflected in the disaster law regimes which are made with a view to mitigate disaster and inculcate resilient attitudes in people experiencing such situations. The spectacle through which these laws and conventions have been formulated and implemented thus requires enquiry. And this begins with an inquiry into the existing variances due to the “biological differences” between men and women and the way in which it differs from the social ones. “Biological reproductive functions remain undeviating, e.g., childbirth. In contrast, socially reproductive functions can witness deviations” (ibid). Looking after children, taking care of the elder ones at home, washing utensils, cleaning, cooking, and other domestic chores can be taken care of by both men and women equally. “Do we have any substantial biological basis for the creation of this distinction in socially reproductive work” (Chaman, 2008)? This influences the relationship between men and women in society in general and more importantly has been deeply entrenched in society as an integral part of the culture of the society which further defines their roles accordingly and their consequent responsibilities and status in the society. These cultural patterns result in emplacing inequalities in control over means of production and further access to resources and adaptability,

succession to property, etc. This would further lead to determining other hierarchies in the social setup such as a role in decision-making, access to other education, economic roles, etc. “A synthesis of these differences and inequalities means that male and female counterparts of the same society face different kinds and levels of exposure and ensuing vulnerability to natural disasters and disaster impacts” (Sondhi, 2020). Against this backdrop, the subsequent paragraphs will discuss how these cultural patterns transform into cultural rigidities which further work as a crisis multiplier during times of climate change disasters. Women do not get any exemption from their routine responsibilities of taking care of their families. They are equally distressed but carry the baggage of the conventional roles assigned to them, and this option for leaving their homes to get relief is not available to many women.

- *Transforming cultural patterns into cultural rigidities:* The differential responsibilities between men and women generally lead to unequal consequences even when there are equal opportunities given to them. In rural areas or small towns, men generally migrate to the cities to find a livelihood for them, and women remain with their families and children to take care of them and also to work in the fields in order to add to their family income. The frequent changes in climate patterns result in subsequent droughts and floods, making the tasks difficult for them. Cultural patterns do limit female mobility and hinder the self-rescue abilities of women. For instance, women in South Asian societies often need the permission of male members of their families in order to leave their homes. Many restrictions are put on women on the level of interaction women can have with other male members of the family. Consequently, “they may be willing to seek shelter in shared communal facilities in case of immediate rescue also, only because they need separate, private spaces and damage to their clothing adds to hesitation in front of stranger males in a shared space” (*ibid*). A lot of instances have been reported where women end up facing sexual favors, the threat of violence, physical abuse, and rapes in the disaster refugee camps. To quote another instance, “in Bangladesh, male heads of household are typically responsible for evacuation decisions and the Purdah system restricts women’s independence movement” (Alam & Collins, 2010). Women are put to greater risks when male members are not there during disaster warnings leading to the delay in their evacuation. Similarly, in the 2005 Kashmir earthquake, “the highly patriarchal social structure and purdah made it extremely difficult for women to evacuate from mountain villages and to access aid materials, healthcare, and compensation for their losses” (Parker & Halvorson, 2007).
- *Accessibility to resources:* “Women’s limited access and control over resources and the gender division of labour in families create barriers to women’s coping with and recovering from disasters” (ADB, 2021a, b). Due to sociocultural inequalities, women very often end up having unequal or no rights over land and family property. Moreover, disasters due to climate change led to severe loss of income, and as a result many times, men are not able to fulfil the needs of their families. Given the amount climate change has severe impacts on the state of

agriculture. Severe conditions of droughts, flash floods, and disturbed patterns of rainfall all result in adverse conditions for agriculture. Men going out to earn livelihoods result in women staying back in rural areas, working on the farms leading to the feminization of agriculture. Women directly bear the stress of adverse conditions in the agriculture sector due to severe impacts of climate change. For instance, “in India, around 65% of female workers depend on agriculture, and they contribute to 55–66% of the total agricultural production” (Census, 2011). “Women are primarily responsible for collecting water to satisfy household and irrigation needs” (Chatterjee, 2021). Impacts of climate change have resulted in long dry periods which add the pressure on women specially to cover huge distances to collect water. They could have invested their time in generating incomes. Food shortage has also led to malnourishment among women and children which further adds to their vulnerability during times of price hikes, unavailability, and unaffordability of food. “A study conducted by the International Food Policy Research Institute (IFPRI) in 2015 found that women were more likely to notice impacts of climate change than men on reduced water availability (18% versus 9%), agricultural productivity (87% versus 72%), and livestock problems (17% versus 8%)” (Kristjanson et al., 2015). Indeed, climate change poses a threat to all livelihoods. However, people associated with the agricultural sector, especially women, are far more burdened by the vagaries of climate change disasters. Even after a disaster has taken place, it is a lot more difficult for women to prove the ownership of their land and property, which in turn amplifies the existing inequalities that they face in relation to men. For example, “following the 2015 earthquake in Nepal, women heads of households experienced direct discrimination when local government officials insisted that distribution would be through male heads of households only” (UN Women; UNFPA; UNDRR, 2021).

- *Violence against women:* Gender-based violence is another important form of gender discrimination that has an impact on women in disasters. Various pieces of evidence show that disasters are associated with high rates of violence against women. Domestic violence is highly prevalent in the South Asian communities. “It increased following sudden-onset disasters and during prolonged disasters such as droughts” (IFRC, 2015). Rapes and sexual assaults have become common in the refugee camps and shelter homes. “Impoverishment due to disaster increased the risk of gender-based violence, including through economic coping strategies such as child or early marriage, transactional sex, and trafficking” (*ibid*). Bizarrely, women face discrimination and violence even during disaster relief work as relief workers. For instance, “In 2015 Chennai floods the women volunteers have reported facing indecent behaviour” (Abraham, 2017). In various disaster management laws and mitigation strategies, women are considered as the beneficiary of the government programs. They receive the relief package and supply distributed at their homes, since they remain at home in accordance with their roles as caregivers. It is important to note that these relief packages are shared by the whole family and the specific needs of women are not often taken

into consideration in the disaster management laws. Due to lack of educational opportunities given to women, there exists unavailability of female doctors after these disasters. “Many women choose not to ‘shame themselves’ in front of a male doctor in general medical camps” (Sondhi, 2020).

Disaster Management Laws and Conventions: Need for a Gendered Approach

There is a second wave of every disaster, which is caused by inadequate response strategies that can be identified as “humanitarian aid induced social problems” (IASC, 2010). The mitigation process in case of disasters demands strong constitutional and legislative actions that are not gender blind in nature. Climatic disasters lead to severe shocks for women as compared to men due to the inherently embedded structural determinants outlined earlier which hinder their resilience and capacities. History of climatic calamities having long-term repercussions has outlined the urgency for a gender lens within the disaster management jurisprudence. The vulnerability parameter differs from country to country, yet women stand at the apex of such inequalities. Governments thus need to mainstream gender into laws and policy guidelines related to disaster risk reduction (DRR) aiming toward sustainable development of all at both national and international levels. UNISDR had set up guidelines in order to strengthen disaster resilience across states through a gender lens in 2006. The underlying objectives focused primarily on highlighting the essential gender concerns in DRR and, secondly, to promote and develop government capacities to integrate gender perspectives within policy-making and DRR legislations (UNISDR et al., 2009).

Decades of marginalization of gender obligations into policy processes globally have delayed the acknowledgment of gender mainstreaming in disaster management and reduction. After the Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters (HFA), the gendered approach was implicitly applied into disaster resilience strategies. “Unfortunately, commitment to gender issues is rarely stated explicitly; rather, it can only be assumed to be an implicit part of larger commitments to the HFA” (*ibid*, pg 3). Despite advocacy of gender equality in development goals by the United Nations, government legislation and efforts have resulted in inadequate and fickle progress. “51 of 62 national reports to UNISDR acknowledged gender as important to DRR, but there was still very little concrete mainstreaming in policies and programmes” (UNIFEM, 2009). Laws play a foundational role, and hence the need for strong legislation is the essential constituent to empower women. The legislative framework all across the globe needs to protect women’s human rights in order to strengthen women’s resilience to climate and disaster risks. “Many laws and policies on climate change and disasters focus on women as a vulnerable group, there is an overarching need to address the underlying inequalities between men and women and the need for women’s empowerment” (ADB, 2021a, b).

Missing Link

Climate-related disasters have further exacerbated the existing gender gaps within the South Asian region. Absence of gender-sensitive legal institutional structures neglects the needs of women and the causes of vulnerabilities which further adds up to the existing structures of gender inequality. The need of the hour is to strengthen and promote national legislations which support gender inclusive DRR and disaster risk management (DRM) at the earliest. Law making, DRR, and DRM are the most integral dimensions under climatic disaster approaches that need to be developed through a gender-sensitive lens in the long run.

- Lawmakers have neglected the idea of gender-sensitive laws in the past. Gender-sensitive legislation aims in mainstreaming gender equality within laws (OSCE, 2017). Adopting the gender perspective is not the end but the means to reduce the ever-deepening gender inequality. The Economic and Social Council (ECOSOC) demanded mainstreaming of gender in all areas whereby “the declarative nature of constitutional provisions does not automatically translate in mechanisms to ensure equal opportunities for women to participate equally with men in all types of economic, political and social activities” (ECOSOC, 1997).
- United Nations Office for Disaster Risk Reduction defined the aims of disaster risk reduction (DRR), “towards preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening the resilience and therefore to the achievement of sustainable development” (UNDRR, 2019). CEDAW committee’s GR37 acted as the anchor by demanding “gender related dimensions of DRR in the context of climate change” (CEDAW, 2018). It urged governments to take immediate actions to prevent and alleviate the risks and adverse effects of climatic disasters and others on the vulnerable sections especially women and girls. The limitation within the existing legislative framework had to address the wider socioeconomic structures that shaped the vulnerability parameter largely in South Asia (*ibid*). National laws have been unable to take into account the key elements that solidify the inclusion and resilience of women under the risk reduction strategies.
- Laws largely have identified women as a part of the vulnerable section but have missed out in addressing the special needs, vulnerabilities, or concerns of gender equality. Good laws and framework empower women both pre- and post-disasters under DRM. “The application of DRR policies and strategies to prevent new disaster risk, reduce existing disaster risk and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses” is defined as disaster risk management (UNDRR, 2019). In 2014 the multi-country report (IFRC; UNDP; Picard, 2014) identified the negligence of countries in incorporating gender-sensitive approaches within the formal structures of law related to disaster and climate strategies. Punjab state in India, Namibia, the Philippines, Vanuatu, and Nepal were the only examples of pledging to consult women within DRM laws (*ibid*).

Women are negligible within DRM governance or institutions that largely aids to gender exclusion within frameworks related to climate and other disaster stratagems. This failure to diagnose women's position within the civil society further explicates why gender dimensions are missing in DRM laws. There is an urgent need for "special measures in the legislation to correct a lack of formal representation and empowerment of women in governance and staffing" (Ha Noi, 2016).

- The under representation of women has been a long-standing barrier in voicing out their opinion and strengthening their capacities. Men as parliamentarians hold three quarters of position globally and four quarters in Asia, depicting women's unequal position in the political sphere till date (IPU and UN Women, 2021). The Ha Noi conference foregrounded that "women in Asia and the Pacific have the lowest decision making and political power in the world, thereby limiting their say and influence in DRR decision making processes" (Ha Noi, 2016).

Women as active decision-makers and participants at local, national, and global level will help in better climate change adaptation and mitigation policies. Intergovernmental Panel on Climate Change (IPCC) recommends "participation of women and other marginalised groups enhances the effectiveness and governance of land based climate change mitigation and adaptation" (IPCC, 2018). Gender-sensitive climate policies can be successful if women decision-makers are able to design frameworks and legislations keeping in mind their inherent structural barriers and gender gaps. Large-scale research has concluded that women's participation leads to "effectiveness of climate change adaptation measures" (UN Women, 2017) leading to more justifiable and sustainable endings.

- Climate change-related laws and strategies have been on the rise post-2009, but gender mainstreaming within them is either negligible or extremely slow. "The absence of gender inclusion in climate change and environment laws suggests a failure to undertake gender analysis during the lawmaking process when developing or amending climate change laws or environmental laws" (ADB, 2021a, b). National responses and legislation have lacked in formulating gender-sensitive climatic actions. Developed countries merely established laws as part of obligations rather than commitments under the Kyoto Protocol, whereby gender inclusion was alien to them (Resurrección et al., 2019). Despite mentioning gender, 32 countries in Asia and Pacific have not implemented any legislations in this regard, thus being unable to deal with the causes of women's vulnerability related to disasters and climate change (ADB, 2020). Gender dimensions and representations are trifling at both national and global levels.
- Absence of participatory rights in Asia and Africa largely has been assessed whereby "no lawsuits specifically detail the need for special protections for women; lesbian; gay; bisexual, transgender, queer and intersex (LGBTQI) people and gender minorities in consultations for climate related projects such as energy, transport or resettlement projects" (ADB, 2021a, b). Thus, both locally and globally participatory rights in climate litigation are important along with a gendered approach.

The above missing links within the legal regimes and policy approaches in South Asia clearly depict the deep-rooted negligence of gender norms. Very little concrete mainstreaming and inclusiveness have been acknowledged in government programs related to gender commitments that can be sustainable in the long run.

Way Forward: Conclusion

Many countries have provisions in their constitutions dedicatedly forbidding discrimination on the basis of gender, but these may not translate into actual apparatuses of gender equality. Therefore “mainstreaming gender into all forms of legislation plays a significant role in the process of promoting and attaining the ultimate objective of gender equality” (ECOSOC, 1997). The legal frameworks and institutions need to be gender sensitive and inclusive in nature to address gender inequality and women’s empowerment. As important as it is to unlay and understand how women have been a victim of sociopolitical and cultural obstinacies and circumstances further aggravated by the wrath of climate change disasters, it is equally important to realize their role in mitigating these disasters and building a sustainable and resilient framework to deal with the challenges posed by climate change disasters. Women participation as the major stakeholders while formulating the laws and policies for disaster management is the foremost step toward gender-sensitive risk management. Disasters of any kind, shape, and size will have exacerbated the existing gender gaps making women more susceptible. Therefore, international agendas over the years have been demanding to build back better for both men and women during such climatic disasters. The major objective of this chapter has been to highlight the need to mainstream gender into all kinds of climate and disaster reduction, management, and recovery mechanisms.

Recommendations

1. Climate change adaptations and disaster frameworks need to apply gender as a fundamental principle, especially in all kinds of socioeconomic development factors within an enabling environment.
2. Countries need to strengthen their policy guidelines and laws related to gender and DRR along with best practices involving gender-sensitive results.
3. Among the major challenges related to gender mainstreaming has been the marginalization of gender issues institutionally. Lack of proper knowledge and information, technical expertise, and absence of awareness and experiences in addressing gender concerns from the root have resulted in poor progress in South Asia. Greater efforts are needed at every level be it local, national, regional, or internationally to strengthen political accountability and financial assets.
4. Sex and age disaggregated data is a must to analyze, evaluate, and report on gender concerns within disaster-related statistics. Both quantitative and qualitative data gaps need to be addressed in terms of gendered impacts of climate change (UN Women, 2018).

5. All kinds of risk assessments, planning, recovery, and reconstruction responses need to take into account preexisting inequalities and gender differences in disaster impacts. Adaptive capacities of women may be hindered by the existing disadvantages and thus require special attention and support of the stakeholders and governance structures.
6. Women are important stakeholders in all kinds of DRR and DRM governance which will enable gender-sensitive policy development simultaneously. “Institutionalise the leadership of women and diverse groups in disaster preparedness response, recovery and reconstruction at all levels” (Ha Noi, 2016).
7. Lastly, a rights-based and participatory approach should be the overall guiding principle for ensuring a gender-sensitive environment.

Climate change adaptation and disaster reduction with gender is a crosscutting issue that needs multiple stakeholders and multilevel cooperation and collaboration to fulfil the goals of a sustainable future based on gender equality.

Limitations and Future Research

With increasing severity of the climate change disasters, the impacts on the low-lying region such as South Asia and that too on one of the most marginalized sections, the women, have been disruptive. One of the major limitations has been the limited availability of sex-disaggregated data or research of the impact of climate change disasters on women. Lack of gender preparedness and representation of the voices of women within policy outcomes is affected by the embryonic stage of any systematic research in the area. Women have also been reluctant in the remote rural areas. This added to the list of impediments while conducting research. The mitigation strategies by international organizations such as UN Women, intergovernmental disaster frameworks, national government agencies like the National Disaster Management Authority, and other stakeholders will provide a lesson during future research in sustainable and engendered policy measures.

Annexure

ADB	Asian Development Bank
CEDAW	Convention on Elimination of All Forms of Discrimination Against Women
DRM	Disaster risk management
DRR	Disaster risk reduction
ECOSOC	Economic and Social Council
HFA	Hyogo Framework for Action
IASC	Inter-Agency Standing Committee
IFRC	International Federation of Red Cross and Red Crescent Societies
IPCC	Intergovernmental Panel for Climate Change

IPU	Inter-Parliamentary Union
OSCE	Organization for Security and Co-operation in Europe
UNDRR	United Nations Office for Disaster Risk Reduction
UNFPA	United Nations Population Fund
UNIFEM	United Nations Development Fund for Women
UNSC	United Nations Security Council
WEF	World Economic Forum

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Women and Domestic Violence During Covid-19 Pandemic in India

142

Rahila Sikandar

Contents

Introduction	2128
Background of the Problem	2130
Importance of Studying Disaster and Domestic Violence	2130
Methodology	2131
Analysis and Discussion	2131
Commonalities	2133
Findings	2134
Recommendations and Conclusion	2135
References	2137

Abstract

The Covid-19 pandemic is one of the most ubiquitous disasters in the history of mankind. The ferocity of the Covid-19 pandemic during 2020–2021 with the increased rate of 4.12 lakh cases to the deaths of 3,971 people a day jolted the whole nation (The Hindu: 2021). The situation worsened when the nation moved to national lockdown during the second wave of the Covid-19 pandemic in India. This national lockdown was imposed with the motive of security and safety of the citizens; however, it has raised other problems including Covid-19. The lockdown during Covid-19 has not only increased the economic burden on individuals but also impacted the lives of common people at large. However, within the Covid-19 pandemic population, it is women who worldwide suffer the most. Women are the most vulnerable section of society and hence profoundly preoccupied by the pandemic. During the lockdown, cases of domestic violence increased around the world, and therefore the United Nations declared it the “shadow pandemic” of the coronavirus-19 pandemic. According to the United Nations report, *One in three women worldwide experienced physical or sexual violence mostly by their intimate partners. And since the breakout of Covid-19,*

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the data and reports have shown that all types of violence against women and girls, particularly domestic violence, have intensified (UN: 2020). The present chapter will focus on domestic violence and its impact on women during Covid-19 pandemic. The sample size which was selected for the study was 15 in numbers; however, due to coronavirus pandemic, only five women responded which make possible a close involvement and a rigorous investigation by the researcher. The sample size was selected based on the random purposive sampling method. This chapter will be based on the primary data in the form of interviews and content analysis of the available secondary data. Access to counseling services online or offline was not available for survivors; no accommodation services were provided to the survivors; no financial assistance was provided to the survivors of domestic abuse during the pandemic; there was no sensitivity of police toward such victims; etc.

Covid-19 pandemic was a global crisis and a test of the vulnerable. Crime against women and children increased during the pandemic. This needs the attention of all executives, the legislature, and the judiciary to pay immediate consideration to domestic violence during the pandemic.

Keywords

Women · Domestic violence · Covid-19 pandemic · Lockdown · Access

Introduction

After the imposition of lockdown by the Government of India dated March 24th, 2020, the first national lockdown for 3 months was imposed. It was against the coronavirus or Covid-19 pandemic which breaks out in December 2019. The whole world comes under the incarceration of this deadly virus; however, this virus was non-inhabitant to the Indian peninsula; it was a foreign virus spreading through cough and cold while humans breathe. It is not only India that was on complete lockdown with the slogan of “Stay Home, Stay Safe,” but the whole global community issued instructions and directions to maintain distance and stay safe. This pandemic affected humanity across the world; it has not only created health hazards but also created a threat to family and social relationships, and it played a role of socially unequalized. The motto “Stay Home, Stay Safe” was for all but not equal for all. The impact of the pandemic on women was stressful and much worse than others. According to the World Health Organization, violence against women is highly prevalent, and intimate partner violence is the most common form of violence. Globally, one out of three women worldwide faced or experienced the sexual form of domestic violence by an intimate partner. Violence by the intimate partner is defined by the World Health Organization as a physical, sexual, or psychological coercive act by a current or former partner or spouse to women (WHO: 2013). Under such circumstances, the rate of domestic violence increased during pandemic. The

pandemic affected women disproportionately; it exacerbated risks, amplified inequality, and escalated the vulnerabilities preexisting in our society.

The definition of domestic violence according to *Section 3 of the Domestic Violence Act, 2005*, is as follows: *For the purposes of this Act, any act, omission or commission or conduct of the respondent shall constitute domestic violence in case it—*

- (a) *Harms or injures or endangers the health, safety, life, limb, or well-being, whether mental or physical, of the aggrieved person or tends to do so and includes causing physical abuse, sexual abuse, verbal and emotional abuse, and economic abuse; or*
- (b) *Harasses, harms, injures, or endangers the aggrieved person with a view to coerce her or any other person related to her to meet any unlawful demand for any dowry or other property or valuable security; or*
- (c) *Has the effect of threatening the aggrieved person or any person related to her by any conduct mentioned in clause (a) or clause (b); or*
- (d) *Otherwise injures or causes harm, whether physical or mental, to the aggrieved person.* (DVA: 2005)

It is essential to understand the concept on which the Protection of Women from Domestic Violence Act, 2005, was based and the insight of introducing this act. Because it is not only the physical violence that takes place between partners but also emotional, sexual, and economic abuse, this act covers all the violence as domestic violence if it took place between partners. This act recognizes and ensures the rights of women to live in a violence-free space in their homes by providing immediate and emergency relief to the victim.

Violence against women is not at all a new phenomenon in our society; before the pandemic, domestic violence against women was present in our society. It is during the pandemic the number of cases of domestic violence increased. In more than 99% of cases, the male partners are the perpetrators. The National Crime Records Bureau (NCRB) data reveals a pattern of increase in the rate of domestic violence in Indian states; these are Bihar, Haryana, and Punjab (Outlook: 2020). The National Commission for Women Chairperson Rekha Sharma said that “the main reason for the rise in domestic violence is that men are at home, and they are taking out their frustration on women and they refuse to participate in domestic work and women during the lockdown were confined into the walls of the house.” The National Commission for Women received more complaints during pandemics for domestic violence than ever; she further states that domestic violence cases have doubled than what it was before the lockdown (Outlook: 2020).

Women in obnoxious relationships face domestic violence in a much more brutal form when they stay at home during the lockdown. Women lost their jobs, and it became difficult for them to maintain their livelihood; stress of being at home with more house chores without help created psychological pressure on them. General Tedros, director of the World Health Organization, states that women in abusive relationships are more likely to be exposed to violence, as are their children, as

family members spend more time in close contact, and families cope with additional stress and potential economic or job losses (2020). According to the World Health Organization, 243 million women and girls between the ages of 15 and 49 years worldwide are subjected to sexual and physical violence (WHO: 2022).

The imposition of a worldwide lockdown to stop spreading the coronavirus has increased the risk of domestic violence, especially in the case of women and children; they faced a double pandemic as the home was more precarious than a secure place to be. In the words of Marianne Hester, domestic violence goes up when families spend more time together, such as Christmas and summer vacations (EPW: 2020). During the lockdown, no access to facilities like a police helpline available to register complaints has increased the rate of domestic violence, and women spent more time with the abusers. With almost 57% of women in India not having access to phones, their options for registering complaints under the lockdown are now limited (EPW: 2020). This phenomenon increased the dependency of women on other family members to report on their behalf. And the Press Trust of India reported that the National Commission of India had received complaints filed by a father of his daughter he alleged was being brutally beaten by her husband and being denied food (EPW: 2020). The quarantine measure heightened the risk of domestic violence in our society which further intensifies gender inequality, economic instability, use of alcohol, and confinement in homes; it further burdened the mental and physical health of women at large. Therefore, it is unquestionable to fight this phenomenon of domestic violence during pandemic; however, none of the states comes forward to show the exact rate of domestic violence during pandemic.

Background of the Problem

The literature combines to what is the situation of women during disasters, in case of missing disaster laws and tries to investigate the status of women and their access to the police stations and courts for filing any complaints regarding domestic violence and its aftermath. As most of the study only focuses on disaster and its mitigation and management, it seems that the absence of disaster laws to handle the situation of victims of domestic violence is worse; therefore, studying domestic violence and access to justice during disasters need to be procured.

Importance of Studying Disaster and Domestic Violence

In general, the study of domestic violence during disasters is very few; thus, it is a remote area of research. The number of victims are increasing during disasters however, its reporting and data availability is lacking. Therefore, this gives a raise and alarm to focus on the survivors of post-disaster abuse. As data reveals, number of representatives of sexual violence during disaster is much lower than the actual victims. There exists an association between disasters and violence against women, as explained earlier that women are confined to the boundaries of the house and

could not move during the pandemic and were easy prey for such acts. Under such conditions, the absence of disaster laws in India worsens the condition of dealing with domestic violence during disasters. The Disaster Management Act came into existence in 2005 including 11 chapters and 79 sections, and each section deals with the management of disaster, but none of them states how to deal with domestic violence or sexual offenses during the disaster. Therefore, it became essential for the legal fraternity to look into the matter; thus, keeping in mind the stipulation of the victims of sexual violence, appropriate laws, and the applicability of those laws at the place of occurrence is the most important fact for studying domestic violence and access to justice during the pandemic in India.

Methodology

Data is collected and analyzed from various courts of Delhi and Allahabad (Uttar Pradesh, India). Data assembling was made by the interviews of women who are coming to courts from different backgrounds and are victims of domestic violence. These women are chosen by purposive sampling method, and a total of 15 women were selected. However, to get a better and deeper understanding of each case, the sample size was limited to 5 only. Data collected are qualitative in nature and are in the form of a questionnaire and personal interviews. Data collected for the review of literature are quantitative in nature; therefore, the analysis will be the outcome of the collected data. According to Crouch and McKenzie, a small number of cases will facilitate the researcher's close association with the respondents and enhance the validity of fine-grained, in-depth inquiry in naturalistic settings (Crouch and McKenzie 2006).

Primary data here includes the interviews of the survivors of domestic violence during Covid-19 pandemic; these survivors are the ones who are now seeking legal aid for themselves and their children, following a short questionnaire including a few questions asked from the survivors. The secondary data includes the reports of the National Crime Report Bureau of 2020, data and reports of the National Commission for Women, Reports of the United Nations, etc.; therefore, this chapter also argues to bring certain amendments in the disaster laws identifying the key theme as disaster and domestic violence.

Analysis and Discussion

All the respondents are from different backgrounds, a few of them are working women, while others are home managers. During disasters when everybody was at home, these women coming from different backgrounds faced one factor in common, and that is domestic violence. Due to the lack of financial stability during the lockdown, many lost their jobs and were forced to be at home.

Domestic violence is always seen as a family affair and is very commonly accepted in our society. The loneliness of a victim can only be narrated by her, the

situations a woman victim goes through during the lockdown in India with no access to police stations or NGOs to access help. According to SWAYAM, a feminist organization, it is observed that, during the lockdown, there was no support of the kind that women would otherwise have got. "If you are being abused, where do you go? There is no family member and even if there is, how do you get to them if you don't have public transport? A lot of them were also not supportive, saying, stay where you are right now, you cannot come because of what is happening" (Frontline: 2022).

In another observation by Akshara, an organization based in Mumbai, being confined at home often led to increased work and sometimes domestic abuse. Men's demands did not reduce; in fact, they increased. Women had to do all the housework, and that increased the levels of resentment and anger on both sides (Frontline: 2022).

Another observation was made by an NGO based in Mumbai, Awaaz-e-Niswaan, that during the pandemic they were able to continue resolving cases of domestic violence from both their offices in Mumbra and Kurla in Mumbai. Despite the lockdown, their staff was able to come to the offices as they lived within walking distance (Frontline: 2022).

The above discussion suggests that domestic violence has increased during the lockdown and there were no recommendations provided to access police and other authorities for help. This also represents that most women were engaged in domestic chores during the lockdown and became a victim of domestic violence. Victims of such violence lived in fear psychosis of happening any unfortunate to them.

After the lockdown when police and courts become functional, many young women knocked on the doors of court against the violence that they faced inside the walls of their own homes by their own intimate partners and family. The following women told their stories of violence, also including a few questions in the form of a questionnaire during personal interaction.

Case I: During Covid-19 pandemic, her husband and family abused her for not doing house chores properly. There was physical violence in her marital life since marriage, but during the lockdown, this becomes a frequent practice; they have two children. The husband regularly beats her mercilessly in front of the children and the family which turned into physical, emotional, and psychological abuse for her. She felt alone and abandoned. But she did not inform anyone or seek any assistance for the harassment she faced because her actions were restricted due to the lockdown, without any knowledge of reaching police and legal counsels during the pandemic. However, after the lockdown when public service departments and courts get functional, she filed a complaint and sought legal assistance for justice.

Case II: During Covid-19 pandemic, her husband lost his job and started abusing her and their child. The husband abandoned her and their child because he could not bear the responsibility and started living with his parents. During the pandemic, she did not have any work to do nor any money to buy food; however, she along with the child somehow survived. She was all alone and devastated. The husband

has not returned home since 2020; she made complaints about him to the other family members, but no one responded. Now, after the lockdown, she sought legal assistance against her husband.

Case III: During Covid-19 pandemic, her husband lost his job, and she was the sole breadwinner in the family; she works from home during the pandemic. They do not have any children. Her husband was an alcoholic; during the lockdown, husband tied her hands and beat her regularly for not giving enough money. During the pandemic, her husband asked her to quit the job and migrate to their village in Haryana, which she denied; he then snatched money and cards, pushed her, and fled from home. He never came back home and have not contacted her since early 2021. Under such circumstances, as soon as the lockdown was over, she filed a case against him and his family and sought justice.

Case IV: The husband left his job immediately after marriage and asked her to take care of the family alone. She works as a teacher in a private school, and during Covid-19 pandemic, she works from home. She has one child. During the pandemic, she was at home with the family all the time doing house chores without any domestic help. Her husband never asked her if she needs any help; he abused her by discriminating and making fun of her accomplishments. He abused her family background and created pressure on her by saying that she is involved with other men and is disloyal to him; he harassed her physically, emotionally, financially, and psychologically, and she did not make any complaint against him during the lockdown, but now she is living separately and seeking legal assistance.

Case V: She works in a multinational company in Bangalore, and her husband is a government employee. During the lockdown, she was working from home and had a daughter. Her husband left her because he and his family do not want a daughter, and later he told her to quit her job and stay with him. He abused her verbally many times and around eight times physically. She complained about him many times to the family, but they asked her to manage the situation; hence, due to family pressure, she could not inform the authorities. He regularly pressured her to leave the daughter with her parents and threatened her to join him or he will divorce her. Later, her husband started living separately, and now she filed a case in the court and sought justice for herself and her daughter.

Commonalities

Among all the cases above, the commonality is that none of the survivors made complaints against their abusers during the lockdown. They were unaware of the state initiatives that took place after the orders passed by several High Courts in the country and the initiatives of the National Commission for Women, for the victims of domestic violence. The indicators of commonalities represent the physical and verbal abuse in each case. Four out of five survivors are working women and financially independent; however, during the lockdown, they faced abuse and harassment by their partners. None of the survivors states that they contacted any

police or legal assistance during the pandemic as they lack awareness about it. In each case, the situation is perceived as “domestic,” but there is a need to recognize the real problem in this word “domestic” and to help those who require urgent attention while reporting domestic violence. It is also to be noted that in India when survivors reached the authorities and complain about their partners or families at the police station, then their lives are in danger because they are bringing disgrace to the family and household.

In the interest of victims of domestic violence during Covid-19 pandemic, a public interest litigation (PIL) was filed by an NGO at the Hon'ble High Court of Judicature at Allahabad in *Ala Hazrat versus the State of UP through its Principal Secretary, Women and Child Development, Government of UP and Another*, seeking the direction of the High Court to appoint the nodal officer for the purpose of monitoring grievances of the victims of the domestic violence in Uttar Pradesh and also to provide necessary procedures in the same direction. In vide order dated 06/17/2020, the High Court of the Judicature at Allahabad directed the state to obtain the status and the steps followed by the Government of Uttar Pradesh in regard to grievances of the victims of domestic violence (PIL: 2020). In the same direction, *the Hon'ble High Court of Karnataka* asked the state about the issuance of the helplines during pandemic and actions taken by the state in matters of domestic violence. In place of another, A petition was filed in the wake of the increasing number of cases in Delhi by an NGO at the *Hon'ble High Court of Delhi* for the implementation of the *Protection of Women from Domestic Violence Act, 2005*, and the state of Delhi in its reply to the government explains about the protocol in Delhi that once the victim calls at the helpline, the receiver will forward the call to the counselor and will provide immediate help during the lockdown. The *Hon'ble High Court of Jammu and Kashmir* also took cognizance of the matters regarding domestic violence and issued directions to the state to create funds and informal spaces for the women at the grocery stores and pharmacies, where they could alarm the authorities without making aware the perpetrator (2021). After the direction issued by the Hon'ble High Court of Allahabad, a commendable step was made by the Uttar Pradesh Police by opening a hotline for women survivors of domestic violence under the tagline, “Suppress Corona Not Your Voice”; this step was taken to promote and provide an enhanced response to the matters of domestic violence during Covid-19 pandemic (2020).

Findings

After analyzing the data collected by conducting interviews and observing the responses, there are several findings that the researcher is able to find. These are as follows:

1. In this study, none of the survivors received any help during the pandemic. They felt alone and were confounded and stressed by the behavior of their partners and family during the pandemic.

2. Another finding of this research paper is that during Covid-19 pandemic many women did not have any financial assistance, nor did they have any shelter or accommodation provided by the Government of India for the abandoned.
3. There was no sensitivity of police toward the victims of domestic violence during Covid-19 pandemic.
4. Another finding of this research paper is that no team efforts were taken place by the Government to provide assistance to the survivors of Covid-19 pandemic.
5. During Covid-19 pandemic, no awareness about legal assistance was provided at the grass roots.

Recommendations and Conclusion

1. Therefore, for such survivors, there shall be counseling services to provide psychological, emotional, and legal assistance to them.
2. There shall be funding and accommodation assistance for the survivors of domestic violence; therefore, this recommendation argues that when the survivor makes a complaint against the abuser or partner, she should be supported and accommodated.
3. There is an urgent requirement for police to become more sensitive toward the survivors of domestic violence. The police shall educate the survivors on domestic violence and its remedial measures; this will help in discontinuing or intensifying domestic abuse in our society and also help in resolving the issue of bringing dishonor and disgrace to the family and allow police to engage with the community.
4. There is a pressing prerequisite for the inclusion of domestic violence and sexual violence during disasters in disaster laws in India. This act should include more sections of penalties against the criminals and sexual offenders of such offenses.
5. The court shall deal in these matters with extreme sensitivity. The judiciary shall always be respondent to the subjudicated.

The Covid-19 pandemic is not only a global crisis but also a test of the vulnerable in our society. During the lockdown, girls, women, and children were confined to the boundaries of the houses by the perpetrators. In India, women and girls have a high tolerance for domestic violence since it is derisory for them to complain about their husbands and family. Therefore, there is an urgent need to make more investments in the education and training of women against gender-based crimes such as domestic violence, sexual violence, etc. In every society, there is a long existence of domestic violence. The pandemic did not cause domestic violence; it only increased the number of cases and exposed it. In India, the Disaster Management Act 2005 does not contain any provision for the management of domestic violence or crimes against women during Covid-19 pandemic which needs urgent attention and action. Further research is recommended during the pandemic for domestic violence and the application of laws, their access, awareness, and availability of resources during a crisis. As a matter of human rights also, this needs the urgent attention of all

executives, the legislature, and the judiciary to pay immediate consideration to domestic violence during the pandemic.

Public Interest Litigation (PIL No. 635 of 2020). Ala Hazrat Helping Society versus. State of U.P Through its Principal Secretary, Women and Child Development, Government of UP and Another. At the High Court of Judicature at Allahabad (2020)

Questionnaire

1. a. What is your name?

Kalpana (name changed); age, 37 years, housewife; district, Allahabad; state, U.P.

- b. Are you a victim of DV during Covid-19? Yes (husband and in laws).

- c. Do you have children? Yes/no

Yes, two children (boys).

- d. Did you seek any help or make a complaint against your partner?

No help during Covid-19; after Covid-19 pandemic, she filed suit against him in family court under DV Act 2005 and maintenance, and right now she is not living with husband and his family.

- e. Did you know about the DV Act?

No, only through counsel.

2. a. What is your name?

Humaira (name changed); age, 32 years, housewife; dist, Allahabad; state, U.P.

- b. Are you a victim of DV during Covid-19?

Yes, victim of DV during pandemic. Her husband beats her brutally; his business was lost during pandemic, and he had no job and no money for wife and children. He left the house and did not return home. He is living with his relatives, ignoring his wife and child.

- c. Did you seek any help or make a complaint against your partner?

Yes, filed suit against him for maintenance and domestic violence after lockdown. During lockdown, she lived alone with her baby.

- d. Do you have children? Yes/no

Yes, one child (girl).

- e. Did you know about the DV Act?

No, only through counsel.

3. a. What is your name?

Lekha (name changed); age, 36 years; works at MNC; New Delhi; state, Delhi

- b. Are you a victim of DV during Covid-19?

Yes, victim of DV during pandemic by husband. Her husband lost his job, and while she works from home, he creates problems due to frustration, never cooperates, and asked her many times to quit her job too. He tied her hands and feet sometimes, beat her, and snatched money and cards from her. Once, it was so brutal that husband pushed her, the victim fainted and her husband thought she died. He left her there and ran away.

- c. Did you seek any help or make a complaint against your partner?
 Yes, filed complaint against him in the family court at Delhi.
- d. Do you have children?
 No.
- e. Did you know about the DV Act?
 Yes, but was not sure about it. Only through counsel.
4. a. What is your name?
Rajni; age, 25; works at MNC; dist, Allahabad; state, U.P.
- b. Are you a victim of DV during Covid-19?
- c. Did you seek any help or make a complaint against your partner?
 Yes, victim of DV during pandemic. Her husband left his job after marriage and asked her to take care of him and his family; later, during the pandemic, she worked from home and took care of the family too; however, he physically and economically abused her.
- c. Did you seek any help or make a complaint against your partner?
 Yes, after 2 years of marriage, I filed a complaint against my husband and filed suit in the court of law.
- d. Do you have children?
 Yes, one child (son).
- e. Did you know about the DV Act?
 Yes but very little knowledge about the act. Only through counsel.
5. a. What is your name?
Vandana; age, 32; dist, New Delhi; state, Delhi
- b. Are you a victim of DV during Covid-19?
 Yes, victim of DV during pandemic. Yes, one child (daughter). She works in MNC at Bangalore, and her husband works as assistant professor in a government university. For last 2+ years, he did not return to his wife and child. He maintains no contacts. Victim's husband and his family do not want daughter for which they abused her regularly.
- c. Did you seek any help or make a complaint against your partner?
 Yes, legal consultations and file suit against him.
- d. Do you have children?
 Yes, one child (daughter).
- e. Did you know about the DV Act?
 Yes, I was aware of domestic violence act but was not sure about it, but now I filed complaint against husband and his family in Delhi.

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Response of Biological Disaster COVID-19 143 in Bangladesh

Nasim Banu

Contents

Introduction	2140
COVID-19 in Bangladesh	2141
Impact of COVID-19 in Bangladesh	2141
Governance of COVID-19 in Bangladesh	2146
Concluding Remarks	2153
References	2154

Abstract

The primary objective of this chapter is to present Bangladesh's antibiological disaster response to COVID-19. Since March 2020, COVID-19 has disrupted the lives of Bangladeshis and the Bangladesh economy. At the onset, to mitigate this biological disaster, the government of Bangladesh (GoB) evacuated its citizens from COVID-19-affected countries and imposed travel and entry restrictions and home quarantine on the returnees from abroad. On-arrival visas and all international flights were suspended, social-distancing measures taken, educational institutions closed, the movements of mass vehicles restricted, and lockdowns in the country imposed, all as preparedness measures. Within the fastest possible timeframe, the GoB set up COVID-19 testing facilities, supplied personnel protective equipment (PPE) such as masks to the people administering COVID-19 patient treatments, raised nationwide awareness of COVID-19 symptoms, and administered vaccinations. To recover from the damage caused to national economy and livelihoods, the GoB provided USD 15.4 billion in stimulus packages to fund various sectors of economy and to distribute cash and food to targeted communities in the country. This management approach was found effective in limiting Bangladeshis' vulnerability to COVID-19. Further, the GoB should

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maintain a comprehensive governance program for capacity building and strengthening health institutions, to augment service delivery, research, and development in line with global development perspectives on biological disasters.

Keywords

Pandemic · COVID-19 · Biological disaster · Infection · Bangladesh

Introduction

Few natural tragedies in world history have sparked as much global concern as COVID-19 has. The world had experienced pandemics earlier, but none had garnered an international response equal to that of the World Health Organization (WHO) in its mobilization against COVID-19. China, on 31 December 2019, reported to the WHO a disease of pneumonia with unknown causes that derived from an outbreak of a cluster of people in Wuhan, Hubei Province. On 12 January 2020, the WHO confirmed that a novel coronavirus was the cause of this respiratory illness. By March 2020, COVID-19 had been transmitted widely and infected most of the nations of the world, with a remarkable death toll. On 8 March 2020, this novel coronavirus was confirmed to have spread to Bangladesh. Because of the economic setback from COVID-19, the poverty rate in Bangladesh will likely increase from 20.5% to 40.9% if COVID-19 leads to a 25% decrease in family income. Consequently, the successes in alleviating poverty over the past two decades may be lost (Ahmed, 2020a).

Bangladesh is recognized as a disaster-prone country with a high population density. Natural disasters are being intensified in Bangladesh because of global climate change, which is also affecting economic growth and upsetting macroeconomic balances. Thanks to managing natural disasters by prioritizing risk reduction and adaptation, the country has an increasing growing and stable economy with basic opportunities for life and livelihood. However, Bangladesh has lately been facing the governance challenges of combating an unprecedented disaster such as the COVID-19 global pandemic, which according to all indicators poses a serious threat to public health and the economy of the country.

This chapter covers the overall situation of the COVID-19 global pandemic, which appears as a biological disaster with associated health risks to the citizens of Bangladesh. It has had impacts on the lives and livelihoods of people and the socioeconomic conditions of the country and has presented major challenges to public management approaches, such as mitigation, preparedness, response, and recovery, to limiting the adverse effects of COVID-19 in Bangladesh. It also provides concluding remarks on sustainable programs for responding to COVID-19. On the basis of published literature, public policy, and strategy actions, a comprehensive study has been carried out to assess Bangladesh's governance on COVID-19. The personal observations of researchers on the COVID-19 situation have also helped to inform this chapter.

COVID-19 in Bangladesh

The Institute of Epidemiology, Disease Control, and Research (IEDCR) of Bangladesh announced in a press conference on 8 March 2020 that two men and one woman aged between 20 and 35 years were found positive for COVID-19. The two men were Italian returnees, and the woman was a family member of one of the other returnees. Bangladesh reported its first death from COVID-19, a patient over 70 years old, on 18 March 2020. By the end of that month, the death toll had reached five, with fifty-one total infections. Since then, infection from COVID-19 had been increasing in Bangladesh day-on-day with an increasing number of deaths. Initially, the risk was exacerbated by the number of Bangladeshi migrant workers, students, visitors, etc. returning from COVID-19-affected countries, and the disease ultimately spread to the community at large. On 24 July 2021, Bangladesh recorded its highest number of COVID-19 infections—16,230—and 32.55% of tested cases were positive, while the highest death toll recorded was 264, on 10 August 2021. According to the government of Bangladesh (GoB) bulletin issued on 24 March 2022, the COVID-19 infections and the deaths caused by it in the country stood at 1,951,072 and 29,118, respectively. Initially, COVID-19 infection was mostly limited to those within the cities of Bangladesh. Subsequently, infection transmitted all over the country, particularly in May–June 2021, when the Delta variant migrated to Bangladesh. By January 2022, the Omicron variant had also visited Bangladesh with high rates of infections. Although enforcing social distancing and social isolation in a densely populated country such as Bangladesh is very difficult, the GoB took prompt measures to control the speed of spread of the novel coronavirus by imposing restrictions on movement and shutting down all nonessential businesses at the very first detection of a COVID-19 case, on March 2020. However, this put millions of people out of work.

Bangladesh is hosting more than a million Myanmar Rohingya refugees. They are residing in a cramped camp: more than 46,000 people per km², one of the densest habitation areas on earth. In the Rohingya camp, the first COVID-19 patient was detected on 14 May 2020 (Noyon, 2020). The GoB took all possible preventive measures in the refugee camp, but COVID-19 regulations, particularly social distancing, were not possible to maintain in the Rohingya camps, because they have to share a kitchen, bathrooms, and corridors. Like other parts of the country, the Rohingya camps were also under lockdown and directed prohibitions, but the arrival of the Myanmar Rohingya refugees could not be stopped. As of this writing, they are still arriving in Bangladesh.

Impact of COVID-19 in Bangladesh

The COVID-19 outbreak and its spread affected almost all the crucial sectors in Bangladesh, including public health, education, the economy, and social values. It put the health system of the country in disarray, increased coronavirus infection and mortality, and exacerbated poverty, unemployment, and food insecurity problems

owing to the reduced economic activity. It has also triggered mass panic among citizens and broken many interpersonal relationships. At an early stage of global pandemic, no COVID-19 outbreak had yet been identified in Bangladeshi hospital patients, but on-duty medical staff fled from a hospital after admitting an immigrant patient with flu-like symptoms. Out of fear of COVID-19 infection, family doctors avoided responding to their patients, and clinics and hospitals in residential and remote areas were shut down. In most cases, COVID-19 patients were avoided by their family and friends. Panic buying, terror, social stigma, and mistrust were highly visible during the lockdown period. Before the advent of COVID-19, the poverty rate in Bangladesh was 20.5%, which has risen to 42.0% during the COVID-19 period; income has decreased by 56.0%; families who were at a marginal level of poverty were maintaining their lives with their savings and their decreasing food expenditures; many children of poor families have already been engaged in child labor; the dropout rate of students rose by 8.0%; and during the COVID-19 period, there were 13,886 child marriage in twenty-one districts of Bangladesh—among them, 50.6% were between ages 16 and 17, 47.7% were between ages 13 and 15, and 1.7% were between ages 10 and 12 (Kalerkantho Report, 2021). Because of the economic setback, the poverty rate in Bangladesh is likely to increase from 20.5% to 40.9% if COVID-19 leads to a 25% decrease in family income. Consequently, the successes over the past two decades in alleviating poverty might fizzle out (Ahmed, 2020a).

Bangladesh is a densely populated country of about 170 million people. On average, the country spends less than 5% of its gross domestic product (GDP) on the health sector. Bangladesh has basic healthcare opportunities, and its immunization program is a success story. During the initial stage of the outbreak of COVID-19, the health sector of the country was adversely affected because of a lack of proper information and professional knowledge on global pandemics from coronaviruses. The unavailability of proper personnel protective equipment (PPE), such as medical masks and gloves, required for healthcare providers intensified the situation. Bangladesh had a 4% mortality rate for doctors, whereas the global statistic was 2.5%. Improper and low-quality PPE was the primary cause for such a high mortality rate of doctors in Bangladesh.

Bangladesh's education sector has endured a long-term disaster. On 17 March 2020, the GoB declared closed all the educational institutions in the country, both formal and informal, without any exception, as part of preventive measures to restrict the spread of COVID-19. Since then, students of all levels were compelled to stay at home to maintain social distancing, to keep them safe from COVID-19. The closure of educational institutions was determined as an effective strategy for stymieing the critical transmission chain during the pandemic (Luca et al., 2018). But it had negative effects as well, especially on underprivileged/disadvantaged students' academic studies, who had to discontinue their learning and whose assessments were disrupted (UNESCO, 2020a). In addition, over 60% of the students in the world were adversely affected by closures (UNESCO, 2020b). The closure of educational institutions forced internal and public assessments and related examinations to be rescheduled, postponed, or canceled, which has negatively affected

students' mental states and academic growth (Chandasiri, 2020). These students were restricted to long-term quarantine at home, which caused disturbances and deteriorations in study habits and performance, which eventually resulted in growing stress and dysfunctional learning behavior (Meo et al., 2020). One study revealed that at the undergraduate level, 57.5% of students were mentally stressed, 30.2% had anxiety, and 58.8% had depression. Bangladesh has over 5000 tertiary educational institutions, with a total of four million students (Ahmed, 2020b). Tertiary-level students have been heavily affected by the COVID-19 situation because they followed social-distancing requirements: no meetings with friends or relatives (Cao et al., 2020). They suffered from the financially difficult consequence of losing their part-time jobs; became emotionally sick from increasing frustration, anxiety, and boredom (Brooks et al., 2020); and waded through an academically uncertain situation as they grew worried over their future education and careers (Cao et al., 2020). UNISEF mentioned in its report that more than 40 million students in Bangladesh, from primary to higher education, were adversely affected by the ongoing COVID-19 situation, increasing the risk of child labor, child marriage, and violence among children and decreasing their likelihood of returning to school (Kalerkantho Report, 2021). The children of Bangladesh became detached from their academic activities as they had to stay at home because of lockdowns. They had fewer opportunities to interact with their peers and engage in physical activities with those peers (Jiao et al., 2020), which led to health hazards such as anxiety, sleeping disorders, stress, and depression (Ramchandani, 2020; Rawstrone, 2020, p. 104). One study revealed that 30.5% of Bangladeshi children experienced mild mental disturbances, 19.3% experienced moderate mental disturbances, and 7.2% experienced severe mental disturbances because of COVID-19 (Yeasmin et al., 2020). In fact, Bangladeshi children endured trauma, for which they need proper behavior and mental treatment as well as suitable opportunities for physical and academic activities in order for them to become thriving citizens.

Bangladesh has been enjoying a stable economy over recent years, with impressive GDP growth (GoB, 7th FYP, 2015). Over the Seventh Five Year Plan, FYP 2016–2020, the expected GDP growth was estimated at 7.40%, and in the first four years, the average GDP grew by 7.60%. In March 2020, COVID-19 infected Bangladesh, affecting human lives, human health, and economic growth, so GDP growth decreased to 7.13%. COVID-19 has swept the globe with impacts on output and trade because of the closure of international borders, the scarcity of raw material sources, and the cancellation of orders, which have put Bangladesh's economy at risk. Through trade and financial flows, Bangladesh's economy has heavily integrated into the global economy; thus, with the slowdown of the global economy due to COVID-19, Bangladesh will suffer worse effects on its exports, remittances, GDP growth, employment, etc. than those after the global financial crisis of 2008–09 (GoB, 8th FYP, 2020). The readymade garment (RMG) industry of Bangladesh is the sector where about four million low-income people work, 85% of whom are women, and a similar number of people indirectly depend on the RMG value chain (Dhaka Tribune, 2020a). RMG products alone cover 83% of the country's exports, but because of the global pandemic caused by COVID-19, work orders worth nearly

USD 3 billion have been canceled, which has affected about four million of the people directly involved in this industry (Paul, 2020). Many RMG workers lost their jobs and did not receive their previous month's earnings. A study by Boudreau and Naeem et al. found that Bangladesh's RMG sector reported order cancelations and renegotiations by buyers during the early stages of the global pandemic. Almost 17.4% of its revenue has declined from BGMEA-member factories in 2020 compared to 2019. Employment has declined by 7.4% in the second half of 2020 compared to pre-COVID-19 levels. Some factories have delayed or decreased their planned investments by increasing automation. On average, 3.6% of RMG factory workers experienced symptoms of or tested positive for COVID-19 between late 2020 and early 2021 (Boudreau & Naeem, 2021).

The COVID-19 intensified numerous socioeconomic crises, such as joblessness, the consumption of reserve funds/savings, and the shrinking of the country's remittance inflow. Remittance is one of the greatest resources of Bangladesh's economy. Thirteen million Bangladeshi migrant workers play significant roles in the country's economy through remitting about USD 15 billion each year. Because of COVID-19, Bangladeshi migrant workers and their 30 million dependents at home were adversely affected because most of the migrant Bangladeshi workers had to return from abroad, and thus, their source of income was reduced to a great extent. COVID-19 led to growing unemployment among Bangladeshi migrant workers; short work hours led to poor quality of life and limited their cash flow to their families. The pharmaceutical companies of the country, except a few at the top, also struggled to remain financially afloat because most drug exports and internal sales have reduced, aside from those of a few cold and fever drugs (Noyon, 2020). Because of the global restrictions and nationwide lockdowns, the airline industry has incurred considerable losses from cancelations for international and domestic flights. According to the International Air Transport Association (IATA), revenue loss in this sector may reach USD 252 million because of COVID-19 (Deb & Nafi, 2020). According to the Tour Operators Association of Bangladesh (TOAB), its members incurred losses of BDT 57 billion within the first six months of the global pandemic, while the Pacific Asia Travel Association (PATA) recorded losses of almost BDT 180 billion (Dhaka Tribune, 2020a). The Bangladesh Bank (2021) identified in its policy report several ramifications of COVID-19 on the economic sector:

- The waves of COVID-19 transmitted mostly to the real, fiscal, external, and financial sectors of the Bangladesh economy.
- The real sector includes the real economy, more specifically industry, the service sector, and the agriculture sector, which were disrupted during the second half of the 2020–21 fiscal year, so GDP declined by 2.91% from the preceding fiscal year.
- COVID-19 caused supply-chain disruptions. The manufacturing industry of the country sharply declined during the January–April 2020 period as the industry depends mostly on imported raw materials, particularly from China and India.
- Because of the COVID-19 situation, the government's revenue shrank by 1.74%, and the country's tax-to-GDP ratio declined to 7.9% in the 2020–21 fiscal year.

The agriculture sector of Bangladesh alone is the source of 40% of the country's employment, providing 14% of its GDP (GoB, 8th FYP, 2020). This sector was adversely affected, but the agriculture-dependent households remained unchanged at 10% between March and July 2020 (*Daily Prothom Alo*, 2020). During lockdown, the quarantine and regulations imposed to mitigate the spread of COVID-19 heavily affected the agricultural sector of Bangladesh because access to agricultural products, materials, markets, and advisory services was restricted; the prices of basic commodities increased at a noticeable rate because of hampered production and disruptions to supply chains; agricultural products were sold at high prices in urban areas, while marginalized farmers were deprived of earning fair prices in areas where their products grow; the transportation of animal feed was hampered, and the value chain of perishable items was disrupted, which in many cases led producers to shut down production; agricultural processing, trade, and impaired production activities were slowed down, which reduced consumer demand, particularly for hotel, restaurant, and coffee shop operations (Assaubayeva & Bi Yi, 2020). The country's crab, shrimp, and fish farmers also faced export restrictions, which caused major economic losses. Crabs farmed for the Chinese market comprise more than 70% of Bangladesh's exports, so the export ban in China was a big setback for the crab industry (Roy, 2020). Although Bangladesh did not face food shortages, nationwide lockdown measures undoubtedly affected the agricultural supply chain and the food consumption behavior of low-income Bangladeshis during the crisis period, which resulted in massive temporary unemployment in the country (GoB, 8th FYP, 2020).

COVID-19 has put millions of Bangladeshi workers out of jobs, and the average household income declined by 20%. A survey conducted by the Bangladesh Bureau of Statistics reported the following results:

- The average monthly income of each household was BDT 19,425 in March 2020, which decreased to BDT 15,492 in August 2020.
- The average expenditures of a family were BDT 15,403 in March 2020, which decreased to BDT 14,119 in August 2020—i.e., household expenditures decreased by 6.14% during this period.
- Some 68.39% of families went through financial crisis, and 21.33% of them had a monthly income of BDT 20,000 or less, which entitled them to receive government relief and assistance during April–July 2020.
- In March 2020, 8% of the country's workers were day laborers, which decreased to 4% in July 2020, but this percentage rose to 7.5% in September 2020.
- Also in March 2020, 17% of workers were businesspeople, which decreased to 10% in July 2020, but this percentage rose to 17% in September 2020.

The COVID-19 outbreak and its spread affected almost all the sectors in Bangladesh, including its social values. Huge demand for coronavirus certificates developed among Bangladeshi migrant workers for them to return to their host countries. In this situation, a few health centers emerged in the country to provide COVID-19 testing services, but some of them engaged in fraudulent business practices by issuing false test results/certificates for COVID-19. Even one of the

hospitals in the country sold huge numbers of certificates showing negative results for COVID-19 but without performing any tests. In another case, two doctors were found to have engaged in selling fake COVID-19 test results/certificates from their labs. This fraudulent activity aggravated the crisis, putting the victims in danger of not undergoing proper treatment. This fraudulence led other countries to impose entry restrictions on Bangladeshi citizens traveling for business, work, etc. A few ecommerce organizations started during the COVID-19 period and attracted people to their products by offering home delivery at cheap prices. But ultimately, most of them betrayed customers and took money in advance. However, all of them have been arrested and taken to jail while awaiting trial. But it caused a huge blow to the image of Bangladesh.

All these impacts of COVID-19 have turned Bangladesh into a biological disaster situation. Bangladesh is a disaster-prone but also disaster-resilient country. After taking proper governance measures to curb the spread of COVID-19 infections, it is now lifting restrictions on movement and withdrawing from lockdowns. Bangladesh has been successfully overcoming the shocks of COVID-19 as best it can within its limited scope and financial capacity but also thanks to the support and assistance of the international community.

Governance of COVID-19 in Bangladesh

The COVID-19 pandemic has posed a serious threat to the lives, livelihoods, economy, and development of Bangladesh. The Bangladesh community has been transformed by the global pandemic. Considering COVID-19 a biological disaster since its outbreak in the country, the GoB immediately took a disaster-management approach to save lives, livelihoods, and the economy. The government has increased its response and recovery plan, a program for strengthening health facilities; improved resource allocation for relief and stimulus packages; promoted its agriculture and manufacturing industries to ensure food security; taken steps to ensure positive and effective risk communication with citizens; and liaised with the international community for financial support, technical support, and information sharing to boost the economy and meet development targets. At the early stage of the pandemic, when COVID-19 first emerged, the GoB immediately evacuated its citizens from COVID-19-affected countries, imposed travel and entry restrictions and social-distancing measures, shut down all the educational institutions, and restricted the movements of mass vehicles while fighting against disinformation, setting up COVID-19 testing facilities, arranging treatment, building nationwide awareness of COVID-19 symptoms, tracing returnees from abroad to ensure that they quarantine at home, deploying its army to help the civil administration enforce lockdown and other COVID-19 related restrictions, providing relief goods to those in need, announcing stimulus packages for various sectors of economy, providing food to citizens at reduced prices, maintaining the stability of market prices for essential goods (Islam et al., 2020).

Imposing the lockdown sparked by COVID-19 threatened millions of people's livelihoods, including those of rickshaw pullers, day laborers, factory workers, maids, and others. Maintaining social distancing in a densely populated country like Bangladesh is an almost-impossible challenge because most people live in proximity to one another, sharing kitchens, bathrooms, and corridors (Ahmed et al., 2020). Meanwhile, the garment industry (RMG), which earned USD 29 billion in 2017 (BGMEA, 2020), was partially exempted from lockdown to maintain the livelihoods of a particular class of people and to export earnings. However, congested regions, especially in marginal communities, encountered challenges to the implementation of the WHO's social-distancing recommendations (Topader, 2020).

In March 2020, Bangladesh had only six physicians for every 10,000 people; a shortage of about 50,000 healthcare staff, including doctors; 1169 intensive care unit (ICU) beds, among which 432 were in public hospitals and 737 in private hospitals; and ninety-four laboratories to perform COVID-19 tests. As of 18 April 2020, the per-million COVID-19 test rate in Bangladesh was only 124, so many were left untested and thus unknowingly transmitted COVID-19 to others. Private hospitals in Bangladesh provide a larger share of healthcare services to patients; during the early stage of the pandemic, most the private hospitals were hesitant to treat COVID-19 patients owing to safety concerns for their non-COVID-19 patients and a lack of trained personnel to deal with COVID-19. Under these circumstances, the GoB took a strong stand on treating COVID-19 patients in private hospitals, and ultimately, well-known private hospitals came forward to treat COVID-19 patients, establishing a separate COVID-19 unit. From the beginning of the COVID-19 outbreak in the country, the GoB followed WHO directions and guidelines to limit COVID-19 transmission and provide treatment, recruited doctors and healthcare staff to fill vacancies, improved and strengthened the inadequate infrastructure of healthcare facilities, and announced stimulus packages on a priority basis to combat the challenge of COVID-19 by taking a disaster-management approach.

On 22 January 2020, the GoB required the Bangladesh airport authorities to screen travelers coming from China. On 1 February 2020, it evacuated and brought back 312 of its citizens from Wuhan, China, on a special flight that ensured that these citizens were attended to by physicians and nurses and ensured that the flights had the necessary medical equipment. All of these citizens were quarantined for fourteen days at Haji Camp, near Dhaka airport. On 22 January 2020, Dhaka Airport (Hazrat Shahjalal International Airport) was instructed to introduce thermal scanners to scan passengers coming from abroad, especially from China, for COVID-19 infection, and at the same time, the airport started tracing returnees from abroad who entered in the airport immediately before the introduction of thermal scanners. Furthermore, following the WHO prescription on 2 February 2020, the GoB suspended on-arrival visas for Chinese visitors, subsequently suspended all on-arrival visas and international flights, and directed the Chittagong Port Authority to examine all the sailors on ships coming from East Asian countries. On 17 March 2020, when eight Bangladeshis were confirmed as COVID-19 positive, all the educational institutions of the country were declared closed for the remainder of

the month. When the number of COVID-19 patients increased to thirty-three in Bangladesh on 23 March 2020, the government declared a ten-day nationwide public holiday, which was in essence a lockdown, from 26 March to 4 April 2020. During the “public holiday,” all public and private offices and organizations were forced to close, except public emergency services, pharmacies, and green markets, and people were also asked to stay at home and maintain social distancing. On 9 April 2020, the government imposed a complete lockdown in Cox’s Bazar, a district where the majority of the Myanmar Rohingya refugee camps were located. The Bangladeshi armed forces, in addition to regular law enforcement, were deployed to help the civil administration enforce social distancing and build awareness among the people. During lockdown, the government also operated a mobile court to maintain the stability of market prices for essential goods.

COVID-19 has had devastating biological impacts worldwide because there was no vaccine against this novel coronavirus, and a limited number of laboratory facilities and drugs were available to combat it. In this COVID-19 crisis situation, the GoB immediately responded with the appointment of an additional 2000 assistant surgeons (doctors) and 5054 nurses on an emergency basis. In 2021, Bangladesh expanded its laboratories to 800, its RT-PCR laboratories to 53, and its general beds and ICU beds to 12,347 and 1092, respectively, in public hospitals, all to provide COVID-19 tests and COVID-19 patient treatments (*Dhaka Tribune Report, 2021*). Meanwhile, COVID-19 laboratories have increased to 883 (*Daily Prothom Alo, 2023*). The GoB arranged for COVID-19 patient treatment in all public hospitals in the country—three of the hospitals in Dhaka earmarked for only COVID-19 treatment—and also established a new regular hospital and a field hospital at Dhaka exclusively for the treatment of COVID-19 patients.

To build nationwide awareness of COVID-19, the Directorate General of Health Services has issued daily bulletins through print, electronic, and social media featuring the latest updates on COVID-19 infections, deaths, recoveries, and other relevant information, including the specific facilities available for COVID-19 treatment and vaccination. The bulletin also covers the responsibility of citizens to avoid COVID-19 infections. In 2020, the international community was relieved to some extent by the good news that COVID-19 vaccines had been successfully invented by companies such as AstraZeneca, Moderna, Pfizer, and Sionphram, and the WHO approved those vaccines for use.

The Serum Institute of India came forward as one of the producers and merchandisers of the AstraZeneca vaccine. At the first opportunity, on 5 November 2020, the GoB and Beximco Pharma, a renowned pharmaceutical manufacturer in Bangladesh, reached an agreement with the Serum Institute of India to import thirty million doses of the AstraZeneca vaccine. Bangladesh paid in advance for fifteen million doses. On 25 January 2021, Bangladesh received five million doses of vaccine from the Serum Institute of India, as per its contract, and two million doses as gifts from the Indian government (*Dhaka Tribune, 2021*). Receiving in total seven million doses of vaccine from India, Bangladesh initiated a nationwide vaccination program on 7 February 2021, targeting 80% of the population for vaccination within six months (*Reuters, 2021*). As per its contract with the Serum

Institute of India, Bangladesh was supposed to receive five million doses of vaccine per month, but the company could supply only seven million doses before March 2021, and Bangladesh received another 3.2 million doses as a gift from the Indian government. Because of huge internal demand, India stopped exporting the AstraZeneca vaccine; therefore, Bangladesh had to suspend its first vaccination program, which was supposed to start on 26 April 2021, and look for alternative sources. Unfortunately, there was uncertainty about second doses for the 1.3 million people who had taken the AstraZeneca vaccine as their first dose. However, this uncertainty was mitigated after receiving AstraZeneca vaccine from Japan under the COVID-19 Vaccines Global Access (COVAX) initiative. Bangladesh also received the Moderna and Pfizer–BioNTech vaccines from the United States and the Sionpharm vaccine from China. As a part of its vaccine governance, the GoB launched an online registration portal prior to initiating its vaccination activities, inviting citizens aged fifty-five and above to use their national identity card (NID) number to register. Registration was gradually opened to citizens aged forty and above, then thirty-five and above, then thirty and above, and then finally eighteen and above. Later on, the government started vaccinating school-age children—i.e., those aged twelve to seventeen—and, under a special arrangement, people floating around the country who were outside of the NID network. The initial plan of the GoB was to vaccinate 80% of its citizens, but the target was revised to 70%, or about 120 million of the citizens of Bangladesh, in line with WHO directions. As of 15 February 2022, Bangladesh has administered 101.2 million doses as first doses, 72.9 million as second doses, and 2.8 million as third doses. As By 26 February 2022, the GoB complete its first-dose campaign by vaccinating ten million citizens over the age of twelve, including those who had no prior registration for vaccination or any NID or birth certificate, instead issuing them a special card for them to receive future doses (*Dhaka Tribune, 2022*).

The success of the vaccination campaign in Bangladesh entirely depended on import supply. On 23 September 2021, in a prerecorded speech for the White House Global COVID-19 Summit, Prime Minister of Bangladesh Sheikh Hasina called for effective global vaccination, for COVID-19 vaccines to be declared a global public good; to guarantee universal access, developing countries that have the capacity to locally produce vaccines must be allowed to do so. On 16 August 2021, the GoB signed a trilateral Memorandum of Understanding (MoU) for bottling, labeling, and dispensing Sinopharm's COVID-19 vaccine in Bangladesh. Under the MoU, local vaccine producer Incepta Vaccines Ltd was supposed to dispense five million doses of Sinopharm vaccine each month from its plant in Dhaka. Bangladesh agreed to purchase the necessary doses of vaccine from them, but Incepta Vaccines Ltd had not yet started production.

However, the COVID-19 situation in Bangladesh is now under control, having suffered few human casualties over a long period of time. A daily newspaper of the country reported the following: (a) The GoB has achieved remarkable success in its COVID-19 vaccination program; (b) 0.96% of those age five years and above have been vaccinated, starting from 7 June 2021; (c) 82% of people have received their booster dose—i.e., their third dose; (d) second booster doses—i.e., fourth doses—

started being administering in December 2022, and as of 20 December, more than 1.6 million Bangladeshis have received their second booster dose; finally, (e) the GoB has already spent BDT four billion to purchase, distribute, and administer COVID-19 vaccines (*Daily Prothom Alo*, 2023).

The GoB has so far allocated USD 15.4 billion to stimulus packages for various sectors of the country to restart economic activities and production and to minimize the suffering of citizens from the various effects of COVID-19 (Foyez, 2020; *Daily Star*, 2020a, b; Bangladesh Bank, 2021). From these packages, USD 166 million has been disbursed to 4.4 million beneficiaries, such as low-income people, elderly people, widows, people with disabilities, and informal sector workers.

The total package cost 3.6% of country's GDP, which had the following aims:

- Provide working capital to affected industries and service sector organizations.
- Supply working capital to the cottage, small, and medium-size industrial enterprises.
- Provide special funding for the export-oriented industries.
- Expand the facilities of the Export Development Fund (EDF), introduced by the Bangladesh Bank.
- Offer incentive packages for preshipment credit refinance schemes.
- Set up special honorariums for doctors, nurses, and other healthcare worker.
- Fund health and life insurance for medical service personnel.
- Set up an agriculture refinancing scheme and an agriculture subsidy.
- Institute a refinancing scheme for the low-income farmers and small business owners sell rice at BDT 10.00 per kg to low-income citizens distribute cash among specific communities.
- Fund incentive packages to expand the coverage of allowance programs.
- Build houses for unhoused people.
- Purchase the operation of 200,000 metric tons of Boro rice/paddy.
- Mechanize agriculture works.
- Freely distribute food materials.
- Offer financial assistance to Quami Madrasa students and teachers in two phases and to the imams and muazzin of mosques.
- Allocate funding to the Palli Sanchay Bank, the Probsahi Kalyan Bank, and the Palli Karma Sahayak Foundation to help youths and expatriates who lost their jobs because of the pandemic.
- Supply harvesters and reapers at subsidized prices.
- Provide loans for farmers at 4% interest, to offset the agricultural fallout of COVID-19 (Khatun et al., 2021).

Prime Minister Sheikh Hasina announced that all the government programs launched to help people adversely affected by the COVID-19 outbreak will continue until the crisis has ended.

The over 5000 tertiary educational institutions in Bangladesh together have four million students (Ahmed, 2020b). Aiming to diminish the disruptions to tertiary education, the GoB created a program to vaccinate all the students above age five on

a priority basis, but because of a shortage of vaccine, the program has taken time to complete. As a measure to keep students in touch with the learning process, the government announced online classes and assignment-based assessments. The University Grant Commission (UGC) provided loans to university students for them to buy laptops/smartphones for online classes. Because of a lack of resources, low-speed Internet, and mental illness, though, students could not avail themselves of the opportunity of online classes (Islam et al., 2020). Additionally, research has found that many students are uncomfortable with and distressed by online learning strategies (Al-Tammemi et al., 2020). Students faced challenges in switching to online lectures, adjusting to new online assessment methods and workloads, communicating with teachers, and dealing with many online education issues, such as the unavailability of electronic devices, weak or no Internet access, the high cost of Internet services, etc.

The government of Bangladesh (GoB) quickly responded with its limited resources and technical abilities to curb the spread of COVID-19 by instituting public health measures; funding programs to provide low-income and other vulnerable households with cash and food; and providing stimulus packages for small businesses to sustain employment in key sectors of the economy. The private sector of the country and the World Bank came forward to support the GoB in its strengthening its national arrangements for public health emergency services. During the lockdown, some nongovernment organizations (NGOs), businesspeople, politicians, and social workers in Bangladesh came forward to provide food and other aid to low-income people. In collaboration with the GoB, business hub Bashundhara Group built a 200-bed field hospital and provided masks and other PPE to doctors and other healthcare workers administering COVID-19 patient treatment. In addition to these businesses, both private financial and nonfinancial organizations also provided donations to the prime minister's special fund for COVID-19 management in Bangladesh.

The World Bank came forward (World Bank, 2020b), within 21 days of the first detection of a COVID-19 patient in Bangladesh, with a project titled "COVID-19 Emergency Response and Pandemic Preparedness Project," amounting to USD 100 million, to help Bangladesh in detecting, managing, and treating suspected and confirmed COVID-19 cases. This project has the following aims:

- Benefit Bangladeshi people with medical and testing facilities and a national health system.
- Equip designated laboratories with testing kits, reagents, and trained staff.
- Deliver medical support to meet increasing demands for the services required to handle and curb COVID-19.
- Mobilize services to ensure faster procurement when buying critical items for COVID-19 detection, prevention, and recovery.
- Support screening at designated health facilities and entry points in Bangladesh.

The World Bank also approved another few projects for Bangladesh, amounting to USD 1.745 billion, to help generate quality employment, provide services, and

start the country's economic recovery from the global pandemic, by building national resilience for the future. The projects have the following aims:

- Help Bangladesh to recover from the impacts of COVID-19 by attracting USD 2 billion in direct private investment and creating 1.5 million jobs.
- Support the GoB response to the COVID-19 crisis by facilitating recovery and building resilience in the economy as well as in workers and vulnerable populations.
- Establish an integrated cloud computing digital platform that will enable the government to operate virtually and deliver critical public services to citizens and businesses.
- Help the country recover from the economic impacts of COVID-19 by providing immediate social protection and livelihood supports to low-income people in rural areas by engaging them in labor-intensive civil works.

On 14 April 2021, the World Bank and the GoB signed three financial agreements, amounting to USD 1.04 million, to build the country's resilience to future crises, including vaccinations against COVID-19, and to accelerate the economic recovery of Bangladesh.

Virtual technology is considered one of the most effective governance tools to control the transmission of viruses in its community. The GoB has been pursuing virtual technology with its limited digital capacity since March 2020, when the first COVID-19 outbreak occurred in Bangladesh. Virtual technology has been extending critical roles in the fight against COVID-19. It is beneficial for exploring telemedicine; planning the treatment and mitigation of COVID-19 infections in the community, particularly in remote areas of the country, by building awareness among citizens; and helping to improve surveillance systems in crisis situations through live video streaming. Telemedicine, video streaming, virtual conferences, virtual courts, virtual classrooms, online educating, etc. have been used in Bangladesh to maintain social and physical distancing to control COVID-19 transmission across the country (Islam et al., 2020). Using virtual technology, the GoB and social media have been building awareness of the effects of COVID-19 among Bangladeshi citizens; of measures that need to be followed for controlling virus transmission; and of social responsibilities. The GoB produced some videos for its citizens on activities that they should do or avoid in order to stay safe from COVID-19. Almost all governments and NGOs have been carrying out their business with virtual technology, because of the increase in COVID-19 transmission. The judiciary of Bangladesh arranged virtual courts; the Ministry of Education used logistic support to encourage educational institutions to continue their academic activities; and the Heath Directorate, IEDCR, and the Ministry Health have been regularly meeting with the press through virtual means to deliver COVID-19 updates on research and development. Often by videoconferencing with local administrators and others, Prime Minister Sheikh Hasina has been closely observing the COVID-19 pandemic situation and the exceptional status of measures and initiatives taken by government to combat COVID-19. Bangladesh is increasing its digital capability, but some

financial constraints remain: It lacks technological infrastructure, and many migrants and marginalized people lack the skill to operate and the ability to purchase the devices that can access digital and virtual services.

Concluding Remarks

The COVID-19 situation in Bangladesh is rapidly evolving. Most nations in this situation opted for a total lockdown to prioritize saving lives at the expense of high costs. But a country like Bangladesh cannot afford such lockdown, because most of its huge population lives hand to mouth, with no savings and unsecure livelihoods. Thus, the GoB needs to consider lives and livelihoods equally when it takes measures such as complete lockdowns to curb the community transmission of disease. Lockdowns were undoubtedly one of the most effective measures to mitigate the transmission of COVID-19 but were not effective at mitigating the other effects of the COVID-19 crisis. Vaccination has so far been the best measure to save lives, and the GoB has given priority to vaccinating its citizens, including children, as per the guidelines of the WHO. Along with its vaccination program, the GoB instituted preventive measures against COVID-19, such as tracking cases and contacts; adding testing labs; providing sufficient testing kits; building awareness among citizens to promote, for example, good hand hygiene practices; and following strict quarantine measures. As the current number of healthcare staff members is proportionately inadequate for providing services to the about 170 million people in the country, students in the life science departments of universities were trained to carry out COVID-19 tests, immediately transforming their labs into COVID-19 testing labs. The GoB should guarantee access to proper hygiene facilities and its vaccination program for its marginalized population and a supply of PPE for its healthcare workers.

Ethnic communities, low-income families, people with disabilities, returning migrant workers, and informal and low-wage earners (such as Bangladeshis in women-headed households, sex workers, and tea plantation workers) have been at high risk of contracting COVID-19, so they need extensive humanitarian aid. The GoB should strengthen its aid program and ask the international community to help them.

About 7% of Bangladeshis are senior citizens (UN, 2020), who are especially vulnerable to COVID-19. These senior citizens more often require hospitalization and intensive care after contracting COVID-19. Thus, the GoB should arrange ICU beds and ventilation supports in at least every public hospital in the country. As a country of rivers, Bangladesh may consider arranging for mobile healthcare facilities for COVID-19 tests, using watercrafts for people in remote areas. Fear and anxiety about the pandemic have caused overwhelming stress for everyone (Xiao et al., 2020); mixed messages have ramped up stress levels, whereas facts have reduced stress levels. The GoB should task political leaders, social activists, print and electronic media, and religious leaders—particularly the imams of mosques—with disseminating factual scientific information on COVID-19 among the population of

Bangladesh. Disseminating basic COVID-19-related facts among marginalized people is the key to controlling the spread of the disease (Zhong et al., 2020).

Bangladesh needs a source of funding to restore the livelihoods that were adversely affected by COVID-19, to help its marginalized people, and to compensate it for hosting Rohingya refugees. The World Bank has come forward to support Bangladesh with projects aiming to mitigate the effects of COVID-19. Individuals and businesses in the country and government stimulus packages have supported citizens in combating the COVID-19 crisis, but these are not enough to meet the country's needs (*Dhaka Tribune*, 2020b; World Bank, 2020a). Therefore, immediate international help is required for Bangladesh to rebuild the livelihoods of its citizens and to build resilience. However, the GoB may prioritize saving money to continue combating the COVID-19 crisis, postponing less important development works and projects for the time being and working through diplomatic channels to find foreign sources of funding for its national interests.

The COVID-19 pandemic required nationwide initiatives and global cooperation because it has caused public health, economic, and social crises. Awareness needs to be raised among the public to protect themselves by abiding by health guidelines, maintaining good hygiene and social distancing, and avoiding crowded places and gatherings. On the GoB side, coordinated and effective planning and strategies are required for ongoing preparedness and a recovery program for the aftermath, to manage the COVID-19 crisis and adapt to a new normal. However, there is no alternative but to strengthen healthcare facilities and preparedness for future humanitarian efforts, in order to reach vulnerable communities. Considering the GoB should incorporate into the mid-term Five Year Plan and the long-term perspective plan the economic implications of COVID-19 on the basis of the vulnerabilities in the country that this crisis exposed. Without strong national strategic planning and multisectoral collaboration, including supports from the private sector of the country and the international community, sustainable recovery from a global pandemic such as COVID-19 may not be possible. The Bangladesh Bank (2021) recommended introducing a COVID-19 Pro-Poor Bond (PPB) as a policy option, to offer jobs to informal sector workers so that they can participate in public works projects.

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Unsung Climate Heroes: Women Protecting Land, Environment, and Livelihood in Odisha

144

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Contents

Introduction	2158
Methodology	2159
The Paradox of Climate Change and Economic Development	2160
The Need for Women's Leadership Initiatives for Disaster Management	2160
Women's Resistance and a Quiet Politics of the Possible	2163
Case 1: Women as the Friends of the Forest: The Communities of Nayagarh, Odisha	2164
Case 2: Rural Women Protesting Against the Establishment of Pohang Steel Company (POSCO)	2166
Case 3: Dongria Kondhs Protecting Niyamgiri as Their Identity and Spirituality	2168
Implications	2170
Conclusion	2171
References	2171

Abstract

This chapter explores unsung climate heroes in correcting human-made climate change and disaster management in India. This research is based on longitudinal ethnographic fieldwork among the Kondhs in Niyamgiri, women in the village Dhinkia, and climate leaders in Nayagarh, Odisha, during 2016–2022. It presents three case studies of rural and indigenous women in Odisha leading the struggle to preserve endangered forests, mountains, rivers, and other vital natural resources. First, the Thengapalli (use sticks to protect the village and the forest) women of Nayagarh are working toward global climate action and environmental awareness. Second, the women of Dhinkia village, in leadership roles, are protesting the government of Odisha's persistent efforts to build a mega steel plant and protect their native land and livelihood. Third, indigenous women of

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Niyamgiri mountain are protesting against mining to preserve their land and spirituality. Their network building through social media has resulted in a global alliance of indigenous peoples to protect the Niyamgiri mountain as a solution to the worldwide climate.

This work draws on several life experiences of grassroots organizers and activists intimately connected with their land and how their lives and livelihood have been crippled by development projects contributing to global warming. These women in rural and tribal regions teach us to create new insights for a stable and sustainable future. Their life experiences introduce us to a new vision of life and livelihood to cope with these disasters.

The stories of unsung heroes suggest women cannot be treated as marginal to the projects of development propagated by the state and corporations. The compelling evidence from India and other parts of the world shows that women have organized themselves in various movements to protect their land, livelihood, forest, and other national resources. It is incumbent upon the policy-makers at the United Nations and the respective states of various levels of local, state, federal, and supranational organizations to incorporate women's experiences and perspectives in making policies on development which has an everlasting impact on their lives and livelihood.

Keywords

Unsung climate heroes · Extraction economy · Human-made climate change · Indigenous women's protest movements in Odisha

Introduction

Climate change has gravely affected people's lifestyles and devastated countries worldwide. India's bulging population and dependence on coal, gas, oil, and wood as energy sources contribute to the climate crisis. It has resulted in extreme weather – drought, floods, heatwaves, and constant drought – placing India fourth on the list of the ten most-affected countries globally on the Global Climate Risk Index (Kreft et al., 2015, p. 7). The Indian National Action Plan on Climate Change (NAPCC) notes that the effects of climate change could prove severe for women (MoEF, 2008). Khan's (2021) documentary, Overheated, observes "Indigenous people are the most acutely affected by the climate crisis – yet they are the most powerful actors in the fight against it."

With 1.4 billion people, India has one of the world's fastest-growing economies, and rural residents are migrating to cities to find work. Development projects have displaced over 21 million indigenous people, resulting in marginalization, a lack of livelihoods, and the depletion of sustainable resources. Forests, mountains, and water resources have been destroyed in the construction of national parks and reserves, roads, dams, and mining. This profit-based development model needs to be addressed in economic rationalization in the narrow paradigm of cost-benefit analysis. Because of mining, indigenous people from the mineral-rich hills have been forced to migrate to the cities in search of work. Women suffer more in these

regions than men because they provide the primary household resources (food, firewood, fodder, and water) and rear their children (Panda & Pandey, 2022). With climate change, families are getting uprooted both in the global south and north.

Women are viewed as victims of climate impacts rather than capable change agents within their communities. This problematic assumption that many policy-makers work with is reflected in state and national policies. In reality, women have proved to be the most potent change agents through effective cross-community participation and collaboration. Mary Robinson (2018) observes that “climate change, human rights, justice, equality, and individual empowerment are all inextricably linked.” Women worldwide have used their traditional and modern knowledge systems to develop alternative sources of livelihood to rebuild themselves, their culture, and the environment. By examining cross-cultural experiences, we can better understand the vital role women at the grassroots have played in dealing with disasters and climate change, coping with their wrath, and developing innovative ways of adapting to the aftermath (Arora-Jonsson, 2013; Jenkins, 2017; Hoffmann et al., 2022; Pandey & Kingsolver, 2022).

This chapter focuses on the prominence of indigenous women in introducing community solutions to global climate problems. It presents three case studies of rural and indigenous women in Odisha, leading the struggle to preserve endangered forests, mountains, rivers, and other vital natural resources: the research took place between August 2016 and September 2022. The research was primarily ethnographic, using primary and secondary sources of information. Using interviews, focus group discussions, and open-ended questionnaires, this study is based on the life experiences of climate leaders in three different regions in Odisha. (a) Women of Dhinkia village, the state’s coastal region, are protesting against the government of Odisha’s persistent efforts to build a mega steel plant and protect their native land and livelihood. (b) Indigenous women of Niyamgiri, the state’s southwestern region, are protesting against mining to preserve their land and spirituality. Their network building through social media has resulted in a global alliance of indigenous peoples to protect the Niyamgiri mountain as a solution to the worldwide climate. (c) The Thengapalli women of Nayagarh in the state’s eastern region are working toward environmental awareness and global climate action.

Methodology

1. One hundred and fifty open-ended interviews with women from the identified women’s groups, researchers working in this area, and concerned government and civil society personnel.
2. Twenty oral histories/narratives of women climate leaders who told their experiences of climate change, state imposition of mining, and corporate hold over their land.
3. Participant observation at tribal festivals, markets, schools, and villages, in different state locations.
4. Twelve women’s focus groups in rural and tribal regions were engaged in interviews. Women’s involvement and leadership in particular climate issues, and their perspectives, were investigated.

5. Secondary data collection based on existing literature review, e.g., books, articles, newsletters, and state and national policy documents about climate, gender, and environment.

This chapter draws on several life experiences of grassroots organizers and activists intimately connected with their land and how their lives and livelihood have been crippled by development projects contributing to global warming. These women in rural and tribal regions teach us to create new insights for a stable and sustainable future. Their life experiences introduce us to a new vision of life and livelihood to cope with these disasters.

Before presenting the case studies, the author will discuss her insights from a review of relevant literature on women's leadership in disaster management in different parts of the world.

The Paradox of Climate Change and Economic Development

The Sixth Assessment Report of the Intergovernmental Panel on Climate Change was released in August 2021 and concluded that climate change is now "widespread, rapid, and intensifying." Policy-makers and researchers have a broad consensus that human activities and their intervention cause the deterioration in global climate (mainly fossil fuels) (Eriksen, 2016; Hoffman et al., 2022). In contrast, the same policy-makers who complain about environmental problems also advocate continued economic growth, undermining an essential principle of ecological sustainability. Eriksen (2016) calls the sweeping neoliberal phenomena taken up by the states in collaboration with multinational corporations "a culture without a people." Its supporters share no customs, language, homeland, or religion but an exploitation motive.

"The whole climate crisis, one could argue," Kohn says, "is the product of people increasingly treating nature as a thing rather than a set of relationships" (Warren, 2021). According to Apffel-Marglin (2012), modern western males perceive themselves as autonomous, who alone determine their worlds (p. 27). They have interpreted nature as the agency of lesser others at the mercy of the masculine culture. The physical aspect of the climate crisis is connected to thoughtless economic development paying no attention to indigenous knowledge who respect nature, unlike the western capitalist civilization. A capitalist logic has prevailed in an extensive extraction economy without considering the well-being of nature and the people.

The Need for Women's Leadership Initiatives for Disaster Management

Women are becoming more visible in taking up climate leadership and engaging in environmental action everywhere. Studies show that women's participation and leadership in natural resource management make it more effective, leading to better

governance and conservation (Leisher et al., 2016). Studies have established that gender quotas make forest conservation and climate interventions more effective and lead to more significant equity in benefit sharing (Cook et al., 2019). According to a study across 91 countries, women's representation in national parliaments can lead governments to adopt more serious and effective climate change policies (Mavisakalyan & Tarverdi, 2019). However, women's voices, agency, and participation need to be more supported, which are under-resourced, undervalued, and unrecognized. In defending the land, environment, and indigenous peoples' rights, women's groups often face multiple barriers. Their voices are often silenced. They face diminishing funding for their projects and threats to their physical security. "Climate action must include investing in women activists, human rights defenders, and civil society organizations," UN Secretary-General Antonio Guterres said in a virtual town hall during the 66th session of the Commission on the Status of Women (CSW 66) March 14–25, 2022.

David Pogue (2021) reported that, in 2018, 3 years of drought dried up the water sources in Cape Town, South Africa. It rains in the winter. The water comes from the mountains and is stored in the six reservoirs in the city. With the drought, the reservoirs were empty, and 4.7 million people in the city faced day zero without water. To solve the problem, city planners and political leaders outlined expensive and environmentally disruptive projects like pipelines and desalination plants. Thandeka Mayiji-Rafu and her colleagues at Nature Conservancy, a local environmental nonprofit organization, devised an alternative approach. It will permanently provide 13 billion gallons of water by clearing 250 square miles of the invasive pine trees that had covered the nine and a half thousand different species of fynbos (fine bush) which make up the eco-reserve of the steep mountains around Cape Town. In the 1800s and early 1900s, the European colonizers brought invasive pine trees, each consuming 400 gallons of water daily. They had covered up the entire ecosystem in the mountains.

Hence the ecosystem was drying out. This project was the only permanent solution to provide water for at least 2 months to the city's population. The project hired women who had lost their agricultural jobs because of drought. Thandeka Mayiji-Rafu said, "the people that can stand on anything are women. Most of them are single parents that are the heads of the houses" (Pogue, 2021). By 2020, the teams cleared 90% of the area they had targeted. These women could earn a living for themselves and their families. Several women emerged as leaders, and this program has made a difference in their lives. This project has worked with nature and supported women to earn their livelihood.

Duolingo, 2022, reports that indigenous women combine ancestral knowledge and scientific and technological training in the Andean mountains of Peru to combat human-made climate change. Two Quechua indigenous sisters, Marcela Machaca and Magdalena, are native to the Andes mountains of Ayacucho, Perú – some 4000 m above sea level. In the rainy season, their community depended on over-flowing rivers. When the rain dried up, it turned on the melting snow on the glaciers. Since the 1970s, climate change has led to El Niño – melting glaciers – making them extinct in the Ayacucho region.

In 1992, Marcela and Magdalena returned to their village after completing their agricultural engineering degree. They were alarmed to see the worst drought they could ever remember. They listened to their elders and combined the ancient indigenous methods and local natural resources to build lagoons to capture rainwater on the mountain. The lagoons provide water for 200,000 people in the community. They are now more prepared for climate change.

Where forests in their successional variety of crops, flora, and fauna disappear, the retention of moisture, water supply chain, and sustainable economy that contributes to local livelihoods also disappear. Women in the villages of Sundarbans, known for thousands of square miles of wetland and vast mangrove forests sprawling between India and Bangladesh, have devised a new strategy to plant hundreds of thousands of additional mangrove trees to protect the battered environment (Raj, 2022).

In 2009 Cyclone Aila devastated the Sundarbans region, and 4.5 million marginalized farmers and fishermen lost their livelihoods to the excessive salination of seawater and their houses submerged in the rising sea.

In this region, men have migrated to the cities for work, and women often lead the climate change fight. Drawing on their indigenous knowledge of the Sundarbans, the women make hand-drawn maps of areas to plant mangroves. They grow saplings from seeds and transport them in boats to replant in mudflats. They keep track of their growth on a mobile app. The income from growing and planting mangrove saplings helps these women sell fish, vegetables, honey, eggs, and other local goods. “The women are like silent climate warriors,” said Shantanu Singha Thakur, an official with the district government (Raj, 2022).

Social movements from the global south compiled testimonies, images, and evidence to show how tree plantations represented “desertification, exploitation, colonization, and starvation,” while forests represented “regeneration, preservation, self-determination, and nutrition.” In Chile, an indigenous Mapuche described forest expansion by the state and private companies: “our parents and grandparents have been tortured and humiliated, we live and have lived in such precarious conditions... it is not easy to forget that” (González-Hidalgo & Zografo, 2017, p. 70). In the global north, indigenous communities experience such expansion as a “colonization of the attachment” they have to their ancestral lands (Groves, 2015). The landscape of forests is changing as they are taken over for extraction and protection, affecting indigenous communities’ identity and a sustainable future for their environments (Arora-Jonsson, 2019).

There have been instances of direct violence and more subtle strategies, practices, and governance technologies (Peluso & Lund, 2011) to control land necessary for forest extraction. In many regions, public-private investments in communal land use co-optation. For example, in pulp and timber plantations in Chile, violence and control were exercised by forest companies through “good neighbor” and “environmental education” programs that sought to foster good relationships between private and public forestry institutions and local communities by offering services such as medical care, hairdressing, and football tournaments. Arora-Jonsson et al. (2021) observe a subtle form of violence as propaganda and financial inducements to male

leaders of communities to encourage the sale of their community's lands that led to internal conflicts that reduced communities' ability and commitment to work together to protect their resources. One settler in Southern Chile remarked, "Paving our roads, building football pitches... the forestry enterprises are giving us pain-killers" (González-Hidalgo & Zografo, 2017, p. 70).

Similarly, in southeastern Cameroon, loggers began offering remuneration for cutting down moabi trees, leading to conflicts within households with men wanting to sell the lineage moabi and women actively opposing such sales because of the food, income, and medicines they got from the forests. They derived no benefits from the sales (Veuthey & Gerber, 2010). In East Kalimantan, the plantation company brought back men who had left their original communities to lead new communities to help them reclaim the abandoned lands in anticipation that they would work to ensure more company access to community lands (Colfer, 2008). The land was assumed to belong to men, not women, and compensation was given to men. This strategy, too, exacerbated internal community tensions creating new conflicts among men and between men and women.

Women's Resistance and a Quiet Politics of the Possible

Studies have highlighted women's roles in grassroots movements to protect forests (Shiva, 1989; Guha, 2002; Veuthey & Gerber, 2010). Women have been at the forefront of grassroots environmental actions to secure livelihoods (Rocheleau & Edmunds, 1997). Rural and tribal women have smashed local taverns that have threatened their family's well-being. There are widespread women's movements in India against making *arrack*, the local liquor, which significantly impacted community livelihoods (Tharu & Niranjana, 2001). There are few studies on women's protests and the lack of support for continued commercial logging to safeguard their family livelihoods (Reed, 2000). Jenkins' (2017) research in Peru and Ecuador and Pandey's research among the Dongria Kondhs (2018) contend that women's anti-mining resistance in Peru, Ecuador, and India depended on daily resistance and was rooted in women's daily lives and experiences. Their activism also implied integrating very unusual circumstances into their everyday realities, including death threats, kidnapping, torture, and imprisonment, mainly from the police, the forest department of the state, and corporations.

Based on long-term research with women's groups that organized themselves in villages in India and Sweden, Arora-Jonsson (2013, pp. 23–24) says that women's work was integral to making local village and forest governance work. However, such work does not have the recognized legitimacy accorded to the visible, male-dominated organizations and tends to remain outside the view of forest researchers and forest/development actors.

Organizing collectively in women's groups is recognized as a political act, although their focus was often on livelihood issues for the entire village. It was a "quiet politics" of belonging and caring about the local community connected to

other scales (Askins, 2014) and “politics of the possible” (Arora-Jonsson, 2013, pp. 107–150) as they navigated systems that constrained them to bring about change.

Based on the author’s ethnographic research in Odisha, the case studies of rural and indigenous women as change agents in climate justice provide alternatives and solutions that the western-centric world can learn from exploring sustainable solutions to climate change.

Case 1: Women as the Friends of the Forest: The Communities of Nayagarh, Odisha

Women in Nayagarh, Odisha, have played a vital role in protecting the trees in the lush forests and hills surrounded by the deep waters of the river Mahanadi and its tributaries. The forests of Nayagarh play an essential part in sustainable livelihood. The abundant sal trees are the common species found here, and men and women from the villages depend on the forests for fuel, fodder, timber, and medicinal plants. Women are the unsung climate heroes who do not get recognized.

With the paper mill and other associated factories, contractors active in profit making have employed local villagers to log the forests for paper, pulp, and wood. Even though they had the license to collect only bamboo for the local paper mill, illegal logging in the forests has been rampant. People from neighboring villages joined the loot, and the stonecutters were caught quarrying the forest.

The women’s movement in this region started first with the Gandhian nonprofit organization Brukshya O Jeevar Bandhu Parishad (BOJBP), translated as The Friends of Trees and Living Beings, in the village of Kesharpur in 1984. Many women joined this organization, schoolchildren were engaged in the campaigns, and their teachers organized planting activities. These leaders introduced social and environmental change irrespective of caste, class, and gender.

The women of the villages have been guarding their forests voluntarily with *thengas* against timber smugglers and are known as Thengapalli (*thenga* means pole and *palli* means turn). Women in groups take turns protecting the forest. They work with the village council, Tehsildar (revenue inspector), and even the district forest officer (DFO) to discuss illegal quarrying. Most times, they win against the wood smugglers. They have taken up forest protection by organizing themselves through Mahila Samitis (women’s organization). In 300 villages around Nayagarh, women became guards of the forests. They kept a watch on the smuggling of timber and forest produce and rejuvenated the forest land with native plantations. The forestry department in this area asserts these communities’ identities as forest caretakers.

By the late 1990s, the state of the forests in Nayagarh had changed dramatically with the BOJBP protection. Women became directly involved under *Paribesa Mahila Surakshya Vahini* (PMSV), the women’s Brigades for Environmental Protection. Manas Mishra, an environmental activist who studied the Nayagarh-Khurda belt’s forest-dwelling communities, says, “We can spot the Giant Indian Squirrel in the Nayagarh belt, which was not the case a decade ago. Even the soil moisture retention has improved” (Qureshy, 2021).

In the last decades, many other regions have taken up the Thengapalli practice. For example, women in the neighboring Mayurbhanj district have prevented logging and smuggling of wood with vigilance.

The local smugglers were afraid of these women's shame and exposure tactics, so they would not confront them, as reported by Mayurbhanj-based Sanjukta Basa, who runs NGO Sangram (*Ibid.*, March 27, 2021).

These women help the forest department provide surveillance of the forests within the Similipal Tiger Reserve in Mayurbhanj. The author has seen women in rural and tribal areas walk miles to the forest to collect food, firewood, and other sustainable resources. They have a dire stake in preserving forest resources compared to men. It falls on them to collect fodder for their animals and wood for fuel. "If the forest cover is depleted, the women must walk an extra mile to collect fuel for their daily needs" (*Orissa Post*, 2021). This awareness encouraged scores of women like Sudamani Mahakud to take up Thengapalli at Punasia village, Mayurbhanj.

Mahamud, at 65, has been guarding the forest in Punasia village for over two decades. "If I need fuel to cook food, I can take leaves and twigs from the forest, giving me greens and tubers. Some trees also have medicinal value. They are a source of food for the cattle as well. What more reasons do I need to protect the forest? I exist because the forest does" (reported in *Orissa Post*, 2021). Besides taking care of their forest, these women's *samitis* are engaged in many village development activities, like building roads by acquiring private land from high-caste landowners and collaborating with other NGOs to protect their livelihood and environment.

Nagraj Adve says that underprivileged women are the single largest social group affected by the climate crisis in South Asia. The climate justice movement must consider women's community-led efforts to better understand its impact on society and adopt a sharper gendered perspective on development (Rights and Resources Initiative, 2019). Women's collectives need to be supported to develop community building.

Women at the grassroots face many challenges in fighting for the cause of the land and the environment. In a 2018 study, UN Special Rapporteur Victoria Tauli-Corpuz explains the effectiveness of community-led conservation of nature: "many (indigenous people and local communities) share an ethical interconnection with nature through their languages, beliefs, and practices, reflecting a commitment to respecting and caring for the natural world" (2018). The worldview of the indigenous people entails their integral connection with nature rather than separate from it.

However, women have faced personal attacks by joining the forest service deemed as a male-dominated profession. Over 40-year-old Sabita Naik, a longtime Thengapalli volunteer appointed as a forest guard, Mayurbhanj, says, "since I would visit the police station often, they labeled me an 'undignified girl.' It became difficult for my parents to find me a groom. However, it did not matter to me. I had grown up listening to the stories about forests, and I did not want to lose them."

Thengapalli women in different parts of Odisha have revolutionized forest conservation since the 1980s. The Forest Rights Act (FRA) was enacted in 2006, which gives these indigenous communities the right to use and manage traditionally held forest lands. In 2009, the Odisha government promised that the forest titleholders would get a house under the Indira Awas Yojana (now Pradhan Mantri Awas

Yojana). While the forest department acknowledges these women's community service, they have yet to receive other benefits. "According to the data collected by Vasundhara, close to 32570 villages in Odisha have the potential to get Community Forest Rights (CFR), but only 2,800 applications have been approved and 2,300 titles given" (IANs, 2021).

The government blames the delay on insufficient documents, but the activists find the bureaucracy slow and insensitive. "We are talking about the rights of people who have been associated with forests for generations. They may not always have the documents. Many of them are unaware of the legalities involved and need guidance," says Bhagyalaxmi, a social activist in the region. She says many of these women environmental activists are unaware of the legalities involved.

These women understand the forest and are committed and motivated to protect it. FRA benefits will help these women and their families pursue forest conservation. Mahakud, a community activist, says, "Forest might be an entity for others, but it is our means of survival. We cannot think of a life without it." Sadly, these women are yet to be recognized by the FRA.

A 2018 Rights and Resources Initiative analysis emphasizes that major conservation investors are indigenous people and local communities. Research shows that indigenous people and local communities conserve their forests and use their communal rights to land and forests to promote biodiversity and lower carbon emissions. There is a positive link between lower carbon emissions and community-owned forests based on local rule making using forests as a surrogate for biodiversity (Chhatre & Agrawal, 2009). In the Brazilian Amazon, protected areas and indigenous territories are equally effective in protecting forests (RAISG, 2017). Research indicates that indigenous peoples and local communities are influential conservationists, with more substantial rights to land and forests positively associated with biodiversity outcomes (Pretty et al., 2009). Studies analyzing regions conserved by indigenous peoples and local communities show the effectiveness of indigenous peoples and local communities, particularly when conditions are conducive to conservation (Nolte et al., 2013). There is evidence in Asia and Latin America that indigenous people's multiple-use protected farming has a lower risk of wildfires than strictly protected areas (Nelson & Chomitz, 2011).

A 2018 report by the Rights and Resources Initiative (RRI) observes that "globally, Indigenous Peoples and local communities are investing an estimated 16–23 percent (i.e., US\$3.16–4.57 billion) of the amount spent by governments, donors, foundations, and non-governmental organizations, combined, on conservation. Much of the value invested by Indigenous Peoples and local communities are in developing countries, whereas the lion's share of public spending is in developed countries" (RRI Report, 2019).

Case 2: Rural Women Protesting Against the Establishment of Pohang Steel Company (POSCO)

In 2005, the government of Odisha signed a memorandum of understanding (MOU) with a South Korean Pohang Steel Company (POSCO) for setting up an integrated steel plant near Paradip port on the Bay of Bengal. Eight villages in three panchayats

of Jagatsinghpur district – Dhinkia, Gadakujanga, and Nuagaon will lose their land to the steel plant. Twenty-two thousand people will lose their livelihood to this 12 billion USD project and be displaced. The company will gain 2700 acres of land to produce 8 million tons of steel per annum (Mining Zone People's Solidarity Group, 2010). A local opposition group, POSCO Pratirodh Sangram Samiti (PPSS), emerged in 2006 against POSCO. Even though the state had gained 2700 hectares of land for the project, the protest from the villagers against POSCO was severe. POSCO realized it was impossible to carry on the project, and in July 2015, POSCO moved out of Odisha.

Local women played a decisive role in the victory of PPSS, the people's movement. This area's fertile land and the conducive climate help people grow paddy, vegetables, and fruits and collect fish from the rivers and streams. The land in and around Dhinkia is fertile and known for the abundant production of *Paana*, *Mina*, and *Dhana* (betel, fish, and rice paddy), and people did not want to give up their lands to build steel plants. Women joined hands with men in the movement against POSCO and the state invasion of their land. Both women and children worked on *Pana Barajas* (betel vines), collecting fish, and growing *paddy*, earning a decent living for their families. The Indian Oil Corporation Limited (IOCL) refinery has threatened the betel vines. Villagers were experiencing the polluting smoke from IOCL nearby, destroying their betel vines.

Women in Dhinkia, led by Manorama Khatua, took up the cause against the state's decision to gain land for POSCO. They joined in increasing numbers, reaching almost 5000 from all three panchayats.

In August 2014, Khatua told the author, "we will not give up '*pana baraja*' for our livelihood. Under the government-provided Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGS), older adults cannot work under the sun. Still, they can work in the beetle vines in the shade." Khatua said, "Our biggest struggle besides protecting our lands was not to allow the construction of Paradip road to pass through our village (Gobindpur). The road was critical for POSCO to progress its export activities." The road would have transported the iron ore from mining areas to the Paradip port and exported it to South Korea to process refined steel.

Women created a picket line outside their homes against POSCO. Their slogan was "POSCO hatao, Vitamati Bachao" (Remove POSCO and save our native land); "*Ame Pana, Mina, and Dhana Chadibunahi*" (We will not sacrifice our Betel Vines, Fish, and Paddy). Khatua emerged as the young leader of the movement uniting village women from different castes and tribes, vehemently opposing the state and POSCO to give up their profit-making initiative at the cost of the people.

"Children also came forward and asked the police to kill them before taking their land, as their mothers were always protesting," said Gauri from Dhinkia village. Children joined their mothers and built a human chain to stop any official from coming to their area. A respondent from the village said, "Men have supported, but women have been most active in the movement" (Panda & Pandey, 2022).

Khatua emerged as a forceful leader who had taken a vow not to allow POSCO to take over their land and livelihood at a young age. She took several rubber bullets fired by the police, still lodged in her chest. The state and police filed false criminal cases against her to intimidate her, but she remained resolute.

For 3 years (2006–2010), the movement was active with full support from women. The government declared section 144 to confine the people to their homes and cut off any food supply to these villages. Khatua says the women broke section 144 and stepped out in large numbers. (Section 144 of the Criminal Procedure Code of 1973 empowers the magistrate to prohibit an assembly of more than ten persons in an area. It will be considered an offense and liable for punishment.) The press cited “*Mahila Durga rupa Dharana kale*” (Women became the goddess Durga, who fights against evil to restore justice in the land). They defied the police and the pro-POSCO mafia and took to the streets in massive numbers. It was like a “do or die” situation for them. Until 2015, the government used many tactics to defeat the people. Pro-POSCO mafia (hired goons of POSCO contractors) threw hand bombs at the women when they were sleeping near the barricade. “This is the greatest betrayal of the state against its people to use the power of the criminal system to implicate villagers in many fabricated cases to intimidate them, instill fear in them, and, finally, break their collective strength against POSCO” (Alternative Law Forum, 2013, p. 21).

People’s protest against the company and the relentless struggle by the women have not allowed POSCO to make any headway in this region. According to Khatua, “POSCO has rolled back because of the women and their tenacity to fight the corporate forces.” People’s movement in opposition to the company and the women’s leadership left no room for POSCO to build its project.

Lately, the state government has invited JSW Utkal Steel Ltd to set up a mega steel plant. The project still needs to receive environmental clearance and is waiting to be cleared by the Union Ministry of Environment, Forest, and Climate Change. Utkal Steel has acquired 2700 acres of land from the state originally allocated to POSCO.

The POSCO *Pratirodh Sangram Samiti* (Anti-POSCO Campaign) is active in the name of the Jindal *Pratirodh Bheetamati Suraksha Samiti* (Anti-Jindal native land protection campaign) and has organized to defend the villages against the state police as in the past. Residents of the region complain that the steel projects will ruin the land and the livelihoods of over 40,000 villagers and will affect three villages of Dhinkia, Nuagaon, and Gadakujanga in the district. People are afraid of getting arrested, targeted as activists, leaving the villages, and living in fear. Padhi (2019) reports that Jindal Pratirodh Bheetamati Suraksha Samiti spokesperson Prasant Paikray said, “Amid the crackdown, over 100 people have been injured, including women and children.” Manorama Khatua noted, “There is a threat to our community and livelihood; we fear entering the village. We are currently trying to organize ourselves and fight for those who have been jailed.” The struggle continues. The state and corporate sector nexus are determined to take the land from the villagers in the name of development, a great danger to the community.

Case 3: Dongria Kondhs Protecting Niyamgiri as Their Identity and Spirituality

Niyamgiri hills, in southwestern Odisha, are home to the Dongria Kondhs, Kuttia Kondhs, and a dozen other Adivasis. Niyamgiri hills, a cluster of 1008 small and big mountain ranges and the source of Vamsadhara and Nagavali rivers, spread over

Kalahandi, Raygada, and Koraput districts in Odisha, is part of the Karlapat and Kotagarh biodiverse landscape.

The Dongria Kondhs and Kuttia Kondhs depend on Niyamgiri for their habitat, food, water, and livelihood. Sumati Jakakika, a Dongria woman, observed that “we go to Niyamgiri every day. Besides growing subsistence crops like ragi, turmeric, and paddy, we collect greens, dry wood, ants’ eggs, and all kinds of roots, vegetables, and fruits for our family and to sell in the market in exchange for clothes and medicine” (personal conversation, April 28, 2016).

Dongria and Kuttia Kondhs practice agriculture (shifting cultivation/swidden type) (In this agriculture, a patch of forest is cleared, and the undergrowth is burned. This patch is then cultivated for a few years (the Dongria Kondh refers to the patch as podu), after which another patch is cleared. The previous patch is left fallow for several years. Thus, patches are removed and used in a continuous cycle, ensuring forest regeneration in the unused patches and the availability of enough forest produce. This kind of agriculture allows the Dongria Kondh to grow a variety of millets, grains, and pulses in the fields, providing them sustenance throughout the year (Singh et al., 2018).), cultivating patches of land cleared from the hill forest in rotation, rearing livestock for meat and ritual sacrifices, and collecting various minor forest produce for sustenance and medicinal purposes (Saxena et al., 2010).

The Kondhs worship Niyamgiri as Niyam Raja, King of the Law, their source of living, identity, and heritage. The deep reverence that the Dongrias and Kuttias have for their hills and streams permeates every aspect of their lives: art, music, dance, and textile making, among others. The name Dongria is tied to *dongar*, meaning “hill,” and the word “for themselves is Jharania: protector of streams” (For details, please refer to Survival (2017)).

For the Dongria people, “the mountain is divine”; Purnima, a Dongria girl, tells New Yorker, “For many generations, we have worshipped these hills, streams, and trees” (Karnad, 2018). Many studies show the spiritual connection of women to the forest. Arora-Jonsson says that the “Swedish women’s groups also often invoked the spiritual concerning the forests” (2013, pp. 119–120). Women’s discussions of how the woods were a salve for their souls (Bergelin et al., 2009) provided transgressive spaces in an otherwise rationalized forum of employment opportunities or the environmental benefits of standing forests and the close links of scientific forestry to male foresters. Pandey and Kingsolver (2022) observe that nature as sacred and alive are treated as “partners in a successful movement by Dongria Kondh women in Odisha to stop the destruction of the Niyamgiri hills through aluminum mining. Whereas in the Appalachian region of the United States, a capitalist logic through which mountains are dead and without a role in acting on their future has prevailed in extensive coal mining through the destructive method of mountaintop removal.”

Niyamgiri hills are known for the abundance of bauxite. In 1997, the government of Odisha partnered with Vedanta, a UK-based mining firm, to extract bauxite from the hills. This ore yields the key ingredient of aluminum. The Kondhs are afraid of losing their land, livelihood, and identity and are opposed to Vedanta.

The Adivasis, a majority of them women, took their case to the supreme court and demanded protection of their land under the Forest Rights Act. In 2013, India’s supreme court ruled that the Dongria, a vulnerable tribal group, would hold a

referendum vote among the village councils to decide Vedanta's mining in Niyamgiri. The 12 Dongria villages voted unanimously against the mining project of Vedanta. Dongrias created history to choose to live in their land, their spiritual abode, without selling their soul to Vedanta. It was a historic decision for the Dongrias to live on their land without altering the climate of Niyamgiri.

Several years after the 2013 supreme court decision, new mining is introduced in the surrounding hills. The government brands protesters as Maoists and indicts them as going against the law and order of the state. The Odisha Mining Corporation, which was in a joint-venture agreement with Vedanta, continues to seek a forest clearance for the Niyamgiri mines, using its status as a state-owned corporation. In 2017, Kuni Sikaka, a Dongria Kondh woman who played a crucial role in the movement against Vedanta, was forced to surrender as a Maoist by the state police. The state coerces the Adivasis not only to lend their signatures in favor of mining but also to remain silent against injustice.

The people of Niyamgiri are not the only group to protest against the mountain as a spiritual being. In Southern Chile, indigenous Mapuche communities associate the reduction of native forests and water availability due to the expansion of tree plantations with the disappearance of the spirits (*ngen-ko*) in their territory. It is usually female Machi (shamans) who first notice this loss. If the *ngen-ko* are not there, Machi's knowledge and existence also disappear. This has impacted indigenous livelihoods and the survival of their knowledge and worldview that connect native forest biodiversity, water, medicine, and spirituality (González-Hidalgo & Zografos, 2017).

Implications

The climate heroes discussed above have put up a brave front to protect their mountains, forests, and rivers despite all the state and corporations' opposition and threats. The case studies in this chapter suggest that women's initiatives have proved necessary grounds for self-empowerment and essential to the democratic process to include women in policy-making. The campaigns made by these women prove the value of the forests beyond the commercial economy. In the industrialized capitalist world, forests are considered sources of extraction without considering the forest-dependent communities and the diversity of human-environmental relationships in and near the woods.

Extensive research on forestry across the global north and south has shown that women's work in forests is often ignored in mainstream forestry, especially related to male-dominated trade and commodification of forest products. Most of the women's forest-based labor is not recognized, and forest products that women collect for fuel, fodder, and livelihood are economically less valuable. It is high time to move away from the linear "take, make, and discard" model of resource extraction and unsustainable production and consumption toward a circular economy that restores, regenerates, is resourceful, and minimizes waste. It is important to recognize women

as climate heroes and their work and engagement with nature as essential and financially beneficial.

Numerous case studies worldwide support women as the climate heroes who have worked hard to improve the fragile environment and their livelihood and habitats. The United Nations acknowledges women's meaningful participation and leadership at all levels. Still, the challenge is to recognize their leadership, reward the women's collectives at the grassroots level for their contribution to climate healing, and ensure their role in the design, decision-making, implementation, and monitoring of the forests. The local and national governments must give these women financial support and provide them access to decision-making in climate finance. Persistent barriers still prevent climate heroes from accessing climate finance and making informed decisions (Liane Schalatek, 2020).

Conclusion

The unsung climate heroes discussed above are the heroes who have struggled hard to follow their tradition and championed the cause of a sustainable environment. They have created a new paradigm and discourse of knowledge and experience for a sustainable and equitable life reconnecting with the earth. They cannot be treated as marginal to the projects of development propagated by the state and corporations. The compelling evidence from India and other parts of the world shows that women have organized themselves in various movements to protect their land, livelihood, forest, and other national resources. It is incumbent upon the policy-makers at the United Nations and the respective states of various levels of local, state, federal, and supranational organizations to incorporate women's experiences and perspectives in making policies on development which has an everlasting impact on their lives and livelihood. It is about time that these unsung climate heroes are fully represented in the development narrative.

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Creating Robust Infrastructure and Response Mechanism: Odisha Model of Disaster Management

145

O. P. Mishra

Contents

Introduction	2176
Institutional Response and Mechanism	2177
Creating a Robust Infrastructure and Empowering Community for Disasters:	
Orissa Model (Natural Disaster)	2182
Early Warning Dissemination System (EWDS)	2182
Apada Mitra (Community Support Base)	2183
Conclusion	2184
Annexure A: Guidelines and Reports and Other Documents Released During Previous Years	2186
Internet Sources	2188

Abstract

Disaster response preparedness assumed critical importance in the 1990s and the decades thereafter at the international level. Yokohama Strategy Plan (1994) and Hyogo Framework for Action (2005) are considered critical documents for laying down comprehensive guidelines for prevention of disaster. This chapter highlights the critical importance of overall preparedness in mitigating the hazards of disaster. The period between 1999 and 2004 in India witnessed severe natural disasters one after other in the states of Orissa and Gujarat including Indian Ocean Tsunami. These disasters demonstrated knee-jerk reaction and exposed institutional inadequacies and limitations of the overall disaster response mechanism in India. In this backdrop, Disaster Management Act, 2005, passed by the Indian Parliament, emerged as a critical piece of legislation which is the omnibus of subordinate legislation and acts as a constitution for the institutions that handle disaster management mitigation, management, and relief at both ends of the federation in the Indian Union. This chapter examines the success model of

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Odisha State Disaster Management Authority in handling natural disasters in the state under the broad institutional arrangements enshrined in the Act.

Keywords

Disaster management · Legislation and institutions · Natural and man-made disasters · Institutional response · Mitigation · Disaster management · National disaster management authority · Psychological stress and trauma · National disaster response force

Introduction

Indian subcontinent is prone to all kinds of natural disasters. Around 80% of its geographical area is vulnerable to various forms of disasters. Droughts, floods, earthquakes, cyclones, landslides, and avalanches are regular disaster activities in some regions of the country. Out of 28 states/eight union territories, 22 are prone to disaster activities of different kinds. Coastal states and union territories of India are more vulnerable to cyclones of different kinds emerging in the Bay of Bengal and Arabian sea. Several disaster-related reports have identified India as one of the most vulnerable countries to natural disasters.

Any solid edifice of disaster management requires a holistic policy and regulatory framework with supporting infrastructural and institutional arrangements. Traditionally disaster management has been conceptualized in terms of merely extending emergency relief during disaster period and postdisaster rehabilitation only. A comprehensive disaster management plan includes operational conceptualization of various scenarios which can emerge during disaster and accordingly incorporate various elements of response mechanism to handle them. It includes placement of required logistics and resources near the disaster site beforehand. The plan must have sufficient budgetary funds allocation covering the multidimensional aspects of prevention and preparedness. It should also contain roles and responsibilities of various agencies involved in management of disaster. Mitigation has always been a core concept in the overall disaster management plan. The basic objective of mitigation is to identify the reasons, mobilize institutional response, so that the impact is less on the community. Operationally, an ideal disaster management plan includes predisaster assessment, preparedness, disaster stage response, search and rescue, and reconstruction and rehabilitation stages.

The present chapter examines how management of disasters in India has evolved from an ad hoc structure to a robust methodological tool with proper policy and regulatory framework supported by institutional arrangements. Various policy initiatives for management of disasters adopted over a period of time by the Central and State governments have reduced human casualties in disaster-prone areas. The focus of the chapter is to highlight the success of Odisha State Disaster Management Authority in managing natural disasters. Before the Odisha model is discussed, it is proper to understand the broad policy framework and initiatives of government of India at macro level and how it has acted as a guiding source, replicated and

customized by various states and union territories while handling disasters. The vulnerable coastal states have acquired professional excellence in management of disaster over the years as per local conditions in their respective areas.

Institutional Response and Mechanism

Legislative Action: The main trigger point for a holistic and comprehensive plan for disaster management in India was realized after massive earthquake in Gujarat in the year 2001. The Gujarat earthquake also popularly known as Bhuj quake killed between 13,805 and 20,023 people, injured 167,000, and destroyed nearly 340,000 buildings. Gujarat Disaster Management Act was passed in the year 2003 to address various issues related to different forms of disasters including earthquake. Gujarat state was the first state in the country to have adopted such a comprehensive legislation on Disaster. Need for a similar Act was also realized in other vulnerable states/UTs. The various activities of disaster management matrix and paradigm in India got a holistic institutional response with the enactment of Disaster Management Act in 2005 passed by Central government. This is a very comprehensive Act which puts in place multidimensional operational activities of disaster management under specified agencies in a federal system of governance. This is very much evident from the concept of disaster management explained in Section 2 of the Act. The definition of disaster as mentioned in Section 2 is very broad and holistic in nature and covers all aspects of disaster management starting from prevention, mitigation, reducing risk, and capacity building. The central focus is on overall preparedness for evacuation, rescue, relief, and rehabilitation.

In other words, the comprehensive definition of disaster management takes care of predisaster, disaster, and postdisaster situations. Seventy-nine sections in the Act cover other critical dimensions of the disaster management and provide institutional response mechanism up to the grassroots level.

Creation of Bodies and Institutions: In pursuance of Section 3 of the Disaster Management Act, a national body called **National Disaster Management Authority** has been created to oversee and coordinate the various activities related to disaster under the ex officio chairmanship of the Prime Minister of India. Nine other members of the authority are nominated by the chairman. The authority acts as an apex body at the national level.

National Disaster Management Authority (NDMA): As an apex body, it has been assigned the responsibility of coordinating various activities related to disaster management with various stakeholders in a federal structure. Theoretically, management of disaster in a State is the sole responsibility of the state government. However, the magnitude, severity, and scale of any disaster could also require assistance in terms of logistics and finance from the central government. NDMA facilitates this on the ground. Some of the core responsibilities of the authority include formulating national-level plans and guidelines for management of disaster. It regularly coordinates with other stakeholders of the state and union territories during disaster situation on the ground as per standard operating protocol. National plan and guidelines are prepared by the Disaster Management Authority through

extensive consultations with all the stakeholders for effective control of natural and man-made disaster. It effectively tries to bridge the operational gaps among various stakeholders during the management of disaster. Over a period of time, it has also identified newer forms of natural and man-made disasters which require prevention. They have accordingly formulated guidelines and policies to address critical issues in handling such disasters. For example, natural disasters like thunderstorm, strong wind/cloudburst, and hail storms/glacial lake burst flood/forest fire were also brought under the overall gamut of disaster management in the national plan in 2019.

NDMA has issued various guidelines and reports covering different dimensions of the disaster since 2007. The comprehensive list of these documents may be seen in Annexure 1.

National Cyclone Risk Management Project: Keeping in view the vulnerability of Cyclone in various coastal states, National Cyclone Risk Management Project was initiated by Government of India. NDMA has been entrusted with the responsibility of coordinating and implementing this project in various coastal states. The foundation of this project is based on four critical pillars: Early Warning and Dissemination Systems (EWDS), Construction of Cyclone Risk Mitigation Infrastructure, Technical assistance for Risk Management, Capacity Building and Knowledge Creation, and Project Management and Implementation Support. The focus of this project is to create proper infrastructure in vulnerable areas covering different aspects of the disaster management. It includes construction of multipurpose cyclone centers for shifting the affected communities well in time. This also includes construction of roads and bridges in the coastal areas for speedy movement of logistics and manpower in disaster-prone areas during disaster. Early warning helps in early evacuation. This project has helped several states in reorienting and modernizing their warning dissemination technical infrastructure with accurate prediction.

India is a union of states and union territories having federal system of governance. Apart from National Authority, a similar structure known as State Disaster Management Authority (SDMA) operates in all the States/UTs under the overall leadership of the state Chief Minister of the State/ Administrator who is also designated as ex officio Chairman of the authority. The State authority has its own executive committee with experts as its members like the national body. The basic objective of the state body is to prepare a state-level plan for the whole state at par with the National Plan in the vulnerable and disaster-prone areas as per local conditions.

District Disaster Management Authority is a body which operates at district level to coordinate the disaster management activities in subdivisions up to village level. The District Magistrate (DM) is the Chairman of the district-level body. Like State-Level Plan, the DM prepares the Action Plan for the whole district. Thus, the act provides a holistic and proper framework for coordinating various activities of disaster up to the grassroots level through creation of similar institutional response mechanisms at every level starting from national level till the village level.

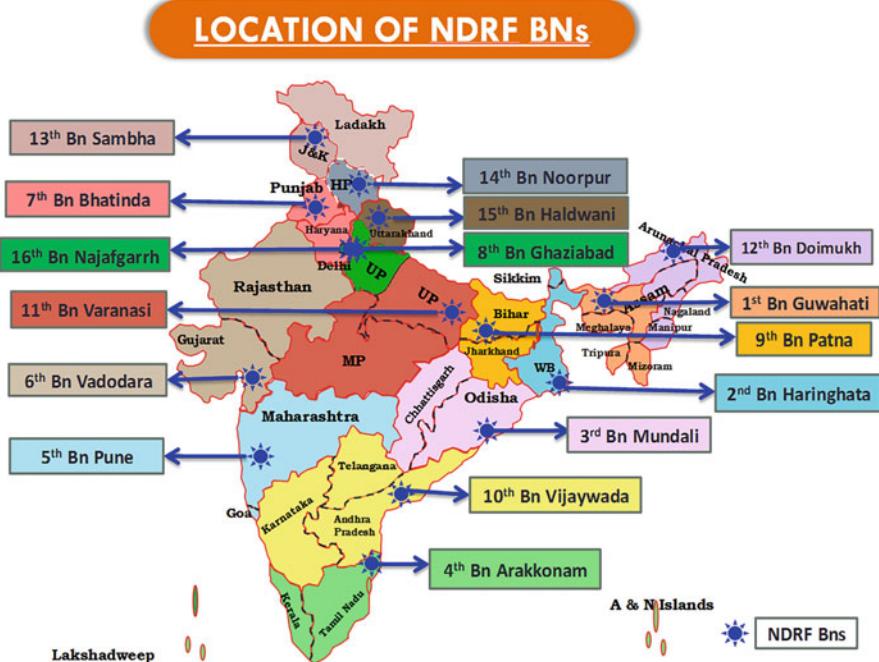
National Institute of Disaster Management: Disaster management tools and techniques are constantly improving. The nature and form of disaster has also been

changing with the passage of time. Several countries in the world prone to various forms of natural and man-made disasters have come up with new tools and techniques for response and prevention. Several Indian states and UTs prone to disaster have come up with good practices in handling disaster situations. In order to ensure that all such new research and good practices in the area of disaster management is shared through an integrated organization, a national body called National Institute of Disaster Management (NIDM) was created. NIDM collates good practices from the different states and has created a national data base of knowledge covering different aspects of disaster management. The overall responsibility of the institute is also to carry out constant research in different aspects of disaster management and train various stakeholders involved in the management of disaster from time to time.

National Disaster Response Force: Historically the management of disaster has been the responsibility of the local law-enforcing agencies. They have been an integral part of the rescue, rehabilitation, and reconstruction activities. Theoretically, local police are not properly trained to handle disaster situations in a professional manner. They always lack proper wherewithal and logistics required for handling disaster situations. Over and above, handling of disaster situations in a primary role for law-enforcing agencies always affected their core and essential citizen-centric responsibilities like prevention and detection of crime. The operational limitations of the civil Police were realized by the policy makers. It created a National Disaster Response Force exclusively to handle and respond to disaster situation across the country. Section 44 of the Disaster Act talks about the constitution of the force and other related aspects. Initially it started with a manpower of eight Battalions. The present strength of NDRF is fifteen Battalions. The manpower component of the force consists of officers and men from BSF, CISF, CRPF, ITBP, SSB, and Assam Rifles. Each Battalion consists of 1149 personnel. NDRF personnel were initially deployed for routine law and order duties also. On October 25, 2007, in a meeting of NDMA under the chairmanship of Prime Minister of India, NDRF was divested of its law-and-order responsibilities. It became a dedicated force to handle disaster-related duties only under the overall command and control of a Director General Of Police rank officer.

All the 15 battalions of NDRF are located in 16 different locations in the country on the basis of vulnerability profile. These battalions have been trained and equipped to respond to all man-made and natural disasters. The basic philosophy behind raising more battalions and placing them in vulnerable states was to reduce the response time of the force in reaching the disaster site. Creation of a separate force to handle disaster situations has proved to be a game changer. The distribution of various battalions may be seen in Graph 1.

Within a period of fifteen years, NDRF has emerged as a very effective force in rescue and rehabilitation activities of disaster management in various parts of the country. The professionalism and competence of the force has not only been recognized nationally; it has also emerged as a savior of people in distress in South Asia. Their response during Japan Tsunami in 2011 and earthquake evacuation in Nepal was highly appreciated by all.



Graph 1 Source: NDRF Website

Apart from search and rescue operations, NDRF also conducts mock exercises and community awareness programs. Various community awareness programs and mock exercises carried out by the force can be seen in Table 1.

Psychological Care and Vulnerability Reduction: Every disaster creates tremendous stress and trauma on the minds of people staying in disaster-prone areas. The trauma and stress continue even after the disaster has ended. American Psychological Association has emphasized effective management of mental trauma and stress in the pre- and postdisaster situations. In order to address the issue of psychological trauma and stress, National Disaster Management Authority has taken up a project titled “Preparation of Psychological Care and Preparedness Modules and IEC Materials.” The thrust of this project is to identify, collate, and compile research materials in the form of a training manual which could enhance the operational capacity and fine tune the response mechanism of volunteers involved in extending psychological support and assistance to distressed persons during disaster and postdisaster situations on the ground. The same document could also be shared with all the stakeholders at all levels. National Institute of Mental Health and Neurosciences (NIMHANS) has partnered with NDMA for designing, developing, and standardizing the training materials in this regard. This will go a long way in reducing psychological trauma and stress in the vulnerable communities in disaster-prone areas.

Table 1 Source: NDRF Website (<http://www.ndrf.gov.in>)

SNO	Unit	Category of activity	Place	Number of people benefited					Total
				Boys	Girls	Men	Women	Senior citizens	
1	7th Bn NDRF	Capacity building	Punjab (1)	330	220	7	3	0	520
2	9th Bn NDRF	Capacity building	Bihar (7)	0	29	280	5	0	314
3		Capacity building	Jharkhand (3)	0	0	169	2	0	171
4		Community Awareness	Bihar (104)	2428	814	5685	1591	6	10,524
5		Community Awareness	Jharkhand (19)	1151	929	1658	850	57	4685
6		Mock exercise	Bihar (8)	0	0	0	860	202	1062
7		Mock exercise	Jharkhand (5)	0	0	1021	0	0	1021
8		School safety	Bihar (70)	13,507	14,502	714	358	0	29,081
9		School safety	Jharkhand (14)	2964	3470	106	101	1	6642
10		School safety		1	50	65	6	0	130
	Total			20,430	20,029	10,546	3121	64	54,190

We will now discuss the response of Odisha State in handling disasters under the overall institutional framework just discussed above.

Creating a Robust Infrastructure and Empowering Community for Disasters: Orissa Model (Natural Disaster)

Odisha (renamed from Orissa in 2011) is one of the most vulnerable coastal states situated along the coast of the Bay of Bengal. Bay of Bengal is very prone to frequent natural disasters like cyclones, floods, and occasional tsunamis. Thirteen districts of the state share their boundaries with the coast. The State has acquired the tagline of disaster capital of the country due to frequency of cyclones and tsunamis. More than 100 tropical cyclones occurred during 1891–2021 in the state, highest among other coastal states.

During the October 1999 super cyclone, more than 10,000 people died and millions became homeless. Similarly, Cyclone Phalin affected more than one million people and property worth crores was damaged. Both these devastating cyclones also demonstrated the institutional inadequacies of the overall response mechanism and forced the state administration to formulate an effective and holistic response mechanism plan for handling of disasters in the state. This led to creation of Odisha State Disaster Management Authority. The authority is entrusted with the responsibility of managing disasters in the state through various stakeholders as per the mandate and institutional arrangements delineated in the Disaster Management Act. Odisha has a disaster-specific institutional mechanism which operates on the principle of decentralized governance.

The State government has reoriented its entire approach in handling the disaster situation on the basis of previous bitter encounters with deadliest tsunamis. Gradually, Odisha has achieved professional excellence in managing disasters through a very robust institutional response system with proper and critical infrastructural base in disaster-prone areas. Simultaneously, it has also empowered the community of these areas to cope with the challenges of predisaster and postdisaster situations. As a result, fatalities which used to be in 10,000s in the 1999 Cyclone came down to double digits in subsequent cyclones.

The following infrastructural arrangements under various components of the National Cyclone Risk Management Project of government of India have played a very critical role behind the success of disaster management in Odisha.

Early Warning Dissemination System (EWDS)

In the year 1999, Odisha government came to know about the cyclone and its travel route very late. By the time it could get itself ready to handle it, a super cyclone had critically damaged the communication infrastructure. As a result, communication with all the critical stakeholders got affected. Contrary to the 1999 situation, the warning system has now improved substantially. EWDS has been placed in 1205

villages in coastal blocks within 5 Km from the coastline. Satellite-based mobile data voice terminals have also been installed in the vulnerable areas. Several towers were placed within the close proximity of the community clusters situated near the coastline to ensure that early warnings of tsunami and cyclone reach the communities at large without any technical disruption and hindrance. Early accurate warning by the Indian Meteorological Department has helped the state in managing disaster better. The accurate predictions regarding route of the cyclone with little deviation have increased the confidence level of all the stakeholders on the ground. Over and above, early warning system prevented large number of unnecessary evacuations taking place in haste and panic.

Multipurpose Cyclone Shelters: On the basis of past exposure to various forms of cyclones and tsunamis, the state has constructed more than 400 multipurpose cyclone shelters all along the coastline in the state. These multipurpose shelters act as a safe habitat for the vulnerable component of the community. These centers have provision for Community Kitchen. Lifesaving materials and other critical gadgets are also available in these centers. They are fully equipped with all the critical logistics required during emergency situations. Adequate number of youths have been trained to take up the critical responsibilities of search, rescue, and immediate medical aid. The trained youth also ensure that cyclone warnings reach the affected communities in time without creating panic.

Apada Mitra (Community Support Base)

Community is at the center of any disaster situation. Preparing the community and ensuring their help in various activities like creating awareness, rescue, and rehabilitation is very critical in the overall management of disaster. The community has been integrated in the overall disaster response mechanism through a very effective Central Government scheme called “Apada Mitra” (Disaster Friend) started in 2016. The center has fixed a target of training 200 volunteers in selected 30 most flood-prone districts in 25 states of the country who could be effectively utilized during various stages of disaster. Jagatsinghpur and Puri districts have been selected as flood-prone districts in Odisha under this scheme. In both these districts, 400 Apada Mitras, 200 each, have been trained to undertake various responsibilities during predisaster and disaster situation. Apada Mitra has been very effective in overall disaster preparedness at the community level. It has also helped in speedy dissemination of alerts and mobilization of the people necessary for effective implementation of evacuation operations. A well-trained community resource base also acts as force multiplier during rescue and search operations during disaster.

Identification of tsunami-prone villages: On the basis of frequent exposure to natural disasters, the state has identified tsunami-prone villages. Identification of the villages was done on the basic criteria of intrusion of seawater. This identification helped the disaster management authority in undertaking various proactive preventive measures at various levels to minimize the damage. These measures have further enhanced their operational response capabilities at different stages of disaster. The

preparedness level of some of the villages were as per the parameters and norms of UNESCO tsunami reduction plans. The UNESCO team physically verified these parameters in 2019.

The overall disaster management response of Odisha has received praise and accolades from everyone. Learning lessons from exposure to some of the deadliest tsunamis and cyclones, Odisha has reoriented its overall response and preparedness mechanism. It has created required infrastructure in the vulnerable areas to handle multidimensional challenges emerging from natural disasters. The State Disaster Management Authority has also empowered the community as a whole in the overall disaster management plan. It has assigned critical responsibilities to the community in the vulnerable areas. The positive results of various measures adopted by the state and policy initiatives could be seen during handling of Super Cyclone Fani in the year 2019 and subsequent years. Fani witnessed one of the biggest evacuations of human beings in the human history during disaster. The effective handling of super cyclone Fani brought Odisha on the global stage. It soon became a global success story duly recognized by international bodies like United Nations. The policy initiatives of the State government of Odisha were also acknowledged and appreciated by the Prime minister of India, Shri Narendra Modi. Effective handling of Phalin stands documented in the category of best practices in 2019 by National Disaster Management Guidelines for Community Based Disaster Risk Reduction.

The emergence of Odisha as a success model in management of natural disasters has been possible largely due to creation of robust infrastructure and response mechanism and community empowerment up to village level by Odisha State Disaster Management Authority.

Conclusion

Management of natural and man-made disaster in India has evolved from an ad hoc and unstructured response system into a highly professional body. This has been possible due to an important Central legislative action by enactment of Disaster Management Act, 2005. The Act has been able to create important institutions for a holistic management of various kinds of natural as well as man-made disasters. It has also created a harmonious ecosystem of cooperation, coordination, and trust for various stakeholders in effectively handling the challenges of disaster in a federal structure. NDMA as an apex body has been constantly improving the response mechanism of States/UTs. We can sum up by highlighting some of the important institutional initiatives which have changed the whole narratives and paradigm of disaster management in India.

Early Warning Dissemination System (EWDS): Early warning regarding any disaster not only helps the various agencies in planning a proper response, but also prepares communities to respond better. Early warning helps critical stakeholders in relocating the resources and logistics in the predicted areas. It ultimately saves human lives and minimizes damage to property and critical infrastructure. We have seen how early warning system helped Odisha in evacuating the vulnerable

component to safe shelters during various cyclones. The same state suffered heavy casualties and damage to property in the absence of a modernized and improved early warning dissemination technical infrastructure.

Multi-Purpose Cyclone shelters (MPCS): Shifting the vulnerable segment to safe shelters as soon as warning signals are received is an important part of preventive strategy in disaster management. Vulnerable coastal states like Andhra, Goa, Odisha, Maharashtra, Karnataka, west Bengal, Gujarat, and Kerala have constructed sufficient number of such shelters where the affected component of the population is immediately shifted on the basis of alerts. These MPCSs have been able to prevent lot of casualties during the disaster. These MPCS are equipped with all critical logistics and resources required for effective response in disaster situations.

Apada Mitra (Disaster Friend): Community is the worst sufferer in every disaster. Any disaster affects lives and property at a large scale. Integrating community in the overall response framework of disaster management is very critical. This has been very effectively and beautifully achieved by creating an institution of "Apada Mitra" by government of India in 2016. NDMA has fixed certain targets for each State and UT. The training of volunteers under this scheme is constantly monitored and reviewed by the authority. This scheme has enhanced the overall resource base of the disaster management mechanism.

National Disaster Response Force: Creation of a special force for rescue of disaster victims has proved to be a game changer in the overall management of disaster in India. The NDRF has emerged as a highly professional force with proper infrastructure and logistics at its disposal in managing disasters. Raising of more Battalions as part of State Disaster Response Force and stationing them in vulnerable disaster-prone states has reduced drastically their response time finally saving human lives and properties at large scale. Their efforts have been duly acknowledged and recognized by the Prime Minister in his public speech on various occasions.

Subhash Chandra Bose Apada Prabandhan Puruskar: Several members of civil society including members of Disaster response force suffer heavy casualties during rescue operations. Subhash Chandra Bose Apada Prabandhan Puruskar recognizes the outstanding contribution of individuals and bodies involved in the management of disaster. Every year, three awards are given to institutions and individuals. While an institution gets an award of Rs 51 Lakhs, an individual gets 5 Lakh. This is another very important institutional milestone in the management matrix of disaster in India. Such awards recognize the unsung heroes who demonstrate exemplary bravery and courage while handling serious disaster situations putting their lives at risk. It also motivates and acts as a catalyst for individuals and civil society organizations to contribute in the management of disaster with their areas of expertise.

Coalition for Disaster Resilient Infrastructure (CDRI): Several countries in the world face multiple challenges from different forms of natural and man-made disasters on regular intervals. They have also acquired and developed professional expertise and excellence in handling them. Neighboring countries always look toward each other during disaster situations for immediate help in rescue and

rehabilitation. There was a need for an institutional mechanism to formalize the various dimensions of cooperation and assistance. India took lead in this direction. Coalition for Disaster Resilient Infrastructure created in the year 2019 is the result of this initiative. CDRI is a platform which facilitates cooperation of various governments at international level. It also brings together various development banks and other institutions and facilitates sharing of knowledge base. Creation of this body has facilitated the cooperation of 22 countries and seven organizations in effective management of disasters in India.

CDRI assumed the status of an international organization duly ratified by the government of India in July 2022. This status entitles CDRI for exemptions and other privileges as contained in United Nations Privileges & Immunities Act, 1947.

Creation of various institutions, bodies, and proactive policies under the overall umbrella of disaster management in the country has enhanced the overall reputation and credibility of National Disaster Management Authority at international level. India has also played a critical role in fostering international cooperation and coordination in management of disasters with its professional acumen and expertise. Several countries, particularly in Asia, look forward to India during disaster incidents. India has always extended all kinds of help and assistance to neighboring countries during disasters keeping in tune with its age-old philosophy of "Vasudhev Kutumbakam." Vaccine Maitri is the latest example of Vasudhev Kutumbakam. During Corona Pandemic, India provided Covid 19 Vaccines to many countries in the world. As of 21 February 2022, India had delivered around 16.29 crore doses of vaccines to 96 Countries.

Annexure A: Guidelines and Reports and Other Documents Released During Previous Years

(i) Guidelines issued:

List of Guidelines issued by NDMA

s.no.	National Disaster Management Guidelines on	Month and year of preparation/ release
1.	Management of Earthquakes	April 2007
2.	Management of Chemical (Industrial) Disasters	April 2007
3.	Preparation of State Disaster Management Plans	July 2007
4.	Management of Medical Preparedness and Mass Casualty Management	October 2007
5.	Management of Floods	January 2008
6.	Management of Cyclones	April 2008
7.	Management of Biological Disasters	July 2008
8.	Management of Nuclear and Radiological Emergencies	February 2009
9.	Management of Landslides and Snow Avalanches	June 2009
10.	Management of Chemical (Terrorism) Disaster	June 2009
11.	Psychosocial Support and Mental Health Services in Disasters	December 2009

(continued)

List of Guidelines issued by NDMA

s.no.	National Disaster Management Guidelines on	Month and year of preparation/ release
12.	Incident Response System	July 2010
13.	Management of Tsunamis	August 2010
14.	Management of the Dead in the Aftermath of Disasters	August 2010
15.	Management of Urban Flooding	September 2010
16.	Management of Drought	September 2010
17.	National Disaster Management Information and Communication System	February 2012
18.	Scaling, Type of Equipment, and Training of Fire Services	April 2012
19.	Seismic Retrofitting of Deficient Buildings and Structures	June 2014
20.	School Safety Policy	Feb 2016
21.	Hospital Safety	Feb 2016
22.	Minimum Standards of Relief	Feb 2016
23.	Museums	May 2017
24.	Cultural Heritage Sites and Precincts	September 2017
25.	Boat Safety	September 2017
26.	Preparation of Action Plan – Prevention and Management of Thunderstorm & Lightening / Squall/ Dust/ Hailstorm and Strong Wind	March 2019
27.	Temporary Shelters for Disaster - Affected Families	September 2019
28.	Disability Inclusive Disaster Risk Reduction	September 2019
29.	Landslide Risk Management Strategy	September 2019
30.	Preparation of Action Plan – Prevention and Management of Heat Wave (Revised Guidelines)	October 2019

(ii) Reports and other documents issued:

s.no.	Description
1.	Revamping of Civil Defence
2.	NIDM's Functioning
3.	Strengthening of Safety and Security for Transportation of POL Tankers
4.	Threats to Municipal Water Supply and Water Reservoirs
5.	Training Regime for Disaster Response
6.	Hand Book for Training and Capacity Building of Civil Defence and Sister Organizations: Part I & II
7.	Managing Crowds at Events and Places of Mass Gathering
8.	Concise Framework for Preparation of Management Plan for Events/ Venues of Mass Gathering
9.	Compendium of Relevant Acts/Laws/Rules/Regulations/ Notifications on Disaster Management
10.	Model Framework of District Disaster Management Plan (DDMP) and Explanatory Notes for Preparation of DDMP
11.	Cyclone Hudhud – Strategies and Lessons for Preparing Better & Strengthening Risk Resilience in Coastal Regions of India
12.	Training Manual: How to Conduct Emergency Management Exercise

(continued)

s.no.	Description
13.	Guidelines on Ensuring Disaster Resilient Construction of Buildings and Infrastructure
14.	Pilot Project on Capacity Building for Advanced Trauma Life Support in India
15.	Capacity Building in DM for Govt. Officials & Representative of Panchayat Raj Institution & Urban Local Bodies at District Level
16.	Roadmap for Mitigation of Urban Flood
17.	Gujarat Flood 2017 - A Case Study
18.	Training of Masons on Hazard Resistant Construction
19.	Tamil Nadu Floods: Lessons Learnt and Best Practices – A Report
20.	Study Report on Gaja Cyclone – 2018
21.	Home Owner's Guide for Cyclone and Earthquake Safety
22.	Earthquake Disaster Risk Index Report
23.	Fire Safety in India (Proceedings of 15th Formation Day of NDMA)
24.	A Preliminary Study to Estimate Temperature Threshold for Heat Wave Warning in India
25.	Pocket Book of Do's and Don'ts on Various Disasters
26.	A Digital Book on Do's and Don'ts and FAQ on COVID-19
27.	National Workshop Report for Preparation and Management of Heatwave 2020

Source: National Disaster Management Authority, Annual Report

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Flood, Livelihood, and Community Resilience: A Study from Barak Valley Region of Assam in Northeast India

146

Suranjan Das and Tapati Das

Contents

Introduction	2190
Materials and Methods	2192
Results and Discussion	2192
Socioeconomic Profile of the Flood-Affected Communities	2192
Livelihood Issues of the Flood-Affected Communities	2194
Importance of Community Resilience for the Livelihood of the Flood-Affected Communities	2196
Conclusion	2198
Appendix-I	2199
References	2201

Abstract

Flood is a major natural disaster that affects millions of people's livelihood. In Assam, the Brahmaputra and the Barak rivers cause floods every year, resulting in substantial economic losses. Historically, flood events have been affecting people's livelihood, particularly that of the small and marginal farmers living in low-lying water-logged areas in the Barak Valley region of Assam. Vast areas of the cultivable land in the valley remain submerged under water throughout the peak farming season, i.e., from May to October. Recurrent flooding in the lowland do not favor the farmers for agricultural production as the fields remain submerged and unused for 6–7 months. The lack of suitable livelihood options, diminishing income, and poor economic condition of the riparian community has led to the loss of interest in agricultural activities. This situation of the poor and marginalized farmers is causing the out-migration of labor to major Indian cities such as Bangalore, Pune, and Mumbai. Hence, it is necessary to design

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appropriate mechanisms and policy measures to make the community more resilient to such natural disaster.

Keywords

Flood · Community resilience · Barak Valley · Assam · Northeast India

Introduction

Flood refers to an overflow of a large amount of water beyond its reasonable limits, especially over what is usually a dry land. Among all the natural catastrophes, flooding has claimed more lives and caused destruction of infrastructure; it has affected socioeconomic and health conditions, and disturbed the natural ecosystem (Barrows & Bruin, 2006). Asia accounts for nearly 50% of flood-related fatalities in the last quarter of the twentieth century (Jonkman, 2005), where countries like Bangladesh, India, Nepal, and Pakistan exhibit a high level of vulnerability (World Risk Report, 2011). In India, the risk related to flood is expected to increase substantially in coming years as a result of both climate change and continued unplanned development (Ali et al., 2019). Therefore, flood mitigation policies and measures have to be implemented in order to enable vulnerable societies to increase their resilience to flood hazards for which there is a necessity of detailed study.

Barak valley is situated between Longitude 92°15' E and 93°15' E and Latitude 24°8' N and 25°8' N with a total geographical area of 6922 km², which comprises 8.9% of the geographical area of Assam in Northeast India. It is situated in the extreme corner of the Indian subcontinent bounded by Bangladesh in the West and the border states of India like Manipur in the East, Mizoram and Tripura in the South, and Meghalaya in the North. The valley is surrounded by hills on all sides (Fig. 1). The River Barak along with its tributaries like Jiri, Chiri, Madhura, Jatinga, Harang, Kalain, and Gumra (to the north), and Dhaleshwari, Singla, Longai, Sonai, and Katakhali (to the south), originating from hills of Manipur and Mizoram, is the second largest river basin system in northeast India (<http://india-wris.nrsc.gov.in>). Besides the river and its tributaries, the landscape is also dotted with numerous other water bodies like ponds, oxbow lakes, floodplain lakes, seasonal wetlands, marshes, and waterlogged areas (Rajbongshi et al., 2018, Reang et al., 2018). The climate of the region is warm and humid and is influenced by the Southwest monsoon extending from April to September (Mahanta & Yamane, 2020; Fig. 2). Because of its typical bowl-shaped terrain condition (Fig. 1) and characteristic rainfall pattern (Fig. 2) Barak valley has been assigned to a landscape dominated by tropical floodplain conditions. As a result, the low-lying areas experience periodic flooding and water logging from adjacent rivers and wetlands (Prasad et al., 2019). Historically, flood events in the Barak Valley region of Assam have been affecting people's livelihood particularly the small and marginal farmers living in low lying water-logged areas. During some years, due to erratic rainfall vast areas of the cultivable

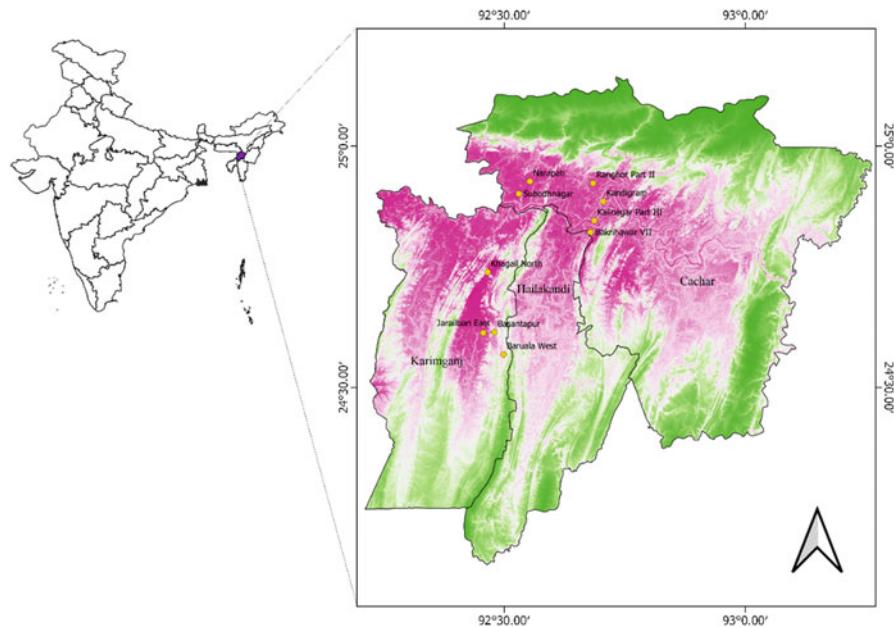


Fig. 1 Map showing the study area and the sampling villages

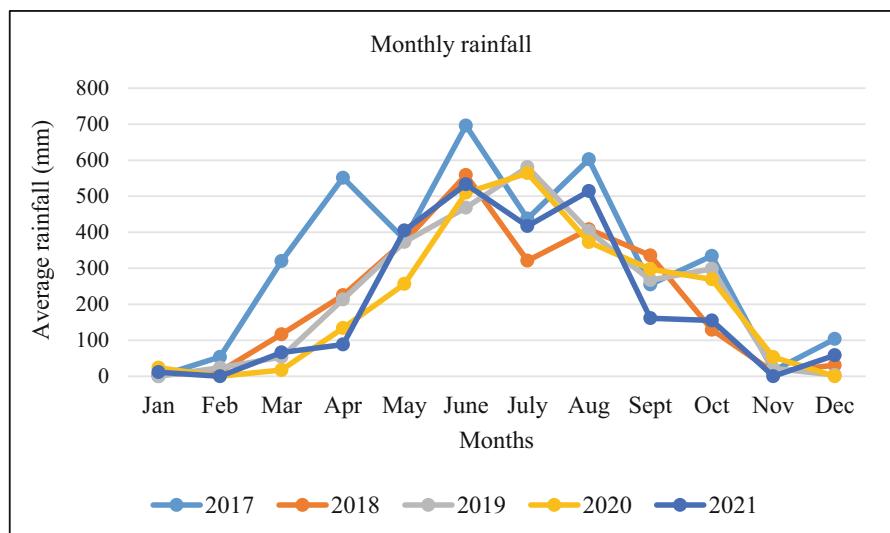


Fig. 2 Average variations in monthly rainfall in Barak Valley for the past 5 years from 2017 to 2021. (Source: [http://hydro.imd.gov.in/hydrometweb/\(S\(l41nejyxulldql45oe4l1pzd\)\)/landing.aspx](http://hydro.imd.gov.in/hydrometweb/(S(l41nejyxulldql45oe4l1pzd))/landing.aspx), and https://imdpune.gov.in/Clim_Pred_LRF_New/Grided_Data_Download.html#)

land particularly the paddy fields remain submerged throughout the peak farming season, i.e., from May to October.

Flood and the associated siltation of aquatic systems particularly in River Barak and its tributaries pose major disaster-related threats in Barak valley. It threatens riverine and wetland ecosystems due to habitat loss of many organisms and causes loss of lives and livestock, damage to infrastructure, property, crops, and many other assets of the riparian communities (Bhagabati et al., 2006). The major problems caused by floods are affecting those local communities who are solely dependent on their immediate surroundings for their livelihood by practicing agriculture, fishing, and allied activities (Goyari, 2005).

Though recently the frequency of floods in the region has decreased considerably due to measures taken by the government at different levels, many low-lying areas are still facing problems of flood and waterlogging conditions. Moreover, the flood highly affects the livelihood of thousands of villagers who are solely dependent on nature for their survival. In the present study, we aimed to identify the significant issues related to floods and the associated socioeconomic problems in Barak Valley and to suggest possible management options for increasing community resilience.

Materials and Methods

Our study area comprised the Barak valley's floodplain region, covering its three districts, viz., Cachar, Karimganj, and Hailakandi. We restricted our study to flood-affected areas (5–11 m asl) where ten flood-affected villages were purposively selected (Fig. 1). Since the estimated total number of households in selected villages are 1165 hence a sample size of 350 households have been selected for the present study so that at least 30% of the households are covered for the required data collection (Shively, 2011). Both primary and secondary data have been used in the present study. The primary data have been collected from the field by adopting tools like interview schedule ([Appendix-I](#)), direct observation, and group discussion. Secondary data have been collected from books, journals, and internet sources. Interview with the local panchayat leaders has also been conducted to collect additional information about the issues of floods and government plans and policies for rehabilitation of the victims of the flood-affected villages. The survey related to the present study was conducted in the year 2021.

Results and Discussion

Socioeconomic Profile of the Flood-Affected Communities

The socioeconomic profile of the communities residing in flood affected areas of Barak valley revealed that communities belonging to scheduled caste constituted the bulk of the population (63%) followed by Muslim minority (21%), other backward classes (14%), and the general caste (2%) (Fig. 3a). Most respondents (30%) attained

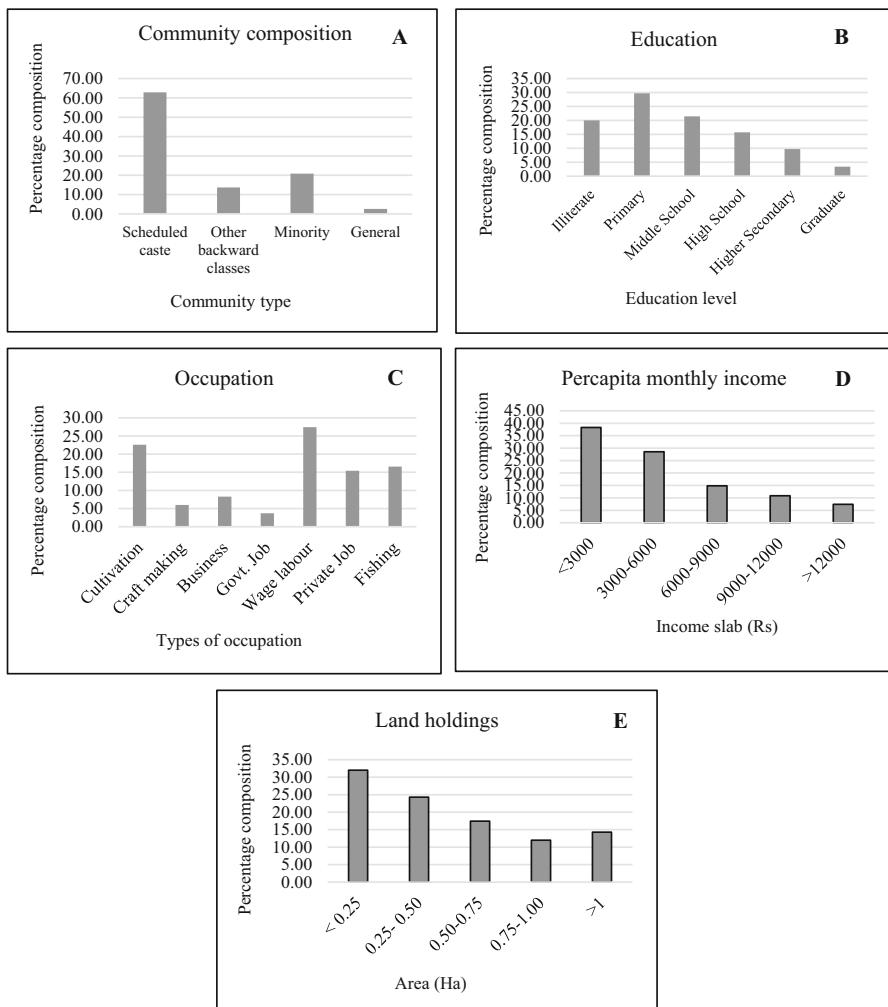


Fig. 3 (a) Community composition, (b) educational status, (c) occupation, (d) per capita monthly income, and (e) land holdings of people inhabiting flood affected areas of Barak Valley, Assam

education up to primary school and only few (3%) were graduates, while 20% of the respondents were illiterate (Fig. 3b).

The respondents were involved in different activities to sustain their livelihood that comprised of wage labor (25%), rice cultivation (23%), private job (15%), fishing (16%), business (8%), government job (4%), craft-making (6%), and vegetable cultivation (3%) (Fig. 3c). Nature-based occupations, viz., agriculture, fishing, and craft-making constituted 45%, while the remaining 55% of households depended on non-agricultural and non-fishing profession. This indicates that the

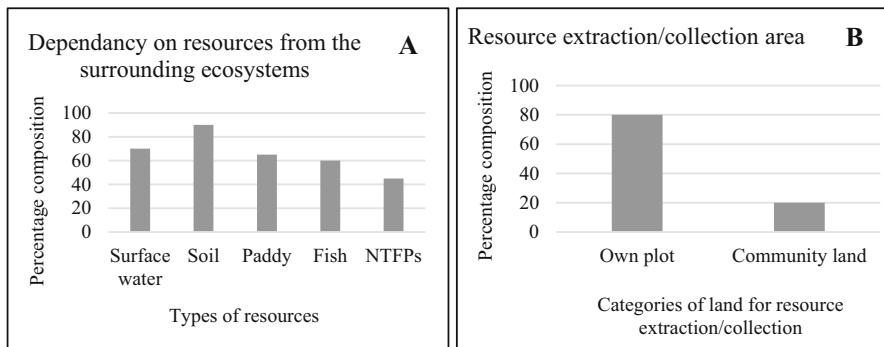


Fig. 4 (a) Dependency on resources, **(b)** resource extraction/collection area of people inhabiting flood affected areas of Barak Valley, Assam

people are involved in traditional nature-based activities as well as other livelihood options available to them.

The monthly per capita income of the majority (66%) of the households is below Rs. 6000 followed by households (15%) having monthly family income between Rs. 6000 and Rs. 9000 and only a few respondents (11%) have family income between Rs. 9000 and Rs. 12000. The number of households having a monthly income of Rs. 12000 or above was negligible (7%) (Fig. 3d). The study shows that per capita monthly income of the majority of the respondents is far below the monthly per capita net national income at current price during the study period (INR 11,182 and INR 10,735 during the year 2019–2020 and 2020–2021, respectively, source- <http://pib.nic.in>).

Majority of the households (32%) had land holding less than 0.25 hectare. Households having land holdings from 0.25 hectare to 0.5 hectare comprised of 24%. A smaller number of households (14%) have land holding more than 1 hectare (Fig. 3e).

The local communities in the study area depend on different types of resources from the nearby low-lying areas and wetlands for their survival. They are dependent on such area for cultivation of paddy (65%), fishing (60%), collecting surface water (70%), NTFPs (45%), and soil (90%) (Fig. 4a). The resources are used for their own consumption and other uses, while the surplus is sold to the local market. It is also observed that most of the respondents (80%) extract resources from their own plots of land and rest (20%) extract resources from community land (Fig. 4b).

Livelihood Issues of the Flood-Affected Communities

Livelihood is a significant issue for the people affected by flood in the study area. Their traditional means of livelihood such as fishing and cultivation are now no more sufficient to sustain their family primarily due to progressive decline in the production of such resources from their nearby ecosystems. Like cultivation, animal rearing

is also not feasible for the community due to lack of grazing land particularly in the rainy season (April to September/October). This might be attributed to the decline in soil fertility, recurrent incidence of flood, and increase in human population and livestock resulting in overexploitation of the existing resources resulting in depletion of the natural resources and less per capita availability of resources. As a result, majority of the cultivators and fishermen have now opted for wage labor to run their families. However, wage-earning is not a sustainable means of livelihood due to the non-availability of work opportunities. Moreover, the government program for rural employment, such as Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), is insufficient to provide sustainable livelihood to the people. As a result, many youths from the study area migrate seasonally to towns and metropolitan cities of India such as Bangalore, Pune, Mumbai, and Chennai to work in the construction sector, domestic works, and security services. Such outmigration often leads to family breakups where the elderly, women, and children are left in the village without much support. Unemployment is a significant problem among the flood-affected communities of the Barak Valley. Topographical isolation and several other obstacles like lack of proper information restrain mainstream entrepreneurs from establishing industries in the area. Large-scale paddy cultivation is not possible due to erratic rainfall patterns. Moreover, commercial rice cultivation is not profitable due to the lack of market demand for local rice. Large-scale commercial cultivation of vegetable and cash crops is not practiced by the farmers, who are mostly habituated to traditional stereotypical cropping modes. Though there is much scope for commercial fishery due to the typical terrain condition of the region, it has not been utilized to a significant level. Thus, paddy cultivation and fishery sectors cannot provide sufficient livelihood options to the flood-affected communities, which calls for finding out other viable and strategic livelihood options like cultivation of vegetables and cash crops in dry season, cultivation of mushroom, fish farming, etc. However, prior to these there should be proper training and awareness program for the rural youth for sustainable livelihood and there should be proper market facility to supply the various agricultural and fishery resources for commercial purpose. This may be made possible by implementing various cooperative societies at rural level in the study area. This would also lead to generation of employment opportunities for many of the rural youths within their local vicinities. This would possibly prevent "rural-push" for their livelihood and strengthen their family support system and hence better socioeconomic system.

Flood causes multidimensional problems to individuals, community, and society. While respondents were asked about their perception related to the adverse effects of flood in their localities, majority of them (90%) opined that flood causes destruction of agricultural crops. Around 80% of the respondents reported the problem of drinking water due to floods followed by 70% respondents who reported the problem of communication and rearing of livestock, 60% reported the problem of unemployment, 40% talked about occurrence of disease, 30% reported inundation of households, and others (20%) have reported about the adverse effects on their fisheries (Fig. 5a). The provision of drinking water is a significant problem in rural areas of Barak valley, particularly for the communities living in flood-affected areas. The

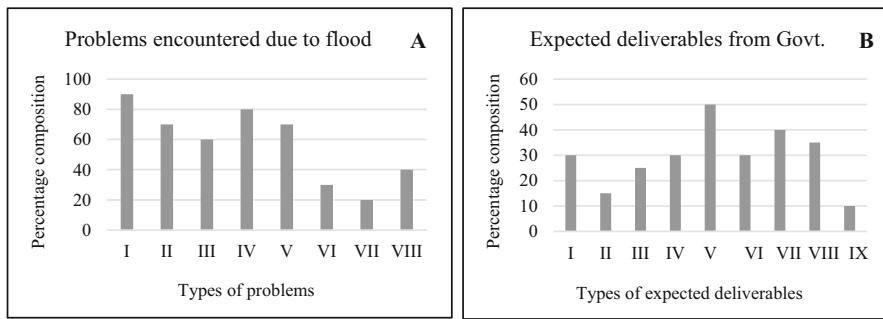


Fig. 5 (a) Perception of flood-affected communities regarding adverse effects of flood in their villages (I = Destruction of agricultural crops; II = Affect livestock; III = Unemployment; IV = Drinking water problem; V = Communication problem; VI=Inundation of households; VII = Affect fisheries; VIII = Disease) and, (b) Perception of flood-affected communities regarding deliverables from the Govt. for overcoming the adverse effects of flood in Barak Valley, Assam (I = Microfinance for starting fisheries; II = Net for protecting fish ponds; III = Irrigation facility during dry season; IV = Relief during major flood incidents; V = Provision for safe drinking water; VI=Dredging of nearby rivulets and rivers; VII=Proper implementation of MGNREGA; VIII = Microfinancing with training for self-employment; IX = Others)

people of flood-affected areas use surface water from rivers and ponds and ground-water sources like tube wells for drinking and domestic uses. Such communities face problems related to drinking and potable water during the flood. The water supply facility by Public Health Engineering Department (PHE) is not available in most surveyed villages. In addition, the flood-affected communities face communication problems due to lack of proper roads. During the monsoon, commuters in such villages depend on boats to connect to the nearest town to earn their livelihood.

Importance of Community Resilience for the Livelihood of the Flood-Affected Communities

Communities need social and institutional support to overcome the adverse effects of flood in Barak valley region of Assam. Fifty percent of the respondents said they need government help for provision of safe drinking water in their localities as they face this problem throughout the year. Around 40% of the respondents prefer proper implementation of MGNREGA to generate employment in their localities. Micro-financing with training for self-employment is preferred by 35% of the respondents whereas 30% of respondents prefer microfinancing for starting their own fisheries. Thirty percent of respondents suggested dredging of rivulets and rivers nearby their localities to avoid the problem of flood and the same number of respondents (30%) opined for relief during major flood incidence whereas some others (25%) suggested for irrigation facility during dry season. Around 15% respondents suggested government assistance to protect their fisheries by net fencing and the rest of the

respondent (10%) need other sort of government assistance such as improvements of roads, housing facility, and loans for purchasing boats (Fig. 5b).

It may be mentioned here that Barak valley has extensive water bodies of different types like ponds, wetlands, water-logged areas, etc. (Prasad et al., 2019). These are inhabited by diverse aquatic organisms like varieties of aquatic plants and fishery resources that can be used for food and other purposes for self-consumption and commercial purposes. Community participation is a crucial mechanism to execute such livelihood options. Social solidarity and cooperation among the communities living in flood-affected areas are needed to participate in community-based livelihood activities. The problems related to lack of social and human capital of the flood-affected community, primarily due to lack of awareness, illiteracy, poverty, long tradition of backwardness, and their isolation from mainstream society, are required to be taken up to make the affected community more self-dependent and resilient.

The local communities, particularly those affected by the flood should be provided with alternative options of livelihood. As the region often faces the problem of sudden heavy rainfall and the associated incidence of flood, resulting in periodic submergence of the low-lying agricultural area, there should be an initiation of some community resilient mechanism among the local farmers to mitigate the recurrent flood problem in this region in context of their livelihood sustenance. In this regard, the traditional rice farming systems such as *Asra* and *Boro* practiced in the wetlands and water-logged low-lying regions may be improvised by introducing the concurrent practice of rice-fish culture that would ensure ecological conservation as well as economic gains (Das et al., 2014; Bhattacharjee & Das, 2018). Local workshops may be organized to create awareness among the communities about the various livelihood options they may undertake by using the existing commercially important aquatic plant resources such as *Trapa natans* (Water chestnut) and *Euryale ferox* (Water cress), which have the possibilities of bioprospection and value addition. Besides, the existing aquatic habitats may be used as nursery of fish and for culture of ornamental fishes, duck raising, and practice of floating vegetable gardens. Mushroom culture and its commercialization can be another viable livelihood options. The local youths should be encouraged to opt for various start-ups through proper training and workshop. Government institutions like Fishery, Agriculture, as well as Animal husbandry and Veterinary departments of the state along with various NGOs need to extend their support to initiate such alternative means of livelihood by aiding necessary funds and adequate training to the stakeholders and arranging the marketing facilities for the agricultural and fishery production in addition to other commercial activities. Seasonal cultivation, particularly the cultivation of vegetables and cash crops in the winter season (dry phase), is another alternative solution that requires sustainable infrastructure and techniques and proper training.

The government of Assam has taken many measures to control the flood situation in the state. As a measure of flood control, recently, many plans and policies have been implemented by the government through different grants from national and international funding agencies. The two big river festivals in Assam known as Namami-Brahmaputra and Namami-Barak, in 2017, were organized by the government. Along with the mission of overall development of the regions, the festivals

also aimed to dredge the rivers to increase the water retention capacity making these rivers suitable for navigation, thereby expanding the scope for trade and commerce (India Today, 2017 November 18). Implementation of flood control projects and the construction of many dams and barrages in the hill states of Manipur and Mizoram have controlled the flood situation to a considerable extent. Moreover, the Assam State Disaster Management Agency (ASDMA) and District Disaster Management Agency (DDMA) in the Cachar district also take measures to control floods. Several measures are taken by DDMA before, during, and after the flood. The flood-prone villages are identified by DDMA to conduct rescue and relief operations in the event of flood. It also provides relief during flood in relief camps. Both temporary rehabilitations (e.g., shelter or camps) and permanent rehabilitations (e.g., setting up of check dams, river embankments, pucca houses) are provided to the affected people on the basis of requirement (<https://cachar.gov.in>, District Flood Contingency Plan, 2020–21). At the block level, there is provision for forming a Block Disaster Management Committee (BDMC) to ensure community participation in flood management activities where the local leaders, teachers, and senior members of different localities within a development block are also involved. As per the government report, many embankments have been constructed recently to control flood caused by major overflowing rivers of the region. Both short- and long-term projects have been taken by ASDMA, DDMA, and other concerned departments of the government of Assam for construction of embankments, dams, and sluice-gates to control major flood situations in the region (ASDMA, 2016). However, it may be mentioned here that though there are various plans and policies formulated by ASDMA and DDMA for flood management in the affected villages, (<http://asdma.assam.gov.in>, village disaster management plan) these are not rolling down effectively to all the flood-affected villages of the region. The respondents are of the view that the government facilities are not sufficient for their livelihood.

Conclusion

Flood has been a long-term problem for the people of Barak Valley in Assam. Though the government has taken measures to control major flood and associated problems, the attention of the government is to be drawn to resolve the problem of seasonal flood and waterlogging conditions particularly in the low-lying regions, which affects livelihood of riparian communities. This may be done by adopting community resilient mechanisms and providing alternative means of livelihood as discussed above. At the same time, community participation is to be ensured to resolve problems associated with flood and waterlogging situations in the region. The study therefore highlights the necessity of multidimensional “top-down” and “bottom-up” approaches to flood mitigation in the study area by strategically enhancing resilience of the flood-affected communities for maintaining their livelihood in a better way. The study therefore calls for a more detailed investigation in this regard incorporating all the stakeholders, viz., the flood-affected communities, different officials related to disaster management, and policy makers so that

sustainable policy measures can be implemented looking into the nature of the terrain and ecology of this region.

Appendix-I

Part A: General information and socioeconomic characteristics of the riparian communities

1. Name of village:
2. Number of households in the village.....
3. Name of respondent:
4. Age and sex.....
5. Community.....
6. Occupation:
7. Educational Qualification.....
8. Monthly/yearly income:
9. Landholdings within wetland (area)

Part B: Utilization of wetland resources and quantity of each goods collected/harvested/extracted

1. Do you extract/utilize any wetland resources? [YES/NO];

If yes, please mention the name of the resources:

2. Do you cultivate paddy? [YES/NO]; if yes, please mention the following:

- (i) Purpose of cultivation:
 - (a) Own consumption.
 - (b) Selling in markets.
 - (c) Both.
- (ii) Cropping and harvesting months.....
- (iii) Total quantity of harvest per season.....
- (iv) Total area of paddy cultivation.....
- (v) Cost for cultivation of paddy.....
- (vi) Economic value of the total yield of paddy.....
- (vii) What are the problems you encounter

- (a) Before paddy cultivation
- (b) During paddy cultivation
- (c) After paddy cultivation

3. Do you cultivate vegetables/cash crops? [YES/NO]; if yes, please mention the following:

- (i) Purpose of cultivation:
 - (a) Own consumption.
 - (b) Selling in markets.
 - (c) Both.
- (ii) Cropping and harvesting months.
- (iii) Total quantity of harvest per season.
- (iv) Total area of vegetable cultivation.
- (v) Cost for cultivation of vegetables
- (vi) Economic value of the total yield of vegetables
- (vii) What are the problems you encounter?
 - (a) Before vegetable cultivation
 - (b) During vegetable cultivation
 - (c) After vegetable cultivation

4. Do you culture/capture fish? [YES/NO]; if yes, please mention the following:

- (i) Type of fishing:
 - (a) Capture fishery.
 - (b) Cultured fishery.
 - (c) Both.
- (ii) Purpose of fish culture:
 - (a) Own consumption.
 - (b) Selling in markets.
 - (c) Both.
- (iii) Quantity of fish harvested per season from:
 - (a) Culture fishery.
 - (b) Capture fishery.
- (iv) Average cost for per kg of culture fishery resources
- (v) Average cost for per kg of capture fishery resources
- (vi) What are the problems you encounter during
 - (a) Capture fishing
 - (b) Culture fishing

5. Do you use any other wetland resources [YES/NO]; if yes, please mention the following:

- (i) Name of the resources.
- (ii) Purpose for use:
 - (a) Fuel wood.

- (b) Fodder.
- (c) Preparation of furniture/handicraft items.
- (d) Others (please specify)

6. Wetland area from where wetland resources were collected/harvested/extracted for following uses (home garden/own plot in the wetland/community land/any other):

- (a) Fuelwood
- (b) Fodder
- (c) Raw materials for preparing handicrafts items.....
- (d) Raw materials for preparing furniture.....
- (e) Soil (sand and clay):
- (f) Other (please specify):

Part C: Perception of flood-affected communities regarding adverse effects of flood in their villages and the expected deliverables from the Government for overcoming such adverse effects.

1. What are the reasons for occurrence of flood?
2. What are the problems you face during flood?
3. What are the problems you encounter related to your livelihood?
4. How do you overcome the problems of livelihood?
5. What would you suggest in terms of intervention by any organization or the government to settle the problems related to your livelihood?

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Community Vulnerability and Disaster Risk Reduction at Sundarbans

147

Rabindranath Bhattacharyya

Contents

Introduction	2204
Storm Narrative	2204
The Problem of Community Vulnerability and Community Resilience	2205
Methodology	2206
Climatic Conditions of Sundarbans Region	2206
Community Vulnerability	2207
Causes of Vulnerability	2209
Disaster Management Plan, 2020–2021	2213
Conclusion	2213
References	2216

Abstract

This chapter attempts to explore community vulnerability and disaster risk reduction at Sundarbans answering four questions: (i) What are the microlevel learning experiences for building community resilience to the storm surge and flood in the Sundarbans areas? (ii) What are the major causes of community vulnerability? (iii) How do the disasters impact upon livelihood pattern of the community? (iv) What are the government strategies and plans for reducing disaster risk there? The methodology followed for this chapter is the field survey by the author and another field survey data collector, Sandip Samanta [who was an M.Phil. Scholar (2019–2021) of the Department of Political Science, the University of Burdwan] carried out for a number of times in various years, viz., 2013, 2016, 2020, 2021, and 2022. Other than the field survey, the government

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and nongovernment documents/reports related to state and national policies on Sundarbans and strategy for reducing community vulnerability have been consulted. Implementation of the Sendai Framework for Disaster Risk Reduction remains as the basic framework.

Keywords

Sundarbans · Cyclone · Storm surge · Aila · Amphan · Yaas · Community vulnerability · Community resilience

Introduction

Sundarbans is situated at the super confluence of Hooghly, Padma, Brahmaputra, and Meghna rivers at the Bay of Bengal, which has been crisscrossed by many rivers like Bidyadhari, Raimangal, Ichamati, Thakuran, and so many others. The whole of the Sundarbans area experiences cyclones and super cyclones on a regular basis. Sidr (2007), Aila (2009), Bulbul (2019), Amphan (2020), and Yaas (2021) are the examples of such super cyclones in the new millennium. Storm surge due to cyclone and concomitant flood have also been a regular occurrence in the Sundarbans region. Collapse of the river dams, mostly built of mud, makes the situation more complex that has increased the community vulnerabilities. Governments, at various levels, have taken steps toward disaster risk reduction, which have substantially decreased loss of human lives. But the impact of storm surge and flood disaster is manifested through the loss of homes, agricultural land, livelihood, and livestock. The research questions of this chapter are as follows: (i) What are the microlevel learning experiences for building community resilience to the storm surge and flood in the Sundarbans areas? (ii) What are the major causes of community vulnerability? (iii) How do the disasters impact upon livelihood pattern of the community? (iv) What are the government strategies and plans for reducing disaster risk there?

Storm Narrative

“It was 20 May 2020.” Ranajit Mandal, a college student, residing at Bhubaneswari village of Maipith coastal thana in the Kultali block of the South 24 Parganas district, was recollecting the horrendous experiences of Amphan. Maipith coastal thana area under Kultali main thana in the Jaynagar II block is that area where Srinibas Mondal was killed by a tiger on November 2, 2021, while sleeping on a small fishing vessel (The Telegraph Online, 4.11.2021). Maipith, like many areas in the North and South 24 Parganas, was severely affected both by cyclones Amphan and Yaas. “We had to leave our home second time after Aila cyclone during Amphan for a safe shelter,” Ranajit recollects. On that fatal day in the morning, Ranajit along with his elder brother was watching through the little open window that the asbestos roofs of

nearby houses were being thrown off or the trees being broken in halves or being uprooted. They were not leaving the home hoping that the strongest push of the cyclone would be over soon. But just before the dusk, the asbestos roof of their own house began to break. They also got the news that the embankment of Thakuran river, a little away from their home, had collapsed and all the people were moving for safe concrete (*pucca*) buildings. So the valuable deeds and papers were packed by Ranajit's father in plastic bags and were kept on the cot, the height of which was slightly elevated by putting bricks under the cot legs. His mother was sent to the flood shelter earlier. Now, Ranajit, his father, and his elder brother also had to move for nearest concrete building. They could not walk properly due to the push of the gale. It was raining forcefully as well. They stayed in the shelter until 10 p.m. along with a huge crowd and their pets like ducks, chickens, goats, and cows and came back to their home with risk to look for the condition of their home around 10 pm, once the full thrust of cyclone was over; but found the whole area as fully inundated. Ranajit had the same experience during Yaas cyclone just 1 year after Amphan.

The Problem of Community Vulnerability and Community Resilience

Maipith area was just one of the many. As per the website of the Department of Sundarbans Affairs, Government of West Bengal (https://www.sundarbanaffairswb.in/home/page/block_profile accessed on 23.3.2022), six blocks of North 24 Parganas district, viz., Haroa, Minakhan, Sandeshkhali-I, Sandeshkhali-II, Hasnabad, and Hingalganj, and 13 blocks of South 24 Parganas district, viz., Canning-I, Canning-II, Mathurapur-I, Mathurapur-II, Jaynagar-I, Jaynagar-II, Kultali, Basanti, Gosaba, Kakdwip, Sagar, Namkhana, and Pathar Pratima, constitute Sundarbans region in India. In fact, a total of 102 islands in these blocks consist of the Sundarbans, which is "criss-crossed with mighty and often turbulent estuarine rivers having no headwater linkages and a crazy maze of innumerable creeks and tributaries. Of these 102 islands, 54 islands have human habitation supporting a population of about 3.5 million" (Bandyopadhyay, 2000, p. 3926). Besides, Sundarbans deltas spread across six *upazilas* of Khulna division and two *upazilas* of Barisal division in Bangladesh. South 24 Parganas district Human Development Report mentioned, "Sundarbans is the world's largest prograding delta region that spreads over India and Bangladesh covering around 25,500 sq. k.m. The Indian part is approximately 9,630 sq. k.m." (Development and Planning Department Government of West Bengal, 291). However, there is a conjecture regarding the measurement of the total area of Sundarbans as online Encyclopaedia Britannica mentions, "The total area of the Sundarbans, including both land and water, is roughly 3,860 square miles (10,000 square km), about three-fifths of which is in Bangladesh" (<https://www.britannica.com/place/Sundarbans> accessed on 5.2.2021). It is worth mentioning here that in 1997 Sundarbans has been declared as a UNESCO World Heritage Site.

Methodology

The methodology followed for this chapter is the field survey by the author and another field survey data collector [Sandip Samanta, who was an M.Phil. Scholar (2019–2021) of the Department of Political Science, the University of Burdwan] carried out for a number of times in various years, viz., 2013, 2016, 2020, 2021, and 2022. The author visited Gosaba block and particularly Rangabelia Gram Panchayat and Bally II Gram Panchayat in November 2013, 4 years after super cyclone Aila and other than field survey interviewed Gosaba Block Development officer to get an idea about *Administrative Planning and Political Response to a Post-Disaster Reconstruction: A Study of Gosaba Block* (in Huong Ha, L. Fernando and A. Mahmood (eds.), 2015, *Strategic Disaster Risk Management in Asia*, Springer: New Delhi). Thereafter, as part of Disaster Research Project team of the Jawaharlal Nehru University (JNU), the author participated in 4 days' workshop from January 30 to February 2, 2016, on “Community Resilience and Preparedness” at Sundarbans and conducted Household Survey on Livelihood in the Bally II Gram Panchayat with three objectives in mind: (i) to explore the ways by which people coped up with the super cyclone Aila disaster in 2009; (ii) the impact on the livelihood pattern of the people of Bally II GP in the post-Aila situation; and (iii) the learning experiences of Aila. In the third week of May 2020, super cyclone Amphan struck the Sundarbans region again, and just after 1 year in the fourth week of May 2021 super cyclone Yaas caused a havoc in the same region. After both super cyclones, Sandip Samanta [who was an M.Phil. Scholar (2019–2021) of the Department of Political Science, the University of Burdwan], a primary data collector, visited the inundated areas of the Bhubaneswari Gram Panchayat of the Kultali thana of Jaynagar II block to provide relief as part of a relief team and collected data from field observation. Once the flood receded, the said field surveyor recorded the interviews of the super cyclone-affected villagers under Maipith coastal thana in February 2022 on the abovementioned research questions.

Other than the field survey, the government and nongovernment documents/reports related to state and national policies on Sundarbans and strategy for reducing community vulnerability have been consulted. Implementation of the Sendai Framework for Disaster Risk Reduction remains as the basic framework.

Climatic Conditions of Sundarbans Region

Singh (2007) of the India Meteorological Department, in his paper, has shown data regarding threefold rate of increase in the occurrence of severe cyclones in the Bay of Bengal and Arabian Sea during the intense cyclone months of May, October, and November (Singh, 2007, p.62). Manas Mondal et al. (2020) in their paper on “Micro-level Assessment of Rural Societal Vulnerability of Coastal Regions: An Insight into Sagar Island, West Bengal, India” cited Mitra et al. (2009) which reveals

that there has been more than 6% increase in surface water temperatures (SWTs) in coastal blocks of West Bengal, especially in Sagar, Kakdwip, Namkhana, and Patharpratima (eastern and western sectors), during the last three decades, and during 2003–2009 sea surface temperature also showed a rising trend (p. 60). On the basis of these findings, Mondal et al. have come to the conclusion that the frequency and severity of cyclonic storms are straightforwardly connected with the increase in sea surface temperature (p. 60).

In a report published by the Council on Energy, Environment and Water (CEEW) in December 2020, it has been observed that in India in the second decade of this millennium 58 extreme cyclonic storms have vandalized 258 districts (p. 24). North 24 Parganas has been mentioned there as one of the most affected districts. Once the cyclone-induced storm surge occurs, the whole area becomes inundated with saline water that kills fishes in ponds, damages the crops, and makes the inundated land infertile for agriculture at least for 2/3 years.

Community Vulnerability

The whole community living in 19 blocks were severely affected by super cyclone Aila in 2009, Fani and Bulbul in 2019, Amphan in 2020, and Yaas in 2021, although there was variance in the severity. According to the NASA Earth Observatory website on cyclone Aila, wind speeds during super cyclone Aila ranged from 74 kilometers per hour to 120 kilometers per hour (<https://earthobservatory.nasa.gov/images/38786/cyclone-aila> accessed on 29.3.2022). The Indian Express (May 27, 2009) reported a total of 36 fatalities by Aila only in South 24 Parganas and North 24 Parganas districts. In 2016, the author as part of the JNU disaster research team visited ten households consisting of two Muslims, three scheduled castes, three scheduled tribes, and two general caste household in the Bally II Gram Panchayat in Gosaba block of the South 24 Parganas selected on a random basis. During that survey, it was found that every household had its own story of how they were affected and how they coped up with Aila. One household narrated that they had a boat and all the members of the family along with the members of other two households of the neighborhood rode the boat when the flood water gushed into their houses collapsing one room at about 10 a.m. in the fatal morning and they were on the boat for 2 consecutive days. Before riding on the boat, they freed the livestock (like poultry birds and cows) which were lost during Aila. However, the boat, the only means of their livelihood, got damaged during this disaster, and they did not have money to repair it. So they had to sell it on a little price. It was found that the people were shifted on that fatal day to a primary school building and the young members of a club nearby rescued all the aged people. However, they could not save the livestock. What the survey team found is that:

- (i) Community is the first responder, although there was no community leader among the en masse people in the GP. The community people were the first

who rushed to save the embankment on the fatal day, although they could not save that and the embankment collapsed to the flood water.

- (ii) Just after Aila, NGO relief would come through the rivers and would be distributed on the river *ghats*. The people living deep inside the island did not get the information of relief distribution. Even if they would get the information, it would have been impossible for them to get the relief pushing flood water for a long distance.
- (iii) Households had insurance neither for their houses nor for the livestock. The households could not save their livestock and were most affected in their immediate earning by losing the cattle or poultry birds.
- (iv) Other than Rs. 10000/- as onetime compensation and 16 kg rice per household per month for 3 years since Aila occurred (both these were given by the Gram Panchayat), Aila-affected people did not get any other compensation.
- (v) In those who had little land for cultivation or pond for fishing, their land or pond became salinized because saline flood water gushed into the land as well as to the ponds. Thus, livelihood on agriculture and fishing became very much affected by the Aila disaster. In such a situation, other than working as laborers in others' farm or working as assistant to mason/unskilled laborer of any contractor outside the Bally II GP as inter-district migration, almost no skilled avenues were open for the households, struck by Aila.

Going by the lessons of Aila, there were many changes in the coastal areas of Sundarbans. In 2010, West Bengal got 300 crores of rupees from the central government for setting up cyclone shelters, which was upheld as a major step toward disaster mitigation (*Times of India, Kolkata, 21 September 2010*). Going by Map 2, one may find a total of 45 cyclone and flood shelters in the North 24 Parganas district (some are being constructed/some are there). On January 30, 2018, *Millennium Post* reported "Govt to build 45 cyclone shelters in Sunderbans." Similarly, South 24 Parganas also is going to get 15 new shelters as has been notified by the West Bengal Disaster Management and Civil Defence Department in its website (accessed on 30.3.2022). But the major problem remains the relative distance of the residence of some people from the shelter, which bars them to bring the domestic pets or all members to that place.

Super cyclones Fani and Bulbul occurred in Sundarbans in 2019. Fani had the landfall at Odisha (not in West Bengal) with a peak intensity on May 2, 2019, with 180 km per hour wind speed (*Hindustan Times, 9 May 2020*). Yet mighty super cyclone Fani, as villagers of Sundarbans region were quoted in the news report (*Mitra, Dola, The Weather Channel (TWC), 5 May 2019*), caused 7–8-feet-high salt water waves, due to which a large area became inundated with the saline water making the farmlands unusable overnight. Super cyclone Bulbul had a land fall at Sundarbans "with maximum sustained wind speeds of 110-120 kmph gusting to 130 kmph" as reported by the TWC India Edit team (9 November 2019). It claimed a total of seven lives in North 24 Parganas and South 24 Parganas (which contain Sundarbans area)

other than eight fishermen, who were missing in South 24 Parganas (The Times of India, Kolkata, 10 November, 2019). Besides, the same report mentioned that 2.73 lakh families were affected in the storm and the fishing towns of Bakkhali and Namkhana were among the worst affected. But the super cyclone could have been more disastrous, since a low tide at the time of the storm prevented the inundation of salt water (Basu, Jayanta, Down to Earth, 12 November 2019). After Bulbul came super cyclone Amphan that crossed West Bengal coast during May 16–21, 2020, with a maximum sustained wind speed of 155–165 kmph gusting to 185 kmph (Ministry of Earth Science, Government of India posted by PIB Delhi, 14 June 2020 Available at: <https://pib.gov.in/PressReleasePage.aspx?PRID=1631493> accessed on 31.3.2022). Citing the Press Release, Government of West Bengal, printed on *Anandabazar Patrika* (National Daily in Bengali), dated May 23, 2020, the Joint Rapid Need Assessment Report on Cyclone Amphan (June 2020) prepared by the State Inter Agency Group – West Bengal mentioned in the report that the following damage was caused by cyclone Amphan: (i) 86 deaths; (ii) 384 blocks/municipal corporation/municipality were affected; (iii) according to the estimate of the West Bengal government, 21,560 sq. km of area was affected in the cyclone impacting the lives of millions of people; (iv) 13.6 million people were affected/28.56 lakhs households were affected; (v) 0.618 million people were evacuated; (vi) 5136 relief camps and 1500 gruel kitchens were set up (p. 8). Just 1 year later, super cyclone Yaas again hit the Sundarbans between May 23, 2021, and May 28, 2021. On May 26, 2021, within hours of landfall, massive inundation occurred followed by surge. “As such, about 281.2 km² of land (11.6% of district area) in South 24 Parganas was flooded, followed by East Medinipur (138.7 km², 12.4% of district area) and North 24 Parganas (10.8 km², 1.7% of district area)” (Paul & Chowdhury, 30 September 2021, p. 230).

Causes of Vulnerability

- (i) Embankment: From the above discussion, two points are clear: (i) super cyclones are occurring in Sundarbans region with an increasing intensity on a regular basis; (ii) inundation of saline water due to surge causes major damage upon livelihood based on agriculture. The inundation can be resisted, if the embankment is substantially high and stable so that it does not collapse by the water force due to storm surge especially during high tide time. In the foreword of the Report (July 2021) of the Expert Committee on the protection of coastal areas and earthen embankment through vegetative solutions, prepared by the Environment Department, Government of West Bengal, it has been noted that due to co-occurrence of high tide and land fall of Yaas, 297 km river embankment and 21 km sea dikes were damaged (p. 4). After the super cyclone Yaas, The Third Pole reported on 6 July 2021 (Basu, J., The Third Pole) citing West Bengal’s minister for disaster management, that the farm lands and fresh water ponds [main sources of livelihood in the region] being flooded with salt water,

livelihoods had been badly hit during cyclone Amphan in 2020. Besides, the gushing flood water also flattened the mud huts. The same thing happened after Aila and Bulbul.

Thus, the collapse of embankment (*Baandh*) is one of the major points of vulnerability for the people living in the coastal areas of Sundarbans. *Sundarban Nodi Bandh o jibonjibika rokha committee* (Sundarbans river embankment and life-livelihood saving committee) has been demanding for concrete embankment for long (Basu, The Third Pole, 6 July 2021). But the Expert Committee on the protection of coastal areas and earthen embankment through vegetative solutions in its report marked a total length of 559 km consisting of 378 stretches of different rivers as vulnerable (p. 5). The Expert Committee emphasized upon multilayer vegetative shield solutions in Sundarbans area rather than erstwhile focus on civil engineering measures to repair damaged/breached embankments (p. 5). Thus, one may find a shift in the policy of the West Bengal government from protecting the embankment by taking civil engineering methods to creating an eco-friendly sustainable vegetative shield of the embankment. Since eco-friendly method may take a decade or more, till then civil engineering measures are to be adopted.

- (ii) Livelihood: In the interviews (February 2022), villagers double whined against the loss of livelihood like crab or fish trading due to the COVID-19-related lockdown, on the one hand, and loss of livelihood due to inundation of saline water by Amphan into the agricultural land damaging all standing crops and making the land infertile for a number of years, on the other hand. The website of the [Department of Sundarban Affairs, Government of West Bengal](https://www.sundarbanaffairswb.in/home/block), mentions the total literacy rate in all the 19 blocks as 64.30% (<https://www.sundarbanaffairswb.in/home/block> accessed on 7.4.2022), whereas the total literacy rate in West Bengal, as per the 2011 Census, is 76.26% (available at: <https://www.census2011.co.in/census/state/west+bengal.html> accessed on 4.4.2022). From this, it is clear that the literacy rate is substantially low in Sundarbans. Moreover, People's Archive of Rural India (PARI) prepared a report on October 10, 2020, on "The slowly disappearing students of Sundarbans" (available at <https://ruralindiaonline.org/en/articles/the-slowly-disappearing-students-of-sundarbans/> accessed on 6.4.2022) that mentioned a sharp rise in dropout rates (in the Sundarbans region) since 2009. The Sendai Framework for Disaster Risk Reduction 2015–2030 has specifically focused on "to anticipate, plan for and reduce disaster risk in order to more effectively protect persons, communities and countries, their livelihoods, health, cultural heritage, socioeconomic assets and ecosystems" (p. 10). The document also mentioned that committed action should be mobilized in dealing with some significant risk drivers like consequences of poverty and inequality, climate change and variability, unplanned and rapid urbanization, poor land management, and so on (p. 10). The website of the [Department of Sundarban Affairs, Government of West Bengal](https://www.sundarbanaffairswb.in/home), mentions (Demographic Information Table 1 – given above) that total scheduled castes (TSC) and total scheduled tribes (TST)

Table 1 Demographic information of Sundarbans region as per 2011 Census

	HH	TP	TM	TF	TSC	TST	TLT	MLT	FLT	TW	CULT	AL
Total Sundarbans (%)	955040	4426259	2264133	2162126	1573859	211927	2846121	1592227	1253894	1662163	203639	327556
					35.56	4.79	64.30	70.32	58.00	37.55		

Source: Website of the Dept. of Sundarban Affairs, Govt. of West Bengal (<https://www.sundarbanaffairswb.in/home/block>) accessed on 22.3.2022)
 Person/household, 4.63; person/sqkm, 996; male/female, 1000:955; decadal growth rate, 1.5%; % of cultivators in regard to TP, 4.6;

% of agril. laborers in regard to TP, 7.4

Note: HH household, TP total persons, TM total male, TF total female, TSC total scheduled castes, TST total scheduled tribes, TLT total literates, MLT male literates, FLT female literates, TW total workers, CULT cultivators, AL agricultural laborers

population percentage in respect of total population in the area is 35.56% and 4.79%, respectively. Although it is difficult to get the number of below-the-poverty-line households in Sundarbans, the poverty and illiteracy in the region remain clubbed with a large number of households particularly among the SC and ST population. In 2009 Planning Commission, the Government of India published the West Bengal Development Report where district-wise Human Poverty Index (HPI) was constructed by taking the weighted average of the indices of knowledge deprivation and that of public provisioning (p. 29). Accordingly, it was found there that South 24 Parganas had an HPI of 41.0 and North 24 Parganas had an HPI of 29.3. Also a large number of people remain excluded from the BPL listing. Being unskilled and uneducated, most of the population in the region depend on traditional forms of livelihood farming in one's own land or works as cultivators in others' land as day wage laborers, fishing in the river as well as ponds and forestry that is forest resource exploitation. Once the super cyclone occurs, these people with traditional forms of livelihood begin to migrate to urban areas as masons. Thus, the livelihood will continue to remain a major cause of vulnerability, if education and skills of the residents of Sundarbans face limited opportunities.

- (iii) Inaccessible Communication: The principal means of communications is navigation through rivers and creeks. On November 23, 2013, the then Gosaba BDO told in his interview that there was no other transport except navigation tide to reach Kumirmari, one of the 14 Gram Panchayats under Gosaba block, and it takes 3.5 hours' motorboat ride during high tide and 2 hours' journey during low tide, from the Gosaba BDO office. In terms of transport and communication, the whole of Sundarbans area is backward. Vulnerability to super cyclonic storms is increased in the Sundarbans by this inaccessible communications. Other than transport and communication, Sundarbans has not developed good information communication system despite the fact that mobile phones are now accessible to even the poorest inhabitants. It was found from the interview of the Amphan cyclone- and Yaas cyclone-affected residents of Sundarbans that before the cyclones for a couple of days nearest police stations or Panchayat offices make the miking through the villages making people aware of the imminent dangers and advise people to take shelter at the cyclone and flood shelters, which are made ready along with storage of food grains. But this could be done digitally by sending mobile SMS messages or voice messages. Also FM radio may be utilized for this purpose. Thus, there is no synchronized disaster risk management policy at a higher plane, and consequently responses, whether during pre-disaster or post-disaster phase, remain mismanaged, late, or uncoordinated. The World Bank in its report ([2014](#)) on Building Resilience for Sustainable Development of the Sundarbans: Strategy Report noted that the quality of disaster risk management in Sundarbans remains very low even "on traditional grounds of disaster planning, preparedness, and response" (p. 134). The report noted that "One of the weakest links in early warning dissemination was the inability of local authorities, such as GPs, to send warnings effectively to coastal communities" (p. 134).

Disaster Management Plan, 2020–2021

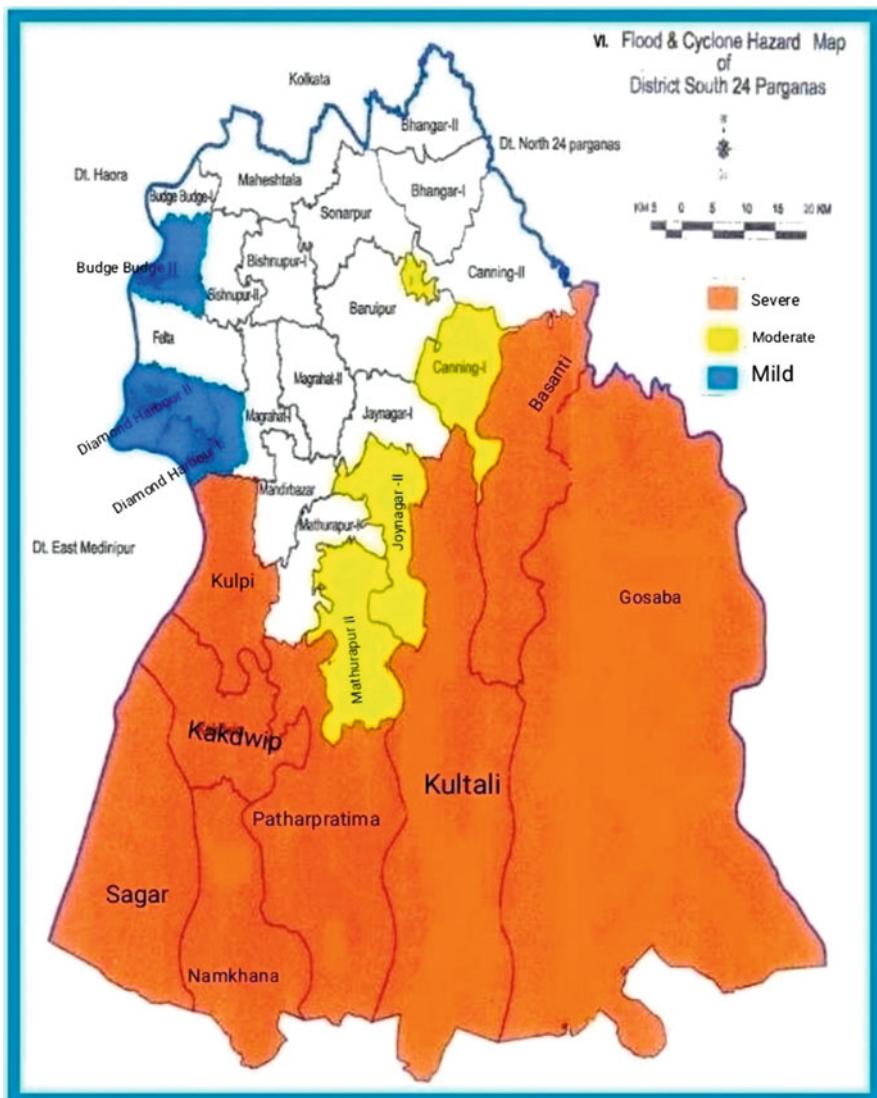
Both South 24 Parganas and North 24 Parganas districts have prepared a detailed plan for the disaster management. In the document of the South 24 Parganas district (p. 8), that detailed plan has mentioned certain targets for disaster management. These are (i) effective communication system networks; (ii) preparedness by general staff of the department and all the associated stake holders; (iii) procurement, inventory, transportation, and distribution management; (iv) setting up of the Civil Defence Establishment of Emergency Operation Centre (EOC); (v) identification of stakeholders for disaster response – early warning system (EWS); (vi) awareness, training, and capacity building; (vii) emergency support functions and preparedness; and (viii) crowdsourcing and media management.

There are certain facts which should be accepted while these plans are to be implemented. The constant change of climate and associated increase in tidal surges will remain for the time to come, and flood- and cyclone-related damage will take place on a regular interval. At the same time, building concrete embankment throughout 3500 kilometers where “the earthen embankments were built along the banks of rivers to protect the floodplain from the tidal submergence during the Raj-era” (Environment Department, 2021, Report of the Expert Committee, p. 5) is not at all possible going by the huge cost. The Report of the Expert Committee, Environment Department, Government of West Bengal, also has noted that “The embankments were built along 3500 km.-long river bank but now the length of effective embankments is not more than 1800 km” (p. 5). Realignment of embankment of the rest 1700 kms may be a long-term disaster management plan. But as short-term measures, the government should plan three things: (i) building as many cyclone and flood shelters within vicinity of the village especially in the multi-hazard areas and fully inundated areas (as shown in Maps 1 and 2) so that the residents may reach there at the time of emergency; (ii) development of education and skills of the residents of Sundarbans so that alternative livelihood could be generated in a post-disaster situation that can change the migration pattern; and (iii) development of a broad consolidated plan (World Bank, 2014, p. 139) to deal with multiple coincidental emergencies like salinity in agricultural land and fishing ponds, damage and breaking of embankment, problem of drinking water, or development of epidemics, which may develop as an aftermath of disaster.

Conclusion

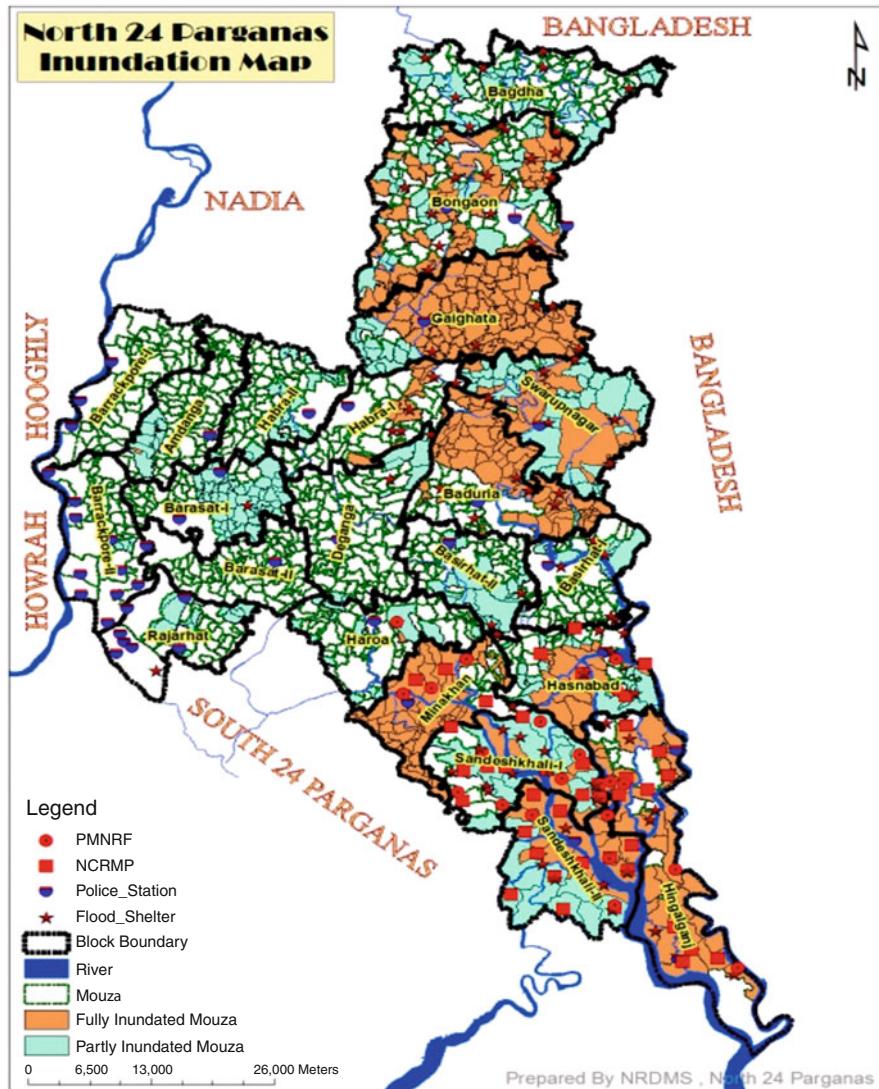
Sundarbans coastal area remains highly vulnerable from the onslaught of storms and storm surges; those are increasing due to the rise of temperature of the surface water of the Bay of Bengal. Every such onslaught destroys the livelihood and infrastructures of the coastal Sundarbans. Both the Government of India and the Government of West Bengal provide relief in every post-disaster situation. But there is a need for a comprehensive plan for disaster risk reduction. Implementation of such plan will lead to the development of capability of the local people and may cut the cost of crisis management in a post-disaster situation.

MULTI HAZARD MAP OF SOUTH 24 PARGANAS



Map 1 Multi-hazard map of South 24 Parganas. (Source: District Disaster Management Plan 2020–2021, South 24 Parganas, Government of West Bengal Office of the District Magistrate, South 24 Parganas District Disaster Management Department (Available at: <https://wbexpress.com/files/2021/05/South-24-Parganas.pdf> accessed on 29.3.2022))

District inundation Map North 24 Parganas with MPCS, Flood shelter and Police Stations



Map 2 (PMNRF, Prime Minister National Relief Fund; NCRMP, National Cyclone Risk Mitigation Project; MPCS, Multipurpose Cyclone Shelter). (Source: District Disaster Management Plan 2020–2021, North 24 Parganas, Government of West Bengal (Available at: <http://wbdmd.gov.in/writereaddata/uploaded/DP/DPNorth%202024-Parganas7789.pdf> accessed on 30.3.2022))

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Part XII

Cities and Urban Governance



Governance Is Affected by Individual to National Level: The Case of the Great East Japan Earthquake and Tsunami in the City of Rikuzentakata, Japan

148

Kiyoshi Murakami

Contents

Introduction	2222
Destruction of Rikuzentakata and Neighboring Towns	2223
Individual and Local Community Response to the Disaster	2224
Responses of Civil Society	2226
Disaster Emergency FM Radio Station	2227
Leadership of Municipality, Response, and Planning for the Reconstruction	2227
Unique and Special Recovery/Reconstruction Plan with Inclusion	2228
“Build-Back Better” – Rebuilding Rikuzentakata from Scratch	2229
“Resilient City” Against Natural Disaster	2229
“Inclusion and Accessibility”	2230
Strong Hope and Dream	2231
Young Deputy Mayor	2231
Supports by Well-Known Business Figures	2232
International Community and Global Assistance	2232
Global Appeal at Photo Exhibition	2232
Amazing Gift from Singapore	2233
TOMODACHI Initiative	2234
Conclusion	2235
References	2236

Abstract

This chapter examines post-disaster processes with the practical approaches at the Great East Japan Earthquake and Tsunami on 11 March 2011. The author discusses his practical experiences in both objective and subjective observations. The City of Rikuzentakata, Japan, completely devastated and wiped out by The

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East Japan Great Earthquake and Tsunami, has been renewed and reconstructed the entire urban city within 12 years.

Introducing the practical cases of the City of Rikuzentakata, each stake holder in the multiple layers from individual, small community, municipality and national governments, civil society, and private sectors conducts critical function to maintain the governance of the respective area. This chapter discusses practical operations in Rikuzentakata provided by each sector including the author's personal experiences and signifies the importance of the post-disaster operations for the future of the urban city.

Keywords

Japan · Tsunami · Earthquake · Disaster · Recovery · Reconstruction · Rikuzentakata

Introduction

Almost 12 years ago, a devastating 9.0 earthquake struck Japan's east coast, followed minutes later by a massive tsunami with 15-meter-high monster waves. Japan's legendary investment in earthquake-resistant design ended up with only about 100 people died in the earthquake itself although over 20,000 people lost their lives in the tsunami. The economic destruction of the "Disaster" was massive: 138,000 buildings were destroyed and \$360 billion in economic losses were incurred. This was the most expensive disaster in human history. Japanese response to the earthquake and tsunami was rapid, effective, and lifesaving (Ferris and Solis, March 11, 2013).

The author introduces his own experience and practical recovery operations in the City of Rikuzentakata, Japan, with the three-phase approaches for making its reconstruction and renewal processes after the Great East Japan Earthquake and Tsunami on 11 March 2011. The chapter discusses the experiences and responses focusing on the urban city with the active involvement of local communities, city government, civil society, private sector, the national government, and the international communities.

The City of Rikuzentakata, in northeastern Japan, was struck by a major tsunami – the product of an offshore earthquake that registered 9.0 on the Richter scale. Within the course of 5 min, the 14.5-meter-tall tsunami had covered the entire city and ultimately killed 7% of the city's population. As Exhibition 3 shows, nearly 1800 of the city's 24,000 residents died in the tsunami. Half of the households in the city lost their homes. The humanitarian response was hampered not only by the scale of devastation but also by the loss of one-third of the city's public officials in the disaster, many of whom died while working to save and protect fellow citizens. A further 185 members of the Chamber of Commerce in the city, out of 700 total members, perished in the disaster; and nearly 40% of all businesses closed (Giles, 2014).

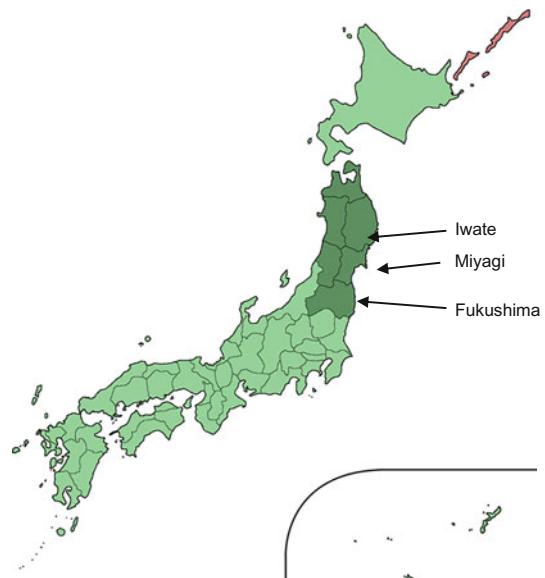
Two days earlier, on March 9, there was also an earthquake of magnitude 7.3 with its epicenter off the coast of Sanriku, the area of northeaster Japan with 300 km length in the Pacific Ocean side within three prefectures of Aomori, Iwate, and Miyagi. After all, the seismic intensity was lower than 5 in Kurihara City, Miyagi Prefecture. Iwate and Fukushima had a seismic intensity of 4. The scale of the earthquake was large, and a tsunami warning was issued. However, the tsunami that actually hit the Sanriku coast was about 20 centimeters across the board. Therefore, even though they knew that the quake on the 11th was indeed a considerable tremor and that a tsunami warning was issued immediately afterward, many people along the coast were skeptical that such a huge tsunami would come (Murakami, 2016).

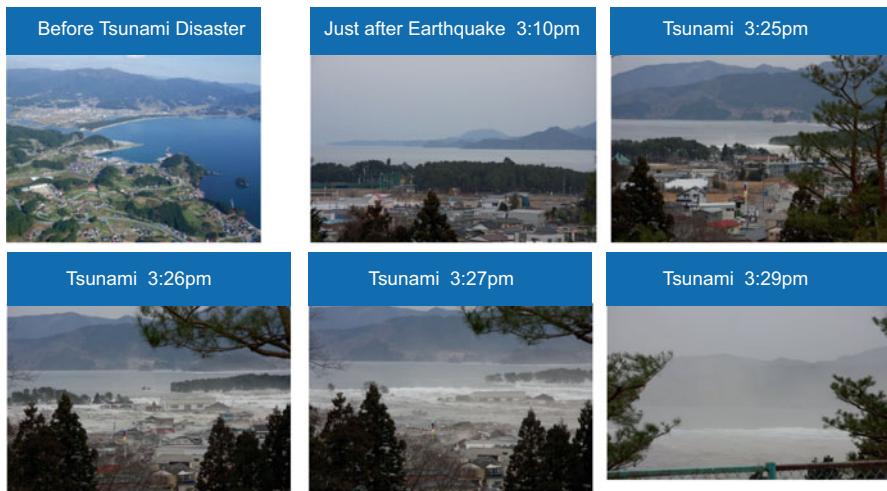
Destruction of Rikuzentakata and Neighboring Towns

Neighboring cities of Rikuzentakata are mostly fishing ports in the bays. The tsunami, literally spreading across the ocean like a giant ripple, entered the narrow bay, increased in height and momentum, and swallowed up the cities. In Miyako, the sea surface with fishing boats flowed into the urban area over several meters of seawall. In Kamaishi, the people who had evacuated to higher ground and still in the process of evacuating, was swallowed by the cold sea water. In Kesennuma, Miyagi Prefecture, next to Rikuzentakata, oil from a heavy oil tank caught fire, and the city was covered in flames in the darkness (Giles, 2014) (see Exhibition 1).

Rikuzentakata had suffered so much damage that the city center was devastated deep inside. There was no media report available from the city on the same day. This

Exhibition 1 2011 Tsunami affected prefectures on the map of Japan





Exhibition 2 Sources: The city of Rikuzentakata, presentation slides from the official report of the review committee on 2011 East Japan earthquake and tsunami, not in print

indicated the severeness of the damages and the destruction was immeasurable so that media reporters could not reach to the site of devastation. On the 12 March, the Self-Defense Forces and news helicopters were reporting aerial footage of various places (Murakami, 2016).

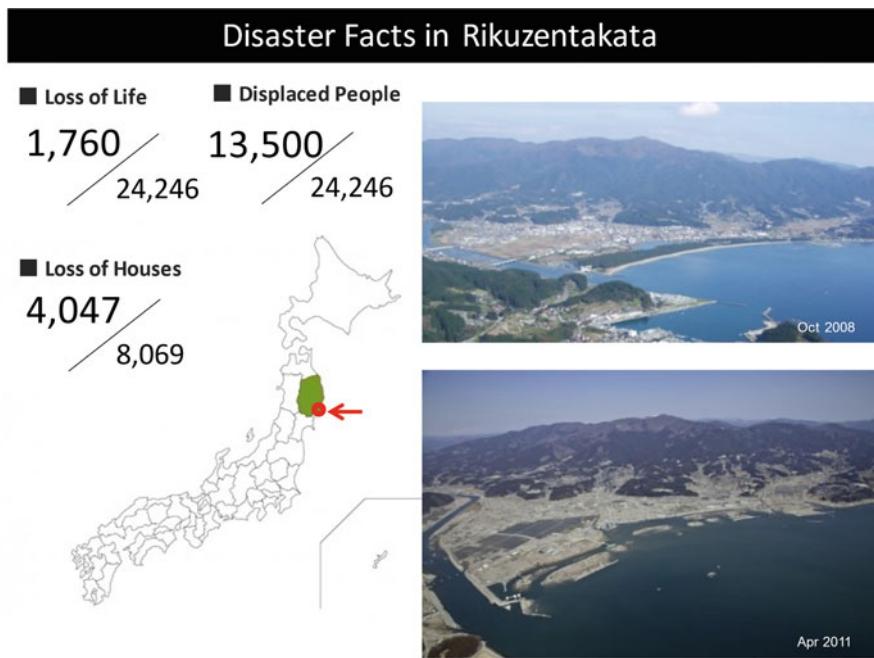
In Rikuzentakata, the “Takada Matsubara,” 70,000 pine trees on the white sands beach were completely swept away, and the tsunami rushed up the Kesen River, destroying not only the city center but also 8 km of inland area. The media reported that the third floor of the Rikuzentakata City Hall, which is a three-story building (partially a four-story building), was swallowed by seawater. Mayor Futoshi Toba, who had just become mayor 1 month prior to the fatal incident, was one of about 200 people who had to evacuate the top notch of the roof of the city hall building. The entire city was completely swamped, and some wreckages of the concrete buildings were shown over the seawater right after 14.5-meter-high tsunami clawed back from the scene (Whipp, 2011) (see Exhibition 2).

Individual and Local Community Response to the Disaster

The author had been appointed as Goodwill Ambassador of Rikuzentakata several years before this tsunami disaster and very actively promoted his own hometown to the world wherever he visited. At the time of the Earthquake and Tsunami on 11 March 2011, the author was in Hong Kong attending the regional business meeting at his company in the pacific region. Immediately after the event happened, he returned to Tokyo to gather information about the details in his hometown. Right

after arriving at the Tokyo Haneda International Airport, the author received a phone call from his long-term friend of the Japanese Diet member (The House of Representatives of the Parliament). Mr. Yoshihisa Inoue, a former Secretary-General of Komei Party of the Japanese Diet, told the author that Mr. Inoue would leave Tokyo for the affected area of Tohoku region, to find out and to give support to the region as a political party at the national level. Meantime, Mr. Toru Kikawada, a member of the House of Representatives with the Democratic Party of Japan representing the electoral district including the city of Rikuzentakata, was contacted by the author to gather the representatives of Rikuzentakata community in Tokyo area for the information gathering to be able to handle the situation for the local government of Rikuzentakata (Murakami, 2016) (Exhibitions 3 and 4).

This is an example of the author to begin conducting rescue and recovery operations. There were numbers of the similar situation among other affected local cities in the region. The residents who were severely devastated would not be able to initiate any operational movement immediately after the disaster. Therefore, many individuals having some connection with the affected area started their own activities and operations besides the government's response.



Exhibition 3 Sources: City of Rikuzentakata, Presentation by Murakami, 2015



Exhibition 4 Emergency FM radio station by AidTAKATA. Sources: Photo taken by Murakami 2011

Responses of Civil Society

There were numerous responses to the large-scale disaster in Tohoku, which had been initiated by the grassroots groups from the entire Japan. Individuals from the affected area, or those who held some connection with the people in the affected area, got together in their respective urban city to organize and establish some supporting groups. The Great East Japan Earthquake and Tsunami triggered the promotion and the development of the movements by Non-for-Profit Organizations (NPO) in Japan.

In the case of Rikuzentakata, AidTAKATA was established immediately after the 2011 Tsunami disaster by those who were originally from Rikuzentakata, holding families and relatives who were victims, living in Tokyo metropolitan area, including the author (Murakami, 2021).

The members of the civil society were unable to get information on the devastated area; so they were not able to find out the exact needs of the people suffering from the fatal tsunami. The author, who has a professional experience at UNHCR, dealing with refugees in the conflict zones as well as 2004 Tsunami disaster relief operations in Indonesia, proposed to send life-saving basic materials to his hometown. AidTAKATA asked Tokyo Coca-Cola Bottlers to deliver one truck of drinking water bottles to Rikuzentakata. Although express ways and other highway systems to Tohoku region from Tokyo area were also destroyed, AidTAKATA requested Tokyo Metropolitan government's deputy governor to issue special permission for Tokyo Coca-Cola to deliver the then mentioned relief supply to Rikuzentakata via the roads available in Japan. Thus, AidTAKATA's special permission process provided was an example for other NPOs to pursue their relief activities at the disaster area in Tohoku (Murakami, 2016).

Disaster Emergency FM Radio Station

One of the most significant and influential activities of AidTAKATA in Rikuzentakata was to establish and operate the Disaster Emergency Radio Station for the local residence, visitors, and volunteer. Immediately after the disaster with the destructive condition at the entire city, the capacity of the municipality administration was impossible to make any information dissemination to local residence in emergency shelters, and saved residential housing and building. AidTAKATA consulted with the national government on behalf of the municipality to establish the “Rikuzentakata Disaster FM Radio Station” (Temporary Disaster Broadcasting Station) to share information with the local people in timely manner (Murakami, 2016).

In the areas affected by the Great East Japan Earthquake and Tsunami, similar radio stations were established for the same purpose. In case of Ishinomaki City, Miyagi Prefecture, an existing FM radio station company immediately changed their status into the Emergency Radio Station so that the station was able to focus on broadcasting information to the residents in the affected area. However, in the case of Rikuzentakata City, the damage was too devastating for the city officials to plan and establish an emergency radio station. Six months later, the Rikuzentakata FM Radio Station was established and started broadcasting with the assistance provided by international and national NGOs and private corporations (Sankei Shimbun, 2018).

In the inaugural program of the radio station the mayor, the city council chairperson, and the author aired a live Talk-Show conveying administrative information and supporting programs for local residents. The Rikuzentakata FM Radio Station operated over 6 years from December 2011 to March 2018 while most of the other similar radio stations completed their missions in 1–3 years (Sankei Shimbun, 2018).

The Great East Japan Earthquake and Tsunami actually paved the way for the growth of Japanese local NPOs. Besides AidTAKATA, numerous other NPOs established and developed their operations, programs, and governance in Japan to serve in the affected areas. The local municipality was not able to accommodate the needs of individual and local communities in the area of mental health and social counseling; therefore, the roles of the local NPOs were crucial in each community (Whipp, 2011).

Leadership of Municipality, Response, and Planning for the Reconstruction

The leadership of the municipality government changes and lead the direction of the recovery and reconstruction. Although municipality mayors of the affected area of the Great East Japan Earthquake and Tsunami conducted their recovery activities, a strong leadership with dedication, devotion, determination, and strong compassion makes a significant difference in the budget, plan, and reconstruction quality (Giles, 2014).

In the case of Rikuzentakata, Mayor Futoshi Toba had been constantly and actively talking in the national and international media as well as making blunt and straightforward words to national diet members. His bluntness has been televised in the national and international media. His strong leadership with strong messages moved numerous political figures in Japan. Few weeks after the disaster, Mayor Toba started his consultation and discussion about the future of the city with people including city officials, national leaders, cabinet members, local citizens, and NPO members.

Mr. Futoshi Toba, who was elected Mayor of Rikuzentakata 1 month prior to the Tsunami disaster, lost his house and beloved wife leaving behind his two sons aged 10 and 8. Mayor Toba devoted himself into the rescue of residents and recovery of the city from the day one. Staying and sleeping at the office of the lunch preparation facility, which was the only public facility that was saved, he led the surviving city official staff in the rescue operations while almost all buildings were destroyed including the city hall.

For 2 months he called for meetings with senior officials every morning at 7 am, delivered food for 13,000 people in the ad hoc rescue shelters in the diversified locations of the city, learnt about the status and situation of each community in the city, and held press conferences. He did not select any particular place for his discussion of city's future. For the discussions he used the mayor's office in the prefabricated temporary government building, any temporary shelters, or the author's parent house, which was also evacuated.

Unique and Special Recovery/Reconstruction Plan with Inclusion

In December 2011, the City of Rikuzentakata designed and formulated the "Rikuzentakata Recovery and Reconstruction Plan." The fundamental concepts and philosophy for setting the plan were (1) Build-Back Better, (2) Resilient City, and (3) Inclusion and Accessibility. Within 10 years of the reconstruction period, it was considered an unprecedently aggressive plan under the locational limitation, which such a rural area far from Tokyo would not be worth investing gigantic financial budget to recover. However, Mayor Futoshi Toba and his colleagues, including the author, insisted that the national cabinet ministers and senior officials of the Japanese government revitalize the vanished town into a newly rebuilt one, with the United Nations concepts of the Build-Back Better, Resilient City, and Inclusion as the fundamental concepts of the reconstruction. Mayor Toba introduced the new concept of the inclusion as the fundamental principle of the reconstruction and the development of the city named "the urban city which do not have to use the word of Normalization." The city had set its goal to become a completely inclusive and accessible community under the reconstruction and development plan. This integrated inclusion effort has been considered the first ever introduced at the post-disaster reconstruction in the international community. Thus, Mayor Toba was officially invited to make his presence and speech at the Third World Conference on the UN Disaster Risk Reduction in Sendai, Japan, in March 2015 (Toba, [2015](#)).

The reconstruction plan used a two-phase approach; (a) Creating foundation of recovery structure (FY2011–FY2013) and (b) Implementing Recovery Plan (FY2014–FY2018). However, the second phase of the Implementation Recovery Plan extended 2 years up to the FY 2020 to solve the unforeseen problems of the landscape with hard bedrock of the mountains. The reconstruction plan consisted of over 140 projects under the following categories.

1. Seawall Improvement.
2. Urban Disaster Area Land Readjustment.
3. Collective Relocation for Disaster Prevention.
4. Construction of Disaster Recovery Public Housing.
5. Development of Reconstruction Roads (Urban Planning Roads).
6. Building All Public Facilities.
7. Takata Matsubara Tsunami Reconstruction Memorial Park.
8. Development of Central Downtown of Rikuzentakata.
9. New Business and Industry Development (see Exhibitions [5](#) and [6](#)).

“Build-Back Better” – Rebuilding Rikuzentakata from Scratch

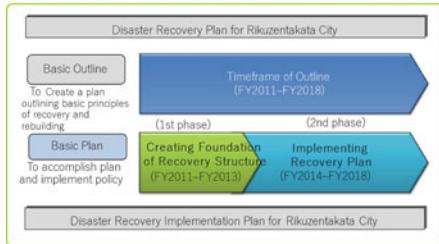
The UNDP and the World Bank started to use the term Build-Back Better (BBB) as the concept of disaster recovery is called “Build Back Better.” The idea of rebuilding the affected area is not simply to return it back to its pre-disaster state, but to transform the city into a much better state of condition and physical infrastructure by resolving the issues and obstacles the city used to have before.

All the categories and over 140 projects described above is aiming to realize the **“Build-Back Better”** in Rikuzentakata. With massive financial resources and the most advanced technologies of humankind, BBB had been testified and utilized for the city.

“Resilient City” Against Natural Disaster

As per BBB concept, Rikuzentakata was keen on the safety of the citizens and power of resilience against the natural disaster as lessons learnt from the Tsunami disaster. Especially, the Seawall Improvement projects, Land Readjustment and Relocations, Reconstruction Roads, and the Central Downtown Elevation projects were objectively implemented to seek this goal. The seawall in Rikuzentakata has been now completed with the 12 meter-high and more than 20 km long coastline of the Hirota Bay in the city. These seawalls will protect citizens from future tsunamis of 10–12 meters height in natural cycle of every 20–50 years. The central downtown area with the size of 18.7 ha has been elevated 10 meters high from the original land level so that a tsunami would not hit the elevated area. The reconstructed roads have been also realigned with wider width of about 25 meters. These new roads have been

Overview of Reconstruction Plan



Rikuzentakata Reconstruction Plan

- FirstHalf 2011-2013
 - SecondHalf 2013-2018

TotalBudget \$ 3.5 Billionfor7yrs

"BUILD BACK BETTER". Rebuilding the entire City frombelowZERO

"ResilientCity" - Strong infrastructureagainst natural disaster

"Inclusivenessand Accessibility". No one is leftbehind to proceed the reconstructiorplan and to create the societyforanyonewho wish to make a dreamtogether

4 (1) Seawall Improvement ①



Basic Plan for Rikuzentakata Reconstruction

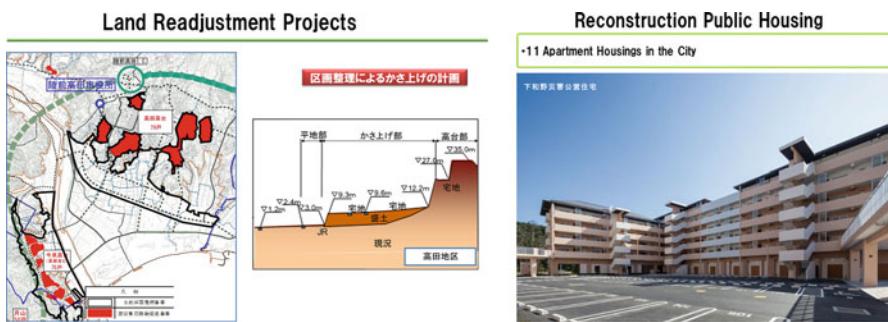


Exhibition 5 Rikuzentakata reconstruction process. Sources: City of Rikuzentakata

designed to use the emergency evacuation for local residents and visitors to drive their own automobile to higher level hills (see Exhibitions 5 and 6).

“Inclusion and Accessibility”

Rikuzentakata City's concept of "Inclusion and Accessibility," or Inclusion, means that the city is aiming to build "a city that does not need the word of normalization." It was raised as part of its post-earthquake reconstruction efforts. Normalization is



Exhibition 6 Sources: City of Rikuzentakata

one of the social welfare concepts born in Northern Europe in the 1960s. Rather than a social welfare philosophy that separates and cares for the vulnerable, such as the elderly and the disabled, it refers to a society in which people can live together with anyone without such distinctions. The city has taken it a step further and aims to become an urban city with the fundamental concept of Inclusion where people of diverse backgrounds stay together without any prejudice and discrimination. This concept had been applied to the public facilities, the memorial park, and the central downtown shopping mall as well as private restaurants and houses in the city (Toba, 2015).

Strong Hope and Dream

Young Deputy Mayor

It was impossible for anyone to believe that Rikuzentakata City, which had completely disappeared, would be rebuilt as a whole urban city in the far remote area of the Tohoku region. However, Mayor Toba identified that the severely damaged residents and business owners needed “Hope” and “Dream” in their mind to grow for future. So, Mayor Toba took unpresented decision and action for the sake of the city. He appointed 35-year-old Mr. Takashi Kubota, a young bureaucrat of the national government, as the deputy mayor of the city. He was also the first ever young deputy mayor within the Tohoku region while other deputy mayors were aged 50–65 years. Mr. Kubota was well known among central government officials as an influential person in the public relations with regard to dissemination of information through social media. Mr. Kubota initiated the communication strategy for Rikuzentakata using the Facebook to update the city’s status as well as in giving information to local residents. As this aggressive initiatives, numbers of young people in and outside of Rikuzentakata were able to update the situation and to find out possibilities to start support programs as well as migrating into the city from metropolitan area.

Supports by Well-Known Business Figures

Meantime, Mayor Toba received many offers from private sectors to support the city. Mr. Miki Watanabe, the chairman and president of Watami Group, one of the well-known largest restaurant chain companies in Japan, offered the support and assistance to local businesspeople to restart their businesses. Mr. Watanabe organized in the last weekend of August 2011 the two-day Special Town Fair for local businesspeople, who had lost all of their business facilities and buildings. Using the school yard of Takata Elementary School as a venue, the city organized the town fair with the assistance of Watami Group, a national level private company in Japan, to encourage residents and business people to re-start their own businesses. Placing the imitation of the lost business district by over 100 event tents, the event invited local residents and local business owners to reinstate the sense of the commercial mindset and the activities since the tsunami disaster occurred. At the event, special cash voucher was distributed to the residents of Rikuzentakata to be able to attend the event without any hesitation. Most of the attendees were so excited and so happy with tears to meet with familiar faces of relatives, friends, community people, business acquaintance, and others at one place. The citizens did not have a chance to meet with other people until this time since the disaster. The event was also supported by people from private and public sectors, representatives of young mayors from Japan, officials from Tokyo Stock Exchange and financial institutions, representatives from Japanese university association, etc.

International Community and Global Assistance

Global Appeal at Photo Exhibition

It was clear that the people needed support and assistance domestically and internationally right after the devastating tsunami. It was also very crucial for the people of Rikuzentakata to inform the world what happened and about the status of the people in Rikuzentakata.

AidTAKATA, a not-for profit organization, headed by the author, took up a very speedy initiative to use the technics of the United Nations. "Global Appeal" has actively been utilized by the UN whenever financial and in-kind assistance are necessary to support and give assistance to those affected by man-made and/or natural disasters as in the case of the 2011 tsunami disaster. AidTAKATA organized in early June 2011 the Rikuzentakata Photo Exhibition in the middle of Tokyo using the photos taken by a Tokyo residing photographer whose mother was living in Rikuzentakata.

AidTAKATA sent out invitation letters of the Photo Exhibition to the supporting groups as well as 20 embassies of major counties in Tokyo. Fortunately, several diplomatic corps agreed to attend the event, including the ambassadors of Italy, Republic of Singapore, and others.

The Ambassador of Italy highly praised the photo exhibition and also announced plans to auction the famous Italian Ferrari in July and donate the proceeds to the city of Rikuzentakata. Minister Bay, Deputy Chief of Mission, of Singapore Republic, expressed his sympathies to the people of Rikuzentakata, and offered to discuss the possible assistance them.

The Rikuzentakata Photo Exhibition provided an extraordinary opportunity for the guests to see their own eyes the worst state of the city of Rikuzentakata .

Amazing Gift from Singapore

Mr. Bay, Deputy Chief of Mission, of Singapore Embassy, indicated to the author that they would provide the most significant assistance and donation to the City of Rikuzentakata.

The author was acting as a representative of Rikuzentakata on behalf of Mayor Futoshi Toba in front of diplomatic corps and international organizations including the case of Singapore and the United States. The Deputy Chief of Mission of Singapore requested the author to make the presentation of the state of Rikuzentakata at the Embassy with the presence of the Ambassador, Special Envoy to Japan on Disaster Relief, President of Singapore Red Cross, and senior officials of Singaporean Foreign Ministry. In this meeting the author presented the need for assistance as well as requested a multipurpose hall be built for the residents to get together at any time. As the city was washed away by tsunami, there were no public places for residents to gather for any occasion and most of the affected residents were living in evacuation shelters and temporary housing in various places, resulting in the community being completely fragmented.

The city of Rikuzentakata and the Republic of Singapore signed up the Memorandum of Cooperation by Mayor Futoshi Toba and Ambassador Ton after many preparatory meetings and discussions done by the author and DCM Mr. Bay within 3 months.

Thus, the Republic of Singapore agreed with the City of Rikuzentakata to support Rikuzentakata by building as multipurpose hall with the financial assistance of JPY 700 million and other assistance thereafter.

In March 2015, the multi-purpose hall, later named “Singapore Hall,” was inaugurated by having the affiliated meeting of the Third UN World Conference on Disaster Risk Reduction (Murakami, 2016) (see Exhibition 7).

In addition, the Singapore Red Cross Society established the “Japan Disaster Fund 2011” and carried out fund-raising activities in cooperation with the Japanese Residents’ Association in Singapore, and collected a total of 2.2 billion yen in financial donations.

This donated fund was also used for the reconstruction works in Miyako City, Iwate Prefecture, Shichigahama City, Miyagi Prefecture, and Soma City, Fukushima Prefecture later on (Murakami, 2016) (Exhibition 8).

The Republic of Singapore donated JPY 700M for Singapore Hall



Exhibition 7 Sources: AidTAKATA

TOMODACHI Initiative

Meantime, in September 2011, Mayor Toba and the author visited the US Embassy in Tokyo and met with the Ambassador Roos and his senior advisor. At the meeting, Mayor Toba told the Ambassador that children were particularly hurt by the tsunami disaster, and requested the US Embassy to establish the “cross-cultural education” to assist school children in Rikuzentakata to change their perspectives about the way of living.

Ambassador Roos promised with Mayor Toba to provide full support for the request made. The author acted as the point of contact for the preparation for formulating and implementing the newly developed program for the children of Rikuzentakata (Murakami, 2016).

The following year, the US-Japan Council established the TOMODACHI Initiative and introduced to the Japanese business and industrial associations. The first program for Rikuzentakata was to provide the 3 day “Homestay” for 13–14-year-old school children. The participants of the program spent time with the American families in the US Navy base of Yokosuka, Japan and learnt about the new culture, spoke English, and enjoyed their life style, but they also suffered in the tiny temporary accommodation for more than 6 months. This post-earthquake reconstruction project aimed to nurture the next generation of leaders with an international



Exhibition 8 Sources: Kiyoshi Murakami

outlook and qualities through programs such as education, cultural exchange, and leadership. The impact of the program was identified by each participant's career they took now (Murakami, 2021).

Conclusion

The East Japan Great Earthquake and Tsunami on 11 March 2011 was a once-in-a-thousand-years disaster. It was also extraordinary that the extent of the devastated area and the number of people who lost their lives, suffered damages, or had their livelihoods destroyed. The City of Rikuzentakata, completely devastated and wiped out, has been renewed and reconstructed into an entire urban city within 12 years. The author introduced his own experiences and practical recovery operations within Japan as well as outspoken to the international community especially with the United States and Singapore. In the City of Rikuzentakata, it was very crucial to keep and maintain the assistance resources, promotion of support needs, as well as three phase approaches for making its reconstruction and renewal processes.

The city's main aim for the recovery and reconstruction was to come up with the designed and formulated "Rikuzentakata Recovery & Reconstruction Plan" in early stage with the consultation with residents and communities. The fundamental

concepts and philosophy for setting the plan were (1) Build-Back Better, (2) Resilient City, and (3) Inclusion and Accessibility.

Rebuilding the affected area with the idea of Build-Back Better is not simply to return it to its pre-disaster state, but to transform the entire city into a much better state of the condition and physical infrastructure by resolving the issues and obstacles the city used to have before. It may cost gigantic financial resources, but the trial attempt in Rikuzentakata has been worth investing the finance to it.

It would be a good opportunity to rebuild a resilient city. In the case of Rikuzentakata, it was so keen on the safety of the citizens and power of resilience against natural disaster as lessons learnt from the Tsunami disaster. Although the reconstruction with houses, buildings, and the fundamental infrastructure of the city have been completed, it is always crucial for local people to establish and to keep the community based disaster prevention programs. Therefore, the concept of Resilient City should be consisted with developing physical safe infrastructure in an urban city and well-trained human behavior by local community.

Although it was a very new concept at the time of the tsunami disaster in 2011, the concept of “Inclusion and Accessibility” has been the norm in the international arena after the Sendai Framework was formulated and disseminated. Residents in Rikuzentakata have been using this concept in the past decade so that city policies and practices have also been impacted by this concept of using another term of the Sustainable Development Goals (SDGs).

Through this chapter’s aim and basic concepts, it is author’s strong wish that all of the introduced measures against disaster and post-disaster could be utilized and shared with any other place wherever recovery and reconstruction is needed after a natural disaster as well as in post-conflict rebuilding of the community.

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Evaluation of Structural Reconstruction Practices: Housing Reconstruction

149

Akanchha Singh

Contents

Introduction	2238
Housing Reconstruction	2239
Gujarat Earthquake, 2001 (Map 1)	2239
Gujarat Reconstruction and Rehabilitation Policy	2239
Community-Driven Housing Recovery	2241
Assistance for Housing Recovery	2241
Housing Reconstruction: Implementation Arrangements and Outcomes	2242
Tax Concession to Industries in Kuchh	2243
Priorities in Reconstruction	2243
Public Private Partnership	2243
Disaster as an Opportunity	2244
Politics of Aid	2244
Priorities in Reconstruction	2245
Uttarakhand Floods, 2013: Pre-existing Vulnerability and Post-disaster Reconstruction (Map 2)	2245
Kerala Floods, 2018 (Map 3, Table 2)	2247
Fani Cyclone 2019 (Map 4)	2249
Damage and Loss Assessment in Fani Cyclone	2249
Damage to Housing	2249
Resilient Housing	2251
Suggestions	2254
Conclusion	2254
References	2255

Abstract

Housing reconstruction occupies a pre-eminent position when it comes to prioritizing sectors needing attention in the immediate aftermath of a disaster. It should be highlighted, however, that housing reconstruction in isolation of long-term

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mitigation strategies can achieve limited success. It has to be linked with livelihood restoration, reinforcing market linkages, environmental protection, and catering to needs of diverse sections of society while having an effective grievance redressal system in place.

Case studies across the world have shown that owner-driven housing reconstruction is the most successful model. Owners have knowledge about the cultural construction of the place and their personal as well as community needs. This when combined with knowledge of hazard, exposure to disasters, and structural safety designs can lead to the best outcome.

The physical loss of housing eclipses various significant aspects of daily existences which are impacted negatively. Although housing reconstruction is accorded a higher pedestal in finance allocation, it has a low profile on the humanitarian agenda per se. A house safeguards health, privacy, dignity, and security of individuals. Thus, housing loss inevitably exacerbates vulnerability of the survivor.

Housing reconstruction faces many hurdles; it is strategically sandwiched between short-term relief work and long-term developmental agenda of the state. Post-disaster housing reconstruction may be limited by finance, strict time frames (up to 1.5 years), institutional capacities, and inaccuracies in damage assessment in addition to implementation failures. This chapter explores various aspects of housing by taking particular case studies of four states of India: Gujarat, Kerala, Uttarakhand and Odisha.

Keywords

Housing · Reconstruction · Disaster · Development · Recovery

Introduction

Housing reconstruction occupies a pre-eminent position when it comes to prioritizing sectors needing attention in the immediate aftermath of a disaster. It should be highlighted, however, that housing reconstruction in isolation can achieve limited success. It has to be linked with livelihood restoration, reinforcing market linkages, environmental protection, and catering to needs of diverse sections of society while having an effective grievance redressal system in place.

Case studies across the world have shown that owner-driven housing reconstruction is the most successful model. Owners have knowledge about the cultural construction of the place and their personal as well as community needs. This when combined with knowledge of hazard, exposure to disasters, and structural safety designs can lead to the best outcome.

Housing Reconstruction

Research has proved that restoration of housing infrastructure is critical for individuals and households to carry on routine activities and function. Thus delay in restoration of permanent housing infrastructure impedes the ability of individuals to swiftly recover from the catastrophe. While the significance of housing reconstruction need not be emphasized, ironically housing reconstruction has emerged as central theme of recovery very recently. The process of housing reconstruction remains significantly understudied.

Gujarat Earthquake, 2001 (Map 1)

The state of Gujarat suffered massive damage in the Bhuj Earthquake. Close to 3.5 lakh houses were completely destroyed while more than 9 lakh houses suffered damage to various degrees.

The World Bank and Asian Development Bank came forward to provide financial and technical input to embark upon housing reconstruction. However, it is to be noted that the assistance provided is the basic minimum for housing reconstruction, immaterial of cost of erstwhile property of the owner. Families with totally demolished *kuchcha* houses were entitled to a maximum grant of INR. 30,000. On the other hand families which owned *pucca* houses, now totally demolished, were entitled to a maximum grant of INR 90000.

While it is true that there is differential assistance to rich and poor people, at the same time the quantum of assistance doled out to middle- and high-income houses was not enough to replace old structures (Simpson, 2013). Settling rights of tenants and homeless persons is a challenging task.

There are certain limitations which are imposed to the maximum assistance which can be provided under the central government Relief Code. According to the code not more than INR. 95,000 can be provided as compensation for totally demolished houses.

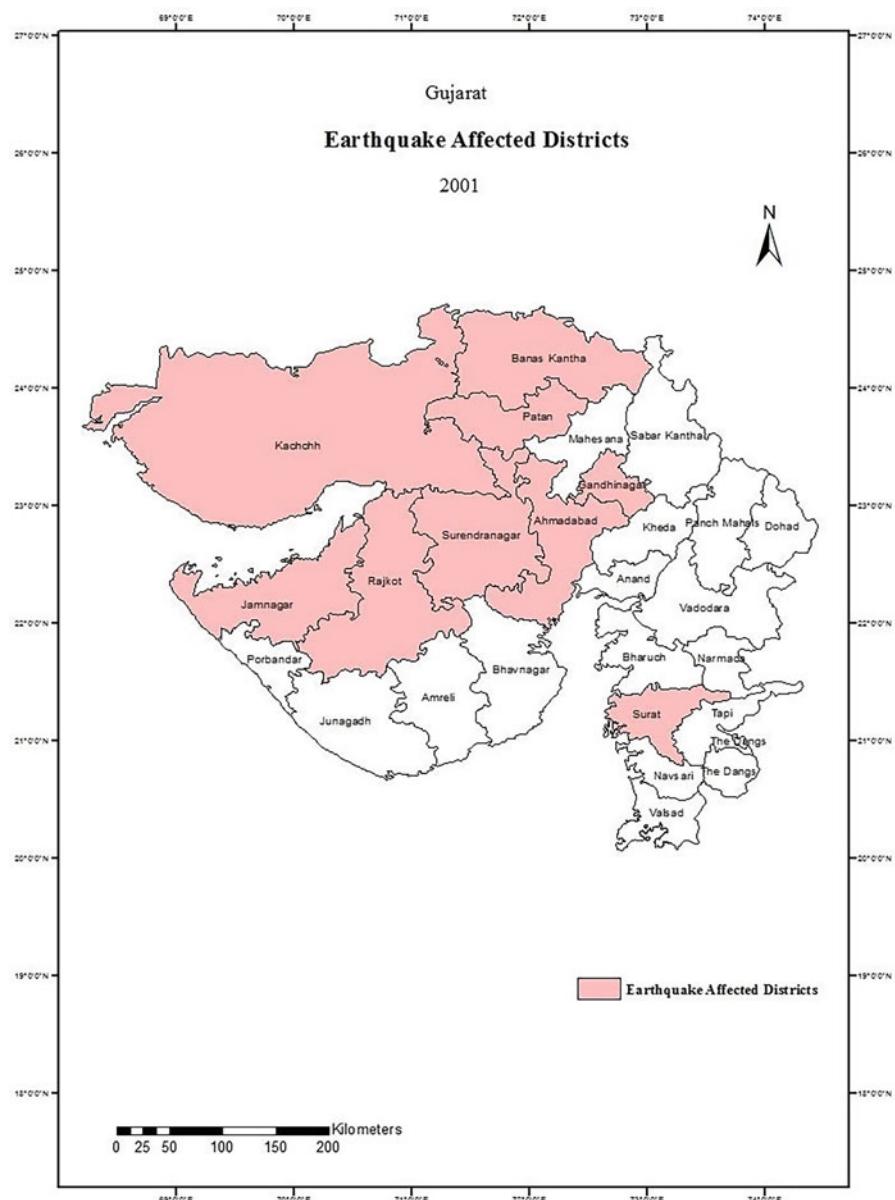
In case of Bhuj earthquake, the government undertook the ambitious target of reconstructing close to 2.3 lakh houses and repair and strengthening of about one million houses.

The state government announced five packages for reconstruction and retrofitting of demolished and damaged buildings.

Gujarat Reconstruction and Rehabilitation Policy

The GSDMA's Reconstruction and Rehabilitation policy document highlights that the government wanted to promote owner-driven reconstruction to instill a sense of confidence among the beneficiaries.

The government promised to support complete reconstruction of 2,30,000 collapsed and demolished houses. The government's housing recovery policy is



Map 1 Earthquake affected districts

participatory, community driven with technical support from the government, private sector, NGO, etc.

Community-Driven Housing Recovery

The state reconstruction policy document claims that the state has offered multiple options to the earthquake-affected population for partial to complete relocation to in situ reconstruction. The document notes that approach to reconstruction is decentralized which delegates financial and administrative and technical resources. The plan document claims that reconstruction should be a community-based, owner-driven program. Owners are responsible for carrying out reconstruction or repair through informal, formal contracts.

The recovery program has been envisaged to be a tripartite program, between the Government of Gujarat, the beneficiaries, and the private sector. While the homeowners were the primary drivers of the reconstruction process, the practical reconstruction exercise is carried out by a partnership between local artisans, NGO, contractor, cooperatives, and the home owner. The document underlines that if a home owner wants to increase his house size than before, he can approach a micro-finance institution for credit.

The government promised to support repair of more than a million damaged houses. Option was provided to the home owner to either repair their damaged houses on their own or to enter into a contract with an NGO or small contractor.

Assistance for Housing Recovery

Package 1

Package I was for the reconstruction and rehabilitation of villages in zone IV and zone V where more than half of the total houses have collapsed. It envisaged INR 3 crore per village of 200 households (1.8 crore for *pucca*, disaster-resilient houses, 70 lakh for infrastructure, 30 lakh for land acquisition, and 20 lakh for creation of emergency facilities).

Package 2

Package 2 is for settlements in seismic zone IV and V which decided to go for in situ housing reconstruction. In this case, those Below Poverty Line families which have lost their houses shall receive assistance of INR 40000, while others may receive assistance up to INR 90000 for reconstruction at the rate of INR 2000/sq. m. of built-up area to a maximum of 45 sq. m.

Package 3

Package 3 was provided for rural settlements located in zones other than Zone IV and V wherein houses have been completely destroyed or partially damaged. The assistance under this package ranges from INR 7000 for totally destroyed huts to INR 40000 for a fully damaged house. In case of assistance for repair of the house, the grant varies from INR 2000 to 20,000 depending upon the level of damage.

Package 4-A

It relates to Reinforced Cement Concrete. Under this package, assistance is provided to the owner of reinforced concrete structure for INR 3500 per sq. m. up to a maximum built-up area of 50 sq. m. Under this package, assistance is provided for repairs and structural strengthening of buildings.

Package 4-B

This package deals with load-bearing structures in municipalities and municipal corporations. Assistance will be provided at the rate of INR 2800 per sq. m. up to a maximum of 50 sq. m. (1. 40 lakh).

Package 5

It relates to the rehabilitation of four worst affected towns: Bhuj, Ajnar, Bhachau, and Rapar. Under package 5, assistance was provided at the rate of INR 3500 per sq. m. with a ceiling of INR 1.75 lakh for a maximum of 50 sq. m.

The state Reconstruction and Rehabilitation policy document underlines that the guiding principles behind these housing packages are twofold: the provisioning of basic shelter to all affected households and equity.

It is clear that the individual assistance for reconstruction of a house is for a minimum of 30 sq. m. and a maximum of 50 sq. m. The scheme of assistance compensates house owners with bigger houses better.

It is categorically stated that the intent of the reconstruction policy is to provide houses for basic sustenance. Those residential units which had non-residential uses would not be compensated for damage. While the reconstruction policy document underlines “resilience” as the desirable goal, it does not define the modalities as to how resilience will be built into the new infrastructure. There seems to be no objective criteria of defining categories of losses; “partially damaged” category is apparently the most extensive category which encompasses losses from 30 percent to 70 percent, the compensation being constant horizontally.

It is to be noted that the amount of compensation released by government is in nature of “ex gratia” grants. This to say that such a compensation is to be released based on government’s discretion and is not an obligation per se; thus it cannot be claimed as a matter of right.

Housing Reconstruction: Implementation Arrangements and Outcomes

The government of Gujarat involved a number of agencies, industrial houses, NGOs, private sector, professionals, and experts in the reconstruction exercise to support the community. Simpson based on his field visit observes that the villages which reconstructed their own houses (owner-driven approach) seemingly produced more sensible and better results as compared to contractor-driven approach. Owner-driven housing reconstruction approach improved awareness about safety designs in building. The model also encouraged local economy as artisans, laborers, and suppliers of

building materials. Even in the owner-driven model of reconstruction, private sector was co-opted as facilitator donning roles which was previously a prerogative of the state. In this manner the role of state was being re-imagined at the grassroots.

Tax Concession to Industries in Kuchh

Simpson (2013) notes that the tax concessions provided to industries to locate in Kuchh would have an impact that is more profound than the earthquake itself. Apart from partial restructuring of the state, the most significant intervention was setting up of new industries in the region. The World Bank, Asian Development Bank, and other development banks hailed this as a big success of their intervention. However, as Simpson notes, the onslaught of private sector immensely altered the character of countryside. He terms the imposition of industries as a “graft as opposed to a revolution at the grassroots.” While admitting that there isn’t anything intrinsically wrong with industrialization per se, the circumstances under which it was imposed and the desperation that accompanied it made it questionable. Notes that capitalism as a system uses public disorientation to control and profiteer. She cites example of the Indian Ocean Tsunami as a case of capitalist opportunism.

Priorities in Reconstruction

The priorities and classificatory practices that were adopted for impact assessment of the earthquake were determined by templates which were provided by the international development banks. The restoration of physical infrastructure was the primary focus objective. Field Study showed that rural urban areas were treated differently. While gender equality and livelihood generation were highlighted as key development interventions, the outcomes did not keep pace. The reconstruction policies were designed in a manner as to fundamentally alter the nature of society, economy, and polity of the region through restructuration.

Public Private Partnership

Public Private Partnership was the popular mode for housing reconstruction. A mandatory insurance policy was enforced in order to cover for future damages due to natural disasters. The loan agreement along with insurance coverage facilitated penetration of private insurance companies into rural markets. This mandatory insurance clause bode well for the profit seekers. The World Bank later acknowledged that this policy improved the customer base for insurance industry (Simpson, 2013).

By focusing largely on reconstruction of physical infrastructure and linking housing programs with private insurance, the recovery exercise has ensured that future cost of disasters would be borne by market forces, with the state playing a

facilitating role. Alternatively, the responsibility of regulation and management of disaster has now been shifted from the benevolent welfare state to the profit-seeking private sector. Watershed in that it the relationship between state and citizenry underwent a profound change. The state could no longer be held “entirely” responsible for clearing up after a disaster.

Disaster as an Opportunity

Looking at the pattern of reconstruction, it can be concluded that disasters are seen as an opportunity to redesign spaces and introduce new systems of land management and governance. Newer legislations were designed specifically in case of Gujarat to do away with protectionist measures. In accordance with the neo-liberal logic, to enable smooth functioning of the market, land records and titling procedures were improved. Simpson (2013) puts it aptly as, “policy drafted in offices in Manila, Geneva and New York rippled invisibly into provinces of Gujarat.” In case of Uttarakhand the disaster did little to ignite a debate on the faulty developmental practices of the state; rather it reinforced the priorities of the plain districts over the hilly ones.

Simpson (2013) notes that the tax concessions provided to industries to locate in Kuchh would have an impact that is more profound than the earthquake itself. Apart from partial restructuring of the state, the most significant intervention was setting up of new industries in the region. The World Bank, Asian Development Bank, and other development banks hailed this as a big success of their intervention. However, as Simpson notes, the onslaught of private sector immensely altered the character of countryside. He terms the imposition of industries as a “graft as opposed to a revolution at the grassroots.” While admitting that there isn’t anything intrinsically wrong with industrialization per se, the circumstances under which it was imposed and the desperation that accompanied it made it questionable. Notes that capitalism as a system uses public disorientation to control and profiteer. She cites example of the Indian Ocean Tsunami as a case of capitalist opportunism.

Looked at disasters as moments of hyper-consumption. Given the right set of conditions, this “moment” could be a powerful economic stimulus. To that extent, a disaster accelerates entropy of the economic system. A disaster is thus used as an opportunity to change the order of things. This may include privatizing commons, cheapening terms of trade, state forgoing its revenue, and consolidation of the private sector. Mill’s proposition of disasters as moments of hyper-consumption was exemplified in case of Gujarat wherein growth did pick up post-disaster.

Politics of Aid

The government of Gujarat in its correspondence with the World Bank while seeking financial assistance highlighted local problems as general issues needing attention. In this manner it lent an emotive urgency to its appeal. It used the earthquake as an

opportunity to speed up reforms and restructure its own institutions and governance framework to incentivize “service providers” and align with market principles. Alternately, these changes are also explained as necessary pre-conditions to be eligible for soft loans. The earthquake exposed the weaknesses and eccentricities of governance and planning in the region. The disaster, in this manner, became intrinsically linked to the general reforms of the financial sector particularly in terms of the ways in which local bodies could access funds for infrastructure development from commercial banks.

Priorities in Reconstruction

The priorities and classificatory practices that were adopted for impact assessment of the earthquake were determined by templates which were provided by the international development banks. The restoration of physical infrastructure was the primary focus objective. Field study showed that rural urban areas were treated differently. While gender equality and livelihood generation were highlighted as key development interventions, the outcomes did not keep pace. The reconstruction policies were designed in a manner as to fundamentally alter the nature of society, economy, and polity of the region through restructuration.

It is also important that housing reconstruction policy should cater to the concern of tenants in addition to that of owners.

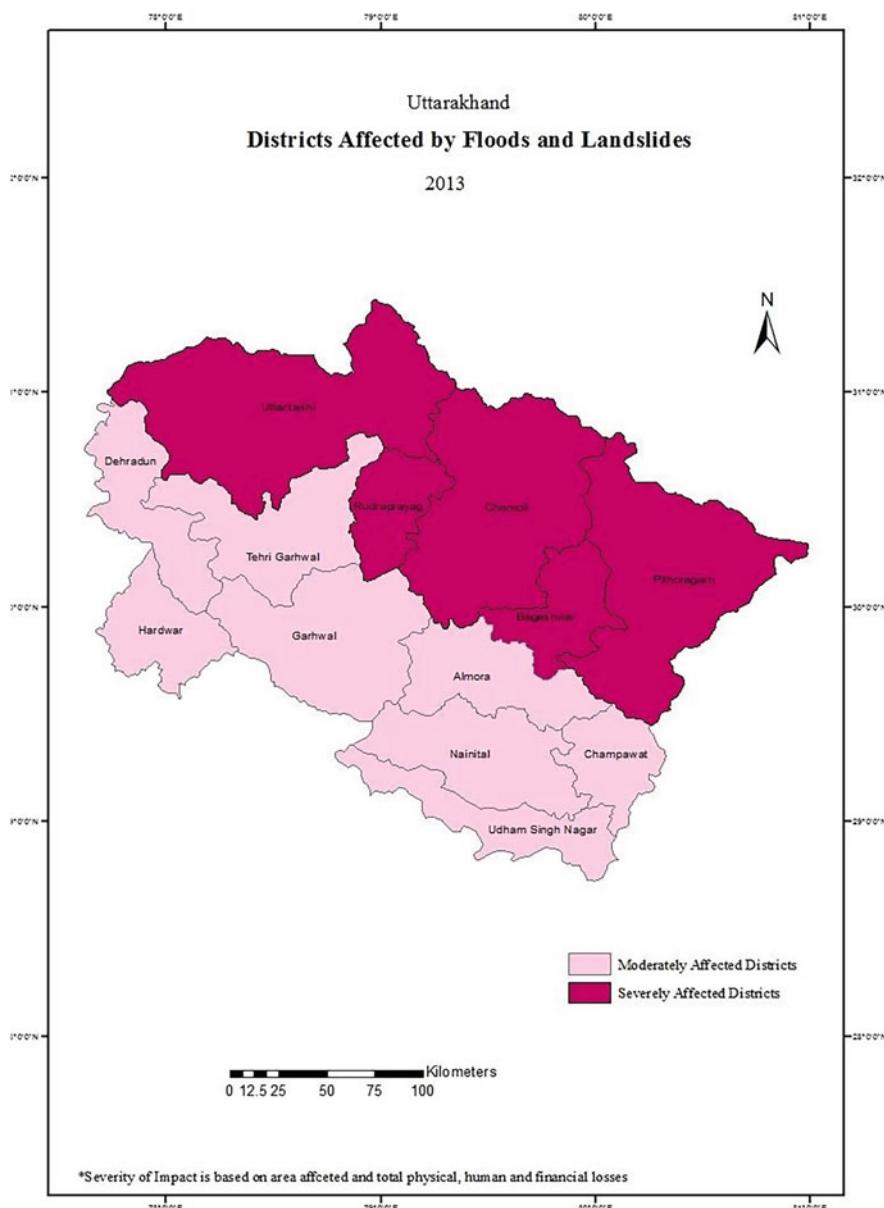
Uttarakhand Floods, 2013: Pre-existing Vulnerability and Post-disaster Reconstruction (Map 2)

In the post-disaster landscape, though structural rebuilding assumes primacy the real challenge lays in restoring lives and livelihoods of the people.

While disasters have been a part of earth’s natural system, there is a reason to believe that anthropogenic activities in the name of “development” exacerbate the impact of disasters. Taking the case of Uttarakhand floods, 2013, it is observed that years of perusal of economic growth-led development model which has little regard of the state’s predisposition to natural hazards have aggravated the impact of floods.

The economic growth centric development model was neither sustainable nor equitable which was manifested in the impact experienced by different sections of society.

It is to be recalled that the agitation which led to the creation of a separate state of Uttarakhand was based on the premise of differential needs of mountainous and plain regions. Paradoxically, the kind of development pursued later was same as in any other non-mountainous region. Though 9 of 13 districts in Uttarakhand are mountainous, policy prescriptions are tweaked towards the interest of districts in the plain.



Map 2 Districts affected by floods and landslides

The legacy of struggle to save the forests (which was epitomized by the *Chipko* movement) was pitching for a form of development which prioritizes the augmentation of human, sociocultural, and natural capital over mere economic growth.

Table 1 Uttarakhand flood, 2013: Summary of damage

Sector	Cost (INR Crores)	Damage as a percentage of Total Estimated Monetary Loss
Housing	151	3.8
Public buildings	103	2.6
Roads and bridges	2710	68.3
Urban infrastructure	127	3.2
Rural infrastructure	131	3.3
Livelihoods	167	4.2
Irrigation	140	3.5
Tourism infrastructure	117	3.0
Energy/power	266	6.7
Forest and biodiversity	54	1.4
Total	3966	

Source: Oxfam, 2015

The disaster experienced in Uttarakhand may also be seen as reminder that the model of development being pursued in the Himalayan states is destructive (Table 1).

As is evident, a substantial proportion of total loss is registered by “roads and bridges category” (68.3 percent). Losses to housing stock are estimated to be 3.5 percent which has been criticized for being an underestimation. Similarly losses to livelihood have been put at 4.2 percent. According to data from Oxfam, total Housing and Livelihood losses have been put at 8 percent.

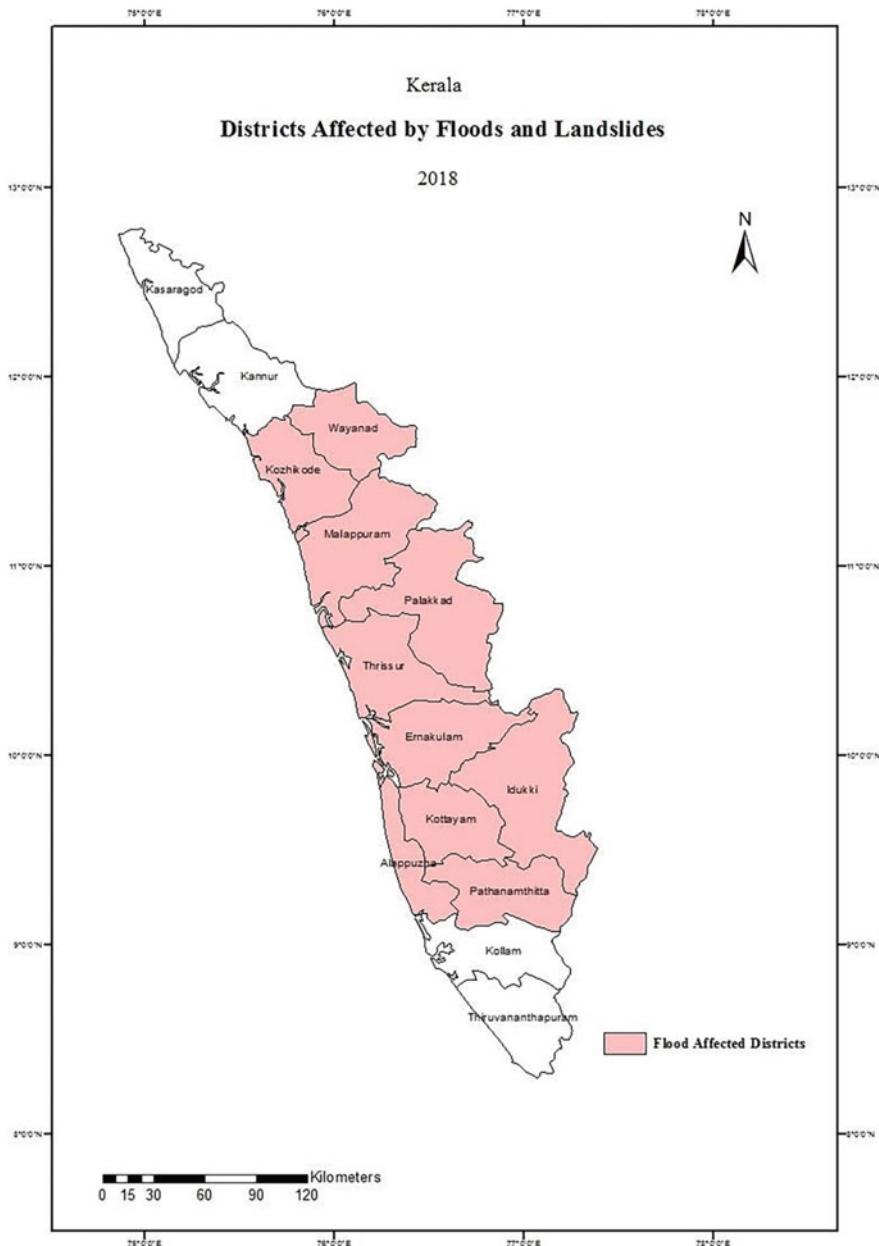
Needs Assessment exercise is crucial as it pegs damage to monetary losses. Underestimation of damage affects allotment of resources in prospective recovery. It is clear that in any disaster, infrastructure sector will account for maximum losses. This has a bearing on monetary allocation for housing reconstruction and livelihood restoration.

Kerala Floods, 2018 (Map 3, Table 2)

It is evident that the World Bank and Asian Development Banks are the major funding agencies for reconstruction in the aftermath of Kerala floods. State governments are increasingly resorting to external borrowings as domestic interest rates are high (Tables 3 and 4).

Highest package is accorded to villages in Zone IV and V where more than 50 percent of houses have collapsed. Amount devoted is to the tune of Rs. 3 crore per village (of 200 households). The package assumes Rs. 30 lakh for land acquisition, Rs. 70 lakh for infrastructure, and 1.8 crore for reconstructing.

The current system of estimation of housing damage is such that it accounts for only a fraction of total losses. Usually in absence of robust financial support, families



Map 3 Districts affected by floods and landslides

rebuild houses with substandard building material which predisposes them to prospective disaster-induced damage.

Table 2 Kerala: Summary of finance mobilization to undertake reconstruction of physical infrastructure

	Funding agency	Proposed loan amount (crore)	Percentage share
1	World Bank and Asian Development Bank	7200	45
2	RIDF	400	3
3	NIDA	2500	16
4	HUDCO	1300	8
5	Cess on GST	1000	6
6	LSGI development fund	1500	9
7	State plan savings	2000	13
8	Total	15,900	100

Source: Finance Department, Government of Kerala, order dated 12.10.2018

Fani Cyclone 2019 (Map 4)

The government of Odisha was praised for its effective preparedness and response when the cyclone hit.

However reconstructing damaged houses was more challenging. In the immediate aftermath of cyclone, the Chief Minister announced that all families with completely or substantially damaged houses would be sanctioned *pucca* houses.

Damage and Loss Assessment in Fani Cyclone

The Damage and Loss Assessment was carried out by Odisha State Disaster Management Authority, United Nations, World Bank, and Asian Development Bank.

The cyclone Fani falls in the “extremely severe cyclone” category. Damage and Loss Assessment was carried out for 15 sectors across four broad categories: Social Sector, Productive Sector, Infrastructure, and Cross Cutting sector. The Needs Assessment report itself concedes that the estimates it makes are conservative due to limited access to data on private losses. Total damage and loss are estimated at close to INR 30000 crore.

Fani affected 1.7 crore people in half of the districts of the state. Most affected districts were Puri, Khurda, Cuttack, Jagatsinghpur, and Kendrapara.

Damage to Housing

Puri has witnessed enormous damage to housing. Overall, 3.6 lakh households were damaged out of which 95 percent were in three districts of Puri, Khurda, and Cuttack. Rural and slum settlements were the worst affected. The Damage and Loss Assessment report pegged “resilient housing” recovery cost at INR 8996 crore (Tables 5, 6, 7, 8, and 9).

Table 3 Summary of disaster impact and recovery needs

Sector	Impact (Damage and Loss)	Percentage Impact	Total Recovery Needs	Percentage of Recovery Needs	Shortfall in Needs Assessment
Housing	6410	24.0	5443	33.4	15.1
Water, Sanitation and Hygiene	1361	5.1	1331	8.2	2.2
Health and Nutrition	527	2.0	600	3.7	-13.9
Agriculture, Fisheries and Livestock	7155	26.8	4498	27.6	37.1
Livelihoods	10348	38.8	3896	23.9	62.4
Education	179	0.7	214	1.3	-19.6
Disaster Risk Reduction	599	2.2	110	0.7	81.6
Environment	26	0.1	148	0.9	-469.2
Cultural Heritage	75	0.3	80	0.5	-6.7
Total	26680		16320		

Source: Data on Impact and Recovery from PDNA, Kerala 2018

Figures exclude data for power, irrigation, and transport. After accounting for these sectors, total impact is 27,000 crore, and recovery needs are 31,000 crores; shortfall in needs assessment calculated by $((\text{Impact}-\text{Recovery Needs})/\text{Impact}) \times 100$; while total loss is calculated to be INR 26680 crore, total recovery needs are placed at 16320 crore thus registering a shortfall of 10,630 crore. Data shows that damage to housing stock accounts for 24 percent of the total losses. Livelihood losses account for nearly 39 percent of the total losses. At the same time, losses to agriculture, fisheries, and livestock are estimated to be 27 percent. The recovery needs for housing has been put at INR 1000 crore greater than the damage

Of the total housing stock, rural kuchcha houses suffered maximum losses. Besides, major portion of losses have been categorized as “partial.” The “partial” loss category is taken as a homogeneous unit, with a blanket compensation of INR 3000. In reality, however, these losses have an enormous range (from 5 to 70 percent), and the meager compensation does little to address the problem (Table 10).

The Damage, Loss, and Needs Assessment exercise had estimated that the total cost of prospective recovery was INR 29,315 crore.

Table 4 Summary of capital investment for reconstruction of physical infrastructure

Sl. no.	Category	^a Proposed outlay (in crores)	Percentage share
1	PWD roads	7648	48
2	Road and sanitation	3500	22
3	Water supply	1450	9
4	Flood protection	1500	9
5	Resettlement	1000	6
6	Public buildings	200	1
7	Health	150	1
8	Biodiversity	450	3
		15,898	100

Source: Response to Application dated 29.07.2019 filed under RTI Act

^aFigures rounded off to nearest integer

Resilient Housing

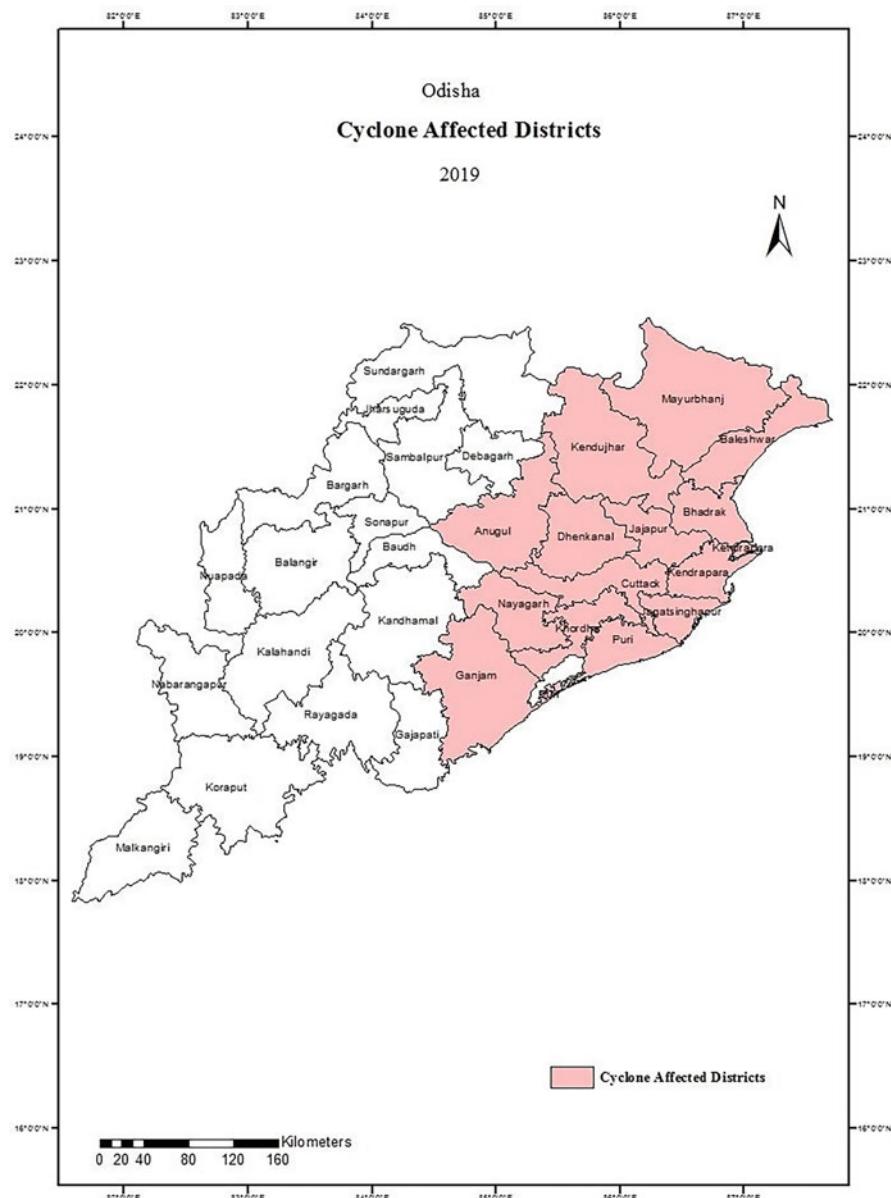
The Housing sector was worst hit by the cyclone. Approximately 3.64 lakh houses were damaged across the 14 affected districts. With the extensive damage to housing stock, the government attributed it to two factors:

- (a) The existing quality of housing stock
- (b) Poor-quality building material and construction design

The total cost of recovery of damaged housing stock was pegged at INR 8996 crore. Even with existing budgetary constraints, the recovery exercise provides an opportunity to replace old dilapidated housing stock to provide resilient and affordable housing for recurrent hazards. While there exists a consensus that reconstructed infrastructure should be resilient, there isn't much discussion on how to operationalize "resilience" in as far as reconstruction/rehabilitation policy documents are concerned. The only reference made to resilient infrastructure is in terms of the "expected cost." Also, there is lack of clarity on how this "expected cost" has been arrived at.

Experiences across countries have shown that owner-driven in situ model of housing reconstruction is most successful. In India too, owner-driven in situ reconstruction model is most popular.

Post-disaster recovery is often undertaken within a fixed time frame, usually 12–18 months. This short window for housing reconstruction is characterized by much haste. In the absence of comprehensive planning measures, the opportunity to "build back better" can be missed.



Map 4 Cyclone-affected districts in Odisha

Table 5 Damage to housing in Odisha

Category	Structure	Type of damage	No. of houses affected	Total number of houses affected
Rural	<i>Pucca</i>	Completely	937	
		Substantially	14,181	
		Partially	61,074	Rural <i>Pucca</i> 76,192
	<i>Kuchcha</i>	Completely	21,015	
		Substantially	75,556	
		Partially	122,940	Rural <i>Kuchcha</i> 219,511
	<i>Pucca</i>	Completely	379	
		Substantially	5435	
		Partially	27,352	Urban <i>Pucca</i> 33,166
	<i>Kuchcha</i>	Completely	3125	
		Substantially	12,571	
		Partially	17,178	Urban <i>Kuchcha</i> 32874
		Total	361,743	

Table 6 Damage to *pucca* houses (rural)

Rural	
Percentage of damaged <i>pucca</i> houses which are completely damaged	1.229788
Percentage of damaged <i>pucca</i> houses which were substantially damaged	18.61219
Percentage of damaged <i>pucca</i> houses which were partially damaged	80.15802

Table 7 Damage to *pucca* houses (urban)

Urban	
Percentage of damaged <i>pucca</i> houses which are completely damaged	1.142737
Percentage of damaged <i>pucca</i> houses which were substantially damaged	16.38726
Percentage of damaged <i>pucca</i> houses which were partially damaged	82.47

Table 8 Damage to *kuchcha* houses (rural)

Percentage of damaged <i>kuchcha</i> houses which are completely damaged	5.305875
Percentage of damaged <i>kuchcha</i> houses which were substantially damaged	27.26529
Percentage of damaged <i>kuchcha</i> houses which were partially damaged	67.42883

Table 9 Damage to *kuchcha* houses (urban)

Percentage of damaged <i>pucca</i> houses which are completely damaged	1.2
Percentage of damaged <i>pucca</i> houses which were substantially damaged	17.5
Percentage of damaged <i>pucca</i> houses which were partially damaged	81.3

Source: World Bank. Cyclone Fani Damage Loss and Needs Assessment (2019)

Table 10 Cost of housing damage, Fani cyclone, Odisha 2019

Type of damage to housing	Rural (number)	Urban (number)	Total (number)	Damage cost (INR crore)
Kuchcha houses damaged	219,511	32,874	252,385	1798.24
Pucca houses totally and substantially damaged	15,118	5814	20,932	596.56
Semi pucca houses partially damaged	61,074	27,352	88,426	680.44
Total	295,703	66,040	361,743	3075.24

Source: World Bank. Cyclone Fani Damage Loss and Needs Assessment (2019)

Suggestions

While the government of Odisha set records in evacuation, the relief and rehabilitation work was not as spectacular. Eleven districts of Odisha with population over one crore were affected by the cyclone. The state government announced relief of INR 95000 for families with fully damaged houses, INR 5200 for partially damaged houses and INR 3200 for minor damages.

There has been a consensus that minimalistic housing provided in the aftermath of disasters does little to address the chronic exposure in hazard prone areas. While daunting as it may seem, there is a need to radically shift from minimalistic provisioning to disaster-resilient housing. Research has shown that as opposed to popular perception, disaster-resilient housing need not necessarily be financially intensive.

Conclusion

The physical loss of housing eclipses various significant aspects of daily existences which are impacted negatively. Although housing reconstruction is accorded a higher pedestal in finance allocation, it has a low profile on the humanitarian agenda per se. A house safeguards health, privacy, dignity, and security of individuals. Thus, housing loss inevitably exacerbates vulnerability of the survivor.

Housing reconstruction faces many hurdles; it is strategically sandwiched between short-term relief work and long-term developmental agenda of the state. Post-disaster housing reconstruction may be limited by finance, strict time frames (up to 1.5 years), institutional capacities, and inaccuracies in damage assessment in addition to implementation failures.

In order to ensure better occupancy, housing designs should be in sync with the cultural sensibilities of the affected population. In situ reconstruction shows better results. Conceptualization of housing reconstruction and livelihood restoration as separate entities creates numerous problems, as was evident in case of Gujarat. It is therefore imperative to look at housing and livelihoods as seen Housing reconstruction and livelihoods restoration should be seen in a continuum.

Owner-driven, in situ mode of housing reconstruction has proven to be the most successful model worldwide. In India too, this model is gaining increasing popularity and wider acceptance.

In order to benefit from scale economies, typically a one-size-fits-all approach is adopted for housing reconstruction. Recovery experience from across the world has shown that instances in which some degree of flexibility in design is provided to beneficiaries are better received. As beneficiaries can mold and adapt structures to their convenience, the reconstructed houses have better occupancy. Besides, involvement of local community in reconstruction not just instills confidence and sense of stakeholder-ship but also aids in psychological recovery of the survivor.

While primacy at present lies in the end product of housing reconstruction, it should rather be viewed as a process. Engaging with the community and working along with them is more important rather than providing ready-made solutions.

Disasters, by their very nature, are unsettling. When faced with a challenge of such mammoth proportion, it is easy to get caught up between the binaries of conservation of status quo and large-scale reforms. While there is no one ideal way, the safest choice lies somewhere in the middle. There is a need to guard against over enthusiastic reform agenda with numerous changes in design, settlement pattern, location, and layout while ensuring that vulnerabilities of pre-disaster landscape are not exacerbated.

Housing reconstruction involves multi-stakeholder participation. While community engagement is much endorsed in theory, it is operationalized in a rather opaque manner, in reality. Reconstruction policy documents do not attempt to define the modalities of community engagement. Wherever community consultation does take place, the literature suggests that it is skewed with regard to representation and devolution of responsibilities and largely dictated by terms of the government. Thus, there exists a need to integrate community participation as a foundational component of project design while housing reconstruction is undertaken.

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Vulnerability of Coastal Communities and Livelihoods Through the Experiences of Developmental Organizations: A Case Study of Kachchh, Gujarat, India

150

Sromona Burman and Suparana Katyaini

Contents

Setting the Context: Disaster Risk in Coastal Areas and Vulnerability	2260
Methodology	2264
Sample Selection	2264
Study Area	2264
Data Collection Process	2267
Analysis	2267
Results	2268
Vulnerability to Disaster Risks	2268
Areas of Engagement of the Organization	2269
Understanding Vulnerability and the Most Vulnerable Livelihoods	2270
Understanding the Organizations' Approach to Taking Measures for Reducing Vulnerability	2272
Case Studies of Vulnerable Social Groups and Livelihoods in Kachchh District, Gujarat ...	2273
The Foot Fishermen: <i>Pagadiyas</i>	2274
The Saltpan Workers: <i>Agariyas</i>	2275
The Pastoralists: <i>Maldharis</i>	2276
Conclusion	2277
References	2278

Abstract

The coastal zones of India are susceptible to multiple and recurring natural hazards, such as cyclones, floods, coastal erosions, salinity ingress, and earthquakes. Climate change and disaster risk literature have established climate change has the potential to increase the intensity and frequency of some of these natural hazards in coastal zones of India. The natural hazards turn disastrous for communities that are dependent on coastal ecosystems for their lives and livelihoods and face an uncertain future with the disaster risk and associated climate risk. The research aimed to understand the most vulnerable social groups

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and their livelihoods in the coastal district of Kachchh, Gujarat, through the experiences of developmental organizations. The study is undertaken to address the research gap of understanding experiential knowledge of developmental organizations on disasters, developed through engagement with coastal communities over a long period of time. Through the interactions with 15 organizations, it was understood how the social and economic aspects of the traditional communities in the coastal districts of Gujarat limit their capacity to adapt to the adverse consequences and events, making them vulnerable to disasters. From the analysis of the interviews, it was inferred that the most vulnerable livelihoods in Kachchh are fishery-based (*pagadiyas*), salt-pan workers (*agariyas*), and pastoralists (*maldharis*); these are traditional and coastal ecosystems-dependent livelihoods. One prominent form of vulnerability that they experience is locational vulnerability. In addition to this, they experience social vulnerability, economic vulnerability, and structural vulnerability. Their different characteristics make them differentially vulnerable to disasters. The study emphasizes on the significance of locally relevant experiential knowledge of developmental organizations for understanding the vulnerability of traditional livelihoods and specific needs for enhancing resilience of coastal communities.

Keywords

Coastal communities · Developmental organizations · Disaster risks · Environment-development interface · Kachchh · Vulnerable livelihoods

Setting the Context: Disaster Risk in Coastal Areas and Vulnerability

Coastlines are the land and ocean interface and have unique physical, geographical, and ecological characteristics of tropical areas. They also have a high exposure to hazards and associated uncertainties. The coastal areas are usually populated, and the demographic profile of the inhabitants is always in a flux (Adger et al., 2005). Around 1/5th of the total world's population inhabits coastal areas. They depend on coastal ecosystem services like the protection of shoreline, food and nutritional security, and economic security for the well-being of their lives and livelihoods (Kabir & Serrao-Neumann, 2020). Therefore, coastlines are complex and dynamic socioecological systems (Halpern et al., 2008; World Resources Institute, 2005; Sathaye et al., 2006).

Indian coastline is the seventh longest in the world, with a length of 7516.6 km spread over nine states and two union territories located on the eastern and western boundaries of the Indian peninsula. Among these, **Gujarat** is situated in the western boundaries and covers 22% of India's coastline (Ministry of Environment, Forest and Climate Change, 2011). This vast coastline consists of Rann of Kachchh, Gulf of Kachchh, Saurashtra Coast, Gulf of Khambhat, and South Gujarat Coast (Gujarat Ecology Commission, 2008; Kankara et al., 2018; Government of India-UNDP,

MAP SHOWING THE COASTAL DISTRICTS OF GUJARAT

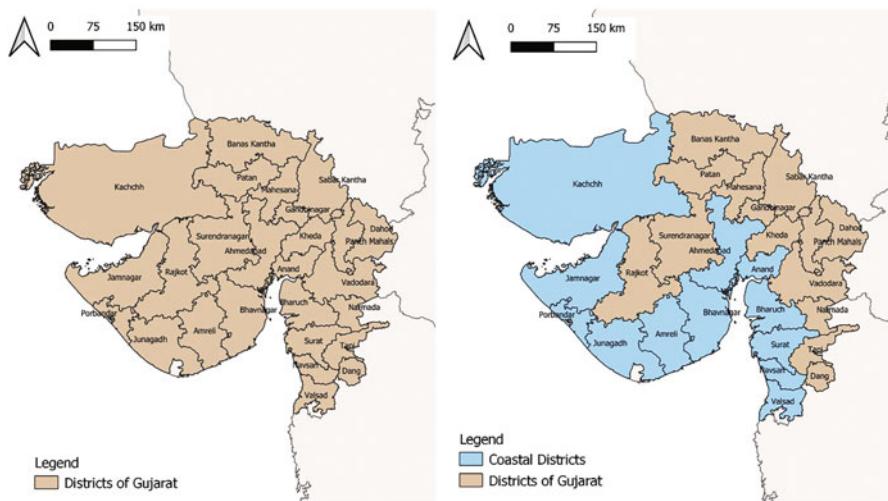


Fig. 1 Map showing coastal districts of Gujarat. (Source: Authors' own)

2007). Gujarat's coastal districts (Fig. 1) are enriched with diverse habitats, specifically mangroves, salt marshes, coral reefs, wetlands, and sea grasses reflecting geomorphic peculiarities and different physiographic features (The World Bank, 2012).

The coastal terrain, riverine nature, and high seismicity of Gujarat's coastline make it vulnerable to multiple hazards like riverine and flashfloods, associated coastal erosion, cyclones, earthquakes, and droughts (Government of India-UNDP, 2007; Government of Gujarat, 2014). Vulnerability of the Gujarat coast to sea-level rise has been scientifically established with western part of Kachchh and the north-eastern part of the Gulf of Kachchh at high risk (Mahapatra et al., 2015).

According to the Gujarat State Action Plan on Climate Change (2014), the extended coastline and high dependence of coastal communities (around 37% of the state's population) on climate-sensitive sectors like fisheries, agriculture, pastoralism, water, and forestation adds to their vulnerability (Government of Gujarat, 2014).

Interactions at the society-nature interface shape vulnerability and these interactions are crucial to understanding who is vulnerable, where the vulnerability exists, and how is vulnerability shaped (Hewitt, 1983; Bankoff et al., 2013). These dimensions of **vulnerability** have been studied through different approaches in different parts of the world. It has been conceptualized as the predisposition, sensitivities, fragilities, scarcities, or absence of capacities of human beings, livelihoods, and resources to overcome unfavorable exposure and adverse effects of hazardous episodes (UNISDR, 2004; Cardona et al., 2012). Severe and extreme weather, and climate events are termed as natural hazards. These natural hazards turn into

disasters when they adversely affect or destroy lives and livelihoods (World Meteorological Organization, 2021). United Nations Office for Disaster Risk Reduction (UNDRR) definition of disaster is “serious disruptions of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts” (UNDRR, 2022). This resonates with the different forms of vulnerabilities to disaster risk.

Gujarat's state disaster management plan (GSDMP, 2016–17) differentiates between social, structural, economic, and environmental vulnerability (Gujarat State Disaster Management Authority (GSDMA), 2016). Social vulnerability is premised on social classification, which leads to inequalities in the society and makes the socially disadvantaged groups in the society vulnerable to disaster risk. Structural vulnerability is determined by the structure and material used in housing and other protective infrastructure, emphasizing the vulnerability caused by weak and inappropriate structure and material which cannot withstand the impact of disasters. A significant section of socially marginalized population may also experience structural vulnerability due to the weak and inappropriate structure of their housing. Economic vulnerability is referred to as the limited financial resources for meeting the basic daily needs. Environmental vulnerability refers to the compromised ability of communities to respond and recover from a hazard event in an environmentally degraded area. These areas like damaged coastlines, mangroves, deforested lands, areas with high air and water pollution caused due to chemical and pharmaceutical industries, and areas facing loss of biodiversity. In addition, the vulnerabilities and capacities index (VCI) refer to material, institutional, and attitudinal vulnerabilities. Vulnerabilities arising from material dimension are determined by lack and limited income sources, educational attainment, assets, and increased exposure. Institutional vulnerability is determined by lack of social networks, kinship ties, infrastructure, warning systems, membership of disadvantaged groups, and minorities. While attitudinal vulnerability results from a gap in the sense of empowerment and the knowledge on potential hazards (Mustafa et al., 2011).

There are certain overlaps and uniqueness of these classifications of vulnerability, for instance (Mustafa et al., 2011), material vulnerability refers to both the structural and economic vulnerability of GSDMP (2016–17). Further, one form of vulnerability can have an influence on the other forms. For instance, certain social constructs can aggravate economic vulnerability to disaster risks in Gujarat, such as landlessness of the socially marginalized, lack of financial resources, and exclusion from social welfare (Government of Gujarat, 2014). Environmental deterioration also aggravates vulnerability of natural resources-dependent livelihoods. Thirdly, forms of vulnerability existing individually or layered with other forms add to the complexity in understanding the risks.

The forms of vulnerability established in the literature are relevant in the context of the Gujarat's coastal communities and their livelihoods. With the high dependence on coastal ecosystem comes a grave concern of sustainable livelihood for these

communities because of the uncertainty posed by recurrent disasters. The remoteness and physical isolation of the coastal communities reduce their access to alternative livelihoods and make them highly sensitive to such uncertainty and disruptions (Pomeroy et al., 2006). Many of the polluted reefs have undergone radical regime shifts, and the populations fail to rebuild themselves after these external shocks (Adger et al., 2005). Further, the social systems, governance, and management practices can lead to changes in the resource use patterns (Adger et al., 2005). Some of the context-specific underlying causes of vulnerability among the coastal communities are the social and economic inequalities, lack of involvement in decision-making, an absence of ownership rights, reliance on natural resource, and slow pace and lack of policies, programs, and schemes that constraint people's capacity to prevent, cope, and recover from disasters. Identifying key drivers of vulnerability is crucial for designing and implementing interventions for strengthening community's resilience (Pomeroy et al., 2006). In coastal districts of Kachchh, industrial development has led to transformation of the common lands into private industrial lands which have significant implications on the livelihoods of the pastoralist community, comprising of nomadic tribes (Government of Gujarat, 2014).

Understanding key drivers of vulnerability across households, and community scales, are relevant for organizations and authorities who are engaged in monitoring the vulnerability to disasters. Mapping various forms of vulnerability helps in strategizing action and gathers knowledge useful for the present and future disasters (Mustafa et al., 2011).

The notion of vulnerability is evolving over space and time; however, there are persistent concerns of poverty, inequality, and exclusion leading to the loss and damages associated with the disasters (Bankoff et al., 2013). These are a major barrier in the path towards sustainable development. Therefore, disaster risk reduction measures have the potential to contribute to two specific sustainable development goals (SDGs) – ending poverty in all its forms everywhere (SDG 1) and building resilient infrastructure – promote inclusive and sustainable industrialization, and foster innovation (SDG 9) (World Meteorological Organization, 2021). Therefore, reducing vulnerability to disaster risk becomes an important step towards sustainable and resilient development.

Developmental organizations also develop an approach to understanding vulnerability to disaster risk through their engagement with the community, state authority, and other organizations. In the space of disaster risk reduction, *developmental organizations' role* has been recognized to be significant (Izumi & Shaw, 2014). This recognition has come through their involvement in the process of disaster response (post disaster relief, rescue), to recovery (in the short, medium, and long term). Their specific role of representation of the vulnerable is dynamic in nature. It is shaped by the opportunities found and created through the intertwining of various activities like capacity building, community mobilization, capacity building, facilitating access to important resources, and providing support in policy decisions, as well as advocating policy changes at the environment-development interface (Katyaini et al., 2021). This highlights that the nature of mediation by the organization between the communities and other stakeholder groups is embedded in the

relations between them. As the characteristics of the communities and their relations vary with time and space, the context-specific understanding of disaster risk, vulnerability to it, and disaster risk management need to emerge. This would be crucial input in strategizing resilience building.

With this background, the study aims to address the research gap in understanding the context-specific vulnerability of coastal communities' livelihoods to disaster risk, through the perspective and experiences of non-governmental developmental organizations in Kachchh district of Gujarat. Through the methodological approach discussed in the next section, case studies of three most vulnerable livelihoods were identified and analyzed.

Methodology

The research methodology was designed to collect qualitative data on the two important aspects of the research – the most vulnerable livelihoods of the coastal communities to disasters and the most vulnerable groups or sub-groups of the coastal communities in Gujarat.

Sample Selection

There are several developmental organizations that are engaged in the disaster risk management cycle in the coastal districts of Gujarat in interaction with coastal communities and the district disaster management authority. These organizations have a diverse expertise and orientation towards disaster risk management ranging from scientific, technical, social, to environmental. With their long-term involvement (over the last 15–20 years), they have gathered context-specific knowledge on the vulnerability and resilience to disaster risk. Two organizations were approached for participating in this study and sharing their knowledge with us to unpack the layers of vulnerability of livelihoods and social groups. Depending on the referrals from this initial sample, the sample grew to 15 organizations (Table 1). Therefore, snowball sampling was used in the study. Eighteen respondents from these organizations participated in this study; among them, thirteen are men and five are women. It was important to gain an insight of women respondents because gendered lens is vital in understanding vulnerability to disaster risk.

Study Area

Kachchh as a study area was selected in consultation with these organizations (Fig. 2). Kachchh is among 12 coastal districts in Gujarat (Coastal districts of Gujarat- Kachchh, Jamnagar, Bhavnagar, Surat, Bharuch, Amreli, Porbandar,

Table 1 Organizations and their expertise in terms of areas, disasters, and livelihoods.

Organization (Codes)	Expertise	Areas	Disasters	Livelihoods
1	Consultancy Social Enterprise	Kachchh	Floods, cyclones, tsunami, earthquake, coastal erosion, droughts, salinity ingress, violent sea action, pollution, sea-level rise, industrial development & climate change.	Pastoralists - Maldhari community
2	Social Development	Kachchh	Coastal erosion, floods, industrial development and pollution	Fishing community - Pagadiyas, and Saltpan workers
3	Research and advocacy organisation	Kachchh, Diu, Sompnath, Hazira, Surat, Khambhat	Floods, cyclones, tsunami, earthquake, coastal erosion, droughts, salinity ingress, violent sea action, pollution, sea-level rise, industrial development & climate change.	Coastal communities
4	Social ecological development	Kachchh (Bhachau, Mundra, Janpath and Abdasa blocks)	Climate Change, Droughts and Floods	Pastoralists - Maldhari community
5	Research and advocacy organisation	Kachchh, Valsad, Navsari, Surat and Bharuch	Cyclone, Shoreline change, Oil spills	Fishing community - Pagadiyas (small-scale)
6	Trade Union	Kachchh (Anjar, Mandvi and Mundra)	Coastal erosion, floods, industrial development, sea-level rise	Fishing community - Pagadiyas
7	Trust and social development organisation	Kachchh, Patan, Rajkot and Surendranagar	salinity ingress, drought, coastal erosion	Saltpan workers
8	Social Development	Kachchh	Cyclones, salinity ingress, sea-level rise, unplanned development, coastal erosion	Coastal communities
9	Social and Educational development	Kachchh coastline	Floods, cyclones, tsunami, earthquake, coastal erosion, droughts, salinity ingress, violent sea action, pollution, sea-level rise, industrial development & climate change.	Coastal communities
10	Livelihood Enhancement and Development Enterprise	Kachchh and Saurashtra	Post rehabilitation and reconstruction	Coastal communities
11	Social and Economic development	Bharuch, mostly South of Gujarat, and Kachchh	Human development issues - poverty and exploitation	Marginalised communities
12	Public Charitable Trust/Social Development	Kachchh, Ahmedabad, Bhavnagar, Amreli and Gulf of Khambhat	Floods, cyclones, tsunami, earthquake, coastal erosion, droughts, salinity ingress, violent sea action, pollution, sea-level rise, industrial development & climate change.	Coastal communities

Table 1 (continued)

13	Social economic Development	Okhla mandal, Kalyanpur and Jamnagar	Human development issues - poverty and exploitation	Marginalised communities
14	Platform for the fish workers upliftment	Kachchh coastline	Floods, cyclones, tsunami, earthquake, coastal erosion, droughts, salinity ingress, violent sea action, pollution, sea-level rise, industrial development & climate change.	Fishing community
15	Fishermen Association	Kachchh (Jakhau of the Abdasa taluka)	Floods, cyclones, tsunami, earthquake, coastal erosion	Fishing community

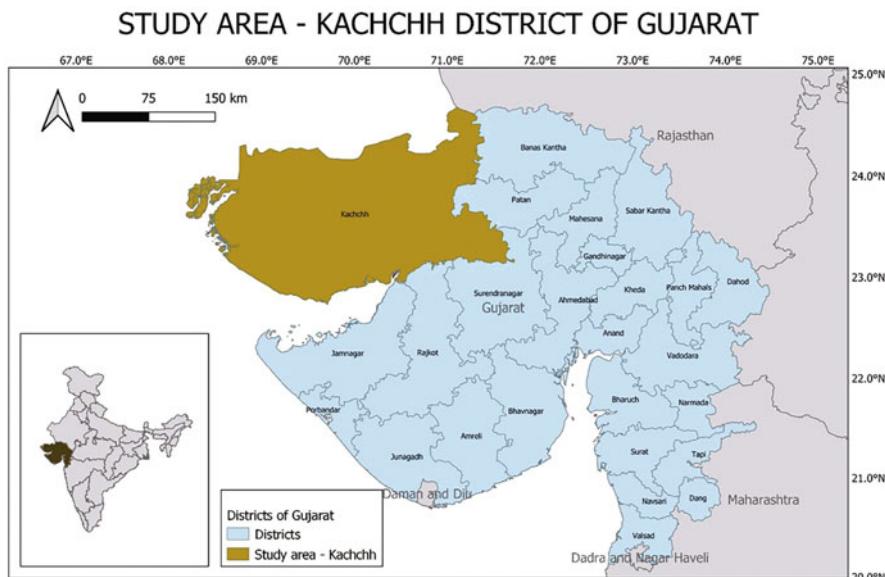


Fig. 2 Map of study area – Kachchh. (Source: Authors' own. Basic Geographic Information System (GIS) tools for collecting, storing, analyzing, and visualizing spatial data (Heuvelink et al., 1989) and QGIS software version 3.16.5 were used in mapping)

Junagadh, Ahmedabad, Anand, Navsari and Valsad). It is an important district even in the context of state disaster governance. The 2001 earthquake (26th January) which struck the district headquarter Bhuj led to establishment of the GSDMA (Government of Gujarat, 2017).

Data Collection Process

Detailed understanding of vulnerability through different organizations' view requires going beyond quantitative measures. Paavola et al. (2006: p. 274) states that "While it is easy to recognize personally the feeling of vulnerability and perhaps to grasp the outcome of vulnerability in others in a similar situation, the translation of this complex set of parameters into a quantitative metric in many ways reduces its impact and hides its complexity." Therefore, for the study, qualitative method of data collection was used. The process involved designing a semi-structured questionnaire to guide the interviews and conducting the interviews. Details of these steps are discussed in the sub-sections.

Designing the Data Collection Tool

The questionnaire consisted of sections on (1) vulnerability to disaster risks with the focus on the nature of recurring disasters and the risk they pose, (2) areas of engagement of the organizations with the coastal communities in disaster risk management, (3) most vulnerable livelihoods and social groups and the drivers of their vulnerability, and (4) understanding the organization's approach to addressing vulnerability.

Conducting the Interviews

Primary data was collected through interviews with the respondents; either individually or as a group interview, most of the interviews were with individual respondents, and only a few were with a group of two or more interviewees. The interviews were conducted during December 2020–March 2021, when the COVID-19 pandemic restricted in-person meetings. Therefore, the interviews were conducted over the telephone, or through online meetings on Zoom and Google Meet platforms, as per the preference and convenience of the interviewees.

The interviews were conducted with the ethical considerations of providing prior information to all the respondents who participated in the study. The information provided was regarding the purpose of the research, and their prior informed consent was taken for conducting the interview and recording it for aiding the process of analysis. The recording was done to ensure that all the relevant data is included. Secondly, confidentiality and anonymity of the respondents were maintained throughout the research, and a method of coding was developed to carry out further analysis. The recordings were transcribed, and the transcripts with the coding were used for the analysis.

Analysis

The responses collected were analyzed using the technique of content analysis. This analytical method is best suited for the study because it helps in drawing a valid inference from interpreting and encoding the textual information. The content analysis was carried out to develop case studies through bringing forth the case

specificities of vulnerability of social groups, and livelihoods to disaster risk, and the specific needs for building their resilience. The method is appropriate for this research as in-depth and comprehensive understanding on selected social units is pursued (Crowe et al., 2011).

Results

Vulnerability to Disaster Risks

Around 16 of the 18 respondents stated cyclone as the predominant disaster in Kachchh, followed by drought, floods, earthquake, coastal erosion, and tsunami (Fig. 3). There was also reference to sea-level rise, salinity ingress, invariability in rainfall, and violent sea action, as the changes in the meteorological and hydrological systems are leading to increase in disasters or giving rise to new forms of disasters. In addition, the respondents also expressed the concern over vulnerability to disasters created by industrial development, oil spill, and pollution.

The respondents cited the cyclone in Arabian Sea in the years 1998 and 2001 as they left massive impact on the coastline of Gujarat. In a four-category classification of degree of proneness to cyclones, Kachchh district lies in P2 category referring to high degree of proneness (Gujarat Institute of Disaster Management (GIDM), 2019). The respondents also referred to increase in cyclone being linked to climate change

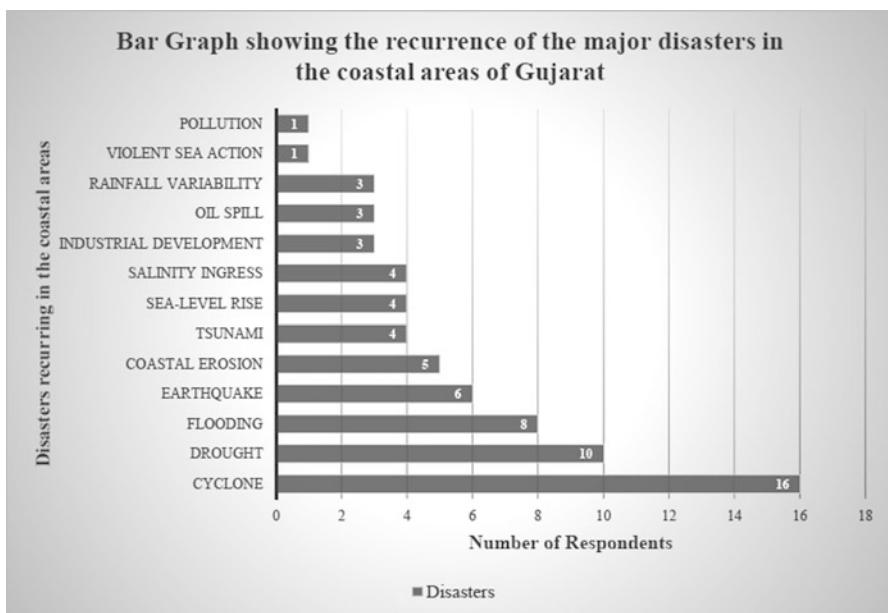


Fig. 3 Recurrence of the major disasters in coastal areas of Gujarat according to the respondents. (Source: Authors' own)

and human-induced activities. The Intergovernmental Panel on Climate Change (IPCC) special report of 2019 also indicates that the frequency of severe cyclone has increased threefold in recent times, and the intensity of the tropical cyclones is reaching to its extreme in the region (GIDM, 2019).

Kachchh has diverse ecosystems ranging from wetlands, mangrove forests, grasslands, and deserts (Mehta et al., 2019). Occurrence of droughts and floods is a major concern in Kachchh according to ten and eight respondents, respectively. The semi-arid and arid parts of Kachchh suffer from droughts. The region of Kachchh district adjacent to Banaskantha district experiences floods; in some parts, it is as frequent as every second year according to the respondents. The respondents identify the reasons for flooding as not exclusively natural; they reflected on developmental activities which have led to obstruction of the flow of water creating flood, for instance, Narmada Canal was found to create such an obstruction. Many areas where fishing is practiced were destroyed and faced degradation due to developmental activities such as setting up of power plants and human-induced floods.

The zones in the Mundra coastline, such as the 32000-megawatt power project, are present, and alongside, a 10000-megawatt project is also progressing. And for this, the industrial waste, “around 6000 lakh liters per hour of water for cooling purposes,” and then it dumped into the sea. The temperature of the seawater increases, and the fishes are migrating due to temperature rise by “approximately 7 degrees”. Due to this man-induced activity, the fish-killing phenomenon occurs because their water intake is harmful to their health. (Organization 2)

Vulnerability to tsunami is also a concern for the coastal communities according to four respondents; the tsunami of 1945 was a prominent disaster in Kachchh. It was triggered by an earthquake of 7.8 magnitude on the Richter scale along the Makran fault line (Prizomwala et al., 2022). Further, a major event acquiring “the shape of a disaster” is salinity ingress according to four respondents. One of the reasons is the presence of limestone. An associated concern with salinity ingress is salinity pollution, which leads to difficulty in getting and storing freshwater, according to the respondents. This resonated with a scientific review carried out by Siddha and Sahu (2020) suggesting that the salinity pollution is immensely noticeable in regions with coral limestone in Gujarat, which includes Kachchh.

Areas of Engagement of the Organization

The organizations have engaged in understanding different forms and levels of vulnerability to multiple disaster risks. This has been shaped by their differential engagement in disaster risk management with distinct thematic and geographical areas.

Specific organizations engage with the livelihood issues of particular social groups in the communities. Organization 6 is a trade union that focuses on livelihood rights specifically the fishermen's rights. A few organizations (1, 3, 9, 12, and 14) are

engaging in understanding the impact of climate change on livelihoods. Their field-based understanding of the global phenomenon reflects that it is a *silent and dormant phenomenon impacting the livelihoods and the ecosystem of the place*. Their consistent engagement in the northwest Kachchh has led to their perspective that climate change and associated sea-level rise intensify the variability of the disasters and severely affect the traditional livelihoods that solely depend on the natural ecosystems. This resonates with the finding that sea-level rise in the Gulf of Kutch is reported to be highest on the west coast of India Noronha et al. (2003). Four organizations (10, 11, 12 and 13) work on the issues of “poverty and malnutrition” because in their perspective *poverty is not independent of disasters or the difficulties that the people face*. They consider these as drivers of vulnerability to disaster risk which need to be combated.

Most engage in rescue and relief activities, while some of them specialize in particular stage of disaster risk management. For instance, engaging in knowledge dissemination, policy advocacy, and providing legal support for compensation based on experienced loss and damage. Around six organizations (1, 2, 3, 8, 9, 12) provide capacity building and awareness generation trainings and leadership training and facilitate institutional development and pilot demonstration of new advances, in addition to mobilizing disaster relief. Their broader orientation was building capacity of the communities on integrated risk management, where disaster is viewed as a juncture of environment and development. Within this scope, the different dimensions of sustainable development – social, economic, environmental, and institutional aspects – are covered. Organization 10 focuses on the post-disaster rehabilitation and *reconstruction in terms of infrastructure of the communities*. Organizations’ engagement at the grassroots level and in rehabilitation activity is from a more right-based approach catering to the marginalized communities’ requirements and their resettlement with relief packages that can be done equitably and transparently.

The organizations expressed that their contact with the community members is on a day-to-day basis through the presence of the “Sangathanas” (literal translation is committees). The organizations are connected to each other and governmental departments through a state level interagency coordination group to carry out disaster preparedness, response, and planning activities in different districts of Gujarat.

The organizations which are part of this study work in parts of ten talukas (sub-districts) of Kachchh including Mundra, Mandvi, Anjar, Abdasa, Bhuj, and Bhachao in Kachchh (Fig. 4), covering 924 villages. In addition to Kachchh, they also engage in Jamnagar, Amreli Bhavnagar, Surat, Bharuch, Navsari, and Valsad districts of Gujarat.

Understanding Vulnerability and the Most Vulnerable Livelihoods

The organizations’ understanding on the vulnerability of coastal communities emanates from their context-specific association. The approach of the organizations is



Fig. 4 Map of talukas in Kachchh. (Source: Extracted from <https://bhuvan-app1.nrsc.gov.in/state/AP#>)

specific to the kind of vulnerability they perceive to be most important. Most organizations perceive social vulnerability to be very prominent and hence plan interventions on addressing social vulnerability. A key finding from the interview with organizations (6, 8, 9, 11) is that *socioeconomic backwardness is the basis of a vulnerability assessment*. This is because the organizations have found that the communities belonging to the socially marginalized groups experience lack of access to relief, rescue, and even rehabilitation assistance. Their vulnerability is enhanced because of the communication gap and unawareness of the coastal and national development plans. Organizations' (7, 8, 12) interventions are in specific reference to marginalized social groups – schedule caste, schedule tribe (also known as indigenous tribes), woman (pregnant), elderly, children, and people with disability or with specific health condition which needs consistent medical attention.

In Kachchh, we have another challenge, which is the high rate of thalassemia cases there. Thalassemia is a particular genetic disorder where the person cannot produce their blood; every person needs to have blood from outside. During the disasters, we keep the account of the thalassemia patients in the communities and simultaneously cater to their requirements. (Organizations 7 and 8)

The organization (13) shared young widows with their children are being abandoned. Women are lacking equal employment and equal pay as women. This is because of stages of pregnancy, menstruation, fostering their children, and household responsibilities. This archaic system of gender inequality exists along with caste and religious minorities in the coastal communities of Kachchh. There is a “considerable gap” in recognizing the role of women and also inclusion of women in the disaster relief schemes, rehabilitation, and reconstruction plans, therefore making

them vulnerable within their social groups. Caste-based distinction in some coastal areas is reflected in Dalit family's lack of access to resources and unawareness of their entitlement. GSDMP (2016–17) also recognizes "women, adolescent girls, old age persons, differently able persons, children, destitute, below poverty line population, scheduled castes, scheduled tribes, and particularly vulnerable tribal groups."

Location is also a very important determinant of exposure to disaster risk. The organizations shared that the coastal areas have greater locational vulnerability to cyclones, tsunami, and floods, and the coping capacity to overcome locational vulnerability depends largely on knowledge, skills, and practices of the communities residing there.

A majority of the organizations stated that the Kachchh region comprises mangroves, coral reefs, mudflats, seaweeds, commercial fishes, and varied marine species. The coast provides a favorable habitat for the diverse sea-based traditional livelihoods like fishing and salt production apart from land-based occupations like agriculture, livestock rearing and breeding, and handicrafts. The large tracts of flatlands provide space for developing saltpans. The different kinds of livelihood dependent on the coastal ecosystems and natural resources in Kachchh are fisherfolks (Pagadiya), saltpan workers (Agariyas), animal herders/pastoralists (Maldaris), and agriculture. The specific resources on which fisherfolks depend are freshwater patches and marine creatures, animal herders/pastoralists rely on the mangroves, and saltpan workers depend on salt farms. Agricultural crops grown are food grains (wheat, bajra), oilseeds (castor oil, groundnut, cotton), and chili, different kinds of vegetables, and coconut trees. Coconut is mainly grown in Saurashtra by farmers with large landholdings. Due to salinity ingress in recent years, the agriculture production and practices have been affected enormously. Instances of the agricultural field where castor oil, cotton, bajra, and wheat are cultivated have been observed to *be disappearing from the coast in Gujarat because of the saline water* (Organization 12).

There are other traditional and evolving livelihoods like charcoal-making (Kohli), artisans weaving handicrafts, and leather processing. There are more than fifty thousand families engaged in leather coloring and leather processing. These families largely belong to the socially marginalized group who were historically considered as untouchables. According to the organizations interviewed, these livelihoods are vulnerable to disasters directly as well as indirectly. The loss and damages to these livelihoods are yet not completely understood, and this kind of lack of information also continues to add vulnerability to these livelihoods.

Understanding the Organizations' Approach to Taking Measures for Reducing Vulnerability

The organizations (2, 5, 6, and 12) specified that they are involved in collecting evidences which are relevant to policy-shaping, capacity building, pilot demonstrations of interventions, review and evaluation of interventions, and co-production of

the local knowledge. These are intended to help the community to be resilient by overcoming different forms of vulnerability.

An important example is the involvement of the coastal village panchayats by the organization (13, and 14) to discuss their issues and challenges and advocate for the schemes, namely, the Coastal Area Consolidated *Sagar Kheru Yojana* (literal translation is farmers of the sea “Sagar,” sea, and “Kheru” – farmer). All the communities were considered as the farmers of the sea. In addition to this scheme, 18 other schemes were consolidated to generate more opportunities for livelihoods and employment diversification in the coastal areas. One of the other developmental schemes cited as important in reducing the vulnerability to disaster risk was *Palan Mata Pita* which supports the children without parents and provides community-based rehabilitation. It is like a social responsibility of the community towards reducing the vulnerability of the children and provides access to education. To reduce the vulnerability of women in the coastal communities, there is specific emphasis on supporting women entrepreneurship, livelihood, and their social welfare.

The organizations (2, 4, 6, and 13) work in coordination with the government authorities, like gram panchayats, and the other governing institutions. In the women federations (Vinayak Samiti), drought as a disaster has been discussed, and the issue of water scarcity has been resolved through setting up developmental committees (*Mahila Mandals*, literal translation women committees) to manage water resources equitably. There are several *Mahila Mandals* organized to support women’s participation in campaigns like *Pani Roko* (literal translation is stop water).

Further, the organization’s focus is also on improving quality of living through intervention like creating a market and introducing technological innovations like solar pumps for agriculture in the Rann of Kachchh to sustain and enhance livelihoods. They also engage in innovations like “bio shield” to create a multilayer plantation of mangroves to help rejuvenate the resources and protect agriculture, animal husbandry, and fisheries from cyclones and floods. These efforts also enhance the capacity of vulnerable groups.

Case Studies of Vulnerable Social Groups and Livelihoods in Kachchh District, Gujarat

Based on the detailed discussions with the organizations, case studies of foot fishermen (*pagadiyas*), saltpan workers (*Agariyas*), and pastoralists (*Maldharis*) were identified as the most vulnerable social group and livelihoods. Around eleven organizations (2, 3, 5, 6, 8, 9, 10, 12, 13, 14, and 15) identified *pagadiyas* as the most vulnerable livelihoods, while seven of the organizations (2, 3, 7, 8, 9, 10, and 13) referred to agariyas and six organizations (2, 3, 4, 8, 9, and 12) referred to maldharis as vulnerable livelihoods. These case studies are discussed with emphasis on the context-specific vulnerabilities from the perspective of these organizations.

The Foot Fishermen: *Pagadiyas*

The intertidal zones in Kachchh are the areas where the fishermen (locally known as *Machimar*) practice a particular method of fishing on foot. In the local parlance, this method is referred to as *pagadiyas*. These intertidal zones are situated in the Bhachau, Mundra, Mandvi, and Abdasa talukas, up to the Jakhau stretch (Fig. 4). The intertidal area has conducive conditions for carrying out this traditional form of fishing, because the net is placed in the water during the low tide and the fish is caught after high tide (IL&FS, 2017). There is an inverse relationship between the tide and the height of the net used; this provides a good catch and enhances the income of the fisherfolks. Their movements are coordinated with the tides and ebb timings in a precise manner, which requires staying out in the water for many hours.

This fishing method is a seasonal livelihood spread over 4–5 months in a year; the fisherfolk migrate from their foremost villages to the banders (fishing settlements) to practice this form of livelihood. A section of the fishing community belongs to the religion of Islam. They are known as the Wagher. They are the denotified tribes (listed initially under the Indian Criminal Tribes Act of 1871) (Government of India, n.d.). One of the respondents from organization (13) traces that the origin of Wagher of Kachchh was primarily located in Okha Mandal in Jamnagar district and suggests that they have migrated according to their needs.

Wagher is most affected because they relocated to the coast for fishing as their primary and only livelihood. Their livelihood is exposed to natural and new forms of man-made disaster risk. The fish catch over time has been impacted by changes in the sea shoreline and industrial waste disposal.

The industrial development at the coast is affecting the coastal ecosystems and affects these fisherfolk through diminished access to the seacoast and intertidal zones which are the fishing grounds. Mundra block is the greatly affected in Kachchh, because it is a Special Economic Zone (SEZ). The ports and sites for the power projects are in close proximity to the fishing grounds. Major types of the industries in the coastal district of Kachchh are port-led infrastructure projects, metallurgical, textiles, chemicals, and cement industries (Gujarat Ecology Commission, n.d.).

The children and women of Wagher tribe are the most vulnerable, with absence of proper and immediate facilities for water, sanitation, and healthcare (anganwadi) and inadequate educational facilities. In addition, adjusting to changes in the language spoken at home and at school makes it challenging for the children of the Wagher tribe to attain formal education in community-run schools. The organizations interviewed shared that this has led to seclusion of the Wagher tribe members from other social groups in the coastal communities. This has implications on their lack of access to different social and loan schemes thereby reducing their capacity to withstand the loss and damage from disasters like cyclone, droughts, and floods.

The fisherwomen play significant roles in fisheries' pre- and post-harvest sectors, especially in the fish processing and marketing, and increase the household's income to a greater extent. The Wagher, due to their low literacy and awareness, find it difficult to supplement income by diversifying their livelihood sources.

Not all forms of vulnerability of these coastal communities are understood completely. This is also because of their practice of periodic migration (6–8 months) and lack of ownership of land. This also adds complexity in recognizing them in the disaster management plan, their access to disaster relief, and other disaster management activities to reduce their vulnerability.

The Saltpan Workers: Agariyas

The communities associated with the salt production in the Little Rann of Kachchh were traditionally called “agariyas.” These traditional saltpan workers came from different religious and caste groups. Most of the agariyas belong to the social category of “Other Backward Castes” and denotified tribes (Bharwada & Mahajan, 2008). Most of the agariyas live without a formal identify because of absence of land survey in the Little Rann since independence and also due to the region being notified as wildlife sanctuary in 1973 (Manzar, 2016).

Around 76% of the total salt produced in India is contributed by Gujarat, and within Gujarat significantly large production of salt takes place in the Little Rann of Kutch. Approximately 15,000 families migrate to the Little Rann of Kachchh every year to produce salt (Bharwada & Mahajan, 2008). During the salt season (September to June) (Manzar, 2016), they are under the direct sunlight of the salt flatlands, with temperature of above 45 degrees Celsius in the daytime. The abnormal rains, floods, cyclones, declining brine yields, fatal gases from wells, and high-velocity winds are the main natural risks. The agariyas dug the flatland and secure it as a shelter to guard themselves against the extreme temperature and prevailing climatic conditions. Financial assistance is provided to licensed salt workers for the damages caused by natural calamity such as abnormal rains, floods, cyclones, etc. (Government of India, 2021). This is a primary step towards reducing their vulnerability.

The marginal salt producers live in a state of chronic poverty because of multiple reasons. About one million tons of salt that is produced and extracted each year from the region is sent to states like Madhya Pradesh and Chhattisgarh and countries like Nepal. The trader gives Rs 15/100 kg of salt to the Agariyas, which has changed to Rs 140–160 per ton with time (Bharwada & Mahajan, 2008). Due to low incomes, the agariyas are caught in a debt through a faulty credit system built by middlemen, traders, and entrepreneurs. Further, there is no assurance in the price rise of their production due to market imperfections. Due to these factors, agariyas focus on maximizing the quantity of salt production rather than quality. Inferior quality of salt, seasonal nature of livelihood, subjected to various natural calamities, market shortcomings, and other production and market-related risks unfavorably affect their livelihoods. These multiple layers of vulnerability faced by agariyas indicate how it weakens their capacity to respond to and manage the risk of any disaster that strikes.

Apart from the severe economic living conditions, the agariyas have to deal with the high salt content in their bodies, leading to several severe body ailments. Their

hands and feet are often affected by salt that they have to be cut off when cremating the body, for they cannot be burnt (Mukherjee, 2018). Stamping and walking all day on the salt pans with bare feet leave agariyas with blisters and skin diseases. It is only lately that some of the NGOs have provided them with gumboots (Organization 11).

The salt workers are engaged in this traditional form of livelihood generation after generation. The periodic migration of agariyas with their family members during September–June to the salt pans has a severe impact on saltpan workers' children's education and literacy levels. With poor living conditions and remote location, these children are excluded from quality formal school education. Organization (2, and 8) has been working on supporting schools where these children of salt workers study. Government of India allocates rewards for the children of the salt workers to pursue education. Around 1580 of 3500 rewards are allocated to Gujarat (Government of India, 2021). This is an initial step towards building their resilience.

The Pastoralists: Maldharis

Through interaction with organization (4), vulnerability of *maldharis* who breed a unique variety of camel referred to as Kharai camel was inferred. They consist of Jats and Rabaris; predominantly, male members of these two social groups engage in camel rearing, while a few women from the Jat community are involved. Camel rearing as a livelihood activity is practiced generation after generation.

According to a report by Sahjeevan (2010–2011), there were more than 12,000 camels in Kachchh district, out of which 10,335 were Kachchhi camel and the rest 2173 were Kharai camel. Kharai camel has a unique ability to swim in the open seas for a stretch of ten kilometers. It has favorably adapted to the ecotone zones and the transitional areas of vegetation – coastal mangroves, grasslands, and saline vegetation. Kharai camels feed on saline trees, shrubs, and grass species like *Salvadora persica* (Khari jar) and Lano (*Suaeda* spp.) (Kachchh Unt Uchherak Maldhari Sangathan, 2012). Kharai camels are found in four talukas of the district – Mundra, Abdasa, Lakhpat, and Bhachau. Due to heavy industrialization, particularly in Mundra, Lakhpat, and Bhachau, mangroves, which are an important food source for the Kharai camels, are reducing (Report by Sahjeevan, 2010–2011). Over the years, there has also been an increase in pressure on the Banni grasslands, which is spread over an area of 2618 square kilometers and accounts for about 5.73% of the area in the district (Geevan et al., 2003). It is also a food source for the Kharai camel which is adversely impacted by extremely sparse rain events, short length of monsoon season, and very high temperature differences between summer and winter (Basu et al., 2019). Growth of certain plant species, like *Prosopis juliflora* (gando baval), in protected areas is useful as fuel; however, it is harmful for livestock rearing. These factors are threatening camel population and in turn affecting the livelihoods of *maldharis*. Due to these threats, the organizations (3, and 4) shared the concern of considerable decline in the camel population over the past couple of years. Further, migration of the camel breeders is also rising because of increased salinity ingress and decreased accessibility to mangroves.

Camels and camel products like milk and wool are traded. Camel milk is considered to have medicinal properties, and this property is further being explored (Sahjeevan, 2010–2011). Due to the establishment of cooperative milk societies, the people of Banni are now preferring to trade camel milk. The handicraft business and small-scale weavers use camel wool as a raw material. However, the camel herders experience uncertainty in access to market for camel wool and milk and are concerned about their livelihood security.

Women, children, and elderly from the *Maldhari* community experience water, sanitation, and hygiene (WASH) issues during cyclones. Lack of safe sanitation facility is their key concern as they have to defecate in Matka (mud-pot) during disaster.

On the basis of these case studies, social, economic, material, locational, and environmental vulnerability of Wagher practicing pagadiyas (fishing on foot), other backward caste forming the agariyas (saltpan workers), and Jats and Rabaris as Maldharis (pastoralists-camel breeders) were inferred.

Conclusion

The understanding on coastal communities' vulnerability, through the lens of developmental organizations, brings forth three important conclusions. Firstly, it provides case-specific context to multiple layers of vulnerability. Among these layers, social and locational vulnerability are persistent concerns that are transferred intergenerationally. The groups facing social marginalization historically continue to be the most vulnerable at present to disaster risks. The concern of a sustainable future is very prominent in the context of uncertainties posed by disaster risks directly and indirectly on their lives and livelihoods.

Secondly, the developmental organizations have also carved their role and focus on specific activities in the disaster risk management cycle, social groups and their issues, and geographical areas facing higher locational and environmental vulnerability. This process of identifying their focus has involved varied interactions with the communities, state departments, and other developmental organizations in the evolving space of disaster risk management. New and emerging challenges posed by climate change, developmental pathways, and persistent gap in meeting the fundamental needs add complexity to this space and interactions between actors in this space.

Thirdly, contribution of the persistent concerns of intergenerational transfer of vulnerabilities in coastal communities, emerging disaster risks to uncertain future, and complex disaster risk management space necessitate taking a resilience approach. Resilience is a relatively recent and budding approach to minimize vulnerability through building or enhancing the existing capacity to respond (UNDRR, 2022; Rashid, 2013; Manyena, 2006). There are various understandings on resilience. Hyogo Framework for Action views disaster resilience as the degree to which individuals, communities, and organizations are capable of learning from past disasters and reducing their risks to future ones at multiple levels (UNISDR, 2005).

Further, socioecological resilience is based on systems' thinking with emphasis on interconnections between the social and ecological systems. The socioecological systems provide essential resources and services to support livelihoods and social development in coastal areas which need recognition. Most of the vulnerabilities cited emerge from incomplete understanding and consideration of the socio-ecological linkages. Further, it is also important to build further on the understanding of the coastal socioecological systems and focus on the cross-level interactions and cooperation for enhancing the adaptive governance as suggested by Adger et al. (2005). Coastal communities' knowledge, preparedness, ability to reorganize, and the responses to disasters are important to preventing long-term social disaster (Berkes et al., 2002). UNDRR, earlier known as UNISDR, views resilience as the ability of a system, community, or society which is exposed to hazards to resist, absorb, accommodate, adapt to, transform, and recover from the effects of a hazard in a timely and efficient manner. It also prioritizes preservation and restoration of its vital basic structures and functions during the process of risk management (UNDRR, 2022). These are the avenues for future research on developmental organizations and their interactions with important actors in the space of disaster risk management for transformation from risk to resilience of coastal communities.

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Reimagining DRR in Urban Transformation: Confronting the Heterogeneity of Urban and Negotiations in Transforming Urban Landscapes

151

Niti Mishra and Lavanya Shanbhogue Arvind

Contents

Introduction	2282
Urban DRR: Contestations and Challenges to Urban Risk Governance	2283
Urban Spatial Inequalities and Urban Heterogeneity	2283
Urban Intersectionality	2286
Urban Risk	2288
Urban Risk Governance and Urban DRR	2289
DRR Towards Urban Transformation: Deliberations and Conclusion	2291
References	2292

Abstract

Governing the urban is a continuous and iterative process of conciliation and contestations over urban space, spatial inequalities, material resources, and political powers. Urban is a complex combination of social, political, cultural, economic, and technology along temporal and spatial extent. This chapter argues that governance must not only confront but also adapt to the heterogeneity of urban landscapes, issues, and actors. In other words, the urban may not be imagined as a monolithic homogenous entity but must be grounded in the recognition of the distinctness and plurality of what the urban really is. The issues pertaining to towns, suburbs, ghettos, urban sprawls, the peri-urban, or the urban village are vastly different from the issues of megacities, large metropolises, or the

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megalopolis, but dealing with urbanization means working along this range of town to metropolis.

When this heterogeneity is viewed from the lens of disaster risk, the idea of single frame solution needs to be interrogated. Every city is unique from spatial, cultural, and economic development, so how does one apprehend the idea of urban risk governance to posit itself to answer these pluralities?

India's present urban system comprises over 7933 cities and towns of fluctuating population sizes. In the decade between 2001 and 2011, many of these cities and towns transformed into burgeoning centers of industrial and business activity. This expansion put pressures on housing, transportation, WASH infrastructure, healthcare, and waste management and exacerbated spatial inequalities and widened income gaps. Urban governance today must be cognizant of the multi-dimensional nature of urban inequality and the overlapping nature of other geographical factors such as urban spatial planning, scale, zoning, environment, and accessibility to various urban facilities.

The authors argue that in confronting this heterogeneity of the urban scape, one must be cognizant of several factors. The current framing of Urban DRR is technocratic, and this chapter interrogates the differential urban needs and how urban DRR needs to be designed within a framework of intersectionality of urban identities.

Keywords

Disaster risk governance · Urban transformation · Urban spatial inequalities · Urban heterogeneity · Urban intersectionality

Introduction

Urban centers around the world are shaped by shifting population demographics and socio-spatial divisions along socio-economic lines. Further, the urban environment is influenced by developmental interventions and environmental extractions that lead to land use modification that is manipulated by biophysical conditions of land (Douglass, 2015).

Governing the urban is a continuous and iterative process of conciliation and contestations over urban space, spatial inequalities, material resources, and political powers. Contemporary cities face several challenges related to increasing interconnectivity and interconnectedness in a globalized era. Disaster forms one such challenge where the impacts can spill over and have cascading consequences beyond spatial and temporal boundaries; this brings about emergence of newer risks along with unexpected interruption and growing vulnerabilities (Oldham & Astbury, 2018).

This chapter argues that governance must not only confront but also adapt to the heterogeneity of urban landscapes, issues, and actors. In other words, the urban may not be imagined as a monolithic homogenous entity but must be grounded in the

recognition of the distinctness and plurality of what the urban really is. The issues pertaining to towns, suburbs, ghettos, urban sprawls, the peri-urban, or the urban village are vastly different from the issues of megacities, large metropolises, or the megalopolis.

India's present urban system comprises over 7933 cities and towns of fluctuating population sizes (Habitat for Humanity, 2018). In the decade between 2001 and 2011, many of these cities and towns transformed into burgeoning centers of industrial and business activity. This expansion puts pressures on housing, transportation, WASH infrastructure, healthcare, and waste management and exacerbated spatial inequalities and widened income gaps. Urban governance today must be cognizant of the multidimensional nature of urban inequality and the overlapping nature of other geographical factors such as urban spatial planning, scale, zoning, environment, and accessibility to various urban facilities (Nijman & Wei, 2020).

The authors argue that in confronting this heterogeneity of the urban scape, one must be cognizant of several factors. Borrowing from the emerging body of thought on disaster risk governance, the authors present a case for coherence and harmony between different urban stakeholders and the line departments of the state at the local, regional, and national level.

Urban DRR: Contestations and Challenges to Urban Risk Governance

Kelman (2008) has attempted to provide definitions of disaster for the urban context as “the capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures” (pg 197). In the urban context, disaster is the ability of a system to maintain its function and structure when exposed to hazards, which influences the capacity of the social system to learn from past events and prepare for the future through risk reduction measures. This perspective on the definition of disasters in urban environments places emphasis on change and learning from the past to achieve resilience (Kelman, 2008). Urban populations residing in middle- and low-income countries are at risk as they're exposed to multiple hazards resulting from extreme weather events, anthropogenic activity on the urban environment, diseases, or accidents (Adelekan et al., 2015).

Urban Spatial Inequalities and Urban Heterogeneity

According to the United Nations Department of Economic and Social Affairs (2008), the world currently is more urban than rural. As urbanization increases, cities are spatially organized as urban-centric regions that go beyond city borders

into peri-urban drawing on resources from rural hinterlands through daily flow of goods, services, and people (Douglass, 2015). Urban centers provide substantive benefits to residents by offering greater opportunities for work and access to critical services such as healthcare and education. In developing economies, rural to urban migration is on a steady rise. In the Indian context, as per the 2001 Census, 52 million persons, out of the-then population of 1.02 billion persons, migrated from rural to urban areas, and such urban shifts have only increased; the 2011 Census recorded a migratory increase with 72 million moving away from their rural homes to urban centers. The burgeoning urban centers place massive demands on urban space and key services such as transportation, sanitation, solid waste management, and health services (Bosher & Ksenia, 2017). As urbanization increases spatially and spreads to peri-urban regions, new forms of vulnerability are created by ill effects of inappropriate planning and development encompassing coastal and swamp areas, inland floodplains, unstable hillsides, and other lands unsafe for settlement (Miller & Douglass, 2016).

Dimension of the built environment, financial investment, and related infrastructure have brought new potentials of large levels of losses (Horlick-Jones, 1995). Since urbanization is inevitable, the resultant urban vulnerability is reality (Balgos, 2016). Cities have to cope with the agglomeration effects that in itself increases impacts of disasters involving millions of people in a single urban setting (Douglass, 2016).

Historically the development of cities and concentration of population has increased risks for urban populations for a variety of reasons. Since the 1980s the shift in Asian cities has entered a period of continuous corporatism of spaces which has increased vulnerability; for instance, mega projects have impinged on development schemes such that poor neighborhoods have been relocated from central to more hazard-prone areas (Douglass, 2016). In addition the changes brought by colonial ports to urban agglomerations have endangered location along with the increasing rural to urban migration to coastal cities coupled with the exposure to rising effects of climate change (Miller & Douglass, 2016).

With nearly half a billion of the Asian population living in slums, the pursuit of alternate safe, secure, and socially just form of urbanization can be seen as overwhelming. Yet the lack of transparency has alienated the civil society from the formal government processes of recovery and reconstruction and led to decrease in public confidence. An outcome of such a type of culture leaves the voices of civil society neglected and creates a feeling of disorientation in the community with destructive consequences on long-term capacities to build resilience to future disaster risk (Miller & Douglass, 2016). The gated housing territories in peri-urban areas have replaced the small farms, while in cities privatization of space along with replacement of local enterprises with global chains has increased concentration of resources for few and resulted in replacement of family-owned farms and business with wage earners (Douglass, 2016).

A disaster does not occur in apolitical spaces and urban societies at the same time are places of heightened contestation, compromised, negotiated and cooperation during crisis, emergencies and disruption (Miller & Douglass, 2016). Urban growth

is unequal globally, but the rate of urbanization is increasing exponentially in developing countries. The accelerated urbanization with lack of planning has brought with it a host of problems: growth of dense and unplanned residential areas, environmental pollution, unavailability of services and facilities, and solid waste and slum growth (Choudhary & Neeli, 2018). High levels of migration have led to growth of slums and informal settlements in places that are highly prone to risk of disasters. For instance, several slums are located near canals or flood-prone areas where flood management measures like canal widening means eviction of informal settlements (Douglass, 2016).

These urban population categories along with the homeless are extremely vulnerable to risk of hostile environments resulting from disasters. The divisions between rich and poor have created risk ghettos that have exposed the conventional vulnerable group to higher levels of risk while the turbulent socioeconomic situations impact the resilience of complex sociotechnical systems resulting in unpredictable effects of system vulnerability (Horlick-Jones, 1995). At a larger level urbanization has brought a new level of vulnerability through “production and ownership” of spaces for the middle class. While for those compelled to live in slums in disaster-prone areas, vulnerability is also added due to lack of land, capital, and resources (Douglass, 2016).

Urban centers contribute to around 43% of India’s GDP that is generated by 100 of the most populous cities in the country. Yet, urban inequalities are stark and reproduce social disparities (Abhishek, 2020). An interrogation of such urban social disparities and implications for urban space will be presented in latter sections of this chapter.

According to the United Nations Department of Economic and Social Affairs (2018), the world currently is more urban than rural with 55% of the world’s population concentrated in urban centers, with projections estimated at 68% by 2050.

The burgeoning urban centers place massive demands on urban space. Homes, workplaces, schools, hospitals, transport networks, water supply, sanitation systems, public health systems, energy generation, solid waste management systems, and distribution networks are part of critical infrastructure that support lives and livelihoods; these are also vulnerable to a broad range of risks and threats including those posed by climate change and extreme-weather induced urban disasters (Bosher & Ksenia, 2017).

Despite spatial exhaustion in urban spaces on increasing built environments, demands for urbanization continue. These are fueled by a combination of population increases including rural to urban migration and unbridled pursuits of modernist developmental ambitions that are backed by bureaucracy. These result in urban sprawls that are characterized by unsystematic extension outside the city’s territorial limits. Such unplanned built environment expansions and change of land-use, land cover result in loss of open green spaces, arable agricultural land, and surface water bodies. The growth of urban sprawls poses several ecological and socio-economic challenges increasing distances between peri-urban population and urban resources

(Bhat et al., 2017). Urban mobility also becomes increasingly difficult for the urban poor.

The heterogeneity of urban spaces, urban population, and social groups requires differential governance based on equity. Variation in vegetation, economic activity, and architecture shapes the urban. The city must not be treated as a homogenous entity while framing urbanization in a singular dimension with scant regard for diversity of ecosystems, people, and needs.

Urban Intersectionality

Social identities in the urban setup are vastly diverse and varied. Urban identity and urban demography are often shaped by migratory patterns with population influx from rural areas. Urban centers provide substantive benefits to residents by offering greater opportunities for work and access to critical services such as healthcare and education. In developing economies, rural to urban migration is on a steady rise. As presented earlier, in the Indian context, there is a massive and increasing migratory rural to urban shift.

The urban identity therefore is not a homogenous one, and social groups occupying the urban space are heterogeneous carrying with them different burdens of identity. Social disparities are typically mediated through historical cultural processes, and in urban settings, such social inequalities are also by-products of prevailing modes of production and allied labor relations (Nijman & Wei, 2020). Categories such as caste, class, gender, disability, indigeneity, race, ethnicity, and religion intersect with each other to produce a multi-dimensional identity on which several axes of discrimination operate on.

The conceptual framework to analyze different burdens on identity termed as intersectionality emerged from black feminist thought to enable comprehension of how intersecting and overlapping social identities of gender and race bring about discrimination and marginalization. The term was coined by UCLA law Professor Kimberle Crenshaw in 1989. Over the years, through Crenshaw's own work as well as others' experiences of discrimination, intersectionality began to take into account other forms of marginalization brought about by systemic oppressions on account of ethnicity, caste, aging, disability, mental health, sexuality, class, religion, indigeneity, membership to certain groups, etc. 20 years later, Crenshaw herself stated that there has been an "intersectional erasure" as power continues to be held by structures of "maleness and whiteness" in the US context (Crenshaw, 2017). Crenshaw revisited the idea of intersectionality a little later and argued that the framework should not be considered as a "totalizing theory of identity" (pp. 1244) but as a way to account for plural grounds of identity construction in the context of the social world (Crenshaw, 1991). Drawing from feminist thought that patriarchy intersects and overlaps with other structures of power (such as racism) has been a useful analytical frame to look at overlaps of different axes of power that make identity a compound (e.g., woman with disability or migrant Muslim).

In the urban space, there are a myriad of identities that comprises the urban demographic. Labor migrants and low-skilled workers, refugees, long-term residents, students, white-collar workers, and affluent migrants across a range of socially and culturally mediated identities such as caste, class, ethnicity, religion, age, gender, etc. occupy the urban space. Such plurality of identities experiences different forms of subjugation in the urban space.

Delhi, for instance, hosts a range of refugees such as Sikh and Christian Afghan refugees (Non-Muslim Afghan refugees), Rohingyas, as well as older refugee populations from the Partition era. Their identity as refugees as a form of political categorization mediate pathways to self-reliance in the urban space. According to the UNHCR, “Self-reliance is the social and economic ability of an individual, a household or a community to meet essential needs (including protection, food, water, shelter, personal safety, health and education) in a sustainable manner and with dignity. Self-reliance, as a programme approach, refers to developing and strengthening livelihoods of persons of concern, and reducing their vulnerability and long-term reliance on humanitarian/ external assistance” (UNHCR, 2011, p. 15). Ideas of belonging and citizenship mediate access to urban resources, and the self-reliance of the refugee population in an urban space is an instance of urban intersectional inquiry.

Several large cities report intra-ward income disparities. Mumbai, for instance, houses the M-Ward which is one of the poorest wards in the megacity. Governance of wards or administrative units is decentralized, and developmental gains have been uneven. The M-Ward’s Human Development Index (HDI) is one of the lowest in the city. Other social indicators such as health and nutrition are also dismal with 50% of the children being malnourished. Megacities are often spoken about as two cities, the city of the “haves” and the city of the “have-nots,” and while both the cities are located within the same geographical territory, they occupy entirely different physical, economic, and social spaces (Mumbai Human Development Report, 2009).

Cities are heterogeneous across a range of socio-economic, cultural, political, ecological, and infrastructural dimensions. Studies surrounding urban heterogeneity immediately draw from studies around urban inequalities and inequities.

Mumbai is home to all major world religions including Islam (20%), Buddhism (4.9%), Jains (4%), Christians (3.2%), Sikhs (0.5%), and a small Parsi population of fewer than 60,000 persons (Census of India, 2011). Urban inequalities manifest spatially through the processes of residential segregation along caste, religion, and migratory patterns. While Dharavi is home to Tamil migrants, areas such as Mazgaon, Mahim, Govandi, and Cheeta Camp record a high concentration of Muslim population. Many of these areas are densely populated and populations live in informal settlements.

There is an insecurity of housing tenure in informal settlements, and environmental injustices are evident with poorest and most vulnerable groups exposed to hazardous wastes and effluent discharges of industries. As an urban entity with increasing industrial overstretches, the Mahul village of Mumbai is an example of how income inequalities and social disparities inequalities manifest as spatial inequality. A former fishing village, Mahul was converted into a resettlement colony

for Project Affected Persons (PAP) as part of rehabilitation programs for various projects. Roughly 60,000 persons (5500 families) were housed in 125 square feet flats located in the specially constructed 72 buildings. Mahul is a substantially industrial area that is home to several petroleum refineries and other industries including power and chemicals. According to residents, both the air and the ground-water are heavily contaminated. The Maharashtra Pollution Control Board (MPCB) has studied the area certifying that the industries release unacceptable levels of volatile organic compounds (VOCs) including benzene. VOCs pose serious threats to the central nervous system.

Resettling PAPs in a heavily polluted area, exposing them to critical public health risks, reveals the unfortunate nature of urban poverty as it intersects with unbridled capitalistic pursuits.

While the elite and white-collar workers traverse the cityscapes in private transportation from posh high-rise homes to sanitized central business districts, the homeless, the labor migrant, the sanitation worker, and the socially excluded groups live in ghettos, peri-urban locales, or urban sprawls or are rendered homeless. Intersections of income poverty and spatial injustice manifest as urban deprivations. The poorest of the urban dwellers in cities live in unplanned, unauthorized developments, characterized by infrastructural deficiencies in terms of access to water, sanitation, and hygiene facilities, healthcare, and other constitutionally guaranteed rights.

Urban Risk

Cities have always operated against the changing background of risk with the twenty-first century providing a better understanding of risk and uncertainty (Oldham & Astbury, 2018). The cumulative impact of everyday, small or recurring disasters is much more significant than a rare occurring larger emergency crisis (Adelekan et al., 2015).

Risk is unevenly distributed both socially and spatially in the urban context. While the vulnerable groups are well established in literature, specific forms of vulnerability related to specific types of hazards are poorly researched. Differential vulnerability in terms of age, gender, class, poor housing conditions, informal settlements, and accessibility to basic amenities and services is discussed frequently. The everyday risk of low-income marginalized groups relate to issues of poor water quality, health and hygiene, sanitation, air pollution, poor ventilation, and built environment; these crucial aspects of people's lived experience do not find adequate space in mainstream DRR thinking. Other urban phenomena such as fires, road accidents, epidemics, and large-scale public health risks such as those related with poor air quality, sanitation, hygiene, and communicable diseases owing to water logging in low lying areas often do not find space in the larger urban disaster risk reduction discourse and remain neglected by DRR policies (Adelekan et al., 2015).

Dramatic changes in urban infrastructure have been possible due to global economic restructuring, the transformation process known as "postmodern urban

landscapes.” These processes reproduce radical social, cultural, and spatial deviations which have implications on vulnerability demonstrated as gentrification of older cities. The process of gentrification in cities is followed by large consumeristic development of shopping and entertainment facilities. This is contrasted by homelessness as an ever-present phenomenon of the megacities (Douglass, 2015). In this regard, what remains to be deliberated is how risk and vulnerability are distributed in urban areas with a focus on poor households, informal settlements, gender, age in the context of climate change, and resulting complex disasters; these continue to impact urban areas with the planning and city management determines the extent and the distribution of risk. The risk accumulation, its tolerance, and acceptance in low-income urban settlement need critical examination in absence of city planning and management and lack of capacity of local government to manage the risk. The risk accumulation and its underlying social, political, economic, and political determinants are associated with its process related to everyday hazards (Adelekan et al., 2015). Other megatrends also include impact of climate change, ignoring inequalities and migration where the immigrant population is left out of welfare schemes creating more vulnerability. These changes in urban forms have sharpened the contrast between the newly established privilege and marginal groups (Horlick-Jones, 1995). These urban transformation and construction related to ever-increasing demands of urbanization and development are all linked to disasters (Douglass, 2015).

Urban Risk Governance and Urban DRR

Urban governance is significant in creating or reducing risk in cities (Rumbach, 2016). Cities are the centers of intense growth and development, with disaster preparedness and resilience along with disaster governance becoming central to addressing vulnerability of urban areas (Douglass, 2016). City regimes that have focused on economic growth or livelihood generation are also discussing disaster risk management (Rumbach, 2016). Risk and their distribution at local level, especially those associated with everyday life, are highly dependent on the way cities are governed (Jorgelina, 2019). Governance strategies for disaster are inclined towards bring about transition in societal foundation. At the same time it is influenced by changes in society. Disaster governance regimes will also shift with changes in predominant governance and its alignments; similar to that seen in risk and environmental governance (Tierney, 2012).

There are several characteristics of current urban planning and development including disaster risk reduction that needs investment decisions (Murray, 2017). The capacity of the city government to manage local development, land use planning and change, benefit distribution, safety standards, resilient infrastructure, and ability to reach out to the most vulnerable influence the everyday risk in urban areas (Jorgelina, 2019). The success of a country’s ability to decrease the gap between actual and potential rate of development and reduce risk is also dependent on leadership ability and commitment to develop and implement suitable policies

(Ahrens & Rudolph, 2006). However, often there is a mismatch between the urban population growth, development trends, and the ability of governance structures to manage levels of risk (Jorgelina, 2019). In several cities investment in disaster risk reduction and capacities for implementation are often lacking which results in emergence of new patterns of intensive risk. In the context of low- and middle-low-income countries, often there is a lack of capacities to plan and manage risk-sensitive urban development; as a consequence disaster risks have increased rapidly in urban areas (Murray, 2017). With a large number of cities now being concentrated in middle- and low-income countries, the projected population growth, infrastructure, and economies mean urban areas will continue to rise unless drastic measures are implemented. Adding to this the climate risk and vulnerabilities are rising in cities making it challenging to distinguish disaster risk reduction from actions on climate change adaptation (Jorgelina, 2019).

The increasing risk to urban areas has also contributed to the argument of linking disaster risk to development. This idea has greatly influenced mainstreaming disaster risk reduction through risk management strategies. There has been considerable progress in managing disaster through efficient response and recovery stages. As a result, losses of lives have reduced drastically; however there has been steady rise in economic losses along with inequity in risk reduction (Jorgelina, 2019). Uncertainties in disasters are too complex to be dealt with; traditional approaches with fixed rules of bureaucratic systems of governance are ineffective, since they are based on predictability models rather than the breaks in the status quo (Douglass, 2016). The governance approach for disaster management takes the larger public policymaking framework into consideration at national and local level along with the executive division, the administration, the interface with public and private actors, and those affected by disasters (Ahrens & Rudolph, 2006). Local governments are better placed to prepare for disasters through interventions such as maintenance of infrastructure, disaster-resilient structures, emergency planning, and land use regulation. They are also the first to arrive for rescue and mitigation efforts and own the knowledge of space and conditions that are valuable in emergencies. Decentralization is considered to have a positive impact on public services delivery, and since disaster management involves provisions of public safety services, it can have a constructive result for efficient disaster management. The benefit of decentralization, enabling local authority to apply local knowledge, leads to better comprehension of local context and vulnerability, effective in preparing for different types of disaster (Bae et al., 2016). In the past several programs by international science and policy agencies focused on improving the national level government capacities that are tasked with risk reduction and to some extent the improving local or global governance. Though it is understood that rational science-based management is required in processes, well-developed cities investing highly in such measures are often criticized as these measures do not offer comprehensive protection to those at risk. An alternative to this is to decentralize and adapt using scientific and vernacular knowledge (Mitchell, 2015).

Strengthening of disaster risk governance at local level was strongly acknowledged in the Hyogo Framework for Action (HFA) and has been better put together in

the Sendai Framework for Disaster Risk Reduction. Disaster risk governance has shown positive progress at international and national level. Such international frameworks have played a crucial role in creating institutions that have provided legal and regulatory frameworks to strengthen DRR. However there is growing recognition that more is required to manage recurring disasters that impact lives and cost. The institutionalization of DRR has created necessary regulations and action for DRR, but at community level efforts are still lacking. There is a lack of comprehensive data and reporting on implementation of DRR at the local level. The major challenge is the capacity of local actors and societal issues that affect the perception and action taken to reduce risk. Hence there is growing attention to strengthening local level governance and its actors, data availability, decision-making, engaging local communities, and vulnerable groups (Djalante & Lassa, 2019). Addressing underlying risks such as poverty, lack of access to services and resources, marginalization, poor settlements, health, and education continues to persist (Jorgelina, 2019). Measuring these through tools of risk assessment in urban areas is complex and challenging to contextualize for local city municipalities/institutions. By considering disaster research from a governmental point of view rather than management brings to light the local power dynamics related to spatial and social inequalities.

DRR Towards Urban Transformation: Deliberations and Conclusion

Governance arrangements for disaster and climate change are occupied by global dynamics, inequality, socio-demographic trends, and globalization on one hand and population density, assets and infrastructure, waste management, improper land-use planning, etc. on the other. The transformative agenda for sustainable city development ensures benefits such as managing rapid urban growth, rural-urban linkage management, decentralization, resilient critical infrastructure, strengthening facilities and services delivery mechanism, provision of jobs, education healthcare, safety and security, and environment protection (Djalante & Lassa, 2019). Disaster risk reduction is incremental when disaster management is improved with the existing status quo, but the same action is considered transformative when there is a system-wide change towards sustainable development through drivers of risk reduction. Such actions of risk reduction become relevant to development and are not merely associated with extreme events. Managing disaster rather than disaster risk leads to actions that do not have the ability to recognize development pathways that generate and propagate underlying risk (Jorgelina, 2019). Twenty-first-century risk governance requires multi-disciplinary, integrated approaches to cope with socio-technical risks in a complex and uncertain risk environment.

The irregular pattern of development of cities creates diverse and divided societies that produce spaces of contestations and fragmentations during disaster due to understandings of vulnerability and exposure. It is important to understand the past experiences of disaster and its implication for better collaboration between

management, policy, institution, social science, and sciences for a better transformation in practice and scholarship. The temporal and spatial complexities of disaster in urban areas need reflection on the chain of interdependencies related to past action that demand a longitudinal lens to study disaster risk governance (Douglass, 2016). Research that addresses poverty, inequality, and institutions in urban areas focusing on dynamic political complexities which result in weak governance leading to unplanned development and mismanagement is pressing necessity. These factors produce better understanding of underlying factors for risk accumulation that can be beneficial for policy-based intervention for risk reduction initiatives. This requires institutional understanding of risks that are historically shaped by organizational and individual actions forming legislation, policy, and practice of urban management. The role of informal mechanisms beyond the state purview active in influencing city risk along with formal structures that are stakeholders in overall city development over time is worth examining (Adelekan et al., 2015).

Considering the growing importance of community-based DRR and climate change adaptation for urban areas, research on urbanization processes that influence risk and knowledge co-production coming from scientific and community are significant to the field of Urban DRR. The capacity of local governments to manage risk is severely lacking in several LMIC. There is a need for the documentation of work where city governments have partnered with local populations and civil society organizations to reduce risk and build resilience to extreme weather (Adelekan et al., 2015). Since it is an urban location, the exchange of practice among varied groups can lead to loss or modification of knowledge due to the interaction of several identities. The changing nature of disaster may need new approaches and initiatives, and in this context certain knowledge and practice may not be relevant. Hence the assimilation of local knowledge with the changing scientific information and governance structures that promote risk reduction and adaptation is an important concern (Molina, 2016).

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Building Rights for Funding Housing Reconstruction: Mexico City's After the 2017 Earthquake

152

Claudia Acosta and Julio Fuentes

Contents

Introduction	2296
The Disaster and the Extent of the Damages	2296
The Resources and their Sources	2300
Land Value Capture and Building Rights	2301
The First Public Policy Attempt	2302
The Second Public Policy Initiative	2304
The Additional Building Rights and Their Public Policy Pathway	2305
Implementation and Numbers	2308
Conclusive Remarks	2310
References	2312

Abstract

On September 19, 2017, one of the most destructive earthquakes in Mexico's history occurred. Mexico City was the most affected region in the country due to the loss of human life, the destruction of public infrastructure, and the damages and loss to thousands of housing across the whole socioeconomic structure. The magnitude of the disaster exceeded the scarce local public resources available to reconstruct the city. As a result, many homeowners faced the collapse or

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demolition of the buildings in which they lived. City authorities mobilized building rights as an in-kind public resource to co-fund the reconstruction of many buildings.

This chapter documents the case and explores some foundational questions: How to finance the reconstruction of those homes? Why do practitioners choose to use building rights? What is the institutional design and performance of this tool? What are the results? This research includes a review of documents and interviews with key actors. It shows preliminary but positive results and illustrates the implementation challenges when using additional building rights to finance building reconstruction in developing countries. The Mexican City pioneer experience shows a feasible recovery based on an equal financial alternative for local governments in similar conditions.

Keywords

Building rights · Earthquake · Reconstruction · Mexico city, local public finance · Extreme events

Introduction

Disasters cause human, social, financial, economic, and environmental impacts. The effects can be long-lasting and multi-generational. Countries like Mexico face more significant challenges with limited capacity to manage the impacts and recovery costs. In addition to dealing with an emergency, authorities must implement actions to repair and rebuild buildings, equipment, public infrastructure, service networks, and architectural heritage that demand great economic and human resources. Land value capture – using the selling of building rights – is integrated into the municipal power of planning and land use regulation. It is available to many local governments and can be a relevant and fair alternative to help cities and citizens recover after a disaster.

This case begins with a description of the disaster, the extent of the damage, and the challenge of rebuilding. Next, it explores the resources mobilized to address the emergency and reconstruction and the context of the apparition of additional building rights tool (in the future ABRs). Next, it delves into this alternative mechanism to co-finance the reconstruction of thousands of lost homes. This case seeks to answer questions about the ABRs' nature, design, implementation route, and results. Finally, it offers some conclusions regarding this case and ABRs' possibilities for local governments to recover after a catastrophe.

The Disaster and the Extent of the Damages

In September 2017, two earthquakes shook Mexico's central and southern regions. The first, with a magnitude of 8.1 degrees on the Richter scale, occurred on September 7 at 11:49:17 p.m. in the state of Chiapas, in the country's south (SSN, 2017a).

According to the Presidential Chronicle, at least 98 people died: 78 in the state of Oaxaca, 16 in Chiapas, and 4 in Tabasco (Office of the Presidency of the Republic, 2017: 40). Twelve days later, on September 19, at 1:14:40 p.m., a new earthquake with a magnitude of 7.1 on the Richter scale occurred between the states of Puebla and Morelos, 120 kilometers from Mexico City (SSN, 2017b). According to the statement by Luis Felipe Puente, National Coordinator of Civil Protection, a total of 369 people died: 228 in Mexico City, 74 in Morelos, 45 in Puebla, 15 in the State of Mexico, 6 in Guerrero, and 1 in Oaxaca (Excelsior, 2017) (Fig. 1).

Mexico City (CDMX) was undoubtedly the most affected region in the country, considering the number of deaths and the magnitude of the economic damage. The earthquake of September 19, 2017 (from now on, "the earthquake") was one of the most destructive in Mexico in the last 100 years due to the damages to construction and human lives (GOCDMX, 2019a: 8). It caused 228 deaths and at least 59,248 victims (considering only housing damages) (CENAPRED, 2019: 28).

The city reported physical damages in 4 public markets, 2951 commercial establishments, 47 hospitals and health centers, 83 government buildings, 1900 educational buildings, and 419 cultural and historical heritage buildings (GOCDMX, 2019a: 9). Damages to the water and drainage system and road infrastructure included 45 wells, 2712 leaks in drinking water networks, 39 kilometers of drainage networks, 87 kilometers of drinking water networks, 12 roads, and 2 pedestrian bridges (*ibid*: 9). It constituted enormous damage to the public infrastructure and equipment for urban activities.

The nature and intensity of the damage depend on the risk of collapse (high, medium, and low risk) and the scheme of property intervention: rehabilitation or

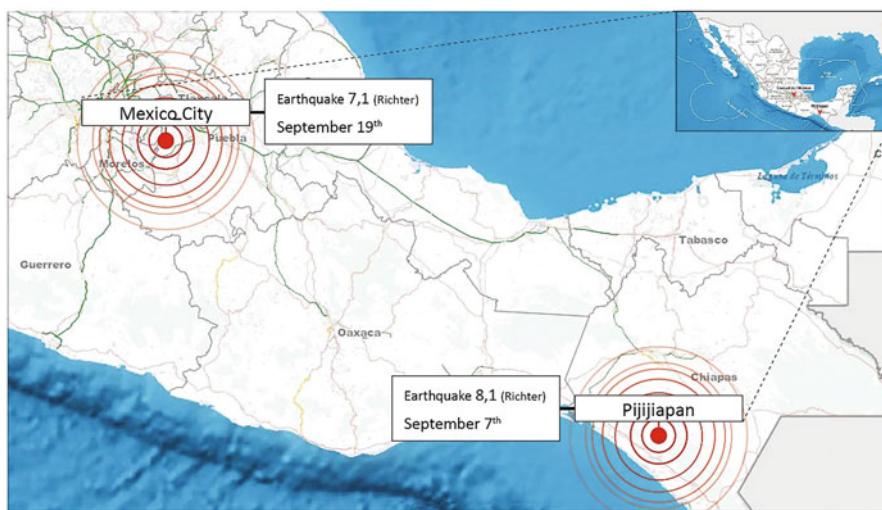


Fig. 1 Mexico: Epicenter of the earthquakes of September 7 and 19, 2017. (Sources: Adapted by authors downloaded on April, 2019, from USGS: <https://www.usgs.gov/> and INEGI: <http://gaia.inegi.org.mx/mdm6/?v=bGF0OjE3LjUwMDY1LGxvbjotOTUuMjcxNzQsej0z>)

reconstruction (for destroyed or demolished properties). In 2018, about 98% of the 26,672 residential properties censored reported damages (GOCDMX, 2019a: 11). In May 2019, the property census registered 371 multi-family properties (from now on, "buildings") as impaired and 109 would need complete rebuilding. Likewise, the

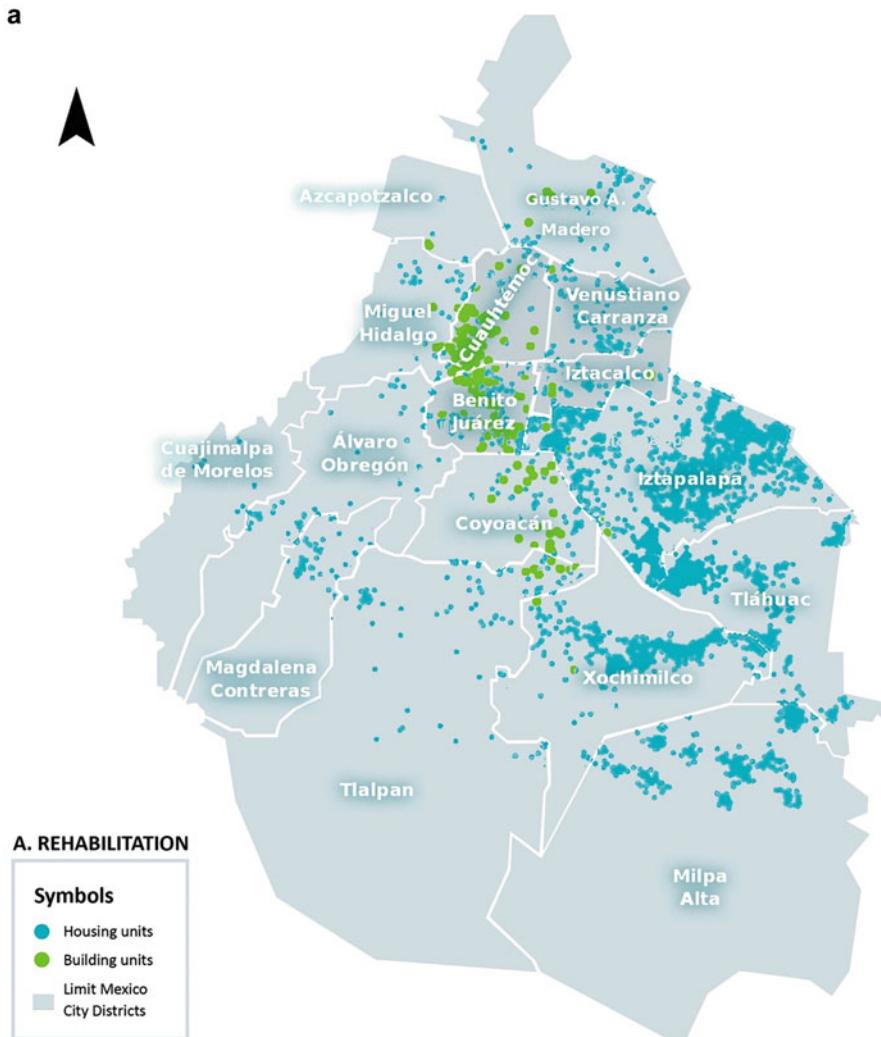


Fig. 2 Mexico City 2019: Spatial distribution of damaged housing by recovery strategy: (a) Rehabilitation, (b) Reconstruction. (Source: Adapted from Mexico City Reconstruction Commission; Map of Districts limits downloaded on June 2022, from: https://es.wikipedia.org/wiki/Demarcaciones_territoriales_de_la_Ciudad_de_México#/media/Archivo:MX-DF-División_pol%C3%ADtica.svg)

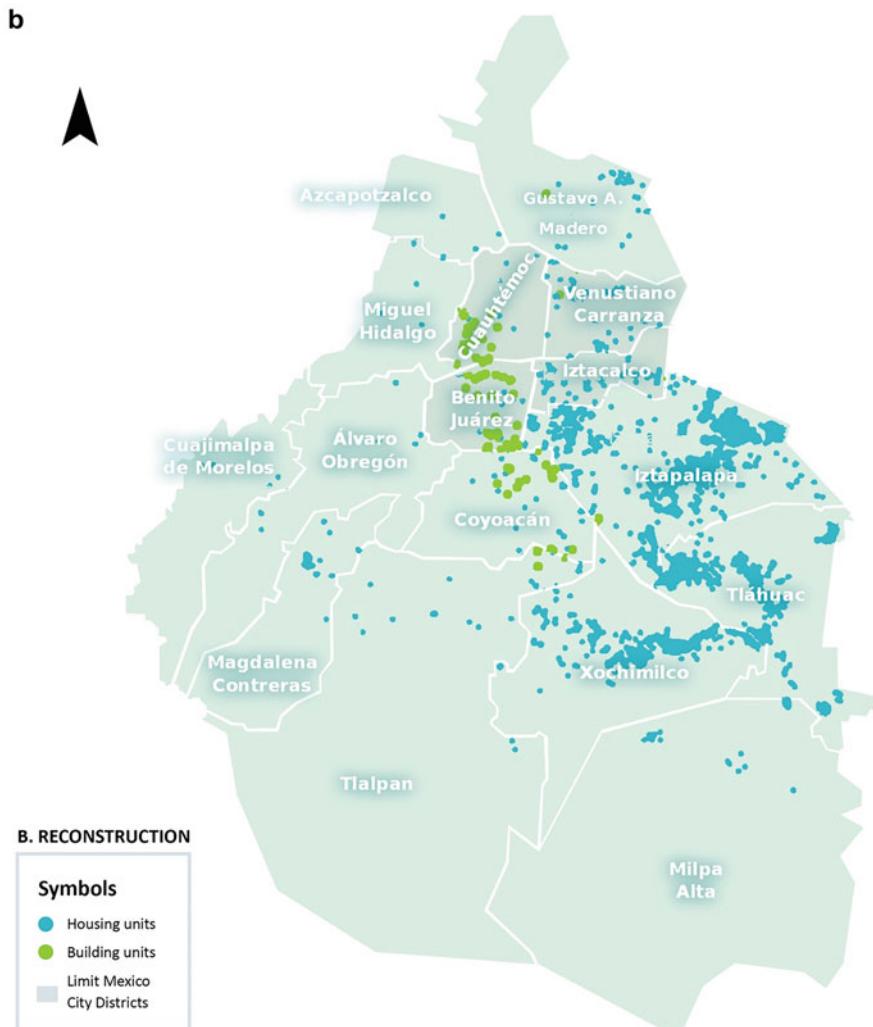


Fig. 2 (continued)

census reported 11,882 damaged single-family properties (from now on “houses”), and 2824 would need complete rebuilding.

Figure 2a, b show the distribution of the 12,253 damaged residential properties identified in May of 2019; it includes the level of risk, treatment (rehabilitation or reconstruction), and type (buildings or houses).

Building damages occurred in different areas of the city. However, 91% of them were concentrated in the central and eastern districts (Cuauhtémoc, Benito Juárez, Coyoacán, Venustiano Carranza, Iztacalco, Iztapalapa, Tláhuac, and Xochimilco),

while the remaining 9% were distributed in the other eight districts (Azcapotzalco, Gustavo A. Madero, Miguel Hidalgo, Cuajimalpa, Álvaro Obregón, La Magdalena Contreras, Tlalpan, and Milpa Alta).

The spatial concentration of the damage is more conclusive if one considers the type of intervention required (rehabilitation or reconstruction) and the type of property damaged (buildings or houses). For example, of the total residential properties that required rehabilitation, 76% of the buildings were downtown (Cuauhtémoc, Benito Juárez, and Coyoacán districts). In comparison, 95% of the houses were in the eastern part of the city (Venustiano Carranza, Iztacalco, Iztapalapa, Tláhuac, Xochimilco, and Milpa Alta districts).

Of the total residential properties that required complete reconstruction, 84% of the buildings were in the same central districts. Similarly, 84% of the houses were in four east districts (Iztacalco, Iztapalapa, Tláhuac, and Xochimilco) (see Fig. 2b). The damage was concentrated territorially by type of structure: buildings in the central areas (more densely occupied) and houses in the eastern with lower occupancy. The public policy schemes to attend the victims considered the territory, type of structure, and resources along with the institutional and operational design.

The Resources and their Sources

Between 2017 and 2020, more than US\$1.037 million funded the emergency and some recovery actions. Those resources came from federal and local budgets and private donations. However, a disaster of such magnitude implies severe financial challenges for the municipal government. Therefore, this chapter concentrates on the financial effort made by the city (Table 1).

During the emergency (2017), resources came mainly from federal funds (Trust Fund for Natural Disasters, FONDEN) and private donations (according to Plataforma CDMX, it was around 1.3 million dollars from civil society and the Walmart economic group). Those resources funded three actions: assessment, reconstruction, and rehabilitation of infrastructures in culture, sports, education, forestry, hydraulic system, monuments, health, and housing. Private donations came from different parts of the republic and other countries – those resources funded just emergency actions without covering the public policy for recovery.

As of 2018, the economic efforts came from the city and focused on reconstruction (approximately 453 million dollars) (GOCDMX, 2017a; ALDF, 2017a). The resources came mainly from the Fund for Attention to Natural Disasters in Mexico City (FONADEN), which feeds off the remains of the city's general budget. Active since July 2015, the FONADEN prepares the city for unexpected situations. By 2018 the FONADEN had accumulated close to 495 million dollars. This fund provided 84% of the resources given to the reconstruction. The rest came from the federal level through the FONDEN, with a specific destination for reconstructing historical monuments (SEGOB, 2018; Legislative Research Institute s.f.). Finally, in 2019 and 2020, the city invested around 208 million dollars per year for reconstruction (GOCDMX, 2018a, 2019c).

Table 1 Mexico City: Economic resources for the reconstruction and their sources (2017–2020)

Year	Total Amount per Year (Mexican pesos / USD dollar) Unit: millions	Amount by Source (Mexican pesos. Unit: millions)
2017	2.625	2.600 – FONDEN (federal found)
		5.3 – Private donations
		20 – Walmart group
2018	9.284	8.700 – FONADEN (City found)
		584 – FONDEN (federal found)
2019	4000	4.000 – City budget
2020	4000	4.000 – City budget
Total amount (2017-2020)	19.909	1.037

Source: The authors based on GOCDMX (2017a, 2018a, 2019c), ALDF (2017a), SEGOB (2018), Instituto de Investigaciones Legislativas s.f.

From the preceding, the city became primarily responsible for funding the great challenge of reconstruction. Although the city counted on reserves for emergencies (FONADEN), the magnitude of the damage exceeded its investment capacity. Thousands of families from different socioeconomic conditions and needs (from reinforcement of physical structures to demolition and total reconstruction) waited for help. Therefore, it was urgent to find new monetary sources that did not depend on the public budget. In this context, an urban financing alternative that had been politically discarded a few months prior during the Constituent Assembly of Mexico City reappeared in the political arena. The land value capture tools derived from land-use regulations came back as a financial option for the recovery.

Land Value Capture and Building Rights

Economics foundations state that land value depends on its attributes. Its attributes depend on the availability of infrastructure and land-use regulations. The land-use regulations define the uses and physical exploitation of the land (building potential) as defined by local governments through urban planning tools. Land use and occupation decisions have economic effects. More profitable uses (such as commerce, services, and non-social housing) and more intensive occupancy conditions (high-rise buildings) reflect higher land prices. The land value effect refers to land-use regulations and public works investments. Hence, the instruments that seek to

recover, mobilize, or capture part or all of these increases in land value are called land value capture tools or land base tools (Ingram and Hong, 2012; Smolka, 2013).

The use of land value capture tools is considered fair for two reasons. First, land value increases are not due to the landowner's efforts but the society and public investments. Second, revenues from land value capture tools finance urban development and help reduce inequalities in urban supports and services between territories. There is a broad spectrum of land value capture tools; one group focuses on building potential and more profitable uses. This group of tools is generally called building rights or development rights and as implied offers the payment of economic compensation to the municipality in exchange for a specific buildable area, mainly in high-rise buildings (Furtado and Acosta, 2020).

In the case of Mexico City, the instrument adopted is the additional building rights. Would it be possible to use the economic potential of urban land through ABRs to subsidize the reconstruction after the earthquake in the city? Unfortunately, the initial answer is no. In December 2016 (just a few months before the earthquake), the Constituent Assembly of Mexico City had eliminated from the new constitutional charter the political proposal to implement land value capture (article 21, paragraphs 7 and 9). The chapter referred to: (i) the land value from the urbanization process would be a public wealth of the city, and (ii) the city government must manage the building rights for the benefit of all. Such a proposal to democratize the land value had been politically crushed based on the argument that “the symbolic force of home ownership (...) the defense of an expectation about the future based on personal sacrifice” (Azuela, 2019: 220).

However, the urgency to find sources for the reconstruction changed this picture. The ABRs changed from a symbolic threat to property rights to a mechanism for securing housing reconstruction. Likewise, this instrument went from being excluded, by the political decision of the constituent power, to being adopted and regulated by the local executive power. Undoubtedly, an episode marked by legal ambiguity. In the context of political transition, two local tenures (outgoing and incoming) saw the ABRs as a powerful tool given the pressure for resources imposed by the magnitude of the disaster.

The First Public Policy Attempt

The local government published the first reconstruction law on December 1, 2017, at the end of its tenure. This law established five housing categories to attend to the victims and different types of financial aid. The housing category and the type of relationship (ownership or rental) were decisive in the definition of the public assistance schemes for the victims, as shown below (Fig. 3):

Next, an analysis of the ABRs policy chosen to co-finance the reconstruction of buildings declared a total loss. Total loss cases required a financial alternative to cover the complete cost of rebuilding. Therefore, the law established two public support options for the victims to choose from. In both cases, Mexico City

Housing Type	Support/financing scheme
Social Housing in rural areas on community property	Direct subsidies to the victims (without specific financial mechanism)
Housing for low-income and vulnerable population	Direct subsidies to the victims (without a specific financial mechanism)
Vecindades*	Mixed financing schemes: subsidies, resources, contributions from victims, credits
Buildings for residential use	Mixed financing schemes: subsidies, resources, and contributions from victims, credits, and ABRs**
Rental Housing*	Support linked to the victims' resources

Fig. 3 Mexico City: Public support by housing type, (2017) (Source: The authors. *Vecindades: Usual arrangement in Mexico City composed by multiple housing lots aggregated in small units that share the yard and other services. **Additional Building Rights)

Building reconstruction costs	Financing Mechanism
Option A. New building with increased buildability. The profit is obtained from the additional buildable area sales to finance the new building.	Benefit: +35% of ABRs* to the original building surface and housing units. Benefit alternatives: <ul style="list-style-type: none">• Construction volumetry increased• Additional building levels (floor) and,• Additional housing and commercial units
Option B. New building with additional housing units but keeping the same volumetry. The profit is obtained from the additional housing unit sales to finance the new building. Victims give up part of the original area to increase the housing units for sale.	Benefit: undetermined from new housing units for sale Benefit characteristics: <ul style="list-style-type: none">• Additional number of dwellings maintaining the original volumetry• New apartments with less space

Fig. 4 Financial alternatives for building reconstruction. (Source: The authors. *Additional Building Rights)

Department of Urban Development and Housing (from now on SEDUVI) is in charge of the support, as follow (Fig. 4):

Redensification, more intensive use of the land (more housing units, higher buildability), and more profitable uses (such as commercial) were the base of financial support for the victims. Selling additional housing units could cover the cost of rebuilding the destroyed homes (GOCDMX, 2017c). Additional funding mechanisms were: the victims' resources or credits for the initial financing of the

reconstruction works and public resources for up to 500 thousand pesos (approximately \$26,000 dollars) per housing unit (GOCDMX, 2018c, d).

The law expressed a motivation “the conditions presented by the affected people and (...) the insufficient resources that CDMX had to attend to the multiple effects caused by the earthquake” (GOCDMX, 2017b). According to some public officers, the main reason to introduce the ABRs was insufficient public financial resources. Between January and August 2019, we interviewed the former secretary of finance, the former general director of urban development (SEDUVI), the first commissioner for reconstruction, and the former reconstruction program director of Mexico City. All of them agreed and highlighted the resources as the main reason for implementing ABRs. Officials also stated that using ABRs was an alternative to finance the reconstruction of the buildings so the cost burden would not fall on the victims or scarce government resources. Thus, re-densification would be public and in-kind support, a density bonus to help the victims rebuild their homes.

However, by December 5, 2018, the first day of the new local tenure and just over a year after enacting the first reconstruction law, none of the 87 buildings that planned to rebuild using the funding scheme had begun reconstruction. The new tenure (2018–2024) kept the ABRs strategy and made essential adjustments to their design and implementation path.

The Second Public Policy Initiative

On December 7, 2018 – two days after the beginning of the new tenure – the new government published the second reconstruction law showing its electoral importance. The new reconstruction program sought to simplify procedures and speed up home reconstruction (Colín, 2018). All the policies of the first law were repealed, except the one based on ABRs to fund rebuilding buildings in a situation of total loss (GOCDMX, 2019a). The second law granted access to public funds for all victims to reconstruct their homes (regardless of the type of home and whether it was rehabilitation or reconstruction). The law also defined that the city government covered the demolition costs, the reconstruction project design, the preliminary and complementary studies, and the work supervision of both houses and buildings.

The policies designed in this phase were more homogeneous and detailed. Economic support for reconstruction was established for all owners of apartments up to 65 m² in size (GOCDMX, 2019a). The city government proposed two alternatives:

1. The increase of up to 35% in the construction potential (ABRs) established in the zoning of the urban development program
2. Redistribution of the preexisting building volumetry to produce more housing units

The law allowed businesses and services to use the ground floor (established in the first law) and added freedom to define the number of levels (floors) and additional dwellings. It also established that the sale of additional housing units and business spaces resulting from the ABRs would fund the building

reconstruction. In an interview developed in March 2019, the General Director of Victims' Attention, Maestra Jabnely Maldonado Meza, confirmed that officials preserved the ABRs reconstruction scheme for three reasons: (i) insufficient public resources to cover all reconstruction costs; (ii) economic viability – the victims would not have to go into debt, and (iii) enable the owners to recover their homes with the original (or similar) size. In her words:

[For the buildings], we did not have resources to reach all victims with direct subsidies (...) For us, [the ABRs] was a sustainable public financial tool without people going into debt. In other words, if we assumed the re-densification (...), we could reach, at reasonable costs, the total financing of the building. So, we kept it [the ABRs] because it was a viable mechanism that allows the government to meet the needs of the people who demand 120 m² with the sale of additional homes: *the resource comes from selling additional housing units.* (Jabnelly Maldonado, March 2019)

The Additional Building Rights and Their Public Policy Pathway

In May 2017, months before the earthquake, the city council approved a subsidy consisting of a density bonus for a specific group of beneficiaries: formal workers affiliated with the national housing agencies. National housing agencies could ask the local government for a density bonus in re-densification projects; the density bonus applies to well-located but low-occupied lots. The bonus allowed to produce additional housing units while expanding access for this group of beneficiaries (SEDUVI, 2018; GOCDMX, 2017d; ALDF, 2017b). The institutional, operative, and financial route was mapped out. The former SEDUVI general director of urban development comments:

...we based our idea on the recently approved norm for the workers of the national housing agencies (...). Let us say that we had already incorporated the scheme into the urban regulation and what we did after the earthquake were some (financial) counts and scenarios to see how much was needed. We saw that, in general, although there were some exceptions (...) with an additional 35% housing units, square meters, and levels built, the cost of reconstruction could reach zero [on the public budget]. In other words, with 35%, the apartments could come out at zero cost for their owners or very close to zero (...). (Luis Zamorano, 2019)

The norm for the workers of the national housing agencies constitutes the most important antecedent for ABRs as a concrete answer to financial needs. The workers' tool "allowed and facilitated the operational route for the city to grant public support, through greater buildable areas, for the construction of homes for workers entitled to national housing agencies" (Fuentes and Acosta, 2021).

This illustrates that ABRs were selected as the primary financial tool to rebuild after the earthquake, which resulted from an institutional adaptation to an already existing tool and path. However, implementing this adaptation still required significant adjustments. The second law defined three groups of actors: (1) *victims*: owners or legal tenures; (2) *government authorities*: institutions, agencies, and dependencies of the Mexico City government, especially the Commission for the Reconstruction, involved from the beginning to the end of the reconstruction process; and (3) the *real*

estate sector: private actors involved in the architectural design and rebuilding such as designers, surveyors, architects, engineers, builders, and developers. The law structured a government-society hybrid governance model for the financial and control components. This model aimed to guarantee the maximum social and economic welfare to the victims and financial viability through additional real estate products for sale.

The financial structure has mixed resources. The city contributes with the ABRs (in-kind input to each building) and public resources; the public resources go to a trust that is replenished and managed in a circular scheme. In addition, the victims contributed to the land (in-kind contribution). The ABRs plus the public resources cover, in many cases, the financial costs of the entire reconstruction cycle – from the design to the delivery of the new building. Once the new building is ready, the victims receive an adequate replacement housing unit with a great advantage: the original location. The city obtains additional real estate products (housing and business units) for sale.

The economic benefits from selling the additional units return to the public trust to support the most significant number of victims in a cross-subsidy scheme between projects (GOCDMX, 2019a, b). Furthermore, commercializing the additional real estate units is designated to SERVIMET, the public company of metropolitan services; it sells those units through private companies. In this way, the local government assumes the financial risk and additional benefits; the latter in the case the income from the sale of the additional units exceeds the costs of reconstructing the building.

The law also established the operational route for using ABRs (24 steps). Table 2 shows those steps grouped into nine phases (Phase 1 to Phase 9). The steps make explicit the logic of public command in management:

The starting point of the Reconstruction program is the high risk of collapse declared on a technical opinion; it includes the demolition recommendation and subsequent complete reconstruction (Phase 1). In cases where it is possible to rehabilitate the building but is more expensive than the complete reconstruction, the group of victims (100%) may opt for demolition and apply to the ABRs program for reconstruction. However, the requirement of total agreement – 100% – has implied significant delays in implementing ABRs (Fuentes, 2020).

The projection phase (Phase 2) begins with the open call for the designer selection (GOCDMX, 2018b, 2019a). Then, the project must define all the new residential and business units, dimensions, and destinations (replacing units for the victims and selling units at market prices). It must include a financial proposal estimating the total cost of reconstruction and the expected revenue from selling additional housing and business units. Finally, the project's approval must be carried out jointly by the Commission and the victims; the victims' group must also participate in the consultation process with authorities. In this phase, the local administration must ensure the victims' well-being through replacement housing units close in size to the original ones and the most efficient economic use of the ABRs in additional units. The aforementioned interviews with different actors indicated that in ongoing projects, the Commission requested designers and victims to include as many additional units as possible to cover the maximum cost of the new building.

Table 2 Mexico City: Phases of building reconstruction

	1	Risk technical opinion	F4	13	Executive project reception and concept catalog elaboration
F1	2	Demolition recommendation		14	Selection of companies for reconstruction and supervision
	3	Designer Call and Selection	F5	15	Financial budget for the building
	4	Trust Resources request – pay the executive project		16	Financial budget check
	5	Project development: agreement sign	F6	17	Trust Resources request – building development
	6	Payment step		18	Constitution of the Public-private council
	7	Financial proposal development	F7	19	Council: Sign of reconstruction and supervision agreements
	8	Preliminary project development		20	Builder payment
	9	Preliminary project Auditing	F8	21	Start of works
	10	Preliminary Project and Financial proposal Approval		22	Informative meetings about work advances
	11	Executive project development	F9	23	Official end of the works
	12	Executive project: structural safety verification		24	Delivery of the new building

Source: The authors based on information obtained from the Portal for the Reconstruction of CDMX, retrieved on June 2020

After the victims and the Commission approves the project, it goes to Phase 3. The Institute for Construction Safety of Mexico City (ISC-CDMX) verifies the structural safety of the proposed building and may request adjustments or adaptations. Phase 4 details the project costs, including all supplies and labor. The Commission should monitor the material cost list.

The execution (Phase 5) starts with a public call. The Commission selects two companies by lot, one to reconstruct and the other to supervise the construction advances. The winning companies present a financial budget that, in turn, is approved by the Commission. The public resources for the reconstruction must be approved (Phase 6). The law and the comprehensive reconstruction plan established that the resources for the reconstruction can only come from the public trust and not from victims' loans from financial institutions, such as the Federal Mortgage Society or commercial banks. This premise guarantees that the victims will not pay interest rates or loans (GOCDMX, 2019a).

Phase 7 requires the constitution of a public-private council to carry out procedures, especially legal ones related to land ownership and the formalization of the government's participation as a partner in the real estate project. The council's constitution takes place in a notary with the participation of the Commission and 100% of the legally recognized victims. The council represents all its members. The council carries out legal procedures such as signing contracts with the companies (builder and supervisor), legal end of the previous condominium, formalization of

the government as new co-owner, and transfer of 35% of the land from victims to the government (GOCDMX, 2019a). The government's condition of co-owner is crucial to it holding the property of the additional real estate products and obtaining the revenue from their sale.

The legal feasibility of a tool is as important as its financial feasibility, and the legal accreditation of a victim that lost his or her property is a very complex aspect of the reconstruction process after a disaster. The first law only accepted one legal condition: ownership. The facts showed that it was an extremely restrictive requirement that, in many cases, seemed impossible to attest to or required a slow and uncertain legal process. The second law kept the absolute majority (an agreement requirement of 100% of the victims) but offered a little juridical flexibility: accredited victims, not just owners. However, in practice, it remains a significant obstacle to the start of the reconstruction project. To stop the entire process requires just one victim with legal difficulties. What to do in cases where there is no possibility to attest the required legal status? In extreme cases and always in agreement with the victims, the law established the possibility of using "*a mechanism through public law*," which means using eminent domain (GOCDMX, 2018b, 2019a; c). Additionally, the law established a restrictive clause for the victims who benefited from trust resources at any phase: the beneficiaries could not sell their properties during the first five years after the delivery of the rebuilt property (GOCDMX, 2018b).

The reconstruction begins with the resource's approbation for the reconstruction and the sign of the construction and supervision contracts (Phase 8). During this phase, the construction company must present progress reports, and the supervising company verifies them. Finally, Phase 9 refers to the completion of the construction, the delivery of replacement housing to the victims, and the additional real estate products for the government to put on the market.

Implementation and Numbers

According to the Mexico City Reconstruction Portal, at the end of 2020, 135 buildings required complete reconstruction. Eleven would be rebuilt through private loans and 26 through private donations (Carlos Slim Foundation). The remaining 98 buildings go through ABRs financial scheme for reconstruction; the group included cases where rehabilitating was more expensive than the entire reconstruction. By January 2021, in an interview with the General Director of Victims' Attention 43 buildings were under the reconstruction process (Phase 8), nine buildings were under the administrative process (Phases 3–7), and the remaining 47 were in the design phase of the architectural project (Phase 2).

The application of ABRs is exemplified in two reconstructed buildings: "Pacífico 223" (Coyoacán district) and Nicolás San Juan 304 (Benito Juárez district). In both cases, all recognized victims already received replacement housing, and the government received additional real estate products for sale. Table 3 shows each proposal and its results:

Table 3 Two reconstructed buildings with ABRs

Project	Pacífico 223	Nicolás San Juan 304
Location		
Original building		
Description	<ul style="list-style-type: none"> Two towers 6 floors: ground for parking, five housing levels, a roof terrace 40 apartments Total area of 4,461m² Seriously damaged 	<ul style="list-style-type: none"> One tower 6 floors 21 apartments Total area of 2,289m² Structural damages. Recommendation of demolition
Render proposal		
Project details	<ul style="list-style-type: none"> Two towers joined by a landscaped square Mixed-use (housing and business) 54 apartments (40 for replacement, 14 additional for sale) One business space for sale Two business spaces (ground floor) Total area of 5,997 m² 	<ul style="list-style-type: none"> One tower Residential use only 28 apartments (21 for replacement, 9 additional for sale) Hypothetical maximum area of 3.090,15 m²
Financial scheme	<ul style="list-style-type: none"> Resources for rebuild public Cost recovery: 80% from the sale of additional units Lost fund: 20% - city budget 	<ul style="list-style-type: none"> Resources for rebuild public Cost recovery: unavailable Lost fund: unavailable

Source: The authors. Information obtained from interviews in June 2020, and public data downloaded in June 2022 from the Mexico City Reconstruction Portal <https://www.reconstruccion.cdmx.gob.mx/redensificacion> and SERVIMET <https://servimet.cdmx.gob.mx/Promocion-de-vivienda/programa-de-reconstruccion>. Render image of Pacífico, 223 Project downloaded in June 2022, from <https://www.archdaily.mx/catalog/mx/products/17471/arquitectura-bim-pacifico-223-protoforma>

According to the same Portal, as of June 2022, a total of 111 buildings were under reconstruction; however, 14 would not use ABRs. It was not possible to verify the state of progress of each of the remaining buildings. The public data indicated at least 16 wholly reconstructed buildings were made through the ABRs financial scheme. Hundreds of families received their replacement housing in adequate conditions in their location while the city recovered the reconstruction cost (partial or total).

Conclusive Remarks

The magnitude of a government's challenges depends largely on the disaster's magnitude. This is especially true for local governments, who by territorial principle are closer to the citizens and the effects of the catastrophe. For municipal governments, even those with considerable state capacity and financial preparation, such as a disaster relief fund, recovery from a disaster requires millions of dollars, attending to many fronts, and almost sole responsibility for their resolution. The institutional conditions will be decisive for the approach and implementation of alternative and sustainable financing strategies, such as those linked to real estate and land value capture.

This chapter documents Mexico City's pioneering and perhaps unique experience in implementing additional building rights to finance the reconstruction of hundreds of dwellings lost after a major earthquake. From a financial point of view, there are several aspects to highlight. This case shows the difficulty that these challenges represent, even for a city with the magnitude and economic dynamics of Mexico City, which was forced to deal with a disaster with minimal support from the federal government. It also shows the weight of urban, constructive, and social conditions, in the modeling of tools and in the search for financial sources. This case highlights an aspect little considered by the literature, the need, in the face of massive damage situations, to find support alternatives for populations with better incomes but who are left equally vulnerable as a result of a disaster and have the capacity to organize themselves and be heard by the authorities.

Customary municipalities establish land-use regulations that increase property prices without charging their owners. At the same time, cities suffer immense difficulties in financing urban development, which multiply when faced with reconstruction after a major catastrophe. This journey illustrates, in the public and political spheres, that a disaster can be a turning point and an opportunity for local governments to implement land value capture tools. This evidence is crucial because it reflects that the adversity and urgency of public resources offer unique opportunities for land value capture tools.

The additional building rights constitute a fair alternative for financing urban recovery. However, this case shows that, in addition to being fair, this is a viable mechanism in countries with less economic and institutional conditions. Redensify, through more intensive and flexible land uses, is a feasible financing option but demands the development of an institutional route and financial estimations. The spatial concentration of damage to homes and buildings, respectively, facilitated the

territorial matching between the ABRs and the affected group of buildings concentrated in a region with potential market demand for density. This case illustrates that the implementation of ABRs was an adaptation and improvement on an existing tool that faced legal ambiguities, something common in the public policy arena. The changes between the first and second reconstruction laws depict the authorities' progress in understanding the tool and its implementation toward the reconstruction target.

From the financial point of view, this case illustrates the permanent tension between the victims' needs and expectations and the reconstruction scheme's viability based on maximizing additional real estate products for sale. From the legal point of view, two challenging questions emerge: the dwelling's legal condition and the use of eminent domain. More frequent than expected dwellings lack adequate property title, this is common in informal markets of the global south. This lack of a title affects the victim's legal status, mainly for governmental reconstruction aid programs. At the same time, it creates obstacles to using land-based financial tools such as the ABRs in this case or the land readjustment in the Chilean experience (see Hong & Brain, 2012). Both land value capture tools require collective decisions and are oriented to attend primarily formal markets. The exit door is the eminent domain that can be the only alternative in cases where the dwelling cannot prove its condition, which addresses social and political challenges and opposition. Reconstructing is a long process that requires social presence and the government's hard work to harmonize potential conflicting interests between victims, private companies, and public policy goals. The victim's participation and involvement are essential to promote and successfully develop a project based on ABRs financial aid.

Considering that the ABRs scheme started in 2019, mere months before the COVID-19 pandemic, this case offers a success story. Typically, a private construction building cycle, without collective decisions or governmental management, takes 24 to 36 months. By June 2022, at least 16 buildings had been rebuilt through the ABRs financial scheme. Preliminary results suggest that the ABRs can be a real alternative, especially in markets with high demand.

In addition, the ABRs anticipate two "extra-financial" and valuable virtues for disaster and reconstruction public policies. Reconstruction policies tend to move people from their original places to the worst locations; they carry negative social impacts and a loss of networks that reinforce damages instead of relieving them. Second, reconstruction housing programs traditionally offer small-sized and homogeneous units regardless of the previous housing condition. The ABRs guaranteed the victims' right to stay in their location while keeping habitational quality; this tool facilitated replacement housing units with similar or equal dimensions to the previous one.

The experience of Mexico City reveals the social, legal, financial, public management, and political complexities of implementing ABRs as part of a public policy strategy for recovery. This case opens a research agenda regarding the potential of land value capture tools as a financial strategy for disasters in the global south.

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Cultural Tangibles and Intangibles and Disaster Challenges: Narratives from Varanasi

153

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Contents

Introduction	2316
India: Land of Diverse Cultural Heritage (Tangibles and Intangibles) and Disaster Risks Challenges	2317
National Policies on Conservation and Heritage Management and Disaster Risk Reduction in India: The Two Different Universes	2319
Conservation and Heritage Management	2319
Disaster Risk Reduction	2320
Global Attempts	2321
Attempts of Integration of the Two Universes, Still a Long Journey on Ground	2321
Varanasi: The Ancient Lived City, at the Cusp of Tradition and Modernity	2322
Challenges that Varanasi Faces Are Manifold: Two Kinds of Hazards: Natural and Human-Induced	2325
Floods	2325
Urbanization: Human-Induced Disaster	2325
Encroachment of the Flood Plains and the River Bank	2326
Loss of Sustainable Ecosystems	2327
Massive Tourist Footfall	2327
Possibilities and the Way Forward	2328
Conclusion	2329
References	2330

Abstract

The chapter places the need for integration of conservation of heritage with disaster risk reduction with narratives from the city of Varanasi. Varanasi is one of the ancient cities which have seen changes in the landscapes as well as in culture. The presence of the river Ganges gives it important resources as well as makes it prone to hydrological hazards. The chapter captures the rapid

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urbanization and the current state of city level services which adds to the vulnerability of the population to the impending hazards. The policies on disaster risk reduction as well as on heritage conservation and management exist but not implemented in an integrated way which leads to gaps in providing coverage from risks. Finally, the chapter dwells into the varied solutions offered by the authors as a way forward to truly build Varanasi as a future-oriented and resilient-smart-heritage city.

Keywords

Cultural tangibles · Heritage smart city · Varanasi · Disaster risk preparedness

Introduction

One of the central discourses of Disaster Risk Reduction in the present times has been shifting towards the concerns of cultural heritage; however it is parsimonious. Largely the initiatives of the preservation and conservation of the Cultural Heritage management exist separately and very much on its own. With times, there is a growing realization that each of these cultural and heritage sites is susceptible to multiple hazards and disaster risks. Each site has its own peculiar concerns and challenges that necessitate the need for an integrated approach of disaster risk assessments of the cultural, historical sites.

This chapter focuses on Varanasi, one of the oldest and lived ancient sites, which is also a storehouse of numerous cultural and heritage sites. It elaborates on the kinds of challenges that this city and the other cultural and heritage sites suffer from existing and emerging risks. Taking narratives from Varanasi, this chapter shall elaborate the challenges that this ancient living heritage city grapples with. It also elaborates on the possible solutions that can be offered to remit these challenges. Making arguments for the need for an integrated approach to cultural risk reductions, it explores the possibilities of undertaking such an approach. Through the lens of Varanasi, it engages with the feasibility of aping and strengthening the existing conservation strategies offered by the governmental agencies in case of disasters and its challenges in the long term or the need for innovative ways. With the changing time, there is a need to focus on the tangibles and intangibles, which foreground cultures. The growing awareness on this concern necessitates engagement with this theme and informs the larger paper. The other significant argument is about attending to the differential needs of each of the sites, depending upon their location and proximity to the kind of disaster risks that each faces.

Some of the significant questions that foreground this chapter are as follows:

- What are the challenges that an ancient living city like Varanasi faces in situations of hazards like floods and unplanned urbanization?
- Where does the protection of cultural heritage stand in the context of smart city governance?

- What have been the attempts made by the local administrative as well as governmental policies on the front of disasters and conservation management?
- Can we take the same approach generic to conservation management and disaster risk reduction, towards cultural tangibles and intangibles?

This chapter is divided into four broad sections; the first section is based on exploration of India as a land of cultural and heritage sites and the diversities of disaster risks faced. The second section engages with the kind of policies, both national and international governments and other agencies have with regard to the conservation and heritage protection. The third section focuses on Varanasi, as a site of the cultural tangibles and intangibles, engaging with varied disaster risks that it faces and grapples with. The last section presents in different possible solutions that can be explored in terms of disaster risk and cultural and heritage management.

India: Land of Diverse Cultural Heritage (Tangibles and Intangibles) and Disaster Risks Challenges

India is a land of multiple cultural and heritage sites, each spread across the diverse geographical expanse. In the context of huge cultural and religious diversities, there are many sites that are rich in bearing that diversity. At present India has 40 sites (32 cultural sites, 7 natural sites, and 1 mixed) which are enlisted in the UNESCO World heritage list (UNESCO Centre, 2022). Consequentially, it is rich both in terms of the cultural tangibles and intangibles. The tangibles come to us in the form physical embodiments as the monuments, sites, cultural and religious landscapes, buildings, and typologies of structures. As central as the tangibles, there has been growing focus on safeguarding the intangibles as well. In 2003, UNESCO Convention specified the meaning of the Intangibles. According to the convention, “The ‘intangible cultural heritage’ means the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage. This intangible cultural heritage, transmitted from generation to generation, is constantly recreated by communities and groups in response to their environment, their interaction with nature and their history, and provides them with a sense of identity and continuity, thus promoting respect for cultural diversity and human creativity. For the purposes of this Convention, consideration will be given solely to such intangible cultural heritage as is compatible with existing international human rights instruments, as well as with the requirements of mutual respect among communities, groups and individuals, and of sustainable development” (UNESCO Convention for the Safeguarding on the Intangible Cultural Heritages, 2003. <https://ich.unesco.org/en/convention> (Accessed on 19th Feb 2022)).

In the larger pursuits of risk reduction of the cultural heritage sites, the necessity for preservation of the tangibles and intangibles of cultures becomes a crucial undertaking. In its absence, there is a huge loss and deprivation for the individuals

as well as communities. Its absence not only takes away from them their heritage and rich past, but also the sense of identity. It is important to recognize that the material objects and monuments are not just static and physical embodiments of one's past or cultural history, but they are necessary medium through which one's identities and ideas of one's society are transmitted. It is also the medium for the preservation of cultural plurality and diversity. "To keep and maintain what we value and to hand it down to future generations is an aspect intrinsic to human development" (Merbach & Stamm, 2014).

As mentioned earlier about the deep diversities that India encompasses in the form of culture as well as geography, therefore, it is important to recognize the many sites (listed in the World heritage sites and many unlisted ones), and their susceptibility to various disaster risks. The Himalayan region is prone to disasters like earthquakes and landslides; the plains are affected by floods almost every year. The desert region of the country is affected by droughts while the coastal zone experiences cyclones and storms. Depending upon the location and proximity of these cultural and heritage sites, to the source of hazards, the threats are manifold and distinct from each other. To add to the list of existing natural hazards, there are human-induced hazards which more often result due to unplanned and non-systematic urbanization.

The threat of disasters has always existed, and many societies grapple with the challenges and the threats and they have found their ways of safeguarding and preservation in myriad ways. There are certain points that need to be made: firstly, the disaster risks to these sites are an existing reality. Secondly, the kind and types of disaster risks that each of these sites is susceptible vary and are distinct from each other, and thirdly it will be an error to generalize the similarity of risks and kind of risks, as these are distinct from each other, and fourthly the urgent need to integrate and reinforce the link and connection between cultural, religious, and sacred heritage (tangibles and intangibles) and disaster risk reduction.

It becomes important to have different kinds of methods and approaches to address the unique disaster risks. While the monasteries in Ladakh, Himachal Pradesh, Arunachal Pradesh, and in other trans Himalayan region face the threat of earthquakes, the temples in Uttarakhand suffered immensely due to the flashfloods, which created havoc in terms of the loss of livelihood and cultural natural heritage. The states like Orissa, Andhra Pradesh, Tamil Nadu, and Gujarat have umpteen number of cultural and natural heritage sites that suffer from the challenges of cyclones. Not to mention some of the sites in urban cities, like Ahmedabad and Varanasi, reel under the pressures of the floods. The natural heritage sites like Majuli Island and Sundarbans mangrove forest suffer due to cyclical floods and cyclones. Few such examples include the Bhuj city palace, the commemorative chhatris which witnessed extensive damage during earthquake in 2001. Similarly, in 2011, the Sikkim Earthquake destroyed many Buddhist monasteries and temples. In the year 2019, the world heritage site of Hampi was flooded. While the tourists were rescued, the ancient site remained underwater and sustained significant damage (India Today,

2019). The flood situation emerged again in 2021 (Deccan Herald, 2021). These states and the sites have always seen worse kind of disasters and have been rebuilt over and over again. However an important argument that needs to be made is that the larger discourse on heritage conservation and management and disaster risk reduction has been divorced and separated from each other. The disaster risk reduction engages with the challenge of the risk reduction, with a focus on human life and assets; it still does not place much importance on the cultural and heritage intangibles. Therefore there is a need to integrate the cultural tangibles and risk assessment while engaging with disaster risk management.

Before we engage with the arguments for the integrated approaches to cultural heritage risk reduction through the narratives of Varanasi, let's look at the various national and global policies with regard to conservation and heritage management and disaster risk reduction.

National Policies on Conservation and Heritage Management and Disaster Risk Reduction in India: The Two Different Universes

With regard to the policies on conservation and heritage and disaster risk reduction, India has many acts and legislations. These are largely separated and are on conservation and heritage management as well on disaster risk reduction specifically and are in tandem with International provisions.

Conservation and Heritage Management

As per the Constitution of India, ancient and historical monuments and archaeological sites and remains, declared by parliament, by law to be of national importance are within the jurisdiction of the Center, the Union government. The state government looks after the ancient and historical monuments other than those declared by Parliament to be of national importance. The states may also have special notified areas under State Acts. Additionally, the Masterplans of several cities identify special heritage precincts, notified areas, etc. which are controlled through the city administration. The heritage cities as identified by central government function through MoUD, MoT, and MoRD and administered locally by state governments and local authorities. Article 29, Article 49, and Article 51 A (F) of constitution of India distinctly provide the guiding light for legislative protection and conservation of heritage.

The Archeological Survey of India (ASI) under the Ministry of Culture, Government of India, is the chief organization that is responsible for the conservation and management of the cultural and heritage sites and monuments. It operates through its State Circles, Museums, Excavation Branches, Prehistory Branch, Epigraphy

Branches, Science Branch, Horticulture Branch, Building Survey Project, Temple Survey Projects, and Underwater Archaeology Wing. The Indian National Trust for Arts and Cultural Heritage (INTACH), established in 1984, works through its various state chapters for carrying out listing of unprotected buildings of archaeological, architectural, historic, and aesthetic significance. The Government of India also launched the National Mission for Manuscripts to undertake digitization of the manuscripts as a means of preservation of our indigenous knowledge and heritage (Niti Ayog, 2020). Apart from this, India is also signatory to the below international conventions (Niti Ayog, 2020):

- (i) Convention on the Protection and Promotion of the Diversity of Cultural Expressions. Paris, 20 October 2005
- (ii) Convention for the Safeguarding of the Intangible Cultural Heritage. Paris, 17 October 2003
- (iii) Convention concerning the Protection of the World Cultural and Natural Heritage. Paris, 16 November 1972
- (iv) Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property. Paris, 14 November 1970
- (v) Protocol to the Convention for the Protection of Cultural Property in the Event of Armed Conflict. The Hague, 14 May 1954
- (vi) Convention for the Protection of Cultural Property in the Event of Armed Conflict with Regulations for the Execution of the Convention. The Hague, 14 May 1954

Disaster Risk Reduction

The National Disaster Management Act, 2005, governs the framework of disaster risk management in India. The Act established National Disaster Management Authority (NDMA) as the apex body for institutional, legal, financial, and coordination mechanisms at national, state, and local level. Various states have thus established state disaster management authorities and district disaster management authorities to execute the work. The Act also established National Institute of Disaster Management (NIDM) to undertake necessary capacity building exercises for disaster risk management. NDMA has developed National Disaster Management Policy (2009 and revised in 2019) and National Disaster Management Plan (2016) for guiding the various activities on risk management. Further it has also published sector-specific guidelines for various domains to undertake disaster risk management activities.

In 2017, NDMA has come up with guidelines on disaster risk management for cultural heritage sites and precincts. The guidelines are comprehensive and serve to provide framework for state level and local government to integrate disaster risk management for heritage management. The new government schemes of HRIDAY

and PRASAD focus on development of infrastructure at the heritage sites, but neither of them integrates strengthening the risk resilience in context of conservation of tangible heritage.

Global Attempts

The global policy document (UNESCO, 2015) for the integration of a sustainable development perspective into heritage conservation as adopted by UNESCO is one of the important international document to holistically consider environmental sustainability, resilience to natural hazards, and climate change into the domain of heritage protection. Resonating the Sendai Framework for Disaster Risk Reduction, this document recognizes the need to inculcate disaster risk reduction for heritage sites and also introduces effective build-back-better for post-disaster recovery at heritage sites. The UNESCO has also come up with strategies to reduce disaster risk at world heritage sites with a focus on building a culture of prevention. It also advocates for cultural diversity, age, vulnerable groups, and gender perspective while preparing risk reduction plans. Community participation is an important aspect which is highlighted by UNESCO for plan preparation and implementation. The five objectives as listed in the strategy for reducing risks from disaster at world heritage properties are the following:

- (a) *Strengthen support within relevant global, regional, national, and local institutions for reducing risks at World Heritage properties.*
- (b) *Use knowledge, innovation, and education to build a culture of disaster prevention at World Heritage properties.*
- (c) *Identify, assess, and monitor disaster risks at World Heritage properties.*
- (d) *Reduce underlying risk factors at World Heritage properties.*
- (e) *Strengthen disaster risk preparedness at World Heritage properties for effective response at all levels.*

Maintenance of heritage sites and their diversity adds to the resilience of the society as a whole. The first priority of the Sendai Framework mentions about understanding the disaster risk of cultural and heritage monuments and develop strategies to reduce the same. Comprehensive disaster management plans need to be formulated based on the specific characteristics of the heritage site and nature of hazards within a regional context.

Attempts of Integration of the Two Universes, Still a Long Journey on Ground

Since 2017, there has been a significant attempt of integrating the concerns of the conservation and preservation of cultural and heritage tangibles and intangibles with disaster risk reduction. Prior to this, the two have been working independently of

each other and have little interface. This shift was pushed with a growing awareness with the changing times and global pressures enamored by UNESCO. The Archeological Survey of India (ASI) has been moving towards integrating the disaster risk reduction in larger conservation. The National policy of ASI, 2014 for the conservation of the ancient monuments, archaeological sites, and remains (ASI, 2014) focuses on preparation for natural or human-induced hazards. The policy mandates preparation of disaster management plans for heritage sites and also to provide training to person-in-charge to ensure effective response and post-disaster recovery. It also requires to undertake structural assessment of the structure to identify the need of retrofitting measures for mitigation. However, a close survey of the sites informs that on ground and in reality, not much is not happening and many a times, these get limited to being on paper.

While the above-stated conventions are important from the viewpoint of conservation, the aspect of integrated planning for disaster risk reduction for the heritage management still needs a lot of work and initiative. The integrated approach is missing on ground, and in reality the two sectors operate independently. When it comes to confluence of the two together, there is still a lot of bridging which is done. Many a times, when disasters lead to significant damage, loss, and destruction, the preservation of cultural sites is not really on top of the agenda. It is not new that many of the world's heritage sites have suffered significantly, to the extent that these have been lost completely and some are at the brink of extinction, but there is significant failure in prioritizing these sites, in situations of disasters. Related to the existing natural threats and risks, the addition of human-induced hazards is significant and is also a huge contributing factor to the threats to these sites. India is experiencing a growth in planned and unplanned urbanization, which increases the vulnerability of heritage sites. Further, the climate change increases the frequency of such hazards.

This has led us to ponder over the collective ignorance among the stakeholders, whether the governmental official or the common masses, on the adequate provision of risk reduction measures for cultural heritage. With this as the larger context and background, we shall now engage with the narratives that emerge from Varanasi with regard to risks that cultural and heritage tangibles and intangibles that Varanasi faces from. The section on Varanasi looks at the discourse around conservation and the kind of challenges it faces from.

Varanasi: The Ancient Lived City, at the Cusp of Tradition and Modernity

Varanasi is known by many names Banaras, Kashi, Muktidhaam, and many others. It is invoked as one of the oldest and ancient living cities in the world. Holding an important position in the Hindu religious milieu, it is seen as a city that liberates, the one that gives *Mukti* (The most common invocation of Banaras is Muktidhaam; it is considered that those who die here attain Mukti (salvation), as they are free from the cycle of life and birth. Therefore many religious Hindus come to the Ghats

(Waterfronts) to perform the last rites). Rana P B Singh refers to the multiple scapes that Banaras encompasses of in the form of ritualscapes, heritagescapes, and spiritualscapes.

Apart from being the haloed sacred city for the Hindus, with key cultural, religious, and pilgrimage sites (cultural tangibles and intangibles), it is equally important for believers of other religious dominations. It is not only a Hindu city, but a multicultural as well as multi-religious city with Jain, Buddhist, Muslim, and folk sites, making it a rich and diverse city. There has been a voluminous scholarship on Banaras's rich cultural heritage; some of the key texts include Diane L Eck's *Banaras: A City of Light*, Hertel and Humes's *Living Banaras: Hindu Religion in Cultural Context*, and Rana P B Singh's *Banaras: Making of India's Heritage City, Cultural Landscapes and the Lifeworld Literary Images of Benares and Banaras, The Heritage City of India: Geography, History, and Bibliography*.

Among the sacred cities in India, Banaras holds a special significance, since it is an ancient city that is living; it has been touched and shaped by many cultures. It has been constantly evolving, with additions coming and integrating. As people from different parts of the country came and eventually settled, they also brought a piece of culture with them and that came to shape Banaras, making everyone *Banarasiya* and making Varanasi a storehouse of many living heritages in one place. Its invocation in literary, cultural, religious milieu has been ancient. It has evolved significantly and holds an important place in temporal as well as the real world. Representations of many kinds are important, specifically in literary works. Banaras has been the house of many great names, from Tulsidas, who wrote the *Ramcharitamanas* at the Manas Ghat, or Sant Kabir or Ravidas. Banaras has been a historical city as well.

With changing times and the pressures of urbanization, there has been a growing focus on smartification of the ancient lived city, to which the heritage tag has been attached, therefore the growing recognition of Varanasi as a smart heritage city. Related to this there is also a growing demand for getting listed as part of the UNESCO's world heritage list. The focus is towards urban and spatial regeneration in tandem of safeguarding the urban heritage. It is important to understand that heritage in Banaras is much more than the monumental heritage, as scholars argue that spirituality is an important aspect of this city. Therefore, aspects of smart city need to be inclusive with the discourse of the heritage city needs to reinforced in any discourse on Banaras, in order for it to cater to the world class aesthetics.

With regard to the discourse on smartification of Banaras, there are multiple perspectives. Rana P B Singh explains the core ideas of one set of thinking as, "The six pillars of envisioning 'Smart-Banaras' Plan are: Suramya ('Picturesque', through religious, cultural and heritage), Nirmal ('Pure/clean', through greening spaces and ecological ordering and reviving the Ganga river as soul), Surakshit ('Safe', through better transport, pathways and vehicle movement), Smmunat ('Improved', through citizenship, civility, liveability and viable employment), Ekatrit ('Integrated', through interfacing and coordination among the various cells for maintaining SDGs) and Sanyojit ('Planned', through balanced between traditions and modernity

in the frame of ‘lifenology’ that would make a balance between liveability and appropriate technology” (Rana P Singh, 2018, 25).

The other set of arguments, largely coming from the masses, is critical of the state and governmental approach, arguing that this drive is disconnected from the understanding of people who have inhabited the city for generations and thus is anti-masses. The people who have been living in the city generationally argue the absence of due attention to the heritage aspect. Vera Lazzaretti argues that many protests have been carried by the local groups claiming that despite the claims of safeguarding the heritage of the city, as part of the smart city project, there is no sign that the larger projects like Vishwanath Heritage Zone and Kashi Vishwanath Corridor are being framed in terms of heritage. In Dec 2017, protests were made against the corridor, with the emergence of the civil society collective, Dharohar Bachao Sangharsh Samiti, arguing that the focus of the smart city initiative is on Vikas (Development), rather than on Dharohar (Heritage). The one major argument is posed against the working of the Kashi Vishwanath Trust (which is one of the key organizations for the Vistarikaran of the corridor). Further, this grand project, which was for preserving the cultural and heritage tangibles and intangibles, had no role or involvement of the national body, Archaeological Survey of India (ASI), and was carried under the aegis of Kashi Vishwanath Temple 371 Trust (KVTT, a private collective). Interestingly Varanasi being invoked as a national heritage, KVTT not being in collaboration with the ASI, explains the ways in which two bodies are being disconnected to each other. In Dec 2018, the Shri Kashi Vishwanath Special Area Development Board was constituted and the act was passed as UP ACT NO: 31 OF 2018, and the corridor was renamed as “Vishwanath Heritage zone,” now encompassing a larger area and territory and interestingly without much role of the ASI.

Though the idea of *Vistarikaran* has been there since a long time, as the argument was floated in 1938, and attempts made in 2007 and 2010, the work really started with the coming of BJP in power. Lazzaretti writes, “An analysis of press reports from the initial period sheds light, however on key words associated it: Vistarikaran or expansion; adhigrahan, or acquistion; sundarikaran, or beautification; and increasingly Vikas, or development. There is no sign of the project being framed in terms of Heritage” (Lazzaretti, 2021). With PM Modi, as the Member of parliament from the constituency of Varanasi, the work on the corridor has now been completed in 2022, but many of the civil society organizations are critical of the corridor and smartification, as they argue that this corridor displaced many of the existing heritage and cultural sites. There is a growing understanding among the masses that the development paradigm of the state, and the city authorities, has marginalized the heritage aspect. They argue that despite the claims of making Varanasi a heritage smart city, the focus is not so much on integrating heritage. In many ways, it is only a lip service. To add to this invisibilization, the additional challenges of disasters, whether natural or man-made, place the many diverse sites in a precarious situation. Let us now look at the various disaster risks that Varanasi suffers from.

Challenges that Varanasi Faces Are Manifold: Two Kinds of Hazards: Natural and Human-Induced

Floods

One of the most common hazards that Varanasi faces is the problem of recurrent floods every year in the month of monsoon. Over the years, the frequency and intensity of such floods have increased due to climate change. The annual floods put pressure on the existing preventive and mitigation measures to protect the heritage sites. The floods caused by swelling of Ganges submerge the city, and many a times, it reaches within the old and the inner city. There are many kinds of threats that it causes; apart from being the source of many vector-borne diseases and health hazards, it causes challenges of distinct kinds. As per the Climate Disaster Resilience Index of Varanasi (Chatterjee et al., 2015), the Varanasi city has capacity in terms of household assets, education, and awareness but ranks lower in terms of institutionalization and mainstreaming of disaster risk reduction and climate change adaptation. Though there has been significant scholarship produced on floods-related challenges that Varanasi faces from, there has not been enough scholarship on the impact of floods on the cultural and heritage sites specifically.

Since the older city is very close to the river front, there are 80 ghats that have been there historically. As the river is deeply imbued in everydayness of the city, it is important for ritualistic and common reasons. Over the years, this space on the river front came to be most occupied. There are historical settlements and thus housing many old temples and cultural sites. The river front is closely enmeshed in the everydayness of the city. Almost every year there are news about the inundation of the city and adjoining villages in the month of July and August, but there has been failure in terms of rectifying the problems ((Mishra, 2021). The year of 2016 specifically witnessed submergence of the ghats of the holy city of Varanasi due to swelling of the Ganga river (Khadka, 2016). There is a strong evidence that the frequency and intensity of riverine floods are going to increase owing to the climate change. The heritage city of Varanasi faces the maximum risk due to increased exposure and lower institutional level resilience. As per Nijesh M in an article written in 2020, flood-prone areas in the northeastern part of Varanasi include Cholapur, Chiraigaon, Kashi Vidyapeeth, and Pindra blocks. In addition to riverine floods (Mishra et al., 2022), waterlogging is identified as an important area of concern for Varanasi, especially in the monsoon season. It results in sewage back-flow adding to the concentration of storm water drainage while the river is already swelled. This can cause irreversible damage to the heritage sites and also make it unsafe for the tourists to visit.

Urbanization: Human-Induced Disaster

The crisis of the floods is further accentuated by the nature of the urbanization that the city witnessed over a long dure, with unorganized city planning and old drainage

system. Some of the efforts that have been taking place in beautification or decongesting the old city have been challenged on the grounds of its impact on the ecological grounds and its non-sustainability (especially the materials used for the same). Varanasi has been selected as one of the smart cities under the smart cities mission of government of India. However, the often neglected cultural and heritage sites within the city are under tremendous pressure. The kind of efforts that the administration has taken in offsetting the loss has not been able to translate in risk reduction.

Urbanization in Banaras has made it earn the status of a “Million city.” As per the 2011 census, the density of population in Varanasi was 2395 per sq. km (Varanasi| Demography, 2022), and the numbers shall be increasing over the years with the projection being skyrocketed by 2050. Rapid modernization and urbanization are related to the challenge of uncontrolled migration, as Banaras over the years has witnessed massive influx from Eastern Uttar Pradesh, Bihar, Orissa, and Jharkhand. Related studies on the emergence of slums in Varanasi need to be read with the challenges of urbanization. In a study of quality of life in the slums in Varanasi, Tripathi argues, “Slums in Varanasi city has been continuously increasing from 1941 to 2011. With the increase in population of the city, housing needs of the city also grew, which could not be met by the formal housing market. Migrating population, which could not avail the facilities of formal housing market, satisfied their needs by occupying vacant land and this has resulted in formation of slums. Another factor, which contributes in the formation of slums, is proximity to work place and low level of income and un-affordability of pucca houses. People living in the slums of Varanasi city are poor working as labour, rickshaw pullers and thela keepers” (Jha & Tripathi, 2014, 174). Over the years, the slums and squatter settlements have been increasing and in ways the pressures on the existing infrastructure, which is not in a very good position. The quality of life on the basis of various parameters like source of living, source of drinking water, housing condition, sewage disposal facilities, place of waste dumping, and medical facilities also informs us about the abysmal living conditions. In the absence of proper infrastructure, especially with regard to the sewage disposal, there are challenges as a lot of sewage as well as waste finds its way through the local nallas, into the Ganga which is already so pressured. This also reflects on the kind of health hazards that emerge in these spaces.

Over a period of time, some of the heritage sites have disappeared, as they are now taken over by the people. This is illegal, but in the absence of adequate living spaces and pressures, many of the sites in the form of temples do not exist anymore. The city municipal authorities have also come under fire, as in the pursuit of beautification of city, and widening of roads, many of the sites (unclaimed) due suffer the threat of extinction and loss.

Encroachment of the Flood Plains and the River Bank

Related to the concern of lack of spaces and non-sustainable forms of urbanization are the related concerns of the encroachment of the flood plains for human settlement,

furthering the vulnerabilities, which is a constant point of deliberations among the policy circles. With the emergence of the new high-rise buildings and housing, close proximity to the flood plains is alarming. The new buildings which are being constructed and some of them already in existence and lived in have complaints about the challenges when the city is flooded. In fact the area around Samne Ghat, which has many of the high-rise buildings, suffers a great deal in times of floods, which has now become an annual feature. There should be some policy that the city urban development bodies, like Municipal Corporation as well as Nagar Palika, should come up with, that forbids any housing or any other construction on the flood plains or in proximity of the ghats.

Loss of Sustainable Ecosystems

The existing ecosystem suffers because of loss of sustainable ecosystems. The traditional water spaces, called Pokhara/Talaabs which were important for both reasons of livelihood and sustainability, have disappeared over the years. Either they have been converted as wastelands, as they are dumped with the tons of waste that are produced every day, or the construction-related waste, in the form of concrete and Malba which are dumped. This heavy encroachment of the naturally existing water bodies, which have now transformed as wastelands, can be related to the challenges and threats caused to the ecosystem. The related concern of unsustainable development is a crucial point that needs to be reflected and discussed. The foremost reason identified for the devastating urban floods in Chennai had been the loss of natural water bodies at the hands of unsustainable development practices, including the city's lakes which used to capture and retain the excess rainwater (Chandrababu, 2021). A similar story is being repeated in Gurgaon where the fetter of development neglects nature's system of balance and conservation. In Varanasi also one witnesses the growth of construction sites and population which has overwhelmed the city's old drainage system.

Massive Tourist Footfall

Since Banaras is considered as one of the most revered cities in the Hindu Universe, every year one witnesses a massive tourist footfall, which is largely religious in nature. This not only creates pressures on the city but leads to massive challenges. As it is an ancient city, its infrastructure is also very old. It was neither designed nor shaped to sustain the large population that the city presently has. The Panchakoshi Yatra is one of the most popular pilgrimage circuits, with massive footfall during the Sawan month (Revered monsoon month, whereby pilgrims from all over the country come to Varanasi, for the holy dip in Ganges as well as to the Kashi Vishwanath Temple, one of the most important Jyotirling). Also, Varanasi is important for the Buddhists, as it is in proximity to Sarnath, which is a key Buddhist site. Since Sarnath doesn't have much of its own infrastructure, a large number of tourists visit

Sarnath from Varanasi. With large number of devotees gathering at Varanasi during specific days and occasions, there is a major risk of crowd-related disasters. Hence there is a need for crowd management with crowd control measures in place, viz., open spaces, traffic management with parking, first aid and medical services close at hand, and basic infrastructure for pilgrims and other visitors. While the COVID-19 pandemic has led to exploration of digital measures to support the administration as well as ease the pressure of tourism, the pandemic management amidst the risk-prone areas along with the efficiency of the services required truly tests the governance capacity. The possibility of integration of digital technology and smart city governance in the backdrop of an ancient heritage city of Varanasi is yet to be explored.

Possibilities and the Way Forward

In the larger context of disaster challenges, risks, and threats that are endemic to cultural and heritage sites and spaces, some of the possible solutions that can be worked towards are as follows:

- (i) Documentation of cultural heritage and disaster risk management plans and practices is required as the first step. The documentation will provide light on the existing plans and also the gaps in the planning needs. There is a need for a Masterplan which integrates all the aspects, and any kind of encroachment should be nipped in the bud.
- (ii) A holistic impact assessment of the current heritage sites needs to be undertaken. While this paper's scope is confined to built heritage, further research should be undertaken which goes beyond and includes the intangibles also. While built heritage can be salvaged through retrofitting and structural improvements, the cultural aspects, the local folklores, the local food, livelihood, and art and craft all are connected as an ecosystem. When a historical monument loses its importance, so does the whole ecosystem which essentially thrives around it.
- (iii) Sustainable livelihood and revenue generation options should be explored for the community which dwells around it. While the states recruit the Bollywood actors as brand ambassadors of the region, investment is required to develop on ground local marketing hubs for the heritage-based goods. Other than providing financial incentives to aid the small-scale craftsmen, adequate training on digital marketing can prove to be a game-changer. The quality and accessibility of the local heritage-based products would be a brand in itself.
- (iv) Embedding of smart cities with smarter heritage sites should be done. Keeping in line with the upcoming smart cities mission, the heritage properties of such cities must be embedded with the new-age cutting-edge digital technologies

including AI. GIS-based mapping and installation of real-time early warning systems in the heritage properties can also provide a base for generating knowledge and awareness on disaster risks and its management. This can aid in inculcating practices of disaster risk management into our culture.

- (v) Cultural diplomacy is an important aspect of conserving and preserving nation's heritage. While India has already made a name of itself in terms of being one of the oldest civilizations, the new age cultural diplomacy requires specific approach. While the Varanasi-Kyoto cultural exchange project provides a head-start in promoting cooperation, it has to be strengthened further to actually implement best practices in conservation of heritage. Japan's history and culture of disaster risk management practices can be contextualized and adopted for Indian regions such as Varanasi.
- (vi) Finally, breaking the silo-based approach and looking at heritage and disaster risk management from perspective of different government departments needs to be changed. Skill development and joint training programs can be explored to educate, train, and build capacities of local government departments so as to undertake a holistic approach. The central government can facilitate this by bringing in a policy which addresses the concerns of the heritage from disaster risk perspective and allocates clear responsibilities and accountabilities to all the concerned departments. India's Heritage is underfinanced, and a comprehensive vision for heritage budget and planning with innovative means of financing is essential. It is equally important to train the common masses in acts of heritage management and preservation, inculcating a sense of responsibility among the locals and visitors to protect the city, and take pride in keeping it clean and visitor-friendly, because in the truest sense they are the true custodians.

Conclusion

Through the narratives from Varanasi, it becomes pertinent that attention is given to the cultural and heritage sites, as they are the most important links to our past and heritage. The need for some ground work and serious engagement with the concern of risk assessment and reduction is the way forward. Heritage management and conservation is not only important from the perspective of glorious tribute to a rich past, but it is also an opportunity of investment and generating employment through tourism. There is a need to protect heritage from unregulated and unsustainable development processes, disasters, climate change, and other human-generated factors. This requires a need to harness the potential of heritage to make cities and human settlements inclusive, safe, resilient, and sustainable for current and future generations (ICOMOS, 2021). Further, the SDG 11 which focuses on making cities and human settlements inclusive, safe, resilient, and sustainable requires the safety and resilience of heritage too.

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Cities and Climate Change: Responding to the Impacts of Water-Related Disasters in Sri Lanka

154

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Contents

Introduction	2332
Disasters	2333
Cities and Disasters: Obvious Links?	2334
Water-Related and Climate Change-Induced Natural Disasters in Sri Lankan Cities	2336
Floods	2336
Landslides	2340
Droughts	2343
Challenges in Water-Related Disaster Management	2344
Challenges in Mitigation Stage	2344
Challenges in Preparedness Stage	2345
Challenges in Response Stage	2345
Challenges in Recovery Stage	2346
Environmentally Smart Solutions to Reduce Disaster Risk and Build Resilience	2346
Improved Environmental Governance	2347
Strengthened Urban Management with Integration, Inclusiveness, and Knowledge	2348
Sharing	2348
Nature-Based Solutions (NbS)	2348
Preparing to Combat Impacts of Climate Change	2348
Smart Cities and IT Solutions	2349
Conclusion	2349
References	2350

Abstract

Globally, disasters and climate change pose a significant threat to sustainable urban development, with increased impacts on the communities and economic costs. Subsequently, policy makers and practitioners face the challenge of introducing a holistic approach integrating risk reduction and adaptation strategies for

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urban sustenance. Sri Lanka is a tropical island which has been experiencing impacts of a variety of disasters as well as climate change in many urban areas. Against this backdrop, the present chapter attempted to examine the impacts of water-related disasters on Sri Lankan cities. Therefore, a comprehensive literature review was carried out supplemented by analysis of available data on disasters. Published reports, research papers, and data portals were used as sources of information.

This chapter begins with an overview of water-related and climate change-induced disasters in cities with a special focus on floods, droughts, and landslides. Key findings reveal that floods, droughts, and landslides in urban areas have demonstrated an increasing trend in the recent few decades. Many coastal cities have faced impacts of floods and droughts, while inland urban areas have exhibited more impacts from landslides. In this respect, the chapter presents challenges in managing water-related disasters. Finally, the chapter sheds light on how the cities could prepare for the rising impacts of climate change and disasters. Equally important though is adopting possible best practices and “environmentally smart” solutions to make cities disaster-safe and disaster-resilient places.

Keywords

Sri Lanka · Cities · Climate change · Disaster management

Introduction

Cities are one of the most dynamic places on Earth, and a growing percentage of the population in many countries live in cities. According to the United Nations, 50% of the global urban population resides in cities, and this is projected to rise up to 68% by 2050 (United Nations Department of Economic and Social Affairs-UNDESA, 2019). They further state that 90% of this increase in global population will be centered in Asian and African cities.

Cities are areas with multiple issues, challenges, and opportunities due to complicated internal factors and compound external influences. Cities are increasingly vulnerable to natural or man-made disasters due to complicated physical infrastructure and socioeconomic networks. Further, a considerable share of city dwellers live under conditions in which high disaster risk prevails, which coincide with enhanced exposure with high vulnerability. On the contrary, there is a growing global concern to understand the nature of complex urban disasters and their influence on cities.

Sri Lanka is an island lying between 6°N and 10°N latitude and 80°E and 82°E longitude in the Indian Ocean, with a land area of approximately 65,000 km². Nearly 48% of the country's population lives in urban areas (Ellis and Roberts, 2016). The country has witnessed a significant increase in both frequency and intensity of climate change impacts. Adverse impacts are particularly evident in the water cycle, especially as alterations leading to floods and droughts. According to the

Climate Risk Country Profile (2021), Sri Lanka faces significant threats from extreme heat and an increased incidence of flooding from climate change. For instance, 2017 was a “threatening” year for Sri Lanka as it was among the three most affected countries by weather-related disasters (Eckstain et al., 2019). In the same year, Sri Lanka ranked the second highest on the Climate Risk Index as a result of weather-related disasters and economic losses. Such projected disaster events may generate increased droughts, riverine floods, flash floods, and landslides. In this context, it is essential for Sri Lanka, like any other country in the global south, to adopt efficient management strategies to achieve urban resilience and safety (Ministry of National Policies and Economic Affairs & Ministry of Disaster Management- MoNPEA & MoDM, 2017).

In this wake, this chapter will present a general description of disasters in cities. Further, the factors that contribute to the increased disaster vulnerability of cities will also be discussed. Then the chapter will focus on water-related disasters in Sri Lankan urban areas and their socioeconomic impacts, paying special attention to floods, droughts, and landslides. Key challenges in different phases in disaster management will then be discussed. Finally, gaining from Sri Lankan experience, the chapter sheds light on possible best practices where environmentally smart solutions are offered to make cities disaster-safe and disaster-resilient places.

Disasters

Any part of the world is not free from hazards that appear in different ways: hydrometeorological hazards (e.g., floods, droughts, and cyclones), geo-hazards (e.g., volcanic eruptions), etc. Yet, not all hazards are transformed into disasters. Hazards, disasters, and vulnerability are linked to communities and their lives adversely. Nevertheless, enhanced resilience uplifts communities. Hazards and disasters can be defined as below.

Hazard: In simple terms, hazard is any natural or man-made event that has the ability to harm, destroy, or destruct the physical or biological environment or people.

Disaster: The central concept of a disaster is “a combination of the exposure to a hazard and vulnerability of people or a place.” The United Nations Office for Disaster Risk Reduction (UNDRR, 2019) defines hazard as a “dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impact, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.”

The terms defined below are significant in understanding disasters.

(a) Vulnerability

When the communities possess insufficient capacity or methods to lessen or cope with the impacts of disasters, they become vulnerable to disaster impacts. Vulnerability is the insufficient capacity or measures to reduce or cope with the potential negative consequences.

Vulnerability can be of different categories: physical (inappropriate and weak construction of buildings), social (restricted education, including insufficient knowledge about disasters), cultural (public indifference about disasters), political (limited number of institutions which have knowledge of disasters), economic (fewer resources like planning and management which are important in preventing disasters), and technological (the lack of using appropriate technology to mitigate the impact of disasters) (McEntire, 2001).

(b) Resilience

As a working definition, we describe disaster resilience as the ability of any component of society to withstand disaster impacts, adapt, and recover from the adverse effects of any natural disaster or stress sustainably. In the literature, the ability of a community or a system to “bounce back to its original state before exposure to the hazard” has been highlighted (Klein et al., 2003).

Cities and Disasters: Obvious Links?

Cities are prone to a plethora of natural disasters as poverty and people are concentrated in limited landscapes (United Nations Human Settlement Program UN-HABITAT, 2010). In fact, in the last two decades, natural disasters claimed lives of many and affected thousands of people in Asia (Table 1). Experts predict that the frequency and impacts of disasters would rise in the coming decades, especially in cities that are becoming more disaster-prone due to increased population pressure and unsustainable developmental activities (Schneider and Woodcock, 2008).

In many parts of the world, attributed to several factors, urban areas are increasingly becoming susceptible to water-related disasters and the impacts of climate change.

Table 1 Disasters in Asia for the last two decades and their effects

Disaster	Number of incidents	Number of deaths	Number of affected people
Drought	85	279	1,124,969,850
Earthquake	370	489,904	103,309,378
Epidemic	169	13,754	2,545,932
Extreme temperature	121	16,629	87,340,817
Flood	1,318	74,379	1,529,828,789
Landslide	240	12,147	4,253,164
Mass movement (dry)	7	158	360
Storm	864	179,757	578,192,044
Volcanic activity	35	889	1,122,493
Wildfire	28	156	499,598

Adopted from EM-DAT, 2021. <https://emdat.be/>

(a) Increased occupancy in hazard-prone areas

Globally, demand for land in cities is increasing, while the land values are also escalating. Such situations force poor communities to live in marginalized lands. They have been left with no option other than choosing to live in hazard-prone areas. Further, they have only remote chances to escape from hazardous events and avoid their impacts. Slum development is increasingly evident in many parts of the world, where most of such locations, such as reservations of waterways and roads, are hazard-prone, especially to floods (MoNPEA & MoDM, 2017).

(b) Increased vulnerability

Vulnerability to disasters is exceptionally high in urban areas, due to increased population density. For instance, 13 of 19 megacities in the world are located in low-lying coastal areas, which encompass high vulnerability to floods due to climate change-induced sea-level rise and storm surges. Since most of the future global population growth is projected to take place in the urban areas of developing countries, the proportion of people who will be particularly vulnerable to natural disasters will rise further.

(c) Poor urban planning and management

In many parts of the globe, poor urban planning and management have affected the living conditions of people while paving the path for many disasters (UN-HABITAT, 2010). According to Habitat for Humanity (2022), 75% of the urban population in rapidly growing cities of developing countries lives in squatter settlements with minimum basic requirements. Inadequate regulations and weak enforcement lead to failure in urban sustainability. With the increased demand for living spaces in cities, many regulations and laws are breached by communities. As an example, slums and shanties will be constructed in marginalized areas in cities to occupy any space left for settlement.

Poorly articulated unsafe housing including slums and temporary dwelling units will be fragile and easily damaged by floods and landslides. Inadequate drainage facilities and poor management of waterways lead to disturbed water flow regimes, inundation of low-lying areas, and flooding (Jerome, 2021). Inadequate solid waste management can result in the blockage of waterways and drainage networks with increased waterlogging and inundation. In many urban areas, it is inevitable to avoid land use and land cover changes. Consequently, in many cities, there is a change in natural infrastructures with time. In this context, destruction and encroachment of wetlands to expand cities have been identified as a major cause of flooding (Hettiarachchi et al., 2014).

(d) Rise in demand for water and water scarcity

Urban areas are seriously facing water scarcity as a result of the overexploitation of groundwater together with increasingly exerted pressure on limited natural

resources. Due to the increase in impervious surfaces and disturbances to the water cycle with lower abilities to recharge aquifers, many urban areas experience a lowering of the groundwater table. Additionally, depleted soil moisture contents lead to poor water availability. Further, the increased population in cities demands more water which puts water resources at risk. Against this backdrop, the impacts of climate change, which put immense pressure on limited water resources in cities, contribute to magnifying urban drought (Wickramasinghe, 2021).

(e) Rise in ambient temperature

Climate change-induced increase in temperatures intensifies the intensity of the heat-island effect in the urban areas. City centers with high-rise concrete buildings and paved roads and similar infrastructure could influence the microclimate of the cities and contribute to unhealthy and unpleasant environments.

Water-Related and Climate Change-Induced Natural Disasters in Sri Lankan Cities

This section elaborates on water-related disasters in Sri Lanka (namely, floods, landslides, and droughts) which are linked with and are closely connected to climate change. It also analyzes the socioeconomic impacts of each considered disaster in terms of the parameters: people affected, number of fatalities, number of injured, property and livelihood destruction, and the loss to the economy.

Floods

General Overview on Floods

Floods are considered the most destructive form of natural hazard in both local and global contexts due to loss of both life and property. It is also the most prevalent form of natural hazard in Sri Lanka (United Nations Office for Disaster Risk Reduction-UNDRR, 2019) where riverine floods are a major constituent.

Since Sri Lanka is located in the Indian Ocean between the Gulf of Mannar and Bay of Bengal, it is often subjected to adverse repercussions by pressure variations created in Bay of Bengal. Consequently, sudden strong wind currents that bring heavy precipitation to Sri Lanka arise (Fig. 1). This, coupled up with the southwest monsoon season and the two inter-monsoon seasons, often results in severe floods in the lower river basins of Sri Lanka (Samarasinghe et al., 2010). The mean annual rainfall to these river basins accounts for about 2,400 mm (Wagenaar et al., 2019). Furthermore, anthropogenic activities like development of infrastructure to accommodate needs in cities, increased extent of impervious areas, blocked drainage systems, and loss of habitats such as wetlands contribute to the occurrence of floods (Dahanayake and Wickramasinghe, 2022).

Fig. 1 Floods in Kaduwela city of Colombo district in 2016



Socioeconomic Impacts of Floods

Understanding the nature of flood damage is essential in managing its risk. Figure 2 depicts that cities of Colombo, Gampaha, and Kalutara districts of the Western Province and Batticaloa and Ampara districts of the Eastern Province are the areas of severe flood damage, with more than 500,000 people affected (Desinventar, 2021). A noteworthy factor is that all these districts are bordering the coastal zone of Sri Lanka implying that coastal cities are severely affected by the floods. This is because these cities are located in the low elevation coastal areas. For example, Kelani River which flows across the most populated Colombo district brings heavy floods during the monsoons. Similarly, the Attanagalu Oya which flows to the sea across Gampaha district (houses the second highest population density of the country) and Kalu Ganga which flows across the Kalutara district (accommodates the third highest population density of the country) contribute to heavy floods in these respective districts.

Both Figs. 3 and 4 depict that in the Western Province, the number of people affected and fatalities due to floods show a gradual increasing trend with time. In fact, both the frequency and the intensity (height of the spikes) have increased from 2000 onward attributed to impacts of climate change and irregular rainfall patterns.

Year 2010 reports the highest number of people affected by floods (Fig. 3). During April 2010, the Colombo metropolitan region experienced serious flood

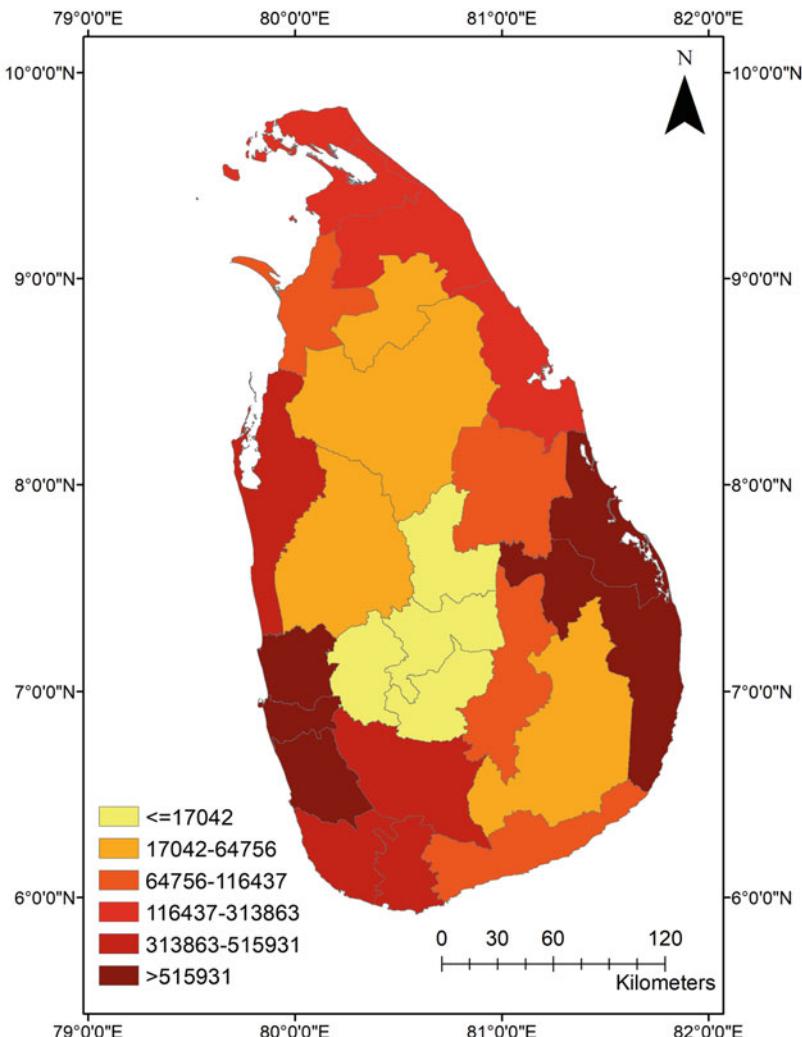


Fig. 2 Spatial distribution of flood-affected districts of Sri Lanka based on the number of people affected from 2000 to 2020 (prepared by a co-author using data from http://www.desinventar.lk:8081/DesInventar/thematic_def.jsp)

damages. The flood event reportedly incurred a cost of USD 1 billion which accounted for 2% of Sri Lanka's GDP (Disaster Management Centre – DMC, 2014). Similarly, 2017 records the highest number of fatalities (Fig. 4). Eckstein et al. (2019) point out that more than 200 fatalities happened nationwide due to 2017 floods confirming the spike in fatalities for 2017 in the Western Province. Further, the Centre for Research on the Epidemiology of Disasters (CRED, 2019) has

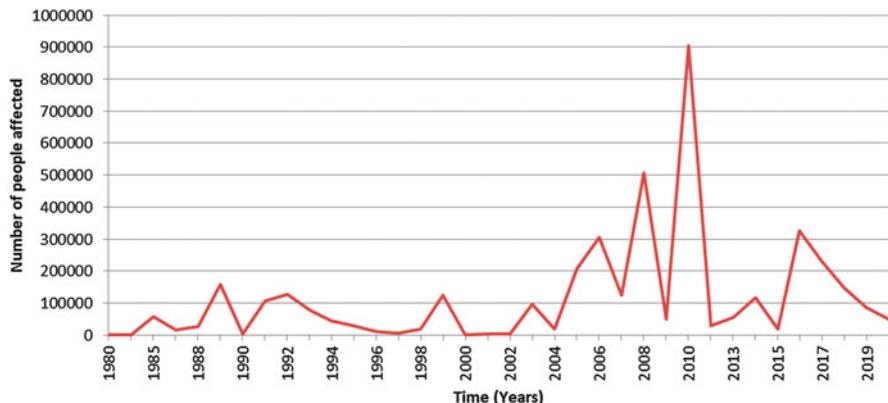


Fig. 3 Plot of number of people affected by floods vs. time (years) in Western Province of Sri Lanka from 1980 to 2020 (prepared by a co-author using data from <http://www.desinventar.lk/>)

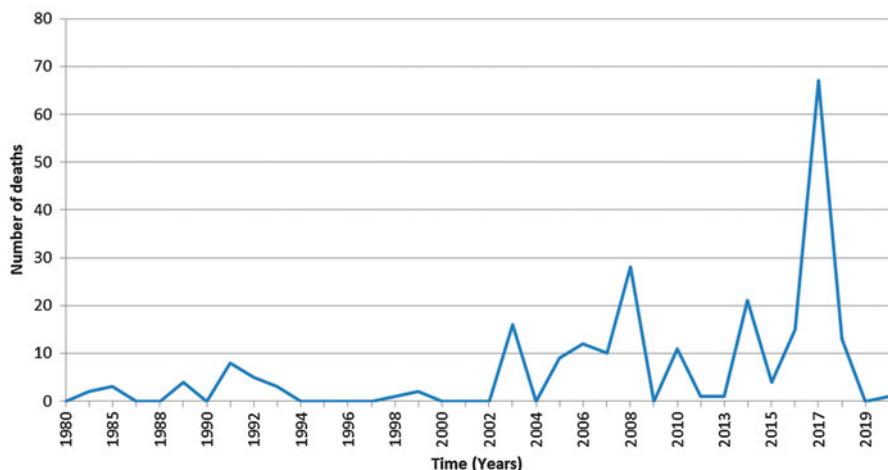


Fig. 4 Plot of number of fatalities by floods vs. time (years) in Western Province of Sri Lanka from 1980 to 2020 (prepared by a co-author using data from <http://www.desinventar.lk/>)

identified that 539 casualties have occurred between 2016 and 2018 which account for 40% of all recorded casualties since the year 1990.

According to UNDRR (2019), a cost of USD 2 billion has been incurred due to flood damage between 1990 and 2018. The impacts include destruction to buildings, properties, and cultivations; interruption to infrastructure provision such as electricity transmission and transport; and disturbances to livelihood of communities (De Silva and Kawasaki, 2018). The damages due to 2017 floods account for USD 415.5 million with the 46% of the burden weighed by housing, education, and health sectors (MoNPEA & MoDM, 2017).

Landslides

General Overview on Landslides

Landslides are one of the deadliest natural disasters in the world that annually accounts for many deaths and injuries and incur billions of damages. In Sri Lanka, landslides are triggered by both natural and anthropogenic factors. Nevertheless, since recently, land use change-induced landslide occurrence has become prominent over natural landslides. Heavy rainfall increases the rate of infiltration into the soil, thus raising the groundwater table. The resultant increase in the pore water pressure of the soil leads to landslides (Harden, 2014). Further, terrain factors including slope angle, bedrock geology, soil type, and elevation of a location increase the vulnerability of slopes to landslides (Jayasinghe et al., 2017; Kalubowila et al., 2021; Somaratne, 2015).

With the overpopulation of cities, the anthropogenic pressure they undergo has exacerbated. Perera et al. (2019) report that landslide occurrence in Sri Lanka has risen due to anthropogenic intervention such as unplanned cultivation, non-engineered construction, and deforestation. The National Building Research Organisation (NBRO) predicts that landslides will be the most catastrophic disaster to create adverse impacts on the up-country of Sri Lanka (Sangasumana, 2018).

Socioeconomic Impacts of Landslides

Figure 5 demonstrates that in the last two decades, Ratnapura and Kegalle districts of the Sabaragamuwa Province and Nuwara Eliya district of the Central Province are the areas with the highest occurrence of landslides, with over 26,000 people affected (Desinventar, 2021).

Therefore, it is observed that landslides predominantly occur in the inland regions of the country, while their risk of occurring in coastal zones is very unlikely. This is attributed to the mountainous topography of the Sabaragamuwa and Central Provinces as opposed to the flat topography in the coastal zone.

Figure 6 depicts the number of people affected by landslides from 1980 to 2020 in the cities of Sabaragamuwa and Central Provinces, two of the most landslide-affected provinces of Sri Lanka. The cohort of people affected due to landslides show an increasing trend both in terms of frequency and intensity. This trend can be distinctly observed from 2000 onward.

The graph also demonstrates that a striking number of people have been affected by landslides in 2017. According to UN Sri Lanka et al. (2017a), 35 major landslides have taken place in Sri Lanka only during May 2017, which is also reflected by the spike for 2017 in Fig. 6.

As a water-related disaster, landslides do not occupy a prominent position in terms of occurrence in Sri Lanka (CRED, 2019). This is also proven by the comparatively lesser number of people affected by landslides (Fig. 6) when compared to that of floods (Fig. 3) and droughts (Fig. 7). Nevertheless, it is the country's second deadliest disaster accounting for 242 deaths (20% of total deaths occurred due to natural disasters in Sri Lanka) between January 2008 and September 2018 (United Nations International Strategy for Disaster Reduction UN-ISDR, 2020).

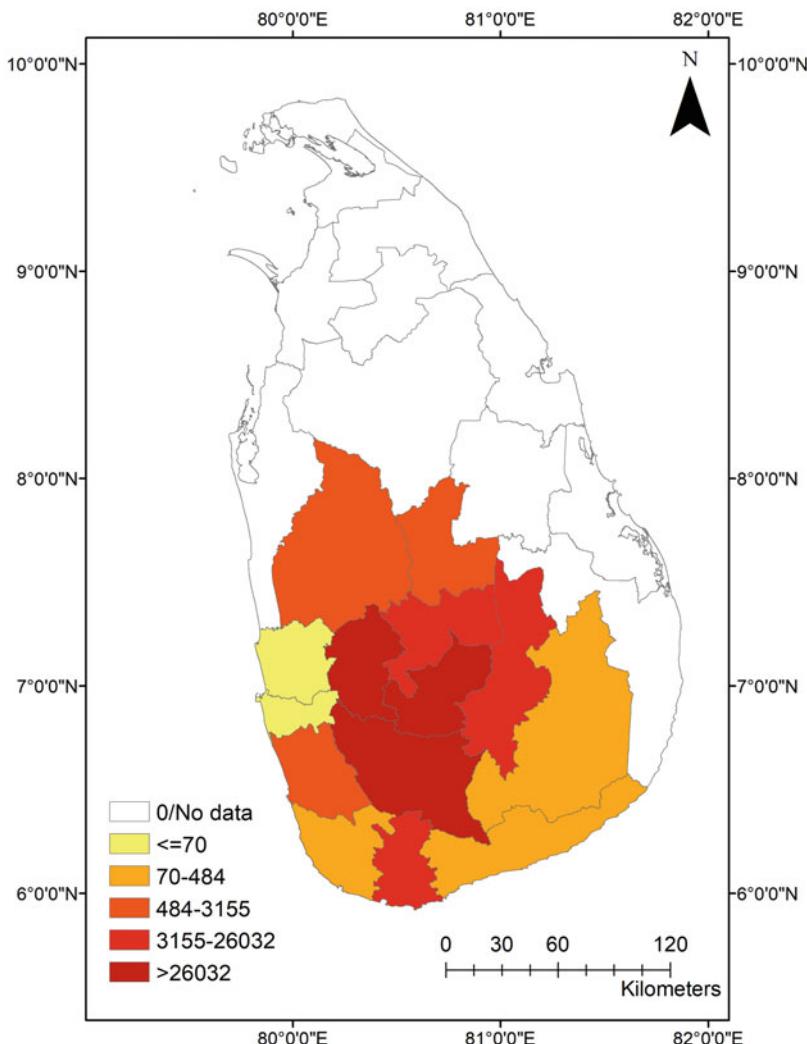


Fig. 5 Spatial distribution of landslide-affected districts of Sri Lanka based on the number of people affected from 2000 to 2020 (prepared by a co-author using data from http://www.desinventar.lk:8081/DesInventar/thematic_def.jsp)

According to DesInventar, between 2000 and 2019, 582 casualties (accounting for 1.77% of the total deaths due to natural disasters in the period) have occurred due to landslides in Sri Lanka (UN-ISDR, 2020).

Landslides create other drastic socioeconomic impacts on people with destruction of households and other properties, making them homeless. A study by Perera et al. (2019) reports that the country lost an annual contribution of USD 160,000 to the GDP by a massive landslide that occurred in the Kegalle district in 2016. This loss

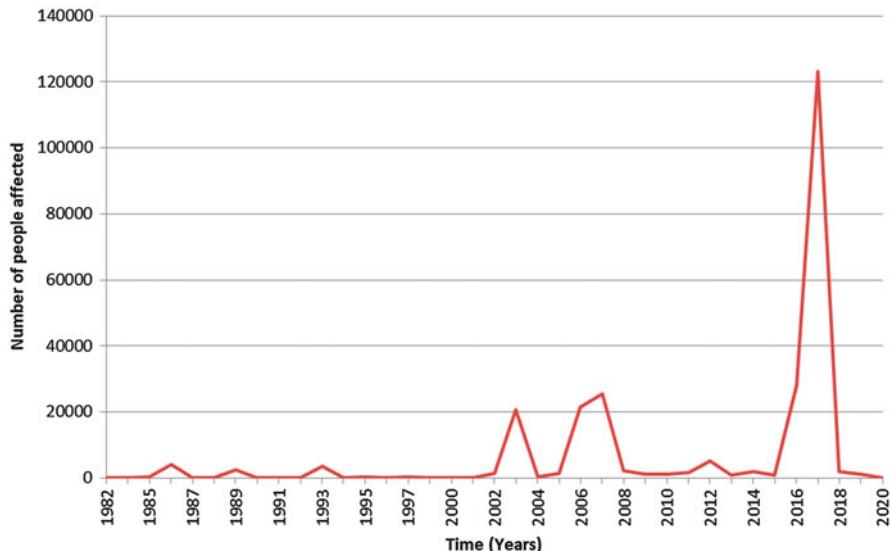


Fig. 6 Plot of number of people affected by landslides vs. time (years) in Sabaragamuwa and Central Provinces of Sri Lanka from 1980 to 2020 (prepared by a co-author using data from <http://www.desinventar.lk/>)

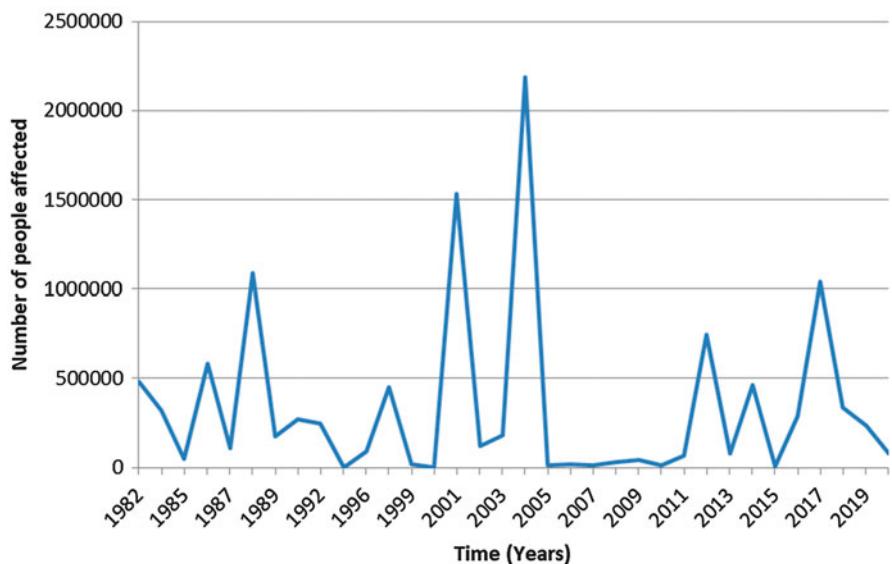


Fig. 7 Plot of number of people affected by droughts vs. time (years) in Northwestern and North Central Provinces of Sri Lanka from 1980 to 2020 (prepared by a co-author using data from <http://www.desinventar.lk/>)

was attributed to the destruction of home gardens and plantations (tea, rubber, and paddy) in the area. Furthermore, this hazard had a heavy impact on women in the area since most of these home gardens and plantations were managed by them. Landslides also incur several financial burdens to the affected by destroying structures, disrupting transport, incurring medical costs, and dwindling property value in the area (Perera et al., 2019).

Droughts

General Overview on Droughts

The World Health Organization (WHO, 2022) estimates that a global population of 55 million people is affected annually by droughts. Likewise, Sri Lanka has also been affected by droughts each year. For meteorological droughts, which are based on the rainfall and are easiest to detect, there are four key geographical and topographical features of Sri Lanka to be considered: (a) being a small island in the tropics, (b) close proximity to the equator, (c) central hills of Sri Lanka, and (d) country's location in the Indian subcontinent to the immediate north and northwest. The first two factors reduce the probability of droughts, while the last two factors trigger it. Apart from the climatic and geographical factors, droughts are also driven by anthropogenic activities like deforestation and play a major role in extending aridity in cities of Sri Lanka.

The International Water Management Institute (IWMI, 2007) states that 80% of the country's extent falls under the dry zone where the mean annual rainfall is 2,000 mm. The period from June to September characterizes the duration for the dry season in the dry zone where only less than 10% of the abovementioned rainfall is received.

Socioeconomic Impacts of Droughts

According to a study by ACAPS (2019), cities of Jaffna, Mullaitivu, and Mannar districts of the Northern Province, Batticaloa and Ampara districts of the Eastern Province, and Matale district of the Central Province are the most drought-affected districts of Sri Lanka with 50,000 or more people affected. One salient feature is that apart from the Matale district, all the other districts are bordering the coastal zone of Sri Lanka implying that coastal cities are severely affected by the droughts.

Figure 7 depicts that the number of people affected by droughts from 1980 to 2020 in the cities of Northwestern and North Central Provinces shows a varying trend. It further demonstrates that about once in every 15 years, the two provinces undergo aggravated drought conditions with the number of affected people exceedingly over 100,000. This fact is also proven by a study conducted by Nianthi (2011) which states that a severe drought condition arises in the dry zone once in every 10 years. Further, according to Fig. 7, the frequency and intensity of the spikes for droughts have increased over time, especially from 2000 onward. This could be attributed to adverse impacts of climate change and also alterations in the rainfall pattern.

Paddy cultivation which produces rice, the staple food of Sri Lanka, is predominantly taking place in the dry zone. Paddy is a very water-intensive crop where inadequate water supply could severely affect the farming system (Prasanna et al., 2011; Withanachchi et al., 2014). Paddy farmers are often influenced by prolonged droughts with less harvest, insufficient and poor quality of food to consume, disturbed day-to-day activities, and increased indirect costs related to farming, health, and medication (Prasanna et al., 2011; Manouri and Jayamanna, 2014). In extreme cases, farmers are sometimes reported to commit suicide due to their inability to pay debts and repeated harvest failures, but official reports are scarce in Sri Lanka compared to India (Parida et al., 2018).

Abeysingha and Rajapaksha (2020) and Wickramagamage (2016) mention that drought is the disaster to affect the greatest number of people in the country while incurring the greatest cost for relief provision. Further, drought is the disaster that incurs the largest cost in national healthcare. The government spends an estimated cost of USD 41.2 million for drought-related healthcare in Sri Lanka (Center for Excellence in Disaster Management and Humanitarian Assistance, 2021).

Droughts affect urban water security. In particular, women have to walk for hours to fetch drinking water, and in Eastern Province women walk for one and half hours at night to collect safe drinking water (The World Bank, 2021). In some coastal cities, the situation is much worse because with extended drought periods, saltwater intrusion makes water unusable. The poor communities are penalized not only in their income but also through sanitation mainly due to the lack of clean water for drinking and hygiene. Among marginalized communities, women and girls suffer the most due to inadequate water for their sanitation needs (Fan, 2015).

In addition, ecosystems are heavily affected from droughts due to loss of biodiversity, species extinction, reproductive failures, and deaths due to heat shock which too are increasingly evident in cities. The environmental and social impacts originated from a simple meteorological drought could cascade through natural ecosystems and end up as a more complex socioeconomic hazard (Van Loon et al., 2016).

Challenges in Water-Related Disaster Management

Disaster management, especially in urban areas, is a challenging task in many countries. Sri Lanka is no exception. According to the disaster management cycle, these challenges appear in each of its four stages, i.e., mitigation, preparedness, response, and recovery. These stages are sometimes overlapping and interconnected and encompass a wide array of sociopolitical aspects.

Challenges in Mitigation Stage

Water-related disaster management is linked with many social, technical, administrative, political, economic, legal, and environmental factors which could be in operation individually or in integration. Discrepancies of rules and regulations and lack of compatibility of different institutions due to the absence of long-term

political commitment have restrained the country for decades from implementing effective mitigation plans. As an example, UN Sri Lanka et al. (2017b) state that bad practices attributed to weak or nonenforcement of regulations and heavy political influences affect flood management.

Further, sociocultural factors pose unique challenges in disaster mitigation. Communities living in flood-prone areas have grown accustomed to the risks posed by annual flooding incidents (Askman et al., 2018; UNDRR, 2019) which hinder relocation to safer places. All these sociocultural factors combined with financial limitations, which is the number one constraint, make the reduction of flood disaster vulnerability by reducing the exposure nearly impossible.

Challenges in Preparedness Stage

Taking sound management decisions requires reliable and updated information. The existing data gap on disaster events has critically affected the ability of authorities as well as communities to prepare for water-related disasters through adequate vulnerability and risk assessments. Pathiraja (2018) has highlighted the importance of having a science-based data collection process with a central database through which different agencies can acquire data.

A proper database with vulnerability parameters such as disaster profile, poverty, and housing conditions is yet to be developed. Unavailability and inconsistency of data could also affect the effective implementation of early warning systems for both slow-onset disasters such as droughts as well as for rapid-onset disasters including floods and landslides.

Incorporation of disaster risk elements should be considered a priority when implementing development projects, construction projects, and other land usages. Inadequate attention paid to the use of planning tools such as the Environment Impact Assessment has crippled the effective implementation of preparation programs. Addressing this issue has been quite a challenge due to the lack of interest of authorities in strengthening policies, environmental standards and guidelines, and proper enforcement.

Challenges in Response Stage

Disparities exist between national-level disaster response plans and the extent to which these are implemented and deployed during disasters at local level. Issues such as inadequate institutional mechanisms at local level, inefficient communication of national-level decisions, and lack of engagement of local authorities in national-level decision-making could have contributed to these disparities (Malalgoda et al., 2016).

Long-term commitment issues have left the country due to profusion of policies, inadequate and less flexible rules and regulations, and also overlapping roles and responsibilities of agencies. These affect the smooth operation of response activities which could enhance the susceptibility of affected communities to the impacts of

disasters. The nonavailability of an emergency fund management mechanism to mobilize and handle funds with transparency during the rapid onset of disasters, such as floods, landslides, and tsunamis, has been identified to be a serious issue debilitating immediate response procedure.

Challenges in Recovery Stage

Lack of consistent government involvement is one of the major challenges during the recovery phase of disasters in cities due to factors like changes in opinions of governing parties, confusions in responsibilities allocated for different authorities, limitations of human and nonhuman resources, and lack of knowledge and technical know-how on reconstruction processes (Dissanayaka and Sangasumana, 2017; UN-SL et al., 2017b). As it has been in all the other stages, financial constraints, combined with lack of transparency in finance handling, play a huge role in creeping recovery actions like compensations and resettlements. Even though the government has made moves with the involvement of public and private parties to relieve the monetary burden on the government and the poor who are incessantly affected by water-related disasters, it still requires improvements to reach its objectives (DMC, 2014). Communication for the purpose of insurance compensations has also been challenging due to the lack of awareness of these communities on the importance of reducing disaster vulnerability.

Environmentally Smart Solutions to Reduce Disaster Risk and Build Resilience

In the backdrop of expanding urban areas and increased impacts of climate change and related natural disasters, where are the cities heading to? How do city planners seek solutions? Although these are obvious and straightforward questions, the answers are complicated.

The Sendai Framework for Disaster Risk Reduction 2015–2030 outlines four priority areas for action to reduce disaster risk, (a) understanding disaster risk, (b) strengthening disaster risk management, (c) investing in disaster risk reduction, and (d) enhancing disaster preparedness, and to “Build Back Better” focusing on recovery, rehabilitation, and reconstruction (Sendai Framework, 2015). The Sendai Framework presents a clear mandate to all the stakeholders, including the governments, local authorities, private sector, scientists, media, and the communities to reduce disaster risk and build resilience. As highlighted in the Sendai Framework, increasing capacity of the affected communities to “bounce back” or to achieve speedy recovery following disasters needs special attention in urban planning. Thus, proactive plans are of high priority, as reducing disaster risk and increasing resilience are significantly becoming central to safe and sustainable cities. In this context, plans should be emerged to integrate science, policy, and practice which address different issues related to sociopolitical and environmental dimensions.

Improved Environmental Governance

Resilient urban development goes hand in hand with poverty and inequality reduction, environmental management, and climate change adaptations. As expanding urban development has a direct influence on environmental degradation, which in turn exacerbates hazards and vulnerability, strategies for building resilience including investment in drainage and water management and the prevention of development in low-lying areas are becoming crucial. Implementation of such strategies in turn relies on good urban and local governance and multiple regulatory, financial, and technical factors.

In 2012, the Metro Colombo Urban Development was initiated by the Sri Lankan government to reduce flood risk in the Metro Colombo drainage basin (Ministry of Urban Development and Housing, 2022). The project, which is still continuing, was a product of multiple contributors that included the Colombo Municipal Council (the largest local government authority of the country) and Sri Lanka Land Development Corporation and many other governmental organizations. The project consists of a natural flood reduction network including canals, lakes, and wetlands in Colombo and suburbs with an improved flavor of environmental conservation and sustainability. Many recreational, transportation, educational, and other activities are included in the project which enhance urban resilience (Fig. 8).

Fig. 8 Urban wetland park in Colombo as means of recreation and natural flood reduction



Strengthened Urban Management with Integration, Inclusiveness, and Knowledge Sharing

In many instances, new policies are formulated to handle single and separate issues in cities, usually with shallow agendas. It is also noteworthy to mention that issues related to certain problems such as solid waste management are handled without paying attention to its link with other burning issues such as emission of greenhouse gases and water pollution.

No policies or plans for good governance of resilient cities can succeed without the active participation of all stakeholders. Opinions, perspectives, and suggestions offered by all stakeholders are key resources in discussions and multilateral divisions. In the era of cyberspaces and IT tools, knowledge management reflecting various perspectives of stakeholders is increasingly becoming efficient and easy. City planners should, therefore, provide platforms for collaborative engagement of stakeholders including the government, local agencies, private sector, researchers, media, and communities.

Nature-Based Solutions (NbS)

NbS could be used as promising techniques to mitigate the risk of water-related disasters. As an example, nature-based landslide risk reduction could be done through the self-organization of vegetation in the slopes (Rietkerk et al., 2002) to mimic a mosaic of different vegetation layers and varieties. This makes sure that vegetation intercepts more rainfall and prevents the free flow of stormwater far more efficiently (Berendse et al., 2015; Osterkamp et al., 2012) as different vegetation types hold onto soil at different strengths. In addition, different vegetation layers which are grown in various seasons (Shen et al., 2017) assure continuous coverage of soil during the whole year.

Further, ancient civilization of Sri Lanka reportedly had better catchment management systems where drought resilience was achieved through reservoir cascade systems (Prematilaka et al., 2021) which is gaining popularity again.

Preparing to Combat Impacts of Climate Change

In the context of climate change and aggravated disasters, the Sri Lankan government has taken steps to introduce new policies and strategies to reduce risks. Among the noteworthy outputs are the National Climate Change Adaptation Strategy (2010) and the National Climate Change Policy (2012) by the Ministry of Environment. The cities which suffer from water shortage will be selected for a pilot project with many sectors reshaped to include climate and environmentally smart solutions. One example is the recently launched project to develop a major inland city, Kurunegala, into a climate smart city with the technical and financial help from donor countries (Climate Change Secretariat of Sri Lanka CCS-SL, 2021). A major emphasis will be

paid to subsectors of water governance and infrastructure and settlements where conservation of land and water will be given priority.

Smart Cities and IT Solutions

Evolving technology can shed light to the development of sustainable and resilient cities in line with the concept of the Internet of Things (IoT) (Das, 2019). According to Singh and Neha (2019), the traditional disaster management systems respond slowly to transmit the disaster information. Cyber- and IoT-based sharing of information, artificial intelligence tools, and software models could be very efficient and beneficial in emergency situations with minimal human involvement (Atitallah et al., 2020). For instance, disseminating real-time information, planning relief distribution, and redirecting vehicles on the road to safer routes require quick responses which demand efficient flow of information using IoT. Sri Lanka's progress in using cyber information in urban planning and development is still progressing. Yet in contrast, cybersecurity threats, issues with personal information, and technological and financial hindrances call for careful consideration when transforming urban management subsectors to IT nodes and spaces.

Conclusion

Growing urban populations produce greater concentrations of people vulnerable to the impacts of natural disasters in cities. On the other hand, cities are at the risk of being exposed to the impacts of climate change-driven hazards. Sri Lanka is among the most affected countries in weather-related disasters in the world with increasing intensities and occurrences of floods, landslides, and droughts. It can be reasonably expected that the country will face more issues in the future with the synergistic effects of climate change and disaster vulnerability.

Following a comprehensive literature survey and analysis of available data, this study revealed some significant key information which would be critical to manage climate change-induced urban disasters. Firstly, floods have been identified as the deadliest disaster of the country with their impacts, in terms of people affected and fatalities, increasing with time. Further, it is identified that severe droughts have been occurring in the dry zone about once in every 15 years. Moreover, landslides, even though possessing a very low prominence in occurrence and affecting a lesser cohort of people when compared to that with floods and droughts, have been identified as the second deadliest disaster of the country. Secondly, the frequency and the intensity of these three disasters are aggravating with time, especially from 2000 onward. Therefore, we can expect these disasters to occur rampantly in the future. Thirdly, the present study indicates that the coastal cities were more affected with floods and droughts, while the inland cities were severely hit by landslides.

In light of this, the present chapter discussed the challenges faced in different phases of the disaster management cycle: preparedness, response, recovery, and

mitigation. Finally, it presented the perspective of environmentally smart solutions to increase urban disaster resilience which is crucial, given the impacts of climate change.

As may be in other studies that explore the local contexts, inadequacy in information and nonavailability of updated and previous data on disaster impacts were the main challenges in the present study. A promising future research, therefore, could consist of investigating disaster risk and vulnerabilities which would be felt more progressively across many urban areas. Integrated urban planning with multi-sectorial proactive strategies which include both hard and soft options should be promoted. Since mitigating climate change-induced disasters is a global issue, the essence of this chapter would contribute to the growing literature on disaster risk reduction in cities. Finally, this study calls for the urgent need of disaster preparedness to improve community and ecosystem resilience and also to build back better from the increasing trend of future disasters.

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Part XIII

Business During Disasters



Business Resilience and Disaster Risk Management

155

Huong Ha and Joyce Linghua Wang

Contents

Introduction	2358
Businesses During the COVID-19 Pandemic	2359
Challenges Faced by Businesses During the COVID-19 Pandemic	2359
How Have Businesses Responded to Such Challenges?	2361
An Overview of the Chapters	2363
The Way Forward	2368
Conclusion	2370
References	2371

Abstract

The magnitude of impact of the COVID-19 pandemic immeasurable, spreading across regions, countries, and sectors, including the public sector, the private sector, and civil society. It is a wakeup-call to many organizations, especially business entities, as it does not only adversely affect the eco and human systems across the countries, but it also drastically disturbs business operations, supply chains, management practices, and many others. It acts as a “test” to measure business resilience, i.e., to what extend businesses are ready to manage risk arising from such pandemics which is considered one of the types of disasters. Many businesses have acknowledged that traditional approaches to planning and preparing for disaster risk are not sufficient to deal with such a pandemic. Also, environmental disaster, man-made disasters, ecological and biological disasters, etc. go beyond the control of any individuals, groups, and countries. Thus, new approaches should be explored to help businesses be more resilient and agile to respond to risk caused by extreme pandemics.

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This section examines the challenges and opportunities that businesses have faced due to the COVID-19 pandemic, and responses by businesses to remain competitive and sustainable during the COVID-19 pandemic. It then proposes new approaches and directions that businesses may consider to preparing for future risk. This section includes ten chapters covering various topics, such as food security, corporate social responsibility, legal frameworks, and good practices to respond to the pandemic in Asian countries.

Keywords

Business resilience · The COVID-19 pandemic · Disaster risk management · Small and medium-sized enterprises (SMEs) · Asia · India · Indonesia · Hong Kong · Korea · Japan · Singapore · Hospitality and tourism industry · F&B industry · Food security · Corporate social responsibility (CSR) · Legal framework

Introduction

The recent report of the United Nations Office for Disaster Risk Reduction (2022) explains that climate disruption and abnormality and man-made and natural disasters, including the COVID-19, pandemic have posed serious threats to all sectors and all countries in all continents and hindered the achievement of Sustainable Development Goals (SDGs). The *Asia-Pacific Disaster Report 2022* by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) (2022) also highlights that disaster riskscape in Southeast Asia is expanded given the increased number of extreme weather events and natural disasters. According to the report by ESCAP (2022), around 450,000 people in Southeast Asia lost their lives in the past 50 years, and 525 million people have endured natural hazards. The average annual losses from disasters were around US\$91 billion, and this figure may reach “US\$108 billion under the moderate climate change scenario (RCP 4.5) and to \$127 billion under the worst-case climate change scenario (RCP 8.5)” (United Nations, Economic and Social Commission for Asia and the Pacific, 2022, p. 5).

Igarashi et al. (2021) conducted a survey among micro-, small-, and medium-sized enterprises (MSMEs) in eight countries in Asia in 2020 and found that the sales of 78% of the surveyed MSMEs reduced due to the COVID-19 pandemic. In Southeast Asia, about 9.3 million of job loss was recorded, and 4.7 million people were classified as “extreme poverty” (2021) due to the pandemic (Asian Development Bank, 2022; Jiao, 2022, para. 1). The survey of 5800 small businesses in the United States in 2020 by Bartika et al. (2020) reveals that 43% of these businesses had to temporarily close due to the COVID-19 pandemic, and their active employment was reduced by 39% since January 2020. According to another survey of 132 small and medium enterprises (SMEs) in 2020 by the International Trade Centre (ITC), the pandemic has strongly affected about 67% of them, and about 20% of them mentioned that their business might be closed down permanently (ITC, 2020). In a survey of small businesses in April 2022 in the United States, Statista Research

Department (2022) indicates that about 21.6% of them were negatively affected by the COVID-19 pandemic. The rapid spread and ongoing nature of the COVID-19 virus has adversely impacted businesses around the world (EY Global, 2020). The International Federation of Red Cross and Red Crescent Societies also classified pandemics as natural hazard. Thus, the COVID-19 pandemic is considered a natural disaster (Seddighi, 2020). Hence, it is justified to discuss business resilience and the COVID-19 pandemic in the context of disaster risk management.

While countries have faced challenges to prepare for and manage disaster risk, the COVID-19 pandemic has escalated the situations. Countries across the world have to respond to the dual challenges of addressing the COVID-19 pandemic and managing disaster risk. Such crises have not only affected the ecosystems and human systems across the countries, but they have significantly disturbed business operations and economic development (IPCC, 2014a, b; Kim & Lim, 2016). It has been noted that environmental disaster, man-made disasters, ecological and biological disasters, etc. have gone beyond the control of any single individual, groups, and countries (Ha, 2016; Ha, 2017; Ha & Jose, 2017; Ha et al., 2019a, b). Also, a single governance approach to address such disasters has not worked well in all scenarios. Apparently, the negative effects of such disasters have required efforts of stakeholders to search for novel governance approaches and do research in various areas and disciplines as well as cross-sectorial, cross-national, and cross-continental to manage disaster risk incidents now and in the future. Such effort should be continuous.

Thus, this section aims to address the three questions, in the context of Asia. Firstly, what are the challenges and opportunities that businesses have faced due to the COVID-19 pandemic? Second, what have business done to remain competitive and sustainable during the COVID-19 pandemic? Finally, what are the new approaches and directions that businesses may consider to prepare for future risk?

This section includes 11 chapters, excluding this introduction chapter. These chapters are contributed by researchers, academics, and practitioners with different backgrounds and from different countries. Overall, this section provides better insights to businesses, policy-makers, researchers, and those who are interested in the topics so that they can have better understanding of how businesses have weathered the adverse impact of the pandemic to remain competitive and how they can better prepare for future disruption.

Businesses During the COVID-19 Pandemic

Challenges Faced by Businesses During the COVID-19 Pandemic

The COVID-19 pandemic has widely and substantially influenced businesses worldwide, hitting both large companies and small- and medium-sized enterprises (SMEs) in all sectors of the economy. At the macrolevel, the main challenges facing businesses during disasters, in general, and during the COVID-19 pandemic include (i) supply chain disruption due to border closures, export restrictions, and shortage of supplies and manpower, (ii) compliance with government regulation, (iii) disruption of operations, (iv) changes in customer behavior and preference, and (v) changes in organizational

behavior (Klint, 2021; Kohli et al., 2020; Moosavi et al., 2022; OECD, 2020b). Other challenges facing businesses include drastic and persistent sales drops, liquidity problems and insolvency risks, massive disruption in the supply chain, workforce shortage, and employee mental health problems.

The containment measures adopted to tackle the health crisis during the pandemic, including lockdowns, social distancing, working from home, etc., resulted in significant and persistent sales drops. A survey conducted by the World Bank Group in 51 countries over six regions showed that the negative impact of COVID-19 on sales has been enormous, widespread, and lasting. More than 80% of firms reported a significant sales reduction from the previous year, with the tourism sector most badly hit. For most firms, the significant sales drop could last 10 weeks or even longer (Apedo-Amah et al., 2020). For example, the closure of restaurants in the United Kingdom in March 2020 caused 85% sales order loss for Caws Cenarth, a small cheesemonger supplying the hospitality industry in the west of Wales (Ross, 2020).

Severe liquidity problems and insolvency risks were natural results of falling sales. At times of crisis, when sales decreased dramatically, fixed costs like rent and interest payments could not be saved simultaneously. This challenge made firms run out of cash, limited their ability to pay back debts, and forced many into bankruptcy. Firms in developing economies with less established financial markets are most vulnerable to these problems and risks (World Bank Group, 2020; Apedo-Amah et al., 2020). Huge inequality existed between large-sized companies and SMEs regarding their ability to assess to finance during the crisis. This inequality could even be observed in advanced countries with established financial markets like the United States (Apedo-Amah et al., 2020; OECD, 2020c; ACCA, 2021).

The pandemic also caused massive disruption in the supply chain which brought a significant impact on businesses, especially those heavily relying on global supply chains. Multiple national lockdowns, lack of transportation capacity, and different recovery paces slowed or even stopped the flow of materials and goods and disrupted economic activities (Harapko, 2021). For instance, the COVID-19 lockdowns in Zhengzhou, China, where Apple's main assembly plant is located have made the record-long wait time to 37 days for iPhones (Yoon, 2022). The closures of meat processing plants due to COVID-19 infection broke the meat supply chain, causing a shortage of meat products in the United States, Australia, and Ireland (Evans, 2020).

Another challenge facing businesses during the pandemic is workforce shortage. Many workers, especially women and senior employees, withdrew from the labor market because of the fears of contagion and the need to take care of the elderly and their children who stayed home due to school and daycare closures (Duval et al., 2022; Melhart, 2021). In many countries, the vacancy-to-unemployed ratios have kept increasing since the outbreak of the pandemic. People have been more and more concerned about low pay, poor working conditions, strenuous tasks, and weak well-being with the experience of the pandemic (Causa et al., 2022). Large-sized companies like Amazon, Apple, Google, etc. acquired talents from different markets by providing flexible working modes, competitive pay and benefits, and greater opportunities for career advancement, making the SMEs even more difficult to attract talent (Melhart, 2021; ACCA, 2021). According to a report by Melhart (2021), the resignation rate of managers was 11.8% higher than that of the pre-COVID period.

Meanwhile, employee mental health problems also called for attention because many employees felt stressful to deal with loneliness, disconnectedness, and loss of work-life balance stemming from working from home (ACCA, 2021; JBA, 2021). The pandemic also triggered reskilling revolution, in which everyone has been transformed by technology through learning and reskilling (JBA, 2021). At the time of returning to the workplace, new employee stresses arose because people who had experienced different ways of working during the pandemic now have new career expectations (Furness et al., 2021).

This section briefly discusses some challenges encountered by businesses. The disruption of business operations has happened across countries. Disruption in one industry or sector has caused domino effects on related/supporting industries. Thus, most of businesses have been adversely affected during crises. Yet, the scope the scale and the magnitude of damages vary across businesses and across sectors. Therefore, the impact of the COVID-19 pandemic on businesses is further discussed in the chapters included in this section.

How Have Businesses Responded to Such Challenges?

The most common response to sales drops caused by COVID-19 has been the introduction and expansion of digital platforms and digital solutions. In an extensive survey conducted from April to August 2020, the World Bank Group found that around 8% of firms started to use digital platforms and around 22% of firms increased the use of digital platforms within 6 months after the outbreak of COVID-19. The findings also showed that the probability of digital transformation increased with the firm size (Apedo-Amah et al., 2020).

Companies also conducted product or business model innovation to diversify into products or services that were less impacted or even needed during the pandemic such as health-related products and services. On average one in four firms performed some product innovation during this period (Apedo-Amah et al., 2020). This response is especially beneficial to SMEs that are flexible in operation but less able to access to finance for digital transformation and digital solutions. Caws Cenarth, a small cheesemonger suffering from a sales plunge after the UK government ordered the closures of restaurants in March 2020, quickly changed its business focus from the service sector to the retail sector by filming a plea for people to buy the cheese or even get the cheese without payment to avoid waste. Its employees quickly learned how to increase the company's social media presence and how to deal with many small orders instead of a few bulk sales. This strategy helped the small business survive the crisis (Ross, 2020). In a survey of 300 senior executives in Europe, McKinsey and Company found that business-model innovation was the most crucial response during the crisis (Diedrich et al., 2021).

Businesses proactively responded to the deteriorating liquidity and increasing insolvency risks by controlling costs, managing payables and receivables, focusing investments on strategic moves, and seeking support from financial institutes and governments. For example, banks quickly closed branches and laid-off staff to save

costs during the crisis. S&P Global Market Intelligence data shows that 3324 bank branches were shut in the United States in 2020, hitting a record high (Aggarwal et al., 2021).

The massive disruption in supply chains during COVID-19 has raised awareness of supply chain resilience. Ernst and Young LLP (EY US) conducted a survey of 200 supply chain executives in late 2020. The result shows that the top priority in the minds of those supply chain executives is increasing efficiency, reskilling the workforce, increasing the visibility of suppliers, and increasing supply chain resilience (Harapko, 2021). Although many businesses suffered from the massive disruption in supply chains, there were outperformers as well. As early as February 2020, Mark Schneider, the chief executive of Nestlé, the largest food producer, was alert to the coming massive global chain disruptions, and his immediate response is to “turn” the organization into crisis mode, i.e., prepare for the worst to come. In response to this crisis, the company built inventories for both raw materials and finished goods, and its crisis committee met twice a week to make prompt decisions to solve operational problems. “There is no magic bullet . . . In some very limited cases we can think about adjusting recipes if there is a critical ingredient missing,” Mark Schneider said (Evans, 2020, para. 4). The strong responsiveness and flexibility helped the company navigate the storm (Evans, 2020).

As for the workforce shortage challenge, large-sized companies solved it by providing appealing job offers. This strategy worked well because better pay, more advancement opportunities, better work-life balance, and more flexibility were the most frequent reasons for those joining a new company (Causa et al., 2022). However, SMEs could not provide comparable salaries. Instead, SMEs tried to build the employees’ loyalty and sense of belonging by creating intimate and shared culture. The strategy helped SMEs to recruit and retain employees during the crisis. For example, Jonathan Tham, the CEO of Guard My Ride (GMR), a Malaysia-based medium-sized company providing extended warranty services for used cars, mentioned that the company’s culture was the most successful selling point to its employees. To show its caring toward employees, the company distributed up to 45% of the profit earned and promised an IPO share to everyone when the company goes public (ACCA, 2021).

To deal with employee mental health problems, Josh Bersin Academy (2021) suggested adopting human-centered leadership, which focuses on inspiring and growing people, driving people to be creative problem-solvers, and supporting people to deal with change, stress, or disruption (Josh Bersin Academy, 2021). A McKinsey survey of 100 executives across industries and geographies provided supporting evidence on human-centered leadership. It was found that organizations that survived successfully with increasing productivity during the pandemic have supported small connections among employees, including coaching, mentorship, idea sharing, and coworking. Those companies have trained managers on remote leadership for the hybrid working mode, redesigned processes to better support a remote workforce, and helped employees adapt and thrive in the new roles (Alexander et al., 2021).

Generally, businesses should prepare for future uncertainties and crises by building resilient and innovative business models, flexible and visible supply chains, and human-centered leadership. Some chapters in this section recommend directions and business models to help businesses cope with ongoing changes in the external environment.

An Overview of the Chapters

The chapters included in this section endeavor to discuss what businesses have done to address issues associated with the COVID-19 pandemic and what businesses can do to further improve their business continuity during crises. Some chapters examine current and new enablers, such as corporate social responsibility (CSR) and behavioral approaches (e.g., nudges and nudging), that can help businesses be resilient during and after crises. Some chapters also propose what can be further done to better prepare for future risk.

This section starts with the chapter titled “Indonesia’s Legal Complexities in Responding to Natural Disasters and the Business Environment” (Chap. 156) by Afriansyah. In this chapter, the author introduces Indonesia’s legislative reform and development for disaster management. The legal framework required for disaster management was not available in Indonesia until 2004 when the severe natural disaster Aceh tsunami hit the country and revealed substantial weaknesses of the law at that time. The Aceh tsunami and the subsequent disasters like Padang earthquake, Mount Merapi eruption, and COVID-19 pandemic sparked the reform and development of the disaster management law in the country. According to its legal framework that was developed based on the international disaster response law (IDRL) guidelines, Indonesia defined natural, nonnatural, and social calamities as disasters. Its disaster management system was directed to focus on the whole spectrum from prevention to rehabilitation. The government also established a national disaster management authority named Badan Nasional Penanggulangan Bencana to oversee and coordinate disaster management across the country and opened the door to the participation from international institutions and NGOs. In response to the COVID-19 pandemic, a series of regulations and policies were introduced to allocate resources, minimize impact, and recover macro- and micro-economy. Generally, the author opines that Indonesia has taken necessary legislative reforms to implement the international disaster response law though more can be done.

► [Chapter 163, “Sustaining and Shielding Business from Disasters: Assessing Indian Experiences of COVID-19 Pandemic Disaster Management,”](#) by Kumar shares how public policy has helped businesses during the COVID-19 pandemic in India. The author examines regulations and policies introduced by the Indian government during the COVID-19 pandemic and the government’s capacity to deliver relevant measures. The prolonged lockdowns and the closures of working places in India during the pandemic resulted in millions of job losses and socioeconomic condition deterioration. To help the masses, the Indian government

announced financial packages, such as providing food and instant cash to the poor jobless migrant workers, distributing free food grains for near 24 months, giving relief to people in need, etc. (National Disaster Management Authority (NDMA), 2020). To help micro-, small, and medium enterprises (MSMEs) which suffered seriously during the pandemic, the Indian government provided interest-free loans, cash subsidies, training MSMEs, and incentivized loan to enterprises engaged in the healthcare, manufacturing, and logistics sectors. Trying to turn the crisis into opportunity, the Indian government enacted a series of economic, banking, and labor laws and announced the special economic and comprehensive packages in the hope to get a foot hold in the global supply chain (National Disaster Management Authority (NDMA), 2020). However, the resumption of normal operations was slower than expectation due to many factors, including socioeconomic changes and shift in consumer behavior and lifestyles. The disruptions in global supply chain and the geopolitical conflicts further obstructed the economic recovery and curtailed India's capacity of handling the disaster.

In the process of disaster risk management, the private sector plays an active role to complement the endeavors of governments by implementing corporate social responsibility (CSR) activities. In ► Chap. 160, “CSR and Sustainable Coexistence with Society During the COVID-19 Pandemic: The Case of Korean Large Enterprises,” Kim reviewed the development of CSR in Korea and documented how the private sector in Korea conducted CSR activities to solve the socioeconomic problems caused by the COVID-19 pandemic. Her study found that large Korean enterprises’ CSR engagement has been evolved from a reactive process to a proactive process (Kim, 2022). The CSR initiatives taken by large Korean enterprises with respect to disaster relief during the pandemic are agile and strategic. More specifically, large Korean enterprises would be able to quickly discover the emergent problems faced by their CSR target beneficiaries, and hence, they incorporated the revealed problems into their CSR planning and provided both immediate and long-term solutions (Kim, 2022). Their pursuance of sustainable coexistence with society in the presence of disaster helped them establish a good and trustworthy reputation which in turn accrued their social capital for business. Based on these findings, Kim concludes that companies should actively and continuously communicate their CSR activities to stakeholders and adopt an authentic, agile, and strategic CSR approach, particularly when there are disasters.

In ► Chap. 157, “Platform Co-operative Models and the COVID-19 Pandemic in Singapore,” Ha and Lin propose that digital platforms can be adopted by businesses, including cooperatives (co-ops), as an “enhanced” business approach, especially during the COVID-19 pandemic. This chapter discusses different types and forms of platform cooperatives, benefits, and challenges of digital platforms. Such platforms can provide on-demand services, job opportunities, and flexibility to users who can join and leave the platforms any time. The popularity of such digital platforms has been observed in many economic activities, especially when social distancing measures were implemented during the COVID-19 pandemic (OECD, 2021). However, challenges associated with such platforms, namely, governance, technology, growth, and capital, also surfaced (Borkin, 2019). In addition, this chapter revisits

Scholz's principles of platform cooperativism, including broad-based ownership, democratic governance, codesign of the platform, and commitment to open-source development (Scholz, 2016, 2018). The chapter assesses how digital platforms have been adopted by co-ops using Singapore National Co-operative Federation's platform as a case study. In order for co-ops' platforms to function well, the authors propose that (i) partnerships with multi-stakeholders and collaborative governance should be developed, (ii) the roles of co-ops should be well acknowledged, and (iii) harnessing technology to support a transparent and accountable digital economy is critical (De Filippi, 2017; Hoover & Abell, 2016; Meah, 2020; Yaraghi & Ravi, 2017).

The next few chapters discuss how different industries have weathered the pandemic to stay afloat. Ha and Wong examine how tourism industry in Indonesia has developed and responded to the COVID-19 pandemic in ► Chap. 158, "Tourism Industry and the COVID-19 Pandemic: A Case Study in Indonesia." Indonesia is a well-known destination for tourists with several iconic landscapes. However, the COVID-19 pandemic has caused much disruption to the country's tourism industry. This chapter examines how the pandemic has affected the tourism industry in Indonesia and how the industry could recover after the pandemic. The findings reveal that the numbers of international tourists to Indonesia reduced by 64.1% in March 2020 (Parama, 2020). Many travel agencies and tourism-related SMEs have temporarily or permanently closed (Hakim, 2020). The Indonesian Hotel and Restaurant Association and the Indonesian Travel Agents Association reported a significant loss of income during the pandemic (Djalante et al., 2020). To rebuild and revitalize the tourism industry, it is recommended that the government should (i) formulate proper policies and put in place effective mechanisms to implement such policies; (ii) improve coordinating efforts at the local, regional, and national levels to enable a speedy recovery for a more resilient industry; (iii) promote environmentally sustainable practices; and (iv) improve infrastructure (Soshkin, 2019; UNEP, 2019). At the industry level, Indonesia's tourism industry needs to strive for a fair balance between attracting tourists, preserving the environment, and complying with government agencies and health authorities to prepare for and mitigate health risks (Mulyanto, 2020).

If the tourism industry in Indonesia has endured huge challenges due to cross-border travel restriction and other social distancing measures during the COVID-19 pandemic, food and beverage (F&B) industry in Hong Kong has encountered different types of difficulties as explained by Wong and Ha, in their ► Chap. 164, "How Food and Beverage Industry Overcome the Impacts of the COVID-19 Pandemic in Hong Kong?." The F&B industry has been subjected to strict regulation because dining in F&B establishments is perceived as one of the key channels to transmit the virus. The impact of the COVID-19 pandemic was reflected through the number of job losses and the decreases in the sales volume of F&B establishments (e.g., a drop of nearly 30%) during the peak of the pandemic. However, the industry has recovered fast. This chapter employs a simplified four-stage framework of disaster risk management by the World Health Organization (n.d.), including mitigation/prevention, preparedness, response, and recovery, to examine how the F&B

industry in Hong Kong has prepared and responded to the pandemic. Apart from complying with all measures stipulated by the Hong Kong government, F&B establishments have also adopted measures that are pertaining to their operations and industry. Together with the experience in managing the SARS outbreak in 2013, timely preparation for all the four stages of the disaster risk management framework enables the industry to respond well to the pandemic and stay competitive during the crisis. It is also noted that preparedness by individuals and businesses could contribute to mitigating the damages caused by disasters (Adams et al., 2019; Sawalha, 2020).

Food security is another important issue that needs to be addressed, not only during the pandemic but all time. Thus, in ► Chap. 159, “Food Security and the COVID-19 Pandemic in Singapore,” Ha and Lim discuss how the COVID-19 pandemic has impacted food acquisition and food prices and review people’s panic buying behavior due to uncertainty (McKeever, 2020). The authors also discuss strategies to improve food resilience, using Singapore as a case study. Singapore is a small country with limited land, Singapore has sourced for much-needed food from around the world, and it has imported about 90% of the total amount of food required for the population (Thai, 2021). However, Singapore has strategically adopted a three-pronged framework, including core strategies, supporting strategies, and enabling strategies to ensure food security for the population (Agri-Food and Veterinary Authority of Singapore, 2020). During the COVID-19 pandemic, there was disruption of food supply chain due to border closures, import restrictions, and social distancing measures as well as panic buying behavior. Hence, food items, essential hygiene items, etc. were emptied from markets and supermarkets’ shelves at lightning speed. Yet, the food security framework implemented by Singapore has worked effectively. For instance, the timely release of stockpiling of food necessities for contingency purposes to increase food supply and the availability of locally produced products helped to control food prices (Singapore Department of Statistics, 2020). Singapore has also sourced for food supplies from overseas markets and invested in food production facilities abroad. Additionally, Singapore has focused on local production by supporting the development of alternative food sources, for example, lab-grown meat, cell-based protein products, and plant-based food products (Nielsen, 2021). Overall, the strategies adopted by Singapore can be reviewed, modified, and scalable to enhance food resilience in other countries with similar political, administrative, and socioeconomic conditions.

Using Japan’s agricultural business which heavily relied on imports and foreign labor as an example, Aoki, in her ► Chap. 161, “The Importance of Restructuring the Local Food System in the Context of Disaster Management: Lessons Learned from the Effect of COVID-19 on Agricultural Business in Japan,” illustrated how strong community engagement could help organizations go through crises. The outbreak and spread of COVID-19 caused disruption in food distribution and the shortage of foreign labor, limiting the supply of domestic food production (Committee for the Coordination of Statistical Activities (CCSA), 2020). On the other side, farmers who produced high value-adding products with a target on foreign tourists faced a

demand plunge due to lockdowns. The closure of schools also created business crises to farmers providing crops and milk for school lunch. To mitigate the impact of damages, people who lost jobs during the pandemic started helping with harvesting. Direct transactions were introduced to better connect consumers and farmers. Solidarity-based transaction and efforts of private social enterprises further relieved the food problem caused by the pandemic. Learning from these lessons, Aoki suggested to adopt the community-based disaster risk management (CBDRM) approach to engage various stakeholders (Van Niekerk et al., 2018). A continuous and trustful relationship among stakeholders is believed to be crucial to ensure stable food supply and food security, no matter in the disaster period or at the peacetime.

To strengthen organizational resilience and prepare for disasters, Seah and Ha, in ► Chap. 165, “[Behavioural Insights, Organizational Resilience, and Disaster Preparedness](#),” echo Linnemayr et al.’s (2016) supposition to implement behavioral insights (BI) in disaster preparedness and response, including the use of nudges and nudging, i.e., implementing activities/initiatives to alter people’s behavior to the expected directions but without significant changes in economic incentives (Marchiori et al., 2017; Thaler & Sunstein, 2008; Zimmermann & Renaud, 2021). The chapter elaborates that BI and nudging can be used in the three states of building organizational resilience, namely, anticipation (before the unexpected event), coping (during the unexpected event), and adaptation (after the unexpected event) (Duchek, 2020). However, the impact of BI and nudging may vary across businesses due to different factors. Therefore, future research should examine the impact of BI interventions for disaster preparedness on businesses with different size, capacities, resources, sector/industry, etc. Finally, although BI has potential to help businesses better prepare for disaster risk, BI is not a one-size-fit-all solution (e.g., Hummel & Maedche, 2019), i.e., BI should be used as an additional tool/mechanism, not a replacement of any disaster risk management frameworks, to provide a cost-effective push for businesses to prepare for and respond to disasters.

It is impossible not to discuss the role of other groups of stakeholders, for example, women and business leaders, in the fights against the pandemic. Thus, Johnson and Thomson try to address the question “Are women leaders more capable of managing disasters?” in their chapter titled “[Times of Crisis: Women and Leadership](#)” (Chap. 162). The authors provide evidence on the exemplars of business and political female leadership during the COVID-19 pandemic. They attribute the success of women leaders in times of crisis to their transformational style of leadership that is aligned with their traits (KPMG, 2019). Different from men leaders who tend to have the transactional leadership associated with their traits like assertiveness, self-confidence, and ambition, women leaders could guide their organizations through crises with empathy and integrity and inspire followers to work for the greater good even at the expense of their own interest (Windsor et al., 2020). Women leaders have been demonstrating their strong competency in managing crises despite the double-bind and glass cliff phenomena caused by the gender bias. Therefore, Johnson and Thomson argue that traditional gender discourse and social norms which doubt on women’s abilities to lead are outdated and women

should be given more opportunities for higher-level leadership in both normal and crisis periods.

The last chapter is titled “Leadership and Crisis Management for Businesses Globally: The Role of Leadership in Business Sustainability in a Crisis Environment” (Chap. 166) by Thomson, Roache, and Muschette. Extending the literature in leadership, Thomson et al. argue that the leadership style intensifies management functions in times of crisis. The functions of management at a time of crisis focus on the effective use of technical, human, and conceptual skills to turn challenges into opportunities and shield the organization from negative impact (Northouse, 2015). This calls for the adoption of an adaptable leadership style to manage changes and formulate strategies based on contingencies that can help organizations sustain and grow in crisis. Prior literature has studied democratic leadership, integrative leadership, transactional leadership, and transformational leadership. Common findings reveal that transformational leadership is the most suitable one during crisis because it focuses on changing, inspiring, and communicating transparently (Bojadjiev & Vaneva, 2021). However, some other studies (e.g., Agusta & Nurdin, 2021) also found evidence on effectiveness of the transactional leadership and multiple leadership styles. Grounding from these findings, Thomson et al. believe that situational leadership that adapts leadership approaches to different situations is most appropriate and effective in times of crisis.

The Way Forward

The COVID-19 pandemic is a wake-up call to many organizations, especially business entities. It acts as a “test” to measure business resilience, i.e., whether businesses have been well prepared for dynamic and significant changes in the external environment. Many businesses have realized that traditional approach to planning and preparing for disaster risk is not adequate to deal with a pandemic as highlighted by EY Global (2020). Actually, it is noted that pandemic preparedness has been inadequate across organizations and across countries (OECD, 2022). Thus, new approaches should be explored to help businesses be more resilient and agile to respond to risk caused by extreme pandemics.

Firstly, given the adverse impact of disasters on businesses, it is important that planning for business continuity and disaster risk management should be incorporated in their business strategies. The COVID-19 pandemic suggests that businesses should not only focus on financial risk but also on disaster risk. A clear disaster risk management framework is necessary for businesses to prepare for and mitigate to risk. Businesses should identify risk; analyze risk and resources available; formulate proper strategy for risk preparation, mitigation, and management; and implement such a strategy. Forbes Coaches Council (2022) discuss critical elements of an effective business continuity strategy, including an effective communication plan,

leadership development, an early succession plan, understanding of internal and external risk, and others. EY Global (2020) also recommends some priorities for planning and responding to future risk, e.g., new pandemics. Businesses should embrace a people-oriented approach to plan and execute business continuity plans because people are the assets to all businesses. No business plan or business strategy can be executed without the employees' contribution. Thus, human elements should be seriously considered during the whole process of disaster risk management. In addition, Asian Development Bank (ADB) and Organization for Economic Co-operation and Development (OECD) (2020) highlight that it is important to invest in technology and infrastructure to manage disaster risk because the economic and human loss due to disaster is huge.

Secondly, businesses should have an effective communication strategy and channels, including social media and other reliable platforms, to disseminate the information and reach relevant stakeholders timely during and after disasters (EY Global, 2020). Businesses should work closely with the public agencies and civil society organizations at all levels in order to receive information, guidance, and assistance as well as provide support to one another during disasters/crises (OECD, 2022). Effective communication during disasters would help stakeholders connect with one another and provide support to recipients. Effective communication would help public education with regard to risk preparation (Kharade et al., 2017).

Finally, cyber risk is not a new phenomenon, but it has been intensified during the pandemic that requires more effort from businesses. Many big companies have invested in technology and measures to ensure cyber safety for their internal and external customers and plan for business continuity and damage recovery (EY Global, 2020). Yet, recent incidents showed that big companies have also experienced such cyber risk that affected thousands of their customers. Apart from the current cyber risk, such as ransomware, spear phishing, etc., new threats have been growing fast. Cyber risk has become more severe during disasters like the COVID-19 pandemic (OECD, 2020a). For instance, a publication by Deloitte (Nabe, n.d.) reveals that about 47% of people encountered an online security incident (e.g., phishing scam) when they were working from home. In other words, the pandemic has presented opportunities to cyberattackers to increase their criminal activities via different forms (Nabe, n.d.). Therefore, public education on cyber risk and cybersecurity to stakeholders should help to improve their awareness of cyber risk, and technological solutions can also be adopted to nudge people to positive behaviors to prevent cybersecurity incidents as asserted by Guitard (2022).

Many businesses in various industries have adopted new practice to steer their organizations through the destruction and disruption during and after crises. For example, the ESG (environment, social, and governance) framework has drawn much attention from the public sector, business, researchers, academics, and practitioners given its relevancy to the volatile external environment and economy, the rapid development of technology, and the ongoing and emerging challenges for businesses. Businesses need to go beyond traditional ESG and CSR (corporate social

responsibility) activities to demonstrate their social responsibility that can also contribute to their business sustainability, especially in the digital age. Thus, a new form of CSR, digital responsibility (CDR), has emerged as a new CSR subtrend. Mellis (2022) defines CDR initiatives as activities that can help businesses protect stakeholders' privacy and security online, etc.

Overall, effective and efficient disaster management would require a comprehensive and integrated legal framework, meaningful and practical public policy, agile and authentic ESG/CSR approaches, effective communication, strong community engagement, appropriate leadership styles, and technology adoption.

Conclusion

SMEs account for the majority of businesses in many countries, and they have contributed a significant percentage to the GDP of the respective countries around the world (Lin et al., 2022). They have been seriously affected by the COVID-19 pandemic. For example, "between February 2020 and April 2021, 70–80% of SMEs across 32 countries lost between 30 and 50% of their revenue" (Lin et al., 2022, para. 1). This reinforces the significance of having a business continuity plan and disaster risk management framework.

Disaster risk management is a complicated, multifaceted, and challenging process, involving different groups of stakeholders in different sectors. Businesses in all sectors have faced multidimensional challenges when dealing with both natural and man-made disaster risk and reducing the impact of such risk to different groups of stakeholders. However, the current business continuity plans, models, and approaches to manage disaster risk by businesses may not be sufficient to withstand future risk. Thus, they should be reviewed, evaluated, and improved in a manner that can help businesses respond to the ongoing changing external and internal environments.

Since the adverse impact of disasters has transcended across industries and across countries and the traditional approaches to prepare for and respond to disaster by businesses have not been effective, innovative approaches to formulate and implement business continuity plans as well as manage disaster risk should be explored not only at the corporate level but also at the industry, national, regional, and international levels.

In general, this section is significant for its coverage of businesses' responses to the pandemic and new directions to respond to the current and future pandemics. The above chapters highlight the importance of searching for more holistic and comprehensive approaches to address the current and future challenges associated with disaster risk management.

Finally, one of the limitations of this section is the limited inclusion of sectors and topics related to business responses to disaster risk due to time and resource constraints. Thus, further research should include more relevant topics and more economic sectors.

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Indonesia's Legal Complexities in Responding to Natural Disasters and the Business Environment

156

Arie Afriansyah

Contents

Introduction	2378
Development of Law Disaster Management in Indonesia Based on Natural	
Disaster That Occurred	2379
Aceh Tsunami (2004)	2380
Padang Earthquake on West Sumatra (2009)	2382
Mount Merapi Eruption on Central Java (2010)	2383
COVID-19 Pandemic and Impact on the Business Environment	2384
Development of Law Disaster Management in Indonesia Based on the International	
Disaster Response Law (IDRL)	2387
Impact of Disaster Management-Related Law, Policies, and Regulations on Business	2390
Economic Impact of COVID-19 Disaster in Indonesia	2390
Indonesian Government COVID-19 Policy Impact on Business	2391
Conclusion	2392
References	2393

Abstract

Indonesia is a country prone to natural disasters such as tectonic earthquakes and tsunamis. With several severe disasters occurring in Indonesia, it has been found that there are several crucial weaknesses in disaster management, including the unavailability of a comprehensive and integrated legal infrastructure. This chapter evaluates the implementation of Indonesia's disaster management law and the related rules and guidelines, including their impact on international disaster response participation. It focuses on the legal aspects of Indonesia's new disaster management system. It examines how the IDRL guidelines have been implemented into Indonesia's new disaster management system, with the legal framework for facilitating and regulating international help in disaster response and how it impacted the business environment. The focus of this chapter is the

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development of a disaster management regime in Indonesia that is influenced by several disasters that happened in Indonesia.

Keywords

Indonesia · Disaster law · Business environment · Pandemic

Introduction

Indonesia is an archipelago between three faults underneath the country: the Indo-Australian, the Eurasian, and the Pacific. This geographic setting makes this country prone to natural disasters such as tectonic earthquakes and tsunamis (Ministry of Finance, 2018). It is also one of the most populous countries globally, with over 270 million people per December 2021 (Mursid, 2022). *Badan Nasional Penanggulangan Bencana* (BNPB), or the Indonesian National Disaster Management Agency, reported that almost 7000 villages/districts in Indonesia are in severe high-risk earthquakes. More than 35,000 others near the area are exposed to medium to a minimum earthquake with moderate risks (BNPB, 2016). This number, as of 2018, was stated by Indonesian Central Statistical Agency (BPS) cumulatively consisting of half the district/village registered in Indonesia (BPS, 2022).

Moreover, in Indonesia, natural disasters are not merely limited to just earthquakes. Geographically speaking, the tsunami is also considered one of the threats to this country's beach-side residents. As occurred in December 2004, the Aceh Tsunami was one of the most significant catastrophes in Indonesia. The counted casualty was estimated at over 130,000 people, with an economic loss of USD 5 billion (Danugroho et al., 2020).

Several crucial weaknesses in disaster management, especially the tsunami and earthquake in Indonesia, are the unavailability of a comprehensive and integrated special legal infrastructure. At the time of the disasters in 2004 and 2005, the existing legal infrastructure was sectoral, and some were oriented toward emergency response. The policy only focuses on government physical assistance. It should be noted that regional autonomy has brought about essential changes in the system of government. However, this transformation was not followed by governance adjustments. The delegation of authority from the central government to regional governments within the framework of regional autonomy does not coincide with the delegation of responsibilities, particularly in protection and public services (Siahaan, 2006). Local governments' response to disasters is often slow and depends on central government policies. Institutionally, the disaster management policy system is centralized. Therefore, the central government is dominant and provides instructional policies to local governments. At the same time, within the framework of regional autonomy, the local government's role is crucial when a disaster occurs. This framework is especially so in reducing the impact of disaster risk. The local

government where the disaster occurs is the most knowledgeable about the direct impact of a disaster (Putra & Matsuyuki, 2019).

After the earthquake and tsunami between 2004 and 2005, Indonesia's disaster management law was developed. Whether it is the line of order or the more integrated delegation of authority between the regional and the capital, this progress is proven by enacting Law No. 24 of 2007 on Disaster Management Regulation. The law indicated a shift in disaster management's general paradigm from responding to disasters to managing all stages of the disaster management spectrum, that is, before, during, and after. This enactment of the law established the BNPB, whose primary purpose is to minimize the damage inflicted by natural disasters on human casualty financial damage. In 2008, the government released three government regulations (*Peraturan Pemerintah*) on implementing the Disaster Management Law such as the Government Regulation No. 21 of 2008 on the implementation of disaster management, the Government Regulation No. 22 of 2008 on the administration of disaster management aids, and the Government Regulation No. 23 of 2008 on the participation of international institutions and foreign nongovernmental organizations. With those regulations mentioned above, Indonesia has finally opened to any participation from international institutions and NGOs. This participation means that Indonesia has taken a significant legislative reform to implement the International Disaster Response Law (IDRL) suggestion.

This chapter evaluates the implementation of Indonesia's disaster management law and the related rules and guidelines, following its introduction in 2007, with their impact on international disaster response participation. It focuses on the legal aspects of Indonesia's new disaster management system. It examines how the IDRL Guidelines have been implemented into Indonesia's new disaster management system, with the legal framework for facilitating and regulating international help in disaster response and how it impacted the business environment. The focus of this chapter is that the development of a disaster management regime in Indonesia is influenced by several disasters that happened in Indonesia. They are the Aceh Tsunami in 2004, the Padang earthquake in West Sumatera Province in 2009, the Mount Merapi eruption in Central Java Province in 2010, and the recent COVID-19 pandemic in 2020.

Development of Law Disaster Management in Indonesia Based on Natural Disaster That Occurred

Disaster management law in Indonesia has been developing since the mid-2000s. This development was caused by a few major natural disasters that shaped Indonesia's disaster management system. This chapter will describe the development of Disaster Management Law in Indonesia from the view of each disaster that happened.

Aceh Tsunami (2004)

The tsunami that hit the northern shore of Indonesia's Nanggroe Aceh Darussalam (Aceh) Province in late December 2004 killed over 130,000 people and destroyed vast infrastructure and property (Danugroho et al., 2020). In the aftermath of the tragedy, a vast local and international rescue and recovery effort exposed serious legal loopholes and institutional shortcomings in Indonesia's legislative framework for disaster response. This sad occurrence and the government's handling of the aftermath prompted the Indonesian government to reconsider its strategy to deal with the broad spectrum of disasters that strike the country's islands on a near-weekly basis.

When the tsunami hit, Indonesia lacked a unified national disaster management law and a statutorily formed national disaster management organization. The policy at the time was the Presidential Decision No. 28 of 1979 on the National Disaster Management Coordinating Board (BAKORNAS). This national institution regime was established during the Suharto and Habibie administrations. BAKORNAS was an inter-ministerial agency coordinating government agencies and international organizations' disaster response efforts. Its secretariat was composed of people seconded from other government offices, highlighting that it was only there for a short time (only during emergency response).

The then Indonesian president, Susilo Bambang Yudhoyono, declared a national disaster on the day of the tsunami in 2004. He put BAKORNAS in charge of organizing the response under a senior military officer (based in the Vice President's Office). BAKORNAS' regional counterparts, the joint task force (*Satuan Koordinasi Pelaksana – SATKORLAK*), handled the response at the provincial level. In contrast, its district counterpart, the task force (*Satuan Pelaksana – SATLAK*), provided relief at the district and subdistrict levels. Within a few weeks, more than 50 international organizations arrived in Aceh. By mid-January 2005, more than 200 international organizations were still working on the ground (Pan, 2005). The tsunami's damage and the outpouring of international aid overwhelmed Indonesian authorities, revealing substantial flaws in the legal regime and institutional architecture governing disaster management.

With the outpouring of international aid, Indonesia's government, especially the Aceh region, found new problems. The cargos were held up due to incomplete or incorrect paperwork or delayed approval without explanation. It is also noted that importation, registration, and insurance procedures were complicated and occasionally contradictory. Large and designated donations delayed the United Nations' efforts to coordinate international organizations. Because of the absence of coordination, competitive planning was encouraged rather than cooperative. Some international organizations, mainly those new to disaster relief, supplied expired pharmaceuticals, disregarded local culture and religion, and failed to consider the economic implications of their work on the local economy, among other things (Willits-King, 2009).

Like many other countries in the Southeast Asian region, Indonesia has focused primarily on disaster response to disaster management. However, following the

tsunami, the Indonesian government revised its approach. It recognized the need for a larger concept of disaster management, owing to the revelation of legal gaps and institutional shortcomings and the impact on the relief effort.

Underpinning this change in mindset are several critical new ideas and perceptions. First, catastrophe management must be viewed as a comprehensive type of risk management, focusing on prevention whenever possible. Second, the government is responsible for safeguarding, respecting, and fulfilling human rights in disaster zones. Third, society, not only the government, feels responsible for disaster management (Moroney & Rand Corporation. National Security Research Division, 2013).

This shift in thinking culminated in the passage of Law No. 24 of 2007 on Disaster Management (hereinafter Law 24/2007). This established legal framework provides a comprehensive collection of provisions delegating national and regional governmental responsibility. It specifies community rights and obligations, business and international institution roles, disaster management stages and needs, and disaster aid finance and management. According to Article 1, Law 24/2007, a disaster broadly includes natural, “non-natural,” and “social” calamities. This definition represents Indonesia’s scope for various natural disasters, the risk of non-natural disasters, and the potential for societal unrest. Furthermore, it defines “disaster management” as “a set of measures that includes policies on disaster risk development, disaster prevention, emergency response, and rehabilitation” (Art. 1, Law 24/2007).

This law was also supported by establishing a governmental body by President Susilo Bambang Yudhoyono called the National Disaster Management Agency (BNPB) in 2008. This body’s primary purpose and function are to formulate and stipulate disaster management policies and handling of refugees by acting quickly, appropriately, effectively, and efficiently. BNPB also coordinates the implementation of disaster management activities in a planned, integrated, and comprehensive manner. The BNPB, based on Article 12 Law 24/2007, also reports to the president every once a month in a nondisaster situation and at any time during the disaster to keep track of international and domestic financial donations.

The law is backed up by several regulations and guidelines covering all aspects of the disaster recovery process:

- Government Regulation No. 21 of 2008 on Disaster Management. It covers disaster management and related activities and international help supplied by governments, international institutions, and nongovernmental organizations from other countries.
- Government Regulation No. 23 of 2008 on the Participation of International Institutions and Foreign Non-governmental Organizations in Disaster Management. It describes the role of international actors in disaster management and response, particularly for international institutions and foreign NGOs.
- BNPB Guideline No. 22 of 2010 on The Role of International Organizations and Foreign Non-Governmental Organizations During Emergency Responses. It establishes a guideline that delves into further depth about international

supporting actors in disaster response, such as international organizations and foreign NGOs.

Padang Earthquake on West Sumatra (2009)

Two severe earthquakes happened off the coast of Padang, the central city in West Sumatera province, within 30 min of each other on September 30, 2009. Over 1000 people were killed and over 200,000 structures and residences were destroyed in the coastal area and further inland due to the earthquakes (Vaswani, 2015). Because the president was out of the country at the time of the tragedy, Vice President Jusuf Kalla called a meeting of seven ministries, including the BNPB, to review at least six assessment reports. Foreign Search and Rescue (SAR) teams were welcome, according to the BNPB, if needed. The president announced a state of emergency the next day during a cabinet meeting (Jennifer et al., 2013).

During this time, Indonesia already had a comprehensive and integrated legal framework for disaster management in Law No. 24/2007. By that, the focus of disaster management is currently more directed at community preparedness in the face of danger. It means disaster management not only in the emergency response but also in pre-disaster actions (mitigation). They can minimize the possibility of the victim and economic loss by disseminating and educating the public about earthquakes, building rules, and identifying disaster-prone regions (Yustiningrum, 2016).

As for the mitigation effort in Padang City itself, according to Copolla, mitigation operations are carried out in structural and nonstructural mitigation (Coppola, 2015). The following are the disaster mitigation activities carried out in the City of Padang. The following are structural disaster mitigation activities (Sugimin Pranoto, 2011):

1. The disaster mitigation spatial-based spatial plan was revised in Padang City Regulation No. 4 of 2012. The revised regional spatial planning (*Rencana Tata Ruang Wilayah – RTRW*) explained areas prone to disasters, resulting in the area becoming a red zone for the neighborhood in physical development.
2. Building and Housing Development Arrangements outlined in City Regulation No. 7. According to the legislation, the government created requirements for the public, private sector, and government in carrying out physical development in 2015. Hence, buildings are resilient and robust against natural catastrophes such as earthquakes.
3. Infrastructure is developed by constructing existing disaster evacuation routes and earthquakes. Even if they are not fully completed, the construction of this route is to provide the public's flexibility in evacuations when an earthquake strikes. It also guides the community to evacuation sites when natural disasters occur.
4. They provide maps and earthquake evacuation procedures to ensure that the community knows where to go and how to get there in the event of an occurring disaster.

The government of Padang carried out several nonstructural disaster mitigation activities. They are (Alhadi & Sasmita, 2014; Simandalahi, Ahsan, & Prasetyadjati, 2015).

1. Disaster preparedness. The program, which involves socialization and disaster simulation, is carried out in every village and school in Padang. The community responded positively to this activity. It has been shown multiple times that the community actively participates in disaster planning, particularly earthquakes. In addition, in this example, the Padang City Government created a disaster preparedness school program and a disaster preparedness community. This practice means the government has socialized directly with families and urban neighborhoods, mosques, *taklim* gatherings, and door-to-door dissemination.
2. The empowerment of the community through *Kelompok Siaga Bencana* (KSB), or Disaster Preparedness Group, disseminates and becomes the spearhead in disaster risk management among the people in a community or traditional gathering Padang. With this kind of group's development, the community should be able to overcome or minimize the risk of the disaster.

Disaster risk management plans in Padang have considerably impacted local governments' and communities' preparedness in disaster risk reduction measures. The government, the corporate sector, and the community supported the different actions to mitigate structural and nonstructural disasters. Furthermore, the willingness to undertake catastrophe mitigation measures in the Padang City Spatial Plan demonstrates a significant effort. This setting demonstrates that local governments are more responsible for the overall protection of the community. This shift represents regional government policy relating to pre-disaster conditions and disaster risk management activities.

Mount Merapi Eruption on Central Java (2010)

Mount Merapi, Indonesia's most active volcano, erupted on October 26, 2010. The eruption occurred near one of the country's centers of Javanese culture, Yogyakarta, which lasted several days, killing over 350 residents and causing many to flee (BBC, 2010). The government's initial response came from the district and provincial levels. The government of Sleman, Yogyakarta, declared a district-level emergency and the Central Java BPBD relocated its operational function to Magelang by establishing a provincial command post. The president declared a national emergency on November 5, 2010, and decided that the BNPB would manage disaster management. BNPB was supported by the Yogyakarta Governor, Central Java Governor, Central Java, and Yogyakarta Military Commander, Central Java, and Police Chief of Yogyakarta. The central government would be represented by the Coordinating Ministry of Public Welfare (International Federation of Red Cross and Red Crescent Societies & Palang Merah Indonesia, 2014).

On this occasion, the effectiveness of Law 24/2007 is shown in the line of order or the more integrated delegation of authority between the regional and the capital. For example, BNPB (regional branch) collaborates with the National Army, the National Police, BASARNAS (Indonesian Search and Rescue), and PMI (Indonesian Red Cross) in the search and rescue of catastrophe victims (BNPB, 2012). The BNPB collaborates with the Ministry of Social Affairs to manage displaced persons. The BNPB collaborates with the BIG (National Bureau of Spatial Information), departments, and agencies to map high-risk locations. The BNPB collaborates with the Ministry of Energy and Mineral Resources and the BMKG (Meteorological, Climatology, and Geophysics Agency) for geological risks, LAPAN (National Space Agency) for hydro-meteorological dangers, based on research from the Ministry of Research and Technology, LIPI (Institute of Science), and universities around Indonesia. The BNPB collaborates with the Ministry of National Education, the Ministry of Religious Affairs, and the Ministry of Communication and Media on disaster risk reduction education. Distributing donations is based on the Head of BNPB Regulation No. 7 of 2008 on Mechanisms to fulfill Basic Needs. Donor aid is distributed to the Internally Displaced Persons (IDP) camps under the supervision of the BNPB and the BPBD (International Federation of Red Cross and Red Crescent Societies & Palang Merah Indonesia, 2014).

COVID-19 Pandemic and Impact on the Business Environment

The first case of COVID-19 in Indonesia was reported on March 2, 2020. As of February 2022, the Government of Indonesia has reported 5,564,448 confirmed cases of COVID-19, including 148,335 deaths across all 34 provinces (AHK Indonesien, 2022). When the virus first attacked, the Indonesian government had never regulated the spread of viruses or pandemics before this new pandemic. As a result, the Indonesian government moved fast to pass numerous new legislation that could prevent the spread of the COVID-19 virus.

The COVID-19 pandemic spread worldwide requires humans to issue new policies and generate new economic conditions. In Indonesia, Presidential Decision No. 12 of 2020 on the Determination of Non-Natural Disasters Spreading Corona Virus Disease 2019 (COVID-19) as National Disasters not only affects the health and activities of the people but also has an impact on the business climate in Indonesia. The economy in Indonesia in 2020 has been affected by the COVID-19 pandemic. Some businesses have even been paralyzed due to unpredictable state regulations and policy changes. Not only that, but the country also even entered the brink of recession in the final quarter of 2020. A *recession* is a time condition that prevails in the economy's long term, and economic growth experiences a negative value for two consecutive quarters (Widiarsih, 2020).

Indonesia's economic activity slowdown focuses on tourism, trade, and investment. The slowdown of Indonesia's tourism can be seen in the decline in the number of tourist arrivals to Indonesia, which previously stood at 16.1 million visitors in 2019, which decreased by 7.62% in January 2020 (Christian & Hidayat, 2020). In

addition, the decline in Indonesia's exports to the world can also be seen as one example of the economic slowdown. Various state policies in tackling the COVID-19 pandemic have caused a slowdown in economic activity. An example is the enactment of Large-Scale Social Restrictions (PSBB) through Government Regulation No. 21 of 2020 on Large-Scale Social Restrictions, which forcefully restricts people's movements and requires people to stay at home (Disantara, 2020).

In the emergence of various policies that cause a recession, it is the responsibility of the government to issue various policies so that the country's economy returns to be stable or even better than before. Some scholars noted that the government should allocate, distribute, and stabilize functions to ensure its best-positioning economy (Musgrave & Musgrave, 1984). To ensure its allocation function is carried out, the government must allocate economic resources efficiently to meet the community's needs. Furthermore, the government must conduct the distribution function by imposing taxes, social security, and public services to balance income distribution. Above all, the stabilization function requires the government to create economic stability. It was also argued that these three functions must be carried out as government intervention in running the country's economy.

Joko Widodo, the president of the Republic of Indonesia, announced various related regulations in mid-2020 about COVID-19's early steps and response activities. The following are some of the initial policies of the Indonesian government:

1. Presidential Decision No. 7 of 2020 established the Task Force for the Acceleration of COVID-19 Handling, entrusted with preventing COVID-19's serious spread. The Task Force's responsibilities include carrying out operational strategies for the faster handling of COVID-19 and coordinating and controlling the implementation of COVID-19-related actions. Then, supervise the implementation of the Coronavirus handling acceleration plan and mobilize resources for the acceleration plan's implementation. The president must be informed of the Task Force's implementation of the COVID-19 handling acceleration.
2. Government Regulation No. 21 of 2020 on Large-Scale Social Restrictions in the Context of Accelerating COVID-19 Handling was enacted on a regional spectrum. Through this legal means, the president issued the regulation governing the issuing of Large-Scale Social Restrictions (*Pembatasan Sosial Berskala Besar* [PSBB]) to break the chain of the Coronavirus spreading. This policy is more appropriate for Indonesia than regional quarantine or lockdown. Local governments may use PSBB with the agreement of the Minister of Health, according to this regulation signed on March 31, 2020. The purpose of social limitations is to control the flow of people and goods into a province, district, or city. Based on Article 3 of this Regulation, PSBB must meet several requirements. Namely, the number of cases or deaths due to the disease has increased significantly. There is an epidemiological link with similar events in other regions or countries. PSBB at least includes school and work holidays, restrictions on religious activities, and restrictions on activities in public places or facilities, as stated in Article 4 paragraph (1). The rules regarding PSBB are then explained in more detail through the Minister of Health Regulation No. 9 of 2020 on PSBB Guidelines.

3. Presidential Decision No. 12 of 2020 on the Determination of Non-Natural Disasters Spreading COVID-19 determined the outbreak of COVID-19 as a National Disaster. This presidential decree is the latest regulation signed by the president regarding the first half of the COVID-19 outbreak. The president officially declared the coronavirus outbreak a national disaster. The regulation explains that the Task Force will carry out national disaster management for the Acceleration of Handling COVID-19. Then, the Presidential Decree also contains the regional head becoming the Chair of the Task Force for the Acceleration of Handling COVID-19 in the regions. Determining regional policies must also consider the central government's policies, as stated in the Presidential Regulation 12/2020.

Regarding the impact on the national economy and business, the government also issued policies related to procuring government goods and services: The Presidential Instruction No. 4 of 2020 on Refocusing of Activities, Budget Reallocation, and Procurement of Goods and Services in the Context of Accelerating Handling of Coronavirus Disease 2019 (Covid-19). This Presidential Instruction instructs to refocus activities using the budget so that procurement of goods during the pandemic can handle the handling of the COVID-19 pandemic. The president also directed the Minister of Finance to make budget changes more effortless. The Minister of Home Affairs to work with regional heads to expedite the use of the Regional Revenues and Expenditures Budget to deal with the COVID-19 outbreak.

Then regarding the procurement of goods and services, the Government Goods/Services Procurement Policy Institute (LKPP) through the Circular Letter of the Head of LKPP Number 3 of 2020 concerning the Explanation of the Implementation of the Procurement of Goods/Services in the Context of Handling Coronavirus Disease 2019 (COVID-19) further explains the mechanism of government procurement of goods/services in the context of handling the COVID-19 emergency.

During the COVID-19 outbreak, the government issued other policies, such as stopping the process of procuring goods and services for the 2020 Special Allocation Fund (DAK) through the Letter of the Minister of Finance No. S-247/MK.07/2020 of 2020 and the Circular of the Minister of Home Affairs Republic of Indonesia Number 440/2622/SJ of 2020 concerning the Establishment of a Regional Task Force for the Acceleration of Handling Coronavirus Disease 2019 (COVID-19). The two policies terminate all procurement of goods/services of types/fields/subsectors of the Physical Special Allocation Fund (DAK), except for the health and education sectors. Based on this letter, the government can stop all activities related to procuring goods/services of types/fields/subsectors of the Physical Special Allocation Fund (DAK) except for the health and education sectors. The government does the policies to focus more on recovering from the pandemic by procuring goods and services focused on health and education.

With the return of increasing economic activity in Indonesia, the economic situation in Indonesia toward the end of 2021 has moved toward a positive and raises a better prospect. One of the moving economic activities is the passage of domestic consumption. Domestic consumption is closely related to people's ability

to become consumers in production activity. In September 2021, the Indonesian Manufacturing PMI Index and the increasing Consumer Confidence Index returned to an expansionary level (Coordinating Ministry for Economic Affairs, 2021). To ensure that domestic consumption continues, the government has allocated a budget of Rp. 172.1 trillion to increase people's purchasing power. The budget is allocated concretely to Direct Cash Assistance, Pre-Employment Cards, electricity exemptions, and various other things (Sasongko, 2020).

It appears that the Indonesian government's COVID-19 policies are to maintain the safety of the people from a health perspective and an economic perspective. At the beginning of the policy's implementation, there was pessimism from the community and entrepreneurs. With the reopening of borders and tourism, the business climate in Indonesia has received a bright spot after a period of dimness. As time goes by, adaptations from all sides of the country's economy gradually return to life after being suspended in animation for the past few years.

Development of Law Disaster Management in Indonesia Based on the International Disaster Response Law (IDRL)

This section compares Indonesia's legislative framework for emergency response and international engagement to the IDRL Guidelines. It references other relevant international legislation applicable in this context and from which the IDRL Guidelines' provisions were based. Several vital stakeholders mentioned the importance of the IDRL Guidelines in shaping Indonesia's legal framework for disaster response since the enactment of Law 24/2007, particularly in drafting Government Regulation No. 23/2008 and BNPB Guideline No. 22/2010. The IDRL Guidelines cover both disaster relief and initial recovery support. "Disaster relief" is defined as "goods and services provided to meet the immediate needs of disaster-affected communities" (IDRL Guidelines, para. 2).

In contrast, "initial recovery assistance" is defined as "goods and services intended to restore or improve the pre-disaster living conditions of disaster-affected communities, including initiatives to increase resilience and reduce risk, provided for an initial period, as determined by the affected State, after the immediate needs of disaster-affected communities" (UN General Assembly, 1991). The IDRL Guidelines contain five main parts: "core responsibilities; early warning and preparedness; initiation and termination of international disaster relief and initial recovery assistance; eligibility for legal facilities and legal facilities for entry and operations" (IFRC and PMI, 2014, 26). The sections of the framework dealing with disaster response and the facilitation of international assistance will be given special attention in the case studies. They are a foundation for evaluating the law's execution, impact, and associated regulations and guidelines. The IDRL Guidelines are broader than Indonesia's legal framework for emergency response and are recommended for extending the provision of some legal facilities to the stage of recovery assistance. This is because Indonesian Law only focuses on the emergency response period. It has been noted that international aid agencies faced many problems during the initial

recovery period. This is because Indonesian Law ensures that these international institutions continue to receive and/or begin to receive easy access by extending the emergency response phase (IFRC and PMI, 2014).

The IDRL Guidelines recognize that disaster response is primarily the duty of the impacted state. However, suppose the state decides that the disaster's impacts surpass the country's ability to respond effectively. In that case, it should seek regional or international aid. Furthermore, the IDRL Guidelines recognize that, in accordance with international law, the state has the sovereign power to coordinate, regulate, and monitor disaster relief and first recovery aid delivered on its territory (Red, 2003). International responders should follow appropriate national and international laws, coordinate with the government, and protect the dignity of those affected, according to the IDRL Guidelines. They also encourage states to provide disaster relief and initial recovery assistance in a nondiscriminatory, nonpolitical, non-proselytizing, noncommercial, and independent manner, according to the principles of humanity, neutrality, and impartiality nondiscriminatory, nonpolitical, non-proselytizing, noncommercial, and independent manner.

In addition, assistance should strive to fulfill minimal quality and accountability requirements such as addressing vulnerable groups' unique needs, facilitating coordination among actors, respecting local culture and customs, strengthening resilience, and being handled openly and transparently. On account of this, Indonesia's existing legal structure clarifies that disaster management is the responsibility of the national and regional governments, depending on the scale of the disaster. It establishes unique procedures for foreign institutions to participate in catastrophe management, including emergency response. BNPB is to offer approval to foreign institutions to engage in emergency response situations based on necessity (IFRC and PMI, 2014, 27). It is assessed by a timely and adequate study and disaster emergency status judgment. The national or regional government coordinates disaster management (depending on the severity of the disaster, as indicated above). The emergency response "command post" coordinates, controls, monitors, and assesses the numerous operations.

The government's purpose is reflected in the principles and objectives of Law 24/2007, which state that disaster management must correspond to the applicable concepts and standards outlined in the IDRL Guidelines. Appropriateness, coordination, transparency, nondiscrimination, and non-proselytism are some principles, while respect for local culture is one of the objectives (IFRC and PMI, 2014, 27). Furthermore, Chap. V of the Law establishes "community rights," including the right to participate in disaster management decision-making. Disaster management during an emergency response is required by law to include the provision of necessities and protection for vulnerable groups. International organizations can collaborate with governments to meet these fundamental needs for catastrophe victims under Government Regulation No. 21/2008. This is supported by BNPB Guideline No. 22/2010, which allows international institutions to participate in a broader range of emergency response activities, such as rapid assessment, rescue and

evacuation, essential needs provision, protecting vulnerable groups, and immediate rehabilitation of vital facilities and infrastructure (IFRC and PMI, 2014, 28).

International institutions can give disaster relief during an emergency response, according to Government Regulation No. 23/2008, providing they submit a list of persons, relief products, and other items for approval by the BNPB. In addition to the basic principles and other standards in the IDRL Guidelines, the list required by Government Regulations can ensure that the type of assistance provided is sufficiently responsive and in accordance with the real needs of the disaster-affected population. The law bars international organizations from intervening in politics or security issues. They must examine and respect diverse social, cultural, and religious perspectives. In addition, BNPB Guideline No. 22/2010 requires aid providers to adhere to and follow 17 principles, including respect for sovereignty, ensuring a good impact, providing qualified support, and aiding based on need (IFRC and PMI, 2014, 28).

While the legal framework considers the core responsibilities outlined in the IDRL Guidelines, it lacks a precise enforcement mechanism or ensures that such principles have complied with. This is aside from the procedures for approving international actors' participation in disaster management or emergency response. International institutions should include communities in the distribution process when giving international aid in relief products. Experts must meet the technical ministry's requirements when providing it in the form of experts. While the IDRL Guidelines are referenced, the framework does not link adherence to humanitarian values to legal facility eligibility, a method for sanctioning participation in emergency response.

Overall, it is evident that Indonesia's legislative system is heavily influenced by the IDRL Guidelines and has made significant progress so far. Many of the legal features found in the IDRL Guidelines are available inside the legal framework. There are notable distinctions, such as not speeding the quality and compatibility inspection process for all commodities, not lowering the rules for recognizing certifications, and not addressing particular goods and equipment such as automobiles and ICT. Likewise, Indonesia's legal framework is significantly more rigid in drug expiration (2 years rather than 1 year) and food sell-by dates (minimum of 6 months). Furthermore, it does not adequately address the granting of temporary domestic legal status nor provides for tax exemptions in other ways.

Finally, it excludes government support for lowering or covering critical expenditures such as transportation and storage. These services may be still delivered in practice. However, if not, it is worth looking into whether the legal framework may be changed to include them. Review and improvement in the legal framework, particularly in ensuring adequate coverage of the law into the recovery period and integrating initial and mitigation procedures into the law. This can certainly improve important aspects of the legal framework. In addition, another benefit is to ensure coverage of "easy access" facilities for all legal facilities as outlined in the IDRL Guidelines. In addition, the eligibility of foreign actors is conditioned to comply with important humanitarian principles and norms.

Impact of Disaster Management-Related Law, Policies, and Regulations on Business

This section will focus on how the COVID-19 pandemic has affected Indonesia's national economy. In addition to recent events, the impact felt by this national disaster was felt without exception in various regions in Indonesia. Subsequently, how the government issues various policies and legal products to minimize the negative economic impact and adapt and recover Indonesia's macro- and micro-economy will be observed.

Economic Impact of COVID-19 Disaster in Indonesia

The impact of the arrival of the COVID-19 pandemic was that almost 2 million people had lost their jobs in Indonesia (Mas'udi & Winanti, 2020). According to the Government of Indonesia, in 2020, a total of 1,943,916 workers lost their jobs from a total of 114,340 companies. These workers were mostly coming from the formal sector of 77% and the rest were coming from the informal sector of 23% (Ministry of Manpower, 2020).

In addition, economic activity has significantly decreased in line with the Large-Scale Restriction Policy (PSBB) as stated in Government Regulation No. 21 of 2020. This legal policy ensures a reduction in community mobility where everyone stays home unless necessary (Mas'udi & Winanti, 2020). With the PSBB, almost all everyday activities were forced to stop, both in the industrial and office sectors. The education sector, public services, all places of worship, shopping centers, restaurants, and tourism were also forced to stop their normal operations (Misno et al., 2020). This social or physical distancing influences the decline in overall economic activity (Iskandar et al., 2020).

As a result of conditions that reduce economic activities, people's purchasing power is also decreased. This will impact the circulation of money, and at the same time, the production of goods will be limited and cause a trade deficit (Kurniawansyah et al, 2020). The enactment of this PSBB policy in a relatively long period causes economic losses. The supply chain will also be affected, disrupting the production of goods and services (Misno, 2020). The people most vulnerable to the economic impact of this pandemic are people with daily income (Iskandar et al., 2020).

One sector severely affected was the tourism sector, namely, hotels, restaurants, and retail entrepreneurs. Hotels experienced a 40% reduction in occupancy. Tourists as consumers in this sector are having a significant impact on restaurants. Areas affected by the retail sector include Jakarta, Manado, Bali, Riau Islands, Bangka Belitung, and Medan (Hanoatubun, 2020).

In general, Indonesia's economic growth has been heavily impacted by the COVID-19 pandemic, as shown in Figure 1. Indonesia's GDP growth from 2010 to 2019 was stable at 5%. However, in 2019–2020, GDP growth fell to -2.5%. Along with improving conditions in general, in 2021, growth could rise to 3.69%.

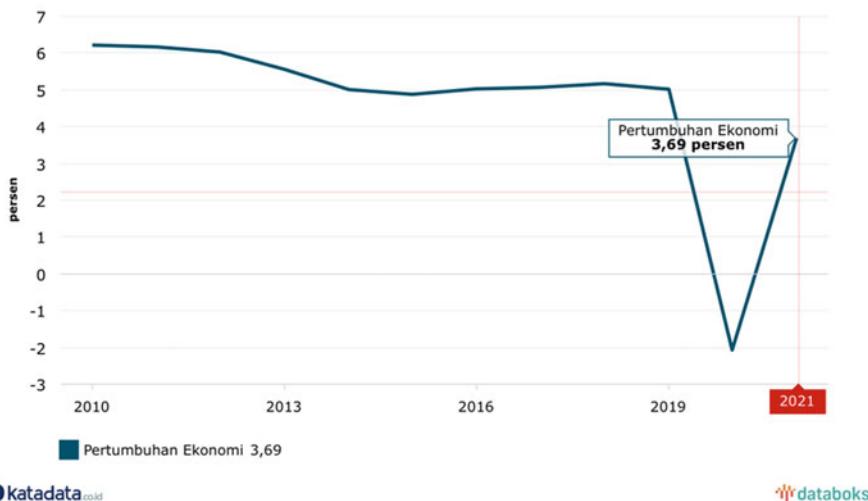


Fig. 1 Percentage of GDP growth in Indonesia. (Kusnandar, 2022)

Indonesian Government COVID-19 Policy Impact on Business

The government has three central policies for handling COVID-19. First, focus on the health sector against corona. The second is a social safety net to help the community. Lastly, economic survival for Indonesia's economic foundation (Mutiara, 2020). As previously mentioned, the COVID-19 pandemic has forced the Indonesian government to issue policy regulations related to its handling. The regulations/policies include four Presidential Decrees, two Presidential Regulations, one Government Regulation, one Presidential Instruction, and one Government Regulation in Lieu of Law. These regulations are an effort to solve problems in the Indonesian state's health, bureaucracy, and political and financial aspects resulting from the COVID-19 pandemic (Widianingrum & Mas'uid, 2020).

These nine regulations are the basis for policies on allocating, distributing, and stabilizing state conditions. The Indonesian government is focusing its policies on allocating appropriate resources to community groups affected by COVID-19, such as business actors who need mass gatherings, unemployed, farmers, daily-wage workers, and the poor (Eddyono et al., 2020).

In addition, the government adopted a policy of interest rates and discounted flight ticket prices due to the continuous movement of the exchange rate and contracting oil prices. This is done so that people are interested in making tourist visits. Amid this pandemic panic, the stock exchange authorities were forced to stop short-selling transactions, which were useful to reduce the pressure experienced and high volatility in the Indonesian stock market (Burhanuddin & Abdi, 2020).

Because of work-from-home and PSBB policies, the government provides tax facilities to relax individual income tax payments and annual tax reporting (Puspasari, 2020). In maintaining its commitment to domestic industry, the

Government of Indonesia issued Minister of Finance Regulation Number 30 of 2020 (PMK-30/2020). This regulation provides relaxation of excise payments due to logistical delays caused by circumstances related to COVID-19. In addition, fiscal and procedural incentives are provided in the field of customs and excise for goods needed to reduce the impact of the COVID-19 pandemic. These facilities consist of a temporary ban on the export of Medical Devices, relaxation of Free Alongside Ship Imports (FAS), exemption from excise duty for the procurement of alcohol-containing products needed for handling COVID-19, ease of import permits on Medical Devices, adjustment of import duties for export companies (KITE), efficiency of online services in handling COVID-19, adjustment of convenience for excise duty and cigarette production, accelerating logistics with National Logistics Ecosystems (NLE), and providing easy sales from KB/KITE companies (Puspasari, 2020).

Conclusion

Indonesia is a country that is geographically prone to natural disasters. With a large and dense population, the impacts and losses caused by casualties and economic losses can be enormous if a natural disaster occurs. To avoid this sizable loss, it is necessary to have a law and regulation regulating natural disaster management. Since the beginning of independence, Indonesia has had an organizational body tasked with helping the community when natural disasters occur, namely, BAKORNAS. However, the Indonesian government's mindset in dealing with natural disasters was initially only dealing with disasters after they occurred. The coordination chain in dealing with disasters by the government is still centralized. All disaster management, aid distribution, and other related matters mostly come from the central government. When a disaster occurs, the local government seems to give a response that tends to be slow. In addition, local governments also seem to depend on direct policies from the central government. Consequently, institutionally, disaster management seems to be designed based on a centralized government paradigm. Thus, the central government plays a significant role and has an instructional link with the regions.

The disaster management law in Indonesia developed only after the earthquake and tsunami in the 2000s. Whether it is the line of order or the more integrated delegation of authority between the regional and the capital, this progress is proven by Law 24/2007. All of this shows a paradigm shift in disaster management. This shift can be seen in managing all stages of the disaster management spectrum, namely, before, during, and after. This enactment of the law also established *Badan Nasional Penanggulangan Bencana* (BNPB), or National Disaster Management Authority, whose primary purpose is to minimize the damage inflicted by natural disasters on human casualty financial damage. Furthermore, by the final regulation mentioned above, Indonesia has finally opened to any participation from international institutions and NGOs. This only meant that Indonesia is also one of the nations globally that have taken a significant legislative reform to implement the International Disaster Response Law (IDRL) suggestion.

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Platform Co-operative Models and the COVID-19 Pandemic in Singapore

157

Huong Ha and Carey Lin

Contents

Introduction	2396
Background	2396
Platform Co-Operatives	2398
Types and Forms of Platform Co-Operatives	2398
Benefits of Digital Platforms for Co-Ops	2398
Challenges of Digital Platforms for Co-Ops	2400
Platform Co-Operativism	2401
Principles of Platform Co-Operativism	2401
Other Platform Co-Operativism Concepts	2401
Research Methods	2402
Co-Operatives in Singapore	2403
Singapore National Co-Operative Federation (SNCF)	2403
Governance of Co-Operatives in Singapore	2404
What Works for Co-Operatives	2406
Multi-Stakeholder Partnership	2406
Collaborative Governance	2407
Emerging Roles of Co-Operatives	2407
Harnessing Technology	2408
Conclusion	2408
Limitations and Suggested Further Research	2409
References	2409

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Abstract

Many studies have discussed the operations and development of co-operatives (co-ops). Nevertheless, their indispensability as an alternate business model during the COVID-19 pandemic has initiated further research on this topic as co-operatives in a digital economy have not been widely researched. Thus, this chapter aims to (i) discuss the benefits and challenges of digital platforms for co-operatives (co-ops) in the context of the COVID-19 pandemic and (ii) revisit Scholz's principles of platform co-operativism. It also assesses how platform co-operativism has been adopted using Singapore National Co-operative Federation's platform as a case study. The selected case is analyzed and assessed based on Scholz's principles of platform co-operativism, namely, broad-based ownership, democratic governance, co-design of the platform, and commitment to open-source development. Based on the findings and Scholz's principles, the following solutions are proposed, namely, development of multi-stakeholder partnership, building collaborative governance, and acknowledgment and encouraging the emerging roles of co-operatives and harnessing technology to support a transparent and accountable digital economy. Co-ops should focus on bridging the gaps between adopting new technologies and reducing the digital divide among members, especially during pandemics. In short, the findings provide insights into relevant stakeholders and will be useful for further research on this area to support the advancement of platform co-operative models given its importance in the digital economy, especially in turbulent times.

Keywords

Co-operative · Co-operativism · Platform co-operative models · Digital platform · Singapore · COVID-19 pandemic

Introduction

Background

Digital platforms have opened greater access to the economy. Digital platforms refer to businesses that use websites, mobile apps, or protocols to sell goods or service. It is a business model that creates value by facilitating connections and exchanges between multiple parties, such as product/service providers and users. The opportunities presented by such digital platforms have sparked business interest in them as they digitally enable business activities and social interaction (Kenney & Zysman, 2016; Bretos & Marcuello, 2017), and thus enable businesses to sustain their operations, especially during the COVID-19 pandemic. This digitally based new economy has been given a variety of "names" derived from its perceived attributes, such as "collaborative economy," "sharing economy," and "platform economy" (Kenney & Zysman, 2016). Organizations can adopt digital technologies to create value, transform their business, produce new products and services, etc. (Toh, 2021; Treutiger et al., 2017).

The Singapore government has provided an enabling environment for organizations to embark on the digital transformation journey by implementing many IT, ICT, and infotech national strategy plans. Such national infotech master plans have not only aimed to leverage ICT, technology, and digital as an enabler of national economic competitive advantage and sociocultural advancement, but they also strive for developing a “globally competitive infotech industry and a knowledge-based economy” (Toh, 2021, p. 6). This has contributed to facilitate the development of digital platforms in the country. Another national program, the Smart Nation initiative, was launched in 2014 to adopt digitalization for promoting better living, strengthening communities, and providing more opportunities to all. To support business, the government also launched the *Services & Digital Economy Technology Roadmap* that aims to energize the service sector with Service 4.0 (Toh, 2021). Platform co-operatives in Singapore do benefit from such strategies that will be further discussed in the subsequent section.

Although this economic paradigm has emerged as one of the alternative business models to help organizations sustain their business, it does result in some challenges to the society. According to Lovelock (2018), there is conflict between traditional business models and these emerging platforms because some of them may not comply with the same rules as other nondigital businesses in the same sector. This can be evident in prominent examples in the transportation sector, such as Uber and Grab whose operations cause anger and frustration to taxi drivers in many countries. Another pressing issue derived from these digital platforms is that they indirectly adopt technology to enter and monopolize the market, often called “platform monopolies” or “platform capitalism” (Smicek, 2016). For this reason, Scholz (2018) and Schneider (2018) began to debate the negative aspects of digital platforms and proposed how platform co-operative models can function in a more equitable manner by instilling the principles of a fair co-operative model.

However, ridding on the digital waves to create online platforms for collaborators to address the needs of society is still a relatively new concept in many countries. Furthermore, co-ops, businesses owned and run by their members that underpinned the principles of co-operative virtues of self and mutual help, democratic governance, and solidarity (Ministry of Culture, Community and the Young (Singapore), 2020a, b), in the context of a digital economy have not been widely researched. Thus, we are particularly interested in examining the concept of platform co-operativism and how it can be adopted to respond to the pandemics.

Specifically, this chapter aims to (i) discuss the benefits of and challenges of digital platforms to co-op and (ii) revisit the principles of platform co-operativism by Scholz (2018). It also assesses how platform co-operativism has been adopted and its significance during the COVID-19 pandemic using Singapore National Co-operative Federation’s platform as a case study. Finally, it proposes some policy recommendations to develop the potential of platform co-operativism and mitigate the risk associated with digital platforms.

Overall, the findings of this study provide insights to relevant stakeholders, including policymakers, businesses, and investors, and will be used for further research on this area to support the advancement of platform co-operativism given its importance in the digital economy.

Platform Co-Operatives

Types and Forms of Platform Co-Operatives

Co-ops are value-based organizations, based on the virtues of self and mutual help. Co-ops-owned and – operated digital platforms are referred to as platform co-ops. Platform co-ops refer to a movement that aims to co-operate digital platform that builds on the principle of co-operative model to regain control and address the governance issue of these digital platforms by changing the ownership structures of the corporate-owned sharing economy into a co-operative model, democratically operated by its employees, customers, users, or other key stakeholders (Scholz, 2016; Schneider, 2018).

Platform co-ops follow the co-operative ownership and governance to distribute ownership and share management of the enterprise to its participants with a mission to improve the common good, job security, and benefits (Cheney et al., 2014; Ministry of Culture, Community and the Young (Singapore), 2020a, b; Rixon & Duguid, 2018; SNCF, 2020).

There are various types and forms of platform co-operatives, and they are generally characterized based on the types of membership and unique features as summarized in Table 1.

Benefits of Digital Platforms for Co-Ops

No doubt the adoption of digital platforms has provided both economic and social benefits to businesses and individuals, especially during the COVID-19 pandemic given the strict measures to control the spread of the COVID-19 virus (Spear, 2000; Schmidt, 2016). From members' perspectives, such platforms provide on-demand services and job opportunities, e.g., Uber, Grab, and Gojek in the transportation sector. In the retail sector, sellers and buyers transact through the online marketplaces (e.g., Carousell and eBay). These digital platforms have enabled provision of affordable goods and efficient services, interaction and access to resources not otherwise accessible (e.g., Obike and AirBnB). Such platforms have also offered flexibility, temporary employment, and opportunities for income earning. JPMorgan Chase Institute (2018) explained that a key value proposition of the digital platform, in most cases, is that users can enter and leave the business freely, which means that there is no lock-in period per se. According to OECD (2021), due to the implementation of social distancing measures during the COVID-19 pandemic, many social and economic activities in many countries have shifted toward digital or online platforms. Many economic activities do not require physical proximity for commercial transactions, operations, and product delivery, e.g., online payment and online shopping, have been moved online. Thus, the use of digital or online platform has increased by about 20% and this has enabled "businesses and households to continue producing and working during lockdowns" (OECD, 2021, p. 3). This also applies to co-ops.

Table 1 The various types of platform co-ops

Type	Characteristics	Example	Source
Co-operative online labor brokerages and marketplaces	Belong to workers, freelancers, or online shop owners	In Germany: Fairmondo is a global marketplace owned by its users	(Zygmuntowski, 2018, p. 15)
Producer-owned platform co-operative	Geographically dispersed producers who collectively sell their produce through a digital platform. The producers are member-owners that drive the governance of the co-op but often do not work together	In the United States: Stocksy, a stock photography website, allows producers to co-own the platform to which they sell their work	(Borkin, 2019, p. 19)
City-owned platforms	Based on municipal providers who pool resources, such as rental spaces or shared transportation	In Korea: Sharing City is a city-operated taxi hailing system	(Zygmuntowski, 2018, p. 15)
Union-backed co-operative platforms	Based on the organizing power, resources, and know-how of occupational unions	In the United States: The Union Taxi Co-operative operates its own platform	(Zygmuntowski, 2018, p. 15; Arthur, 2015)
The institution as peer to peer protocol	Based on infrastructure advocating blockchain architectures rather than centralized ownership	In Singapore: KPMG Digital Village is an online platform that provides corporates with a platform to co-innovate with other corporates, start-ups, investors, etc., in a collaborative ecosystem to drive the adoption and integration of innovative solutions	(Arthur, 2015)

Crome and O'Connor (2016) highlighted that the intrinsic characteristics of the platform co-ops would help users in different sectors create competitive advantages in the digital economy. First, such co-ops enable creators (e.g., musicians, journalists, and photographers) to have more control over how revenues are generated and distributed. Thus, it could be a more sustainable business model given a lower degree of dependence on investors. Second, platform co-ops can provide a “commitment” mechanism to ensure various stakeholders have an equal stake in decision-making. Third, platform co-ops can be seen as a social movement by playing the role of the trade union outside of traditional trade union structures to ensure members’ welfare and equity are embedded in digital platforms. Platform co-ops usually achieve more effective collective governance as compared to traditional co-ops.

because technology (i.e., blockchain) has enabled members' contributions and interactions to be recorded/logged digitally and automatically (Borkin, 2019).

Other benefits of platform co-ops include their ability to respond to market demand through the six initiatives: "1) lower transaction and retention costs, 2) surplus revenues of co-ops are transferred to the members, 3) money flows within local communities, 4) protection from exploitation through ownership, transparency, control, 5) higher commitment of users disincentivizes short-termism and 6) prospect of data democracy" (The Platform Cooperativism Consortium, 2018).

Challenges of Digital Platforms for Co-Ops

Borkin (2019) and Graham and Anwar (2018) identified the challenges faced by the platform co-ops. Some of the most commonly discussed challenges include the difficulties in raising capital, leveraging on technology and getting the right people with the right skills to run the business, getting attention from the market, and finally the impact of network effects (see Table 2).

Algorithm, a set of instructions or decisions used by the digital platforms, is another concern. Algorithms could manipulate the operations in ways that may discriminate against some users, such as the gig workers, who rely on the digital platform infrastructure and customer network to earn a living (Yaraghi & Ravi, 2017; Yeganeh, 2019). Workers who rely on the digital platform infrastructure and customer network to work can be defined as the gig workers (Yeganeh, 2019).

Gig workers typically have less bargaining power than those in the traditional labor markets. They are not protected in terms of the minimum wage requirements, overtime pay, access to sick leave, insurance coverages, and other benefits (Yeganeh,

Table 2 Challenges faced by platform co-ops

Areas	Challenges
<i>Governance</i>	Organizational problems may arise due to (i) a lack of "geographically rooted community" since members can reside in different locations, and (ii) the divergent stakeholders' interests as different groups of stakeholders may have different interests
<i>Technology</i>	Lack of resources (e.g., physical, financial, and social capital) hinders owners' ability and capacity to develop current and new platforms and provide supporting infrastructure that are at the same standards as commercial platforms. Thus, they may not be able to meet their customers' demand and expectation pertaining to user experience
<i>Growth</i>	Platform co-ops may not adopt a "pure profit-driven business model," and thus their growth patterns and speed will not be the same as those of commercial entities
<i>Capital</i>	They may not be able to accept capital and other resources funded by venture capitalists and other financial institutions

Source: Adapted from Borkin (2019, p. 25)

2019). Sadly, gig workers are being described by Graham and Anwar (2018) as a commodity that are bought and sold in the market. This is because the work performed by the gig workers is often on-demand, thus gig workers can easily be replaced (Graham & Anwar, 2018). Bonoli (2019) predicted that as the number of gig workers in the labor force is likely to increase over the time, and the income level of the gig workers would be reduced in the long term. Yet, working conditions would be worsened, and the likelihood of unemployment would be high due to severe competition among themselves. Furthermore, as gig workers do not require a defined place to work or follow a regular work pattern, it would be a challenge to connect with them.

Platform Co-Operativism

“Platform co-operativism” refers to a movement that aims to co-operate digital platforms that are built on the principles of co-ops to regain control and address governance-related issues of such co-ops by changing the ownership structures of the corporate-owned sharing economy into a co-operative model that is democratically operated by its stakeholders (Scholz, 2016). Platform co-operativism refers to applying technology to a co-operative model involving several groups of stakeholders, such as employers, owners, and employees, who can exercise their collective political and socioeconomic power to govern the co-ops (Arthur, 2015).

Principles of Platform Co-Operativism

Scholz (2016) initially proposed the 10 principles of the platform co-operativism, e.g., “collective ownership, transparency and data portability, co-determined work, a protective legal framework, and the right to log off.” These principles have been adopted by several organizations and government bodies. With the emergence of platform co-ops in various forms in different sectors across countries, Scholz (2018) proposed to view platform co-ops as part of the broader co-operative ecosystem and established the four key principles of platform co-operativism, some of which overlap with the early 10 principles. The four key principles for platform co-operativism are broad-based ownership, democratic governance, co-design of the platform, and commitment to open-source development (Table 3).

Other Platform Co-Operativism Concepts

Apart from the concept of platform co-operativism by Scholz, there has been a growing interest in research on platform co-operativism. This is not a surprise as there is no single blueprint for an ideal platform co-op due to many factors. Recently,

Table 3 Four key principles of platform co-operativism

Principles	Features
1. Broad-based ownership	It should be owned by multi-stakeholders, including workers. Therefore, they have “direct control the technological features, production processes, algorithms, data, job structures of their online platform” (para. 14)
2. Democratic governance	The entity is collectively self-governed by stakeholders in a democratic manner, e.g., voting rights
3. Co-design of the platform	Various groups of stakeholders, including users and marginalized persons, “are included in the design and creation of the platform” in order to reduce the digital divide and meet the needs of users (para. 16)
4. Commitment to open source development	It promotes open-source development by using “a common of open source code” (para. 17)

Source: Adapted from Scholz (2018)

the newly launched Institute for the Co-operative Digital Economy has done research on the emerging platform co-op ecosystem to promote and support a co-operative platform economy (Sammallahti, 2019).

The “open co-operativism” concept by Bauwens is also in line with the common paradigm. The three aspects of this system are sustainability, openness, and solidarity (P2P Foundation, n.d.). The co-creation of the commons should be overseen by open and participatory governance that include all stakeholders (P2P Foundation, n.d.).

Schneider (2018) also proposed a democratic ownership to allow a process of open-ended choices and a co-ownership model based on open, interdisciplinary, and transdisciplinary co-operation to serve the platform economy.

Research Methods

The study adopts the case study method as it is appropriate to address the research objectives, namely, discuss the benefits and challenges of platform co-ops, revisit Scholz’s principles of platform co-operativism, and assess various forms of platform co-operativism based on these principles. Policy recommendations to develop platform co-operativism and mitigate the risk associated with such platforms are also proposed.

The case of the Singapore National Co-operative Federation (SNCF) in Singapore is selected for several compelling reasons. First, Singapore has an enabling environment and infrastructure for growth opportunities in the digital economy. Second, the Singapore regulatory framework is known for its “agility,” which allows the creation and piloting of new business models and technologies (Ng, 2018). Third, Singapore is determined to drive forward a resilient and innovative ASEAN community, where it brings several agreements designed to invigorate the region’s digital economy.

Co-Operatives in Singapore

There are around more than 80 registered co-ops in Singapore, but there is no official data on the number of platform co-ops or co-operatives that have offered a platform to serve their members (Ministry of Culture, Community and Youth, 2021a). Although the selected case might not be a true representation of the platform co-ops in Singapore, it provides an opportunity for a more in-depth understanding of the platform ecosystem as the basis to explore how businesses and existing co-ops can contribute to shaping a fairer platform economy.

Singapore National Co-Operative Federation (SNCF)

SNCF was established in 1980, adopting “The Co-operative from Within” type (Table 1). Its mission, similar to the co-ops formed by the National Trades Union Congress (NTUC), is to provide social safety support to the workers and their families.

SNCF is a collective body of the co-operative movement representing co-operative members in Singapore through its affiliated co-ops with millions of members (SNCF, 2018). There are four main sectors: Credit Co-operatives Sector, NTUC Sector, Service Co-operatives Sector, and Campus Co-operatives Sector. SNCF also represents the collective voices of the co-operative movement in Singapore. It provides co-ops and the general public with comprehensive information on co-operative society and programs for their members. SNCF also supports co-ops to strengthen their enterprises and better serve their members and the community.

SNCF acts as the contact network for collaboration among co-ops, businesses, and governments to address the needs of the members (SNCF, 2020). For instance, Silver Caregivers Co-operative Limited (SCCL), a social enterprise, aims to better the quality of life of caregivers via training and support groups. In 2017, SCCL partnered with Assurance Technology and launched their eHealthAssist mobile app to empower caregivers with digital services. This integrated patient health management app helps users monitor their health records and track appointments, request and monitor queue numbers from their health clinics, make appointment requests, etc. (SNCF, 2018).

SNCF’s operations have been assessed based on the four main principles of platform co-operativism as follows:

- (i) **Broad-based ownership:** It has a collective representation of the co-operative movement representing 99% of co-operative members through 66 affiliated co-ops and more 1.4 million members (SNCF, 2020).
- (ii) **Democratic governance:** Collaboration amongst co-ops that represent the collective voices of the co-operative movement in Singapore has been observed. SNCF is governed by members who “actively participate in setting their own policies and decision-making. This means members vote on policies

passed and vote for elected representatives" (Ministry of Culture, Community and Youth, 2020a, para. 6).

- (iii) **Co-design of the platform:** It serves as a platform for collaboration among co-ops, businesses, and government agencies to address the needs of the society. It also represents Singapore to be a member and/or have a working relationship with international organizations, namely, International Co-operative Alliance, the World Council of Credit Unions, the UN, and the International Labor Organization (SNCF, 2020).
- (iv) **Commitment to open-source development:** There is little evidence that SNCF focuses on open-source development. However, a Central Co-operative Fund (CCF) was set up under the *Co-operative Societies Act* and administered by the Minister for Culture, Community and Youth (2020b). The CCF is funded by co-op contributions, and it provides grants for various types of development to benefit the co-operative movement (SNCF, 2020).

Governance of Co-Operatives in Singapore

In Singapore, the co-ops sector is primarily anchored by the government's and SNCF's support, where the key priorities are enabling workforce transition alongside economic progress (SNCF, 2020). The focus of broad-based ownership structure is to ensure that ownership concentrates on those that participate in the business, rather than investors. There are very few platform co-ops owned by the customers and/or employers, where the members of the co-ops consist of various stakeholders. This can be explained by two observations. First, some e-platforms, e.g., DPS platform, are not formally registered as co-ops but adopted the co-operative principles in running the digital platform, and thus they can be classified as platform co-ops in Singapore. Second, most platform co-ops are either directed by ministries or supported by Singapore's Smart Nation initiative to become the leading digital economy through an inclusivity framework to include multi-stakeholders to co-develop and co-create innovation solutions for secured collaboration platforms (IMDA, 2018). As such, this could be the reason why the democratic governance principle is less demonstrated by the platform co-ops in Singapore (see Table 3).

The established platform co-ops are mostly formed by co-operation among the co-ops. Nevertheless, some are the joint effort by the co-ops, start-ups, and government. The platform co-ops demonstrated the broad-based ownership principle through the collaboration and inclusivity framework to include multi-stakeholders, regardless of the business model. Some examples include (i) GoGoVan, an app platform that connects thousands of drivers for on-demand delivery; (ii) Lendor, a free peer-to-peer-sharing app; and (iii) CrowdFarmX, the world's first co-operative farming platform using blockchain technology.

There is also an increasing use of blockchain technology in the design of the digital platforms for security and trust reason. In fact, researchers have been

exploring how the blockchain model could support growth in the co-op sector. In a similar vein, some even argued that blockchain technology would put co-ops at the front of the digital revolution because of its natural capabilities of shared and immutable ledger (Ertz & Boily, 2019).

Although different platform co-ops follow slightly different sets of principles, platform co-ops in Singapore have generally adopted the four principles of platform co-operativism, and promoted the values of self-help, self-responsibility, democracy, equality, and solidarity. A good example would be the lead taken by SNCF to champion the establishment of code of governance for co-ops and promoting greater self-regulation. SNCF provides the necessary guidance and education to co-ops in Singapore. Besides, members' feedback taken by the platform co-ops to forge consensus has also contributed to democratic governance.

In general, co-ops in Singapore have been governed by "Code of Governance for Co-operatives" set by SNCF, and co-op societies regulation and act administered by the Registry of Co-operative Societies (RCS) (SNCF, n.d.). There is also another set of code of governance applied to credit co-ops. Besides, SNCF and RCS have co-issued three sets of governance guides for credit co-ops with regard to how to manage internal controls, loans, and investments. In addition, the relevant act and regulation also require co-ops to promote good governance principles, promote members' welfare, as well as support activities and initiatives that help them achieve their mission and vision (Ministry of Culture, Community and Youth, 2021a, b). Good corporate governance has made Singapore co-ops different from others in terms of transparency, accountability, and security in terms of cyber security, data protection, and training and development, as well as financial support to members, especially during pandemics (Ministry of Culture, Community and Youth, 2021b; Tan, 2021). Finally, co-ops' principles and values are promoted among members, e.g., volunteering, openness, democracy, autonomy, independence, co-operation, and participation (SCF, 2022a).

Although digital platforms have been adopted mainly by for-profit business entities (e.g., KPMG Singapore Digital Village, DEX, and PwC Singapore blockchain-based platform), the Singapore government has encouraged and provided resources (e.g., grants, assistance) to enable organizations, including co-ops to adopt digital platforms. Many co-ops have utilized virtual meetings during the COVID-19 pandemic, virtual and/or hybrid modes of meetings post-COVID-19. During the pandemic, SNCF has provided its corporate members with digital support, e.g., supporting designing workshops for members to be familiar with the digital playground and manage their digital projects (SNCF, 2022b).

Nonetheless, platform co-ops in Singapore are lagging in terms of contribution toward sustainability development as most of them focus on economy and social dimensions. Lastly, from the case studies, platform co-ops in Singapore have adopted the platform co-operativism concept rather than other concepts as they oriented toward the common good and have governance models including all stakeholders (P2P Foundation, n.d.).

What Works for Co-Operatives

SNCF, a Singapore platform co-op, appears oriented toward the common good and includes all stakeholders. Thus, it reflects the need to achieve “cooperative essence,” i.e., truly co-ops (Gizman et al., 2019) for creating a co-operative network connectivity among such multi-stakeholders in the entire digital value chain, and for them to Hoover and Abell (2016). The following four interrelated components are proposed, in accordance with the platform co-operativism principles in order to build a holistic co-operative ecosystem.

Multi-Stakeholder Partnership

A robust co-operative digital ecosystem involves not just within co-ops’ members but must include multiple external stakeholders to achieve greater integration and sustainability. It is, therefore, imperative to create the co-operative network connectivity among the multi-stakeholders in the entire digital value chain (Hoover & Abell, 2016). To build a sustainable platform in the ecosystem, stakeholders need to have a neutral broker and co-creator to embrace joint innovation (Hensmans, 2019). A notable example is the KSDV platform, a co-operative ecosystem in which stakeholders consisting of start-ups, corporations, and government agencies that can scale the activity of the platform co-ops and foster sustainability.

Hoover and Abell (2016) had identified the stakeholders (“actors”) spanning across the private, public, nonprofit, and financial sectors (Table 4). The list is not exhaustive; however, the message conveys that each actor has its own roles and contributions to the co-operative ecosystem.

To facilitate collaboration among stakeholders, one way is to make them actively participate in the ecosystem by a collective approach so that every member will have the same opportunities and access to benefits from the ecosystem. Moreover, technology blurs the lines between sectors, and cross-sector problems are transient in nature, and thus, the involvement of multi-stakeholders through this collective

Table 4 Actors in a co-operative ecosystem

Financial sector	Public sector	Private sector	Non-profit sector
Financial institutions	Government Policymakers	Businesses, including co-ops	Colleges/universities Community-based organizations
Credit unions	Small Business Development Center	Local business groups	Co-operative developers
Foundations	Workforce development	Professionals Secondary co-ops	Labor and workers’ centers
Investors			

Source: Adapted from Hoover and Abell (2016, p. 14)

approach to ideas would likely open up the possibilities for innovative collaboration and co-creating of solutions that perhaps can benefit many other sectors.

Collaborative Governance

One of the challenges co-ops need to overcome is governance. Platform co-ops are almost unseen in the policy agendas for the digital economy. What is particularly concerning is that policy and regulations for co-ops are different from purely for-profit entities. The question, then, is how the co-ops can be constructively engaged for a more grounded view to shape public policy to benefit most stakeholders. Moreover, as societies are increasingly dependent on digital technologies, algorithms could sometimes become the “policymakers,” resulting in what is known as the algorithm basis (Yaraghi & Ravi, 2017).

Collaborative governance is a decision-making approach whereby multiple stakeholders are engaged in consensus-oriented decision-making (Ansell & Gash, 2008). To embrace collaborative governance, one possible way is to create a platform to turn co-op voices into concrete actions through collaborative implementation of regulations. Nevertheless, it is necessary to consider accountability, hidden agendas, power imbalances, and cultural barriers that would probably arise in collaborative government regimes. Therefore, it is important to ensure that a system is in place to regulate this challenge and establish a platform for formal discussion. This established system should not only identify the real needs of the stakeholders of the platform co-ops, but also create a more participatory governance that can provide greater clarity and flexibility to stakeholders.

Emerging Roles of Co-Operatives

In tandem toward building a co-operative ecosystem involving multi-stakeholder partnerships, co-ops will need to address and manage diverse groups of members. Therefore, co-ops’ roles need to be redefined for the creation of socioeconomic values in this digital era.

Social Dimension

Technological advancement had compelled social transformation with new demand from the workforce. The Straits Times (2018) reported that the number of gig workers is expected to increase with the expansion of digital platforms. Thus, it is recommended that the existing co-ops should address the issues of social safety net for the gig workers, specifically, access benefits typically enjoyed by traditional employees (Tan, 2018). In this context, co-ops can act as intermediaries to offer support to the gig workers, such as addressing disputes in the digital platforms and providing training and education to gig users (Hartung, 2019). Co-ops can help workers upgrade their skills to adapt to the changing demand of work in the digital

economy (Tan, 2018). This is also required to improve the post-COVID-19 working conditions for the workers.

Economic Dimension

Capital funding is a challenge to platform users. Hence, financial co-ops can take a more active role in providing capital and investment credit to their members as a viable alternative to commercial banks. To achieve economies of scale (known as “network effects”) in the digital economy, platform co-ops can focus on co-operation between co-ops and existing digital platforms. When platform co-ops collaborate with one another, efforts are synergized, resources are consolidated, and that is likely to reduce operational costs. In addition, collaborating with established digital platforms that have superior network effects would increase co-ops’ competitive stance in the marketplace. Notably, successful platform companies tend to operate multiple platforms due to economies of scales. Such collaborations could also offer opportunities to co-ops to venture into other sectors, and may also fuel the possibilities of corporations adopting the co-op business model (Yeganeh, 2019).

These platform co-ops are the enablers to transform Singapore from becoming a country as a platform, which offers the connectivity of the various shareholders. This is also in line with Singapore’s economic strategy in response to the COVID-19 crisis with the three-prong strategy of (i) innovation, (ii) inclusivity, and (iii) sustainability (Meah, 2020).

Harnessing Technology

Blockchain-based platforms are considered as the parallel movement of platform co-operativism because of their natural capabilities of decentralization and immutable ledger (De Filippi, 2017). Activities performed on blockchain-based platforms are open for stakeholders to view and to be accountable for their actions. Blockchain has great potential in many sectors and is a powerful tool for platform co-ops to create a platform architecture to mitigate the risks associated with the digital economy. At the same time, it upholds members’ trust and confidence in using a blockchain-based platform because it is based on the transparent ledger and information can be encrypted to protect data confidentiality if it is implemented in the correct manner (Mannan, 2019).

Conclusion

This study discussed the benefits and challenges of platform co-ops, and evaluated the platform co-ops in Singapore against Scholz’s four key principles of platform co-operativism. It also proposed four interrelated components that could positively influence the growth and development of a co-operative ecosystem to chart the co-operative movement forward. Apparently, platform co-op business models can be considered as one of the alternative models for the pandemic and post-pandemic economic activities.

The co-ops in Singapore have been blessed with the government's support. The key priorities are on enabling workforce transition alongside economic progress (SNCF, 2020). That said, platform co-ops must make use of these advantages to find opportunities for platform co-operativism movement to flourish. In the digital era, platform co-ops should not only focus on the ownership model but also anticipate change and harness the benefits of digital technologies. This suggests that co-ops must be open to changes to seize the opportunities offered by the digital economy (Hirsch, 2018). Building upon the concept of platform co-operativism, the future roles of co-ops should be bridging the gaps between adopting new technologies and reducing the digital divide, providing not only physical access to infrastructure but also cultivating social support and equipping people with necessary skills to participate in the digital economy Gurría, 2019). Lastly, it is essential to improve governance collaboration in a digital economy, which further echoes the need for a platform to facilitate users' dialogues and coordination in the management of the digital economy, As discussed earlier, platform co-ops have echoed the importance of the roles of each stakeholder as they act as the vital channel for providing the access to information and activity. They play the key role in ensuring information shared is reliable as well as other cybersecurity activities.

To conclude, moving forward, co-ops need to embrace and manage technology, and allow stakeholders to co-create values with the objective of preserving a high level of social cohesion and economic security.

Limitations and Suggested Further Research

This study only considers the case in Singapore and Scholz's four key principles of platform co-operativism. Therefore, the recommendations made are only partly extrapolated to other countries with similar contexts. Also, as this chapter uses only the case study method, it may not provide enough evidence to justify the viability of the proposed components.

Thus, future research can focus on the roles of the stakeholders in terms of contribution to the digital economy. With the changing nature of work in the digital economy, it is worth exploring the implications of the challenges faced by the gig workers and how to improve socioeconomic security for them. Finally, platform co-ops in Singapore are lagging in terms of environmental sustainability. Thus, it is proposed to investigate the roles that platform co-op can play in advancing environmental sustainability.

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Tourism Industry and the COVID-19 Pandemic: A Case Study in Indonesia

158

Huong Ha and Timothy Wong

Contents

Introduction	2414
Revisiting Strategies for the Tourism Industry	2415
The Impact of COVID-19 on Indonesia's Tourism and Supporting Industries	2416
The Impact of COVID-19 on Indonesia's Economic Growth (GDP)	2417
Increased Environmental Consciousness in Tourism Norms	2418
Findings and Solutions	2419
Recommendations	2420
Conclusion	2422
Lessons Learned	2422
Limitations and Suggested Future Research	2423
References	2423

Abstract

The COVID-19 pandemic of 2020–2021 has devastated most economies. According to the latest forecast by International Monetary Fund (2020), a 5.4% contraction in global GDP in 2021 was projected. The global economy had been badly hit, as global trade declined and tourism was brought to a halt. With the shrink in the global economy and expected harsh conditions, Indonesia had reduced its 2020 GDP growth outlook to 2.3%, down from 5.3%. Indonesia is well-known among tourists for its iconic landscape and distinctive culture of both its big islands, such as Java and Sumatra, as well as small islands such as Komodo Island, Lombok, and Wakatobi Island. This main attraction had brought about significant growth in tourism in these islands over the years. However, with an

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escalating number of COVID-19 cases and related deaths being reported in Indonesia, the country's immediate priority would inevitably be to mitigate the impact of the pandemic.

Thus, this chapter aims to shed light on the strategies adopted by the tourism industry in Indonesia as well as the experiences it has encountered during the COVID-19 pandemic and seeks to explore how the industry could recover from this difficult circumstance. The preliminary findings reveal that there is an increasing need for the government to improve the business environment by having proper policies and putting in place effective mechanisms for coordinating nationwide efforts to enable speedy recovery for a more resilient and sustainable tourism workforce.

Keywords

Tourism industry · Indonesia · Responses to the pandemic

Introduction

The COVID-19 pandemic first began as a health crisis and has quickly escalated into a global economic crisis, causing a chain effect of poor business performance on a global scale (KPMG, 2020a, b). Given the uncertainty of the global economy and when the economic situation could stabilize, there is a pressing need to explore alternative strategies that could pave the way for a road to recovery from the pandemic.

Companies all over the world have been severely impacted by the pandemic as it greatly disrupts business operations and personal livelihoods. With a reduction in wages in sectors that are directly affected by border closure, such as the aviation, hospitality and tourism, and recession fears, the main concern would be to mitigate damages caused to livelihoods of people. The willingness to adapt to the new normal caused by the pandemic has become paramount due to the severity of the COVID-19 situation.

The pandemic had also accelerated the implementation of digital transformation efforts, especially during the lockdown period. Digitalization of internal business operations and service delivery has boded well for most organizations. New work practices and norms, such as the frequent use of video conferencing and remote-working platforms for work from home (WFH) employees, are also evident as a global response to the pandemic (KPMG, 2020a, b).

Indonesia is selected as a case study for this study as it is well-known among tourists for its iconic landscape and distinctive culture of both its big islands, such as Java and Sumatra, as well as small destinations, such as Komodo Island, Lombok, and Wakatobi Island. This main attraction had brought about significant growth in tourism on these islands over the years (Hakim, 2020). Also, there were about 2,919,800 people employed in this industry in 2019, but this figure was reduced to 2,057,600 in 2020,

i.e., nearly 900,000 of them were out of the industry (Statista Research Department, 2022).

However, the onset of the COVID-19 pandemic had brought global travel, tourism, and leisure to a halt, and this has adversely impacted the country's economic system. The Indonesia government has projected that it would lose more than \$10 billion in tourism revenues (2020), because foreign tourist arrivals have been declining rapidly, by around one-third, as compared with the 2019's figures (Vivek et al., 2020).

The very nature, circumstances, and impact of the pandemic, being global and large scale, meant that the crisis has an intense and possibly long-term impact on the tourism industry (Sigala, 2020). As such, having strong and effective mechanisms are crucial for Indonesia's ability to respond to such a crisis and to recover post-pandemic.

The main objective of this chapter is to identify and examine the effectiveness of Indonesia's current strategies implemented by the tourism sector to mitigate the impact of the COVID-19 pandemic. It aims to identify gaps in the existing strategies and propose recommendations for improving the effectiveness of its framework in handling a similar crisis or pandemic situation. The findings in this chapter highlight the pressing need for Indonesia to improve the business environment by having a proper emergency plan and putting in place effective mechanisms for coordinating nationwide efforts to enable the speedy recovery of the tourism industry.

Secondary data was from reputable sources, such as peer-reviewed academic journal articles, reports from well-known international organizations, government and industry reports, and government documents.

Revisiting Strategies for the Tourism Industry

Given the uncertainties involved in the tourism industry during the pandemic, it is important to understand the existing strategies and their shortcomings in order to propose robust strategies that can combat a crisis. This would enable Indonesia and other countries with similar conditions to better prepare their emergency plan and put more effort to facilitate the recovery of the tourism industry.

As the tourism industry is highly interlinked with the global economy, such efforts to support this industry are scalable to neighboring countries with similar conditions in the region, enabling these countries to be more resilient in bouncing back from the outbreak.

Finally, this chapter begins with the introduction and the discussion on the background of the issue and factors affecting the tourism industry in Indonesia in a pandemic situation. The chapter then examines the possibility of rebuilding a post-COVID-19-ready tourism industry by focusing on local demand, i.e., expanding domestic tourism and developing new niche markets, such as nature-based tourism to adapt and cater to the change in tourists' behaviors (Vivek et al., 2020).

The Impact of COVID-19 on Indonesia's Tourism and Supporting Industries

Prior to the COVID-19 pandemic, flight traffic to Indonesia was brisk. Tourism is seen as one of the key drivers contributing significantly to Indonesia's economy as it creates many jobs for the local communities. Indonesia's tourism industry also contributes considerably to the regional development. According to Indonesia's travel statistics from 2017 to 2019, the contribution from neighboring Southeast Asian countries like Malaysia and Singapore to Indonesia's tourism was sizeable. The data from January 2020's travel records showed that about 206,532 tourists from Malaysia and 138,625 tourists from Singapore traveled to Indonesia. China is also one of the top contributors, with 181,281 tourists visiting Indonesia in January 2020. The most visited destinations in Indonesia by tourists are Jakarta and Bali (Hakim, 2020).

As traveling is perceived by medical experts as one of the main mechanisms for the spread of the disease, the Indonesian government has resorted to reducing and stopping flight traffic to various domestic destinations, for example, Bali. According to data from travel agencies, demand for tour programs declined drastically in the first quarter of 2020. This could be attributed to the restriction imposed by the government to prohibit tourist visitation to tourist attractions in order to contain and reduce the spread of the virus. Understandably, this led to a chain effect on other businesses, such as the transportation, food and beverage, and accommodation sectors. Many transportation companies were forced to shut down due to the huge decline in travel demand. Similarly, the accommodation sector has also been adversely impacted by the decrease in tourist arrivals. For instance, Bali has closed about 96% of its hotels since April 2020 (Hakim, 2020). Home-stay accommodations, such as Airbnb, have also taken a drastic hit. Food and beverage businesses that are geared toward catering to tourists' needs have also been affected, i.e., many restaurants and cafes had to close their businesses due to lack of demand. Tourism-related jobs such as drivers, tour guides, and tour planners were made redundant. Consequently, many travel agencies and SMEs related to tourism have been winded up, and their employees being laid off (Hakim, 2020).

Official data from Statistics Indonesia, a non-ministry government agency in charge of providing statistics to the public sector and the public, revealed that foreign tourist arrivals declined by 64.1% in March 2020 (Parama, 2020). It also unveiled that tourists' arrivals from China, which accounted for a major source of tourism revenue for Indonesia, dipped by 97% in March year-on-year in 2020 (Parama, 2020).

Total tourist arrivals from January to October 2020 were 3.72 million, and this presents a huge decrease of 72.35% from the same period in 2019 (Rahman, 2020). The number of tourists from around the world had drastically declined and this is a huge blow to Indonesia's tourism industry and its supporting sectors, such as hotels/accommodations and food and beverage sectors.

The spillover effect of the decrease in the number of tourists in the accommodation sector saw hotel occupancy rates drop to 32.2% in March 2020 (Parama, 2020). The huge decrease in international travel demand was the aftermath of the lockdown measures and border closure (Susan et al., 2020). The Indonesian Hotel and Restaurant Association reported a loss of about US\$1.5 billion since January 2020. The Indonesian Travel Agent Association also reported that there was no income for the travel agent sector since February 2020. The travel sector experienced a huge loss due to passenger cancellations and this is likely to sustain until the pandemic subsides (Djalante et al., 2020).

The Impact of COVID-19 on Indonesia's Economic Growth (GDP)

Indonesia's economic recovery is expected to take a slow pace as it has been adversely implicated by the prolonged COVID-19 pandemic. According to the latest data by Statistics Indonesia, Indonesia's GDP fell by 2.07% for the entire year 2020, and this full-year contraction was one of the worst recessions since the Asian financial crisis in 1998 (Al Jazeera, 2021).

The decline in GDP would inevitably translate into a higher employment rate for Indonesia. According to data from Statista, Indonesia's unemployment rate surged to 4.84% in 2020, the highest one since 2011. Statistics Indonesia reported that 2.67 million residents lost their jobs because of the COVID-19 pandemic (Statista, 2021).

The adverse impact on Indonesia's labor market should not be understated. The recession also caused a country-wide consequence where the number of formal workers declined, and the number of informal workers surged due to an unavoidable change in the labor market. Indonesians who lost their formal jobs had to rely on alternative unsecured sources of income, such as street vending (Borsuk, 2021). This paradigm shift from workers in the formal sectors into informal ad-hoc jobs is an unwanted and unintended consequence of the pandemic. The growing unemployment rate made it even harder for Indonesia to bounce back from the current crisis (Borsuk, 2021).

The delay in the Indonesian government's response to the COVID-19 health crisis had proven to be catastrophic for its population's health. Criticisms were levied on the Indonesian government for not responding promptly to the pandemic. Neighboring countries, such as Singapore and Malaysia, reported signs of the widespread of the COVID-19 virus in February 2020, but Indonesia only reported its first two confirmed cases in March 2020. The restricted measures in the form of containment and lockdown, in a bid to flatten the curve of the pandemic, came at a huge expense. Tourism, which heavily relies on social gathering and physical presence, took a hard hit, as the demand for such activities sharply declined. The Indonesian government initially ruled out lockdowns due to the severe economic impact associated with the decision, but eventually relented and declared a national health emergency. Indonesia then closed its international borders in response to the surge in the number of COVID-19-related deaths in the country. So far, the government allocated about 4% of GDP (Rp 641 trillion) toward combating COVID-19 (Susan et al., 2020).

The lack of data transparency in Indonesia at the initial stage caused misinformation in the form of underreporting the actual number of COVID-19-infected cases. This exhibits that the government's response measures were inadequate and not timely. As a result, the lack of information and lack of clear policy communication could further impede the government's ability to respond rapidly to such a crisis (Nugroho & Syarie, 2021).

The tourism sector has limited business continuity plans (BCP), and the lack of such contingency preparedness has been a longstanding issue. This issue has yet to be addressed by both the government and the tourism industry itself. The lack of clarity in surviving and recovering post-COVID-19 requires the public to adopt careful planning and thinking for a long-term recovery phase (Djalante et al., 2020).

However, the Indonesian government's ongoing efforts to combat the COVID-19 pandemic, and her aggressive financial stimulus to improve her economy enable some recovery to take effect albeit at an incremental and slow pace. Economic recovery, restoration of business activities, and financial market stability would largely depend on the government's efforts and responses to effectively curtail the spread of the virus (Manggi & Wisnu, 2020).

Increased Environmental Consciousness in Tourism Norms

Back in 2018, Indonesia tried to push toward boosting tourist numbers, and this was met with much concern and criticism raised by environmental activists. These activists argued that the massive push for tourism came with social and environmental costs as the natural ecosystems and traditional livelihoods became diluted through such commercialized activities. The reclamation projects comprising the building of luxury hotels and theme parks were both a boon to boosting its economy and a bane to its natural environment (Hewson, 2018).

Environmental activists have also highlighted that the tourism industry has a substantial negative impact on its environment. This is due to the added pressure on natural resources when there's over consumption happening in tourism leading to depletion of natural resources, and an increase in pollution and waste problems could occur when tourists overconsume and do not conscientiously make efforts to keep the attractions clean (Budeanu, 2005; TheWorldCounts, 2021).

To this end, the Indonesian government has made some shift toward being environmentally friendly by implementing a ban on single-use plastic bags to reduce the amount of plastic waste. The implementation is still difficult to enforce at traditional markets and shopping centers as tourists and customers are not accustomed to using and bringing their own bags (Yulisman, 2020). Thus, much more can be done to convince and persuade the majority of the customers and tourists to switch to being more proactive in contributing to a more environmental-friendly and sustainable environment. This can be done by organizing more educational campaigns for the public, including tourists, and using social media to reinforce the importance of such initiatives.

Findings and Solutions

Key findings showed that the COVID-19 pandemic had made Indonesia and the rest of the world more conscious of the need for effective prevention measures for the population's health safety. Indonesia could use the lessons learned from the pandemic to formulate relevant strategies to better counter the spread of a future pandemic. Indonesia could also benefit from adopting the best practices implemented in other countries in terms of effective self-containment measures to flatten the pandemic curve.

As the public sector does not have all the resources to massively campaign COVID-19 prevention alone, it could liaise with the private sector and civil society organizations to mobilize their resources to further disseminate the importance of mitigation measures and educate the uninformed on the need to adhere to safe distance measures that can collectively combat the crisis as a nation. Beyond broadcasting information through the traditional and social media, communities' responses should be galvanized, as part of the mass movement to spread educational content on combating the spread of the COVID-19 virus (Djalante et al., 2020).

To effectively handle the COVID-19 crisis collectively, Indonesia needs to develop effective containment policies and enforcement mechanisms, as well as implement effective stimulus and financial assistance packages for people and businesses, who are affected by the pandemic, while attempting to stabilize the financial system. Policymakers worldwide have already proposed an exceptional level of stimulus, which is more than 10% of the global GDP, and this has been implemented in many countries. As there is uncertainty on how long the pandemic will last, such stimulus measures will need to be implemented, evaluated, and reviewed with a view on long-term approach for fiscal sustainability (Susan et al., 2020).

In the first stage of Indonesia's tourism recovery, domestic tourism could be ramped up to partially compensate for the huge losses incurred for global travel revenues. Indonesia could take the opportunity to further capitalize on local demand by promoting the lesser-known attractions and destinations to its local and domestic tourists. The government and the tourism industry could take more initiatives to spur domestic demand by encouraging local residents to take breaks and short trips within Indonesia to rediscover and explore new site visits while combating fatigue due to lockdown. Indonesia could also make full use of the lull period in global travel to further improve its infrastructure for tourism and enhance the service standards of the tourism industry (Vivek et al., 2020).

Bali, which is probably the best-known travel destination in Indonesia, has been badly affected by the environmental effects of over-tourism. The pandemic could be a turning point for Indonesia to commence the practice of sustainable tourism in Bali and other destinations (Mulyanty, 2020). It is estimated that Bali's ecosystem has suffered, especially with the sharp rise in the number of domestic and foreign tourists between 1996 and 2018, as tourists were said to generate 34 times more waste than local residents (Vivek et al., 2020). Generally, the growth in tourism is a

double-edged sword as the increase in waste, especially plastic waste, has somehow damaged the country's reputation for its attractiveness (Vivek et al., 2020).

Thus, implementing nationwide initiatives to clean up the waste, and strongly advocating the use of recycling may contribute to providing a better overall experience for foreign tourists since global travel has progressively resumed. This would enable long-term sustainable environmental development and would also aid in Indonesia's economic development as a country with clean and beautiful natural tourist attractions.

Recommendations

Overall, Indonesia could consider adopting the following approaches as strategic measures to support the recovery of the tourism industry from the pandemic.

Rebuilding and Revitalizing Tourism Industry

In order to revitalizing the industry, Indonesia's tourism industry players will have to strike a fair balance between attracting tourists and cooperating with the government and health authorities to mitigate health risks. Apart from the immediate devastating effects, the COVID-19 pandemic is likely to have long-term effects in a country like Indonesia, where its main cities and provinces are heavily dependent on tourism. Her borders have been shut down since April 2020, along with the closure of many tourist attractions. Industry experts and critics posited that Indonesia should rethink its tourism master plans and embrace major changes as the world progressively recovers from the COVID-19 pandemic (Mulyanto, 2020). Tourism, being a major revenue source for Indonesia, has more than 16 million tourist arrivals in 2019. Bali alone accounted for more than 6 million tourist arrivals. However, due to the COVID-19 pandemic, potential visitors will be more cautious when it comes to interacting with Indonesian dwellers and their preference will be geared towards the concept of private travel and wellness. Therefore, there is a need for enhanced health and safety protocols to facilitate communication for combating the virus. A good example is the case of Traveloka, an Indonesia's travel and lifestyle booking platform. Traveloka is adapting to the crisis by collaborating with business partners to promote safe health and hygiene protocols for travel (Mulyanto, 2020).

Develop Alternative Strategies to Gain and Increase Revenue by Redirecting the Focus on Local Tourism

Once the situation is safe for travel, Indonesia could promote its various unique and less popular tourist attractions to its local residents. Similar to Singapore's attempt to encourage local tourism through its "SingaporeRediscover Vouchers" campaign when Singapore citizens were given vouchers for spending on rediscovering the city and supporting local tourism businesses, i.e., vouchers could be used to purchase tickets for attractions, pay for hotel stays and local tours (Tay, 2020). Promotion of local tourism is also in line with OECD countries (OECD, 2020). Thus, Indonesia can adopt similar initiatives to spur local demand and encourage local residents to

take short trips within the country as part of a well-being campaign to reduce the fatigue from the prolonged restricted measures due to the pandemic (Agarwal et al., 2021).

Improve Tourism Infrastructure during Full Period

The lull period in travel also presents opportunities for Indonesia to improve its tourism infrastructure, such as airports and service standards in the tourism industry and related sectors. Customer sentiment analysis on past customers' surveys could be conducted in order to know which areas have fallen short in the eyes of tourists in order for the industry to fill the gaps (Soshkin, 2019).

Promote an Environmentally Sustainable Lifestyle

Environmental pollution resulting from waste, such as plastic trash (apart from air, noise, and water pollution), has been negatively attributed to the rapid growth in tourism and the lack of tourists' consideration in helping to keep the attractions clean (UNEP, 2019). The consequence is dire as it tarnishes the beauty of Indonesia's natural attractions. Hence, the tourism industry can take the lead to promote greater tourists' awareness through environmental campaigns and marketing outreach efforts via traditional and new media. This can also be done by collaborating with major corporations and educational institutions to educate tourists and local residents to move away from single-use plastics and advocate the collection and recycling of plastic waste in a bid to become more environmentally friendly and sustainable.

Repurpose the Affected Sectors Supporting the Tourism Industry for Alternative Revenue Sources

The affected sectors, such as hotels and accommodations, supporting tourism could be repurposed to provide co-working office spaces (like WeWork's business model). From a business viewpoint, these affected sectors could collaborate with companies to provide co-working spaces for employees with the necessary safe management measures that are in compliance with government's guidelines. This could help the relevant sectors better unlock the potential of such resources, instead of leaving them intact to suffer financial losses.

Some organizations operating in the transportation industry, which is providing ancillary support to the tourism sector, could be repurposed to provide food and parcel delivery services to better meet the current needs of the public during the pandemic. The government could also provide more support to delivery companies with regard to digital transformation efforts, i.e., bring technologies to such companies, so that they can cope with the increasing demand for delivery services, for instance, provide transitional subsidies to delivery workers and companies to support the expansion of manpower and resources in response to the rising demand for such services (pandemic (Agarwal et al., 2021).

Also, there is a huge mismatch between the jobs available in the labor market and the skills required. Therefore, to remain relevant in the global economy, Indonesia could consider focusing on harnessing its digital capabilities to aid its tourism industry and its supporting sectors to cope with the transition and the new normal

after the COVID-19 pandemic. More jobs focusing on digital capabilities could be designed to partially address the unemployment situation (World Bank, 2021).

Conclusion

This study discussed the benefits and challenges of platform co-ops, and evaluated the platform co-ops in Singapore against Scholz's four key principles of platform co-operativism. It also proposed four interrelated components that could positively influence the growth and development of a co-operative ecosystem to chart the co-operative movement forward. Apparently, platform co-op business models can be considered as one of the alternative models for pandemic and post-pandemic economic activities.

This study hopes to provide a better understanding of how Indonesia has handled the COVID-19 pandemic and how Indonesia's public sector can work with various stakeholders to better control and manage the national health crisis. The impact of the COVID-19 pandemic situation has reinforced the need for having proper and viable strategies to counter such a situation. As such, there should be a greater emphasis on rapid and sound decisions that can be implemented at the national level to swiftly respond to the global pandemic in real time. This would include collaboration among the public and the private sectors and civil society in order to prepare an effective action plan to execute its containment and ring-fencing strategy successfully in the case of a pandemic situation.

Tourism is one of the most important "employers" in Indonesia and other countries with one in 10 jobs relating to tourism, and is also a major contributor to most countries' GDP (Sigala, 2020). And technology is one of the key approaches to combat the COVID-19 crisis, and acts as an enabler to rebuild tourism and the economy, for example, contact tracing mobile applications, digital identities, etc. The use of technology in tourism has also been necessitated. This includes e-broadcast and e-circulars for information on worldwide travel restrictions, online COVID-19 alerts, COVID-19 control measures, and hygiene practices. Technology can be deployed as a measure for alternative revenues, for instance, the introduction of virtual tours, events, and festivals (Sigala, 2020).

Lessons Learned

First and foremost, a country's adequate preparation and the ability to respond quickly in a complex situation is paramount, and this is evidenced by the resulting damage and fatalities when governments are slow to respond to the COVID-19 pandemic situation.

Secondly, apart from implementing effective policies in response to the pandemic, the public sector needs to work closely with major stakeholders in various organizations, including civil society, religious organizations, prominent educational institutions as well as community leaders (Ikhwan & Yulianto, 2020). Strong collaboration would enable the government to utilize existing manpower and

resources to formulate an effective strategy and put it into action with the help of all involved stakeholders. The collaborative efforts would better enable all, including the public, to do their part to adapt in response to the pandemic.

Limitations and Suggested Future Research

The main limitation of this chapter would inevitably be the coverage of the issues linked to the COVID-19 pandemic and tourism industry in Indonesia, as not all issues would be covered and addressed due to certain constraints, such as time and resources. To overcome the limitation, future research studies could focus on all relevant issues and challenges at the national level, the industry level, and the corporate level. Adopting a quantitative research method would also enable a more comprehensive analysis to be conducted to validate the key indicators and factors relating to effective responses to the COVID-19 pandemic, as well as to deduce and find out the best practices to enable a resilient workforce and nation in the midst of the pandemic.

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Food Security and the COVID-19 Pandemic in Singapore

159

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Contents

Introduction	2426
Background	2427
Food Security Management	2428
The COVID-19 Pandemic and Panic Buying Behavior	2428
Case Study	2429
Singapore's Approach to Food Security and Resilience	2429
Impact of COVID-19 Pandemic on Food Security in Singapore	2430
The Way Forward to Achieve a Higher Level of Food Self-Sufficiency	2432
Conclusion	2433
References	2434

Abstract

In modern days where the world is well connected with a high volume of people-to-people exchanges and transactions, the occurrence of a pandemic is expected to cause widespread impact, including impact on food security. Past and present pandemics, such as H1N1 swine flu (2009), SARS (*severe acute respiratory syndrome*) (2013), and COVID-19 (year 2019), saw many countries being forced to close their borders to curb the spread of the virus. Such border closure has affected food production and the operations of food suppliers globally that led to the rise of food prices across countries.

This chapter focuses on the impact of the COVID-19 pandemic on food security, using Singapore as a case study. It aims to examine (i) Singapore's current strategies to attain food security; (ii) the extent of the impact of the pandemic on food acquisition, the fluctuation of food prices, and people's panic buying behavior during the pandemic; and (iii) how the current strategies can be further improved to strengthen Singapore's food resilience. Some lessons learned from the Singapore's experience are also discussed. It is essential to review

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approaches to ensure food sufficiency so that proper adjustments can be recommended to enhance the country's food resilience, especially under the shadow of the pandemic.

Keywords

Pandemic, Food security, Food supply chain, Food resilience, Singapore

Introduction

Food security is one of the key aspects of human beings' survival. It emphasizes the importance of ensuring adequacy of food supplies that are sustainable, reliable, and nourishing to sustain people's healthy life. Food security is attained "when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (Committee on World Food Security, 2012, pp. 6–7). People should have physical and economic access to food (Simon, 2012). The increase in food produced domestically, innovation, and technology adoption are considered as some enablers for countries to attain food security (Singapore Food Agency, 2020). From the perspective of a country that can produce food products, the emphasis of food security is on satisfying the needs of food consumption of its people, followed by its ability to export food products to other countries in order to generate revenues. As for countries that are dependent on food imports to feed their population, diversity in food sources is critical to ensure stability of food supplies. Apparently, food security of a country is inevitably linked to its political and economic stability, and thus dedicated management of food security is paramount.

Food security may be subjected to disruption, caused by three scenarios or a combination of these scenarios. These scenarios include nature, man-triggered, and force majeure. Nature scenarios refer to the occurrences of natural disaster or harsh weather conditions, which include droughts, the infestation of pests that destroy crops, etc. Man-made scenarios refer to wars between countries, civil unrest, political instability resulting in reduction/cessation of food production capabilities, disruption to food supply chain operations, etc. Occurrences of force majeure refer to unprecedented events that may probably go beyond control, such as the occurrence of a pandemic among livestock or human beings. These scenarios threaten health and the survival of mankind. Under such circumstances, the absence of stable food supplies and surge in food prices would have devastating effect on a country's population. Hence, there is a need to anticipate, prepare, and mitigate the likelihood of such scenarios in order to reduce their impacts on food security, in particular (Independent Task Force on Global Food Security, 2017).

Singapore is an island nation in the Southeast Asia region with a land size of approximately 728.3 square kilometers (2020) (Open Government Products, 2022) and a population of approximately 5.45 million people (June 2011) (Singapore Department of Statistics, 2022). The country comprises of Chinese, Malays,

Indians, and other residents, with a diverse food culture setup and needs. Being a nation constrained by its small land size, Singapore depends largely on food imports from countries around the world to satisfy the consumption needs of the population (Singapore Public Service, 2021). A strategy of food supply chain continuity has been put in place to ensure food security by the government. It involves a two-dimensional strategy of domestic and international sourcing. The former refers to the domestic production of food products to increase the ability for self-sufficiency, while the latter focuses on diversity in food sourcing internationally to achieve supply chain sustainability and cushion the impact of import disruption in the event when some of these countries are unable to export food products to Singapore due to unforeseen circumstances (Agri-Food and Veterinary Authority of Singapore, 2020).

Thus, this chapter will focus on the impact of the COVID-19 pandemic on food security and approaches to attain food security, using Singapore as a case study. Singapore was selected as Singapore has performed very well in terms of ensuring sufficient food for her population although she depends heavily on food imports to feed her population. Data for this chapter were gathered from open sources, such as government reports, news articles and publications by renowned organizations, and academic journals.

This chapter will briefly discuss the literature review followed by case study analysis. The case study will examine the current strategies of food supply chain management in Singapore. It will assess how the COVID-19 pandemic has disrupted the food supply chain Singapore and the current suite of mitigating measures to cushion the impacts. Finally, the chapter will make some recommendations to strengthen Singapore's food security approach to improve its resilience against future outbreaks.

Background

Singapore, being land scarce, depends on overseas suppliers for majority of her food supplies to meet the needs of her population (Thai, 2021). However, the country has managed her food security, including food production, food safety, food quality and pricing, etc., well. The country acknowledged the need for a framework to manage and improve food security and thus has implemented a food security management plan. This plan placed emphasis on (i) ramping up domestic outputs to become more self-sufficient, (ii) conducting a contingency planning process, and (iii) further strengthening overseas sourcing (Agri-Food and Veterinary Authority of Singapore, 2020).

With the ongoing changing external environment and socioeconomic landscape, such as climate change and the COVID-19 pandemic and change in dietary requirements, food shortage and food security would continue to be an issue to countries around the world, including Singapore. Therefore, emphasis on the need to have future-proof of food security through various initiatives, such as research and development (R&D), technology innovation and adoption, and stronger

collaboration among stakeholders, such as the public sector and food-producing businesses, etc., would be worth to be studied (NTU, 2021). Also, several aspects concerning food security management and how a pandemic can result in panic buying behavior among people are briefly discussed in this section.

Food Security Management

Food security is characterized by food availability, food accessibility, and the level of food supplies by the producers as well as the level of food consumption by people (Committee on World Food Security, 2012). The volatility of food prices affects the population and results in uncertainty among people, in particular, lower-income families where such impact would be more severe (Timmer, 2012). Timmer's (2012) study on human behavior and food security proposed that when a crisis occurred in a country, such as a pandemic, it would most probably result in the country's administration imposing regulation and policies to safeguard the domestic interests first. These policies could include accumulating food stockpiles for domestic consumption, while food exports to other countries would likely be stalled or suspended. For the importing countries, depending on the importance of the types of food imported and the ability to find alternative sources, an increase in food prices would likely take place during such a crisis. An atmosphere of panic among people for fear of not being able to access to these food supplies would emerge if such fear is not addressed timely. There were past instances in 2007 and 2008 where people residing in several countries experienced panic buying due to a spike in rice price (Timmer, 2012). Timmer's study also highlighted the importance of fostering better connection between food producers and consumers via a competitive food market model and more international trade among countries (Timmer, 2012).

The COVID-19 Pandemic and Panic Buying Behavior

During the peak of the COVID-19 pandemic, countries around the world imposed lockdowns and border closure in an attempt to contain the spread of the COVID-19 virus. There were cases that essential hygiene items (e.g., toiletries, toilet papers, detergent, masks, etc.) and food items (e.g., instant noodle, rice, canned food, etc.) were emptied from supermarkets' shelves at lighting speed.

McKeever (2020) explained that when people feel uncertain during a pandemic, people would turn to panic buying supplies as a response to such uncertainty, and this has happened in the past, for instance, during the Spanish flu in 1918 and the 2003 SARS outbreak (McKeever, 2020). Billiore and Anisimova (2021) elaborated that panic buying has been originated from herd mentality and mass behaviors that may be socially undesirable. As highlighted by experts, such behaviors occur as the resultant of the reaction of humans' brain and humans' instinct to survive. These behaviors could move along the spectrum of responses to uncertainty, and the behaviors can reach the two extreme ends, either exhibiting a state of panic or

undermining the risks that are present or may occur (McKeever, 2020). For the former, it was an attempt to demonstrate the level of control over the situation to address the fear within individuals. The state of lack of information or misinformation about the pandemic was one of the causal factors behind such behavior among the people. For the latter, it was the mentality and belief of individuals that they would unlikely be affected, thus reducing their level of vigilance against the seriousness of the pandemic, despite numerous sources stating otherwise (McKeever, 2020).

Li et al. (2021) also found that environmental factors trigger change in people's behavior, i.e., panic buying behavior. These authors also suggested that "perceived scarcity, affective response and perceived lack of control could directly shape panic buying" (Li et al., 2021, p. 8). Overall, there is a need to contain the level of uncertainty among people in order to tackle their panic buying behavior and facilitate the effort by the authorities in order to deal with the pandemic more effectively (McKeever, 2020).

Case Study

This case study briefly discusses Singapore's strategies to ensure food security for the population, the impact of the COVID-19 pandemic on food security, and the way forward to self-sufficiency in Singapore.

Singapore's Approach to Food Security and Resilience

As an island nation, land scarcity does not allow Singapore to establish many large-scale food production facilities. Currently, only 1% of the land had been set aside for such facilities. Hence, Singapore relies heavily (more than 90%) on food imports to satisfy the needs of the population (Thai, 2021). The reliance on food imports poses a challenge in ensuring food safety, quality, pricing, and supply continuity. Thus, a structured approach toward achieving food security is crucial in an ever-changing environment filled with uncertainties. As such, Singapore has long embarked on a three-pronged strategic framework, covering (1) core strategies, (2) supporting strategies, and (3) enabling strategies as depicted in Table 1 (Agri-Food and Veterinary Authority of Singapore, 2020).

Core strategies acknowledge the importance of diversity in food imports, the need to venture into local food production, and establishing an inventory system of necessary food, such as rice, for unforeseen situations that may arise food supplies. This aims to mitigate any disruption of food imports in order to ensure that consumers continue to have access to food supplies and maintain food prices. *Supporting strategies* focus on research and development (R&D) and reducing food wastage via public education. These strategies also aim to improve infrastructure for food production. Finally, *enabling strategies* require strong coordination among different government agencies that need to work closely with one another to

Table 1 A framework for food security for Singapore

	Key points	Enabling strategies
Core strategies	Search for diversity sources of imports Invest in related food production facilities abroad Focus on industry development Strategies to complement limitations in diversification Improve food local production Maintain stockpiling of food	Foster coordination among government agencies Improve emergency planning Effective communication channels
Supporting strategies	Focus on R&D Reduce food wastage Strengthen infrastructure Use of financial instruments Take care of welfare/affordability aspects	Monitoring market Have a clear fiscal, legal, and regulatory framework

Source: Adapted from Agri-Food and Veterinary Authority of Singapore, [2020](#)

plan for emergencies, regulate, and monitor the market to ensure food security (Agri-Food and Veterinary Authority of Singapore, [2020](#)).

Impact of COVID-19 Pandemic on Food Security in Singapore

The occurrence of the COVID-19 pandemic in 2019 is a classic example of how food security came under threat due to import restrictions (Thai, [2021](#)). At the initial stage of the pandemic, there were worries of the likelihood of food supply disruption as border closure and import restrictions were imposed. In Singapore, panic buying and food hoarding occurred which resulted in empty shelves in the supermarkets as consumers, who were overconcerned about the scenario of food supplies running out, tried to buy whatever they could get in case of emergency (Ng, [2020](#)). However, the government has ensured that such a scenario would not become a reality. The food security framework of Singapore stands up to the test of time and ensured the continuity of food supply.

As a developed country, the majority of Singapore's population, both adults and children, have been able to easily gain access to food necessities and consume more than enough food, exceeding the dietary requirements stated in the FBS data. Being land scarce and having a multiracial society with diverse food needs, Singapore has obtained much-needed food sources from around the world, i.e., Singapore imports about 90% of the total amount of food required to feed her population. The occurrence of the COVID-19 pandemic entails prolonged border closure and import restrictions by many countries that have tried all means to curb the spread of the virus. The food security framework implemented by Singapore enables relevant government agencies to activate the contingency plans, for example, stockpiling of food necessities has been released into the market timely to balance the supply and

the demand of food, and the availability of locally produced products to close the gap of import restrictions. Such strategies have produced positive results, i.e., food prices were stabilized (Singapore Department of Statistics, 2020).

Despite the comprehensive framework, Singapore has still experienced panic buying and food hoarding among her population at the initial stage of the COVID-19 pandemic. People's concerns about the ability of Singapore's respective government agencies to maintain a stable food supply chain to meet their dietary needs are valid since the majority of food products come from overseas. This scenario illustrates the critical need to continue raising public awareness of Singapore's food resilience. This can be done through education campaigns and publishing sufficient information to keep the population informed and assured about the stability in the food supply chain in Singapore.

Beyond having stockpiling of food for contingency purposes, Singapore has sought a wide range of food sources from overseas and has invested in food production facilities abroad. Yet, the COVID-19 pandemic has proved to be a challenge for Singapore to manage such overseas food production facilities. With prolonged border closure and export restrictions, operational disruption in the logistics and the transportation industries has also posed challenges to deliver food products from overseas to Singapore (Ellyatt, 2021). This situation could potentially deplete the stockpiles of food that Singapore has set aside since the new batches of food imports would be delayed or not be able to arrive in Singapore at all. Being a global crisis, the COVID-19 pandemic has impacted many countries, and such impact became noticeable over time. Thus, it is important for Singapore to rethink her current strategies on food security and make proper adjustments to emphasize certain aspects, i.e., ramping up local food production and food related R&D. Firstly, ramping up local production in Singapore beyond the target of 30% of the total food supply by 2030 would be important as it can help Singapore achieve sustainability of food supply chain in the future (Thai, 2021). Ramping up local production would serve as a more tangible buffer as Singapore would have direct and immediate access to much-needed food necessities domestically. Secondly, strengthening R&D into food production could potentially open another sustainable food supply source for Singapore. In recent years, Singapore has supported the development of alternative food sources. The country also saw the growth in number of establishments focusing on lab-grown meat, cell-based protein products, and plant-based food products (Nielsen, 2021). These food products are strictly regulated to meet the requirements of being safe for human's consumption (Steffen, 2021). In a time of pandemic where food imports hit a roadblock, access to nutritious alternative food products would not be an issue since these lab-grown products would be readily and easily available for the consumers in Singapore. Calibration of focus in the food security framework, where more emphasis would be placed on ramping up local production and R&D, would strengthen the food security safety net for Singapore and would place the country in a better position to handle crises like the COVID-19 pandemic in the future.

The Way Forward to Achieve a Higher Level of Food Self-Sufficiency

Singapore has long acknowledged the importance of adopting a contingency mindset toward food security. Thus, she has embedded local production as part of the core strategies for this purpose. Singapore aims to achieve up to 30% of the total amount of food required to meet the population's needs from local production by 2030. In order to achieve this goal, various government agencies have been ramping up efforts through tapping on innovation and technology enablers. Apart from traditional food production facilities, Singapore has also explored new facilities, for example, those that enable the production of food in a manner that is not affected by weather conditions. Creative approaches, such as utilizing rooftops of residential areas for the purpose of establishing farming facilities, were piloted. These local products came in timely to cushion the impact from import restrictions to Singapore during COVID-19 pandemic (Thai, 2021). To prepare for the future, more initiatives, such as vertical farming of rice, have been on trial to explore the possibilities of novel approaches to food production. This will help Singapore push toward to achieve 30 percentage of local food production (Zheng, 2022).

The adjustments of the emphasis toward increasing local food production and food-related R&D would serve as a feasible move by Singapore to attain its food security sustainability when a pandemic like the COVID-19 occurs in the future. However, practical implications cannot be neglected as they contribute to justifying the reasons why adjustments to the food security framework are necessary to make it more effective and efficient.

Firstly, it would require more land to build bigger food production facilities that enable producers obtain a higher output of local food production. In the context of Singapore, it would not be easy to achieve this target since most of the land has been allocated to use in a manner that can enable the population “to live, work and play in a high quality environment” (Ministry of National Development, 2013, p. 3). As such, innovative ideas and implementation of technology and innovative solutions to allow better land utilization and tapping on the existing spaces available within housing areas to generate food produces would help Singapore overcome this constraint (Ministry of National Development, 2013). Better land utilization would include the use of the available underground space to establish controlled food production facilities that are not affected by weather conditions. As mentioned earlier, tapping on existing spaces including transforming rooftop of HDB blocks and carparks into agriculture facilities has already been explored (Thai, 2021). The establishments of such facilities may be costly for businesses to bear alone due to the complexity in constructing and operating such facilities. Thus, a joint investment by the public sector and the private sector, for example, interested food production businesses, would be a more feasible approach. The third sector (civil society organizations) and the public can also play an important part in reducing food waste. Röös et al. (2017), Springmann et al. (2018), and Bajželj et al. (2020) explained that reduction of food waste could save scarce resources since less land, water, etc. will be used, and GHG emissions associated with food production would

also be reduced. As highlighted by Bajželj et al. (2020), sustainable use of scarce resources can improve food system resilience.

Secondly, R&D of food production would be successful if two criteria can be met. These criteria include food prices and acceptability. Prices of food products produced by new approaches should be competitive with those produced through conventional methods. Lab-grown food products and their safety and quality should be accepted by consumers. The competitive advantage of lab-grown food products will be dependent on the ability to mass produce them to achieve economies of scale in order to match the cost of food products produced by conventional methods. The acceptable level of the consumers will be dependent on the public education and product publicity to raise public awareness of alternative food sources (Steffen, 2021). In addition, regulation and stringent law enforcement should be in place to ensure that lab-grown food quality and food safety as well as food nutrition level meet international standards. This will increase the degree of acceptability by the public (Chua, 2020).

Conclusion

The COVID-19 pandemic sent shockwaves around the world over access to food supplies and witnessed panic buying by people across countries. Border closure and import restrictions could potentially deny the population access to food supplies over time. Even in Singapore, a country with an established food security framework, panic buying and food hoarding did occur during the lockdown period. The fear of lack of food was an understandable one, considering that Singapore imports the majority of food products from overseas. However, it is heartened to know that Singapore has been able to overcome the food supply disruption due to contingencies in place, such as having stockpiles of food and improving local food production to cushion the impact of the COVID-19 pandemic as well as ensuring continuous access to food necessities for all.

Apparently, food security is critical to ensure political and socioeconomic stability in a country, and it provides assurance to the population with regard to their rights to access to sufficient and quality food sources to meet their basic dietary needs. Having a sound food security framework is important as it can provide relevant government agencies and businesses with a structured approach toward handling food supply disruption caused by crises like the COVID-19 pandemic. Well-prepared contingency planning to ensure the integrity and sustainability of food supply chain can reduce the anxiety and fear of the public pertaining to food security during the COVID-19 pandemic. Singapore has done extremely well in these aspects.

The current Singapore's food security framework has presented new areas to improve food resilience, such as R&D into food production, and new methods to produce food locally. Yet, as the food security landscape continues to evolve, Singapore should continue with her forward planning approach. Assessment of the potential internal and external risks that can threaten the country's food security and

affect the population would be crucial. Relevant government agencies can further engage and educate the population to raise their awareness on the food security framework that can help to reduce the likelihood of panic reaction when new crises occur in the future.

The Singapore's framework would be deemed comprehensive for countries with similar conditions that recognize the importance of food security and food system resilience. Thus, it would be worth examining and emulating by such countries that also face big challenges in terms of food security and food self-sufficiency. Finally, the COVID-19 pandemic may continue to impact the world, given new variants. Given the possibility of emerging pandemics in the future, further research should be carried out to explore how food security can be further improved given limited resources.

In general, the chapter discusses the Singapore's framework for food security and feasible solutions to enhance the overall food resilience, especially during the COVID-19 pandemic. It brings merits to the Singapore's framework through food waste reduction, in addition to ramping up local food production and R&D on food production.

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CSR and Sustainable Coexistence with Society During the COVID-19 Pandemic: The Case of Korean Large Enterprises

160

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Contents

Introduction	2438
CSR in South Korea	2439
Its Adoption and Approach	2439
Function of CSR	2440
CSR During Disasters and COVID-19	2441
COVID-19 and Coexistence with Society in Korea	2442
Discussion	2444
Conclusion	2446
References	2446

Abstract

The role of the private sector during national disasters is becoming increasingly important. Specifically, the essentiality of this sector's engagement with communities in overcoming a national crisis has manifested during the pandemic caused by COVID-19 (coronavirus disease 2019). This chapter describes how the private sector factors in the creation of a sustainable society and documents the investigation of the behaviors exhibited by companies in South Korea amid the global outbreak. The results showed that the Korean large enterprises commit to society by implementing corporate social responsibility (CSR) activities revolving around disaster relief and adopting a problem-discovery, targeting, and solving approach to tackling the socioeconomic problems caused by the pandemic. This study illuminated that these companies pursue sustainable coexistence with society by modeling the citizenship and contributing to the creation and reinforcement of social value, benefiting society.

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Keywords

Corporate social responsibility (CSR) · COVID-19 pandemic · Social value · Sustainable coexistence · South Korea

Introduction

Business and society are inseparable, and this close interconnection dictates that they should coexist in a sustainable way. Businesses are encouraged to engage with society primarily by creating economic benefits, but the boundaries of this corporate involvement have been considerably expanded. The emergence of the popular term “corporate social responsibility” (CSR) means that the social obligations of corporations now transcend the economic and legal domains to encompass ethical and philanthropic responsibilities (Carroll, 1979). CSR highlights the role of companies as good “citizens” who exhibit citizenship to create healthy and sustainable communities. Given that more active social engagement is currently expected from these entities, their activities are anticipated to improve social benefits and eventually create social value. Most enterprises have been implementing various CSR activities through different practices and programs designed to deal with economic, social, and environmental issues that may or may not directly influence their businesses. Specific CSR initiatives include donation, the provision of services and products at no charge, the sponsorship of individuals and non-profit organizations, and the establishment of partnerships.

Social engagement through CSR activities is particularly necessary during disasters (Ballesteros et al., 2017). Disaster relief is perceived primarily as a domain for which governments are responsible (Johnson et al., 2011), but the participation of the private sector in this area surpasses the coverage achieved by administrations. The business activities of companies are influenced directly by risks, such as those posed by the COVID-19 (coronavirus disease 2019) pandemic. If company stakeholders (which include business partners, employees, and the immediate communities where their facilities are located and customers reside) are infected by the coronavirus, activities such as procurement, production, and sales are delayed or terminated. Given these direct and indirect effects, companies should devise and practice appropriate measures for recovering from risks. Such entities capably manage the risks deriving from unexpected disasters because they are experienced in risk management and have resources that can be rapidly mobilized and directed toward people and communities in need (Ballesteros et al., 2017). Correspondingly, their prompt response to a disaster helps reduce the time it takes for communities to recover from adversity and return to normal living.

This study recognized the important role of corporations during disasters and investigated the disaster relief-related CSR activities of companies in South Korea during the COVID-19 pandemic. It also formulated recommendations for appropriate CSR directions and strategies in response to the global crisis. This chapter is structured as follows. First, the chapter describes the general CSR situation in South

Korea, with focus on its adoption, the approach with which it is carried out, and its function in South Korean society. Second, it introduces the CSR activities that companies carry out during disasters and the COVID-19 pandemic. Third, it discusses the CSR activities conducted in Korea during the global outbreak before ending with concluding remarks.

CSR in South Korea

Its Adoption and Approach

CSR is defined as the “actions on the part of the firm that appear to advance or acquiesce in the promotion of some social good, beyond the immediate interests of the firm and its shareholders and beyond that which is required by law” (Waldman et al., 2006, p. 1703). This concept, which underlines the righteous and moral deeds of corporations, received attention in Korea during and after the 1997–1998 financial crisis. Going through this nationwide economic catastrophe, Korean companies were pressured by focal actors, mainly from the government, to restructure their organizations by adopting and complying with Western governance and management systems (Choi & Aruilera, 2009). Since then, Korean companies have endeavored to review and redefine their roles and relationships with society by reinforcing their CSR engagement. For example, the majority of large enterprises have created in-house CSR departments through which to establish and systematically implement CSR programs. This movement led to the ongoing practice of CSR, which has caused a gradual increase in corporate CSR expenditure. In its annual report on such expenditure, the Federation of Korean Industries ([FKI], 2021) indicated that the CSR expenses of the 500 largest Korean companies have considerably increased since 2000. That year, companies spent an average of KRW 3.6 billion (193 surveyed companies) – a figure that grew fourfold in 2020 to KRW 13.6 billion (191 surveyed companies).

The main beneficiaries of CSR in Korea are the education, environment, and art sectors, and the pattern of implementation in the country has evolved from reactive to proactive. Initially, companies were driven by philanthropic reasons, donating money and supplies to socially disadvantaged individuals and communities, because of the convenience of these endeavors and the instant cosmetic effect produced by them. These days, they carry out CSR activities by actively solving social and economic problems together with society, which in turn enables them to create values for communities and populations. The FKI study reflected such a change in CSR activities (FKI, 2021).

The survey results (FKI, 2021) also indicated that Korean companies perceive their CSR programs as initiatives that should address the social problems confronting local communities, and they regard engagement as an activity that should persist under structured planning and continuous investment. Good examples of long-term, problem-solving CSR programs are world steel manufacturer POSCO’s Venture Platform (This is a project that involves discovering, nurturing,

and investing in new ventures. POSCO supports venture companies in both financial and nonfinancial ways. From 2011 to 2019, POSCO invested KRW 16.8 billion in 99 venture companies (<http://corporatecitizenship.posco.com/citizen/eng/brand/s919e10004200c.jsp>).) and Samsung Electronics' C-Lab Outside. (This project was launched in 2018 to support young start-ups and contribute to revitalizing the start-up ecosystem. Samsung Electronics discovers potential start-ups and supports them by providing work spaces, business funding, technical and managerial consultations, and business opportunities for collaboration (<https://www.claboutside.com/>).) Concerned about imbalance in the business ecosystem and the lack of new business entrants, the companies designed the programs to nurture individual and small-scale entrepreneurs by providing financial and nonfinancial support. Through this support, they can resolve the problems existing in the current business ecosystem and contribute to revitalizing communities. These endeavors are another reflection of the changing approach to CSR in Korea.

Function of CSR

Given the broad social engagement of companies through activities that reflect social accountability, CSR is no longer considered simply an annex to companies. Rather, it is regarded as an inevitable and important function for business success. Arguments continue to be raised as to the effectiveness of CSR in advancing business profitability (Godfrey et al., 2009; Oh & Park, 2015; Orlitzky & Schmidt, 2003). Although CSR activities may be unrelated to direct and short-term business performance, they are expected to moderate company risks and pay off sustainably in the long run. Studies contended that CSR helps companies achieve their intended business purposes, thus increasing the possibility of enhancing profitability, growth, and stakeholder values during managerial changes and crises (Deng et al., 2013; Lins et al., 2017). This is because the implementation of CSR activities amid risk increases the social capital of stakeholders who are directly related to companies' business activities. Social capital is associated with trust and reciprocity between parties and is viewed as "an enabler of collective action and cooperation, and thereby leading to positive outcomes" (Lins et al., 2017, p. 1790). That is, high CSR engagement in the presence of risk sends a good signal to stakeholders and aids companies in establishing a reputation as good and trustworthy entities. This reputation determines stakeholders' attitudes toward a company and motivates them to exercise reciprocity and cooperation.

In Korea, large-sized companies take the social capital-accruing function of CSR seriously. They perceive CSR activities as contributory to the improvement of corporate reputation and image, which they regard as stemming primarily from the trust gained from communities and employees (FKI, 2021). This observation is supported by Kang (2021), who investigated the relationship between people's perceptions of the CSR initiatives carried out by three Korean conglomerates (Samsung Electronics, Hyundai Motors, and SK) and their attitudes toward these companies. The author found that people view the corporations as socially

responsible and that such an impression builds trust, consequently contributing to shaping favorable attitude toward the companies. Similarly, Hur & Choi (2014) discovered that CSR engagement increases consumers' trust in a company, which, in the end, is linked to customer loyalty. The authors argued that CSR activities should be authentic, as this is the key to gaining the trust of stakeholders, including customers. Another study indicated that stakeholders are aware of responsible behaviors among businesses (Kim, 2015) and that they are smart enough to discern genuine motives behind CSR activities (Alonso-Almeida et al., 2019). Companies should therefore satisfy CSR requirements proactively and persistently to secure certification as authentic.

CSR During Disasters and COVID-19

Generally, disaster management and disaster relief activities are closely related to government organizations (Johnson et al., 2011), but this notion changed with the emergence of CSR and corporate citizenship; the private sector is now expected to engage in the aforementioned initiatives (Johnson et al., 2011; McKnight & Linnenluecke, 2016). This orientation is attributed to the fact that CSR involvement has expanded to include the resolution of social problems and the display of righteous citizenship behaviors by corporations in the societies where they operate, thrive, and sustain themselves. Furthermore, governments are unable to handle the socioeconomic risks occurring during disasters because of their rigid and bureaucratic organizational structures, which impede immediate action (Edwards, 2007; Kusumasari et al., 2010; Neal & Phillips, 1995; Waugh & Streib, 2006) – a deficiency that has compelled society to turn to the private sector as an effective problem solver (McKnight & Linnenluecke, 2016).

Dynamic capability theory (Teece, 2007) maintains that companies adeptly, effectively, and efficiently seize and solve the problems that plague communities by mobilizing their resources during disasters; this proficiency paves the way for companies to help communities extricate themselves from risks and increase their resilience (McKnight & Linnenluecke, 2016). During disasters, therefore, corporate engagement as a means of solving problems is a critical measure that significantly affects society (Ballesteros et al., 2017). Even if such engagement is not cost-effective in the short term, exercising corporate citizenship during difficult times accrues and increases a corporation's social capital (Madsen & Rodgers, 2015). For instance, they elevate their reputation as good and trustworthy companies and the awareness of them as such, thereby benefiting them in the long run and adding to their sustainable business success and prosperity (Madsen & Rodgers, 2015). Also, the recent study shows that companies' disaster-relief CSR activities enhance their long-term financial values (Qui et al., 2021). This is why social contributions, particularly during disasters, should be carefully managed by companies (This term refers to "how communities address adversity and return to 'normal' functioning following catastrophe" (McKnight & Linnenluecke, 2016, p. 3).).

Large enterprises have actively involved themselves in efforts to cope with the COVID-19 pandemic. Recent research highlighted the vigorous and immediate response of the private sector when this catastrophic event occurred, with companies exhibiting commitment to society by implementing various CSR activities centered on disaster relief (García-Sánchez & García-Sánchez, 2020; Kim, 2022; Mahmud et al., 2021). They identified areas with emergent needs and provided them with assistance through philanthropic projects, such as offering financial aid, providing supplies, and building partnerships with non-profit organizations. Adding to this speedy reaction, companies have attempted to solve pandemic-engendered socio-economic problems.

The COVID-19 pandemic differs from other episodic and short-term natural disasters in that it is a long-term catastrophe that has exerted national and global effects, thus giving rise to serious social and economic problems and creating a striking social divide between the “haves” and the “have-nots” (Carroll, 2021). Recognizing these social issues, companies have taken the initiative to support small-scale and individual entrepreneurs, suppliers suffering from lockdowns and social distancing restrictions, and children enduring limited educational and digital access during the transformation to online education (Kim, 2022). This proactive action of privately owned companies indicates their clear understanding of their relationship with society and their role as good “citizens.”

COVID-19 and Coexistence with Society in Korea

Since the occurrence of the COVID-19 pandemic on January 20, 2020 in South Korea, the private sector has conducted disaster relief activities (Kim, 2022; Park & Chung, 2021). Large corporations’ CSR expenditure on disaster relief and emergency response in 2020 accounted for a large proportion of their total CSR expenses because of the COVID-19 crisis: KRW 29.8 billion was spent on such endeavors, which is five times greater than the expenses incurred in 2019 (FKI, 2021). This difference points to the private sector’s proactive engagement with society. As revealed in Kim’s (2022) case study on representative Korean firms, disaster relief action has been very prompt and anticipatory, with specific directions aligned with CSR strategies. Companies have taken a problem discovery, targeting, and resolution approach to dealing with the issues arising from COVID-19. They observed the various social problems experienced by vulnerable individuals and groups and identified target populations for CSR support. As these enterprises support and fulfill the needs of the vulnerable, they also try to solve social problems, thus enhancing social benefits. Table 1 lists the disaster relief CSR activities implemented by selected large Korean companies (Samsung Electronics, LG Electronics, and Hyundai Motors) during the COVID-19 pandemic. It shows that the enterprises discovered the emergent problems that their respective target beneficiaries faced and

Table 1 Disaster relief CSR activities of Large Korean firms during the COVID-19 pandemic

Company	Target beneficiaries	Activities
Samsung electronics	Suppliers	<ul style="list-style-type: none"> Providing emergency financial aid, supplies, and management consulting through the operation of a supplier support center and fundraising.
	Employees	<ul style="list-style-type: none"> Distributing relief supplies to employees and their families in quarantine. Expanding flexible work arrangements. Serving special meals to employees for health improvement.
	Communities	<ul style="list-style-type: none"> Providing relief supplies, such as masks and sanitizers, to vulnerable individuals and groups. Donating money to national relief organizations. Supporting traditional markets and farmers in need by purchasing their produce and distributing gift certificates.
LG electronics	Suppliers	<ul style="list-style-type: none"> Providing emergency financial aid and supplies and increasing the <i>sang-Saeng</i> cooperation fund.
	Employees	<ul style="list-style-type: none"> Giving relief supplies to employees and their families in quarantine. Expanding flexible work arrangements.
	Communities	<ul style="list-style-type: none"> Providing relief and food supplies to children in need. Donate money and blood donor card. Supplying artificial intelligence products (Chloe-subbot) to medical centers to assist in deliveries and minimize human contact.
Hyundai motors	Suppliers	<ul style="list-style-type: none"> Using emergency disaster relief funding to support suppliers.
	Employees	<ul style="list-style-type: none"> Strengthening the safety and health management of employees. Expanding flexible work arrangements.
	Communities	<ul style="list-style-type: none"> Implementing <i>sang-Saeng</i> campaigns to support individual and small business owners by purchasing their products. Donating money to national relief organizations and conducting campaigns to prevent the spread of the coronavirus. Providing facilities for use as temporary quarantine lodgings for people traveling to Korea.

Source: News reports accessed from the companies' websites (Samsung Electronics: <http://csr.samsung.com/ko/programViewCSRHeeMang.do> LG Electronics: [LG 뉴스룸 | LiVE LG - LG전자 소셜 매거진 \(lge.co.kr\)](#) Hyundai Motors: [전체 뉴스 - 뉴스&공지 - 홍보실 - 회사소개 | 현대자동차 \(hyundai.com\)](#))

initiated prompt and appropriate projects to help those with an attempt of solving the issues.

As argued by Kim (2022), the CSR activities of Korean large firms during the COVID-19 are distinguished by the companies' agility in carrying them out; they promptly identified and responded to prevailing social needs while they sustained their CSR involvement. Engaging with communities, they pursued sustainable coexistence with society as an important value. The term "coexistence" (*Sang-*

Saeng [상생] in Korean), which has its roots in biology, is often referred to as the founding value behind the CSR activities of Korean firms. It represents the close, interdependent, and complementary relationship between parties, denoting their obligation to cooperate with each other for the betterment of mutual benefits. Korean firms believe that they should operate in harmony, as well as healthily and sustainably, with society because they cannot exist without the actors composing it. Accordingly, they have practiced active and immediate action during the COVID-19 pandemic, advancing community recovery and rebuilding. The projects illustrated in Table 1 such as *Sang-Seang* fundraising for suppliers, the expansion of flexible work arrangements for employees, and the donation of money and supplies to communities represent this case.

Having a sense of community is embedded in Korean companies' pursuit of CSR activities. They are convinced that the risks and problems confronting society should be addressed by enhancing their sense of collectivity. Importantly, community resilience determines company resilience and vice versa (McKnight & Linnenluecke, 2016), implying that a company's continuity hinges on whether a community can survive a disaster and how well and how fast the community can recover from this occurrence. If companies behave for self-serving and economic interests (Crane & Matten, 2020), their continued and sustained operation would be difficult to achieve. The notion of cultivating sustainable coexistence between companies and society suggests implicit cooperation and reciprocity during times of need. This rationalizes why companies should direct endeavors to relieve society of its burdens during disasters. In turn, these deeds will be reciprocated by trust from society, which will increase the likelihood that their businesses will be sustained.

Discussion

The International Institute for Management Development (IMD, 2021) recently reported that Korea's competitiveness has gradually increased over the past 5 years. In fact, Korea was ranked 23 out of 64 countries for competitiveness in 2021. The study noted significant improvements in management practices, as Korean companies were considered "agile" (ranked 18th), business leaders were lauded as "socially responsible" (ranked 29th), and the business environment was deemed "entrepreneurial" (ranked 15th). This finding projects an optimistic outlook for the future of Korean business. The country's environment is characterized by a distinctive, dynamic culture; an affluent, talented, and educated population; and a reliable infrastructure that provides a social safety net. These attributes serve as favorable stimuli that improve the direction of business in Korea. Globalization and changes in institutional norms, regulations, and stakeholders' attitudes have led to a volatile and complex business environment in which business sustainability cannot occur without active social engagement. As this study highlights, Korean companies, particularly large-sized enterprises, should pursue sustainable coexistence and build a strong relationship of trust with society to ensure business continuity, particularly during national disasters.

This finding is valid, considering that CSR positively affects businesses by allowing companies to accrue social capital (Lins et al., 2017; Madsen & Rodgers, 2015). However, companies encounter potential risks when they manage disasters by engaging in CSR activities. In fact, shareholders may not welcome CSR activities during a disaster. CSR expenses can financially burden companies and threaten their cash flow, which may disappoint shareholders and create conflicts with them (Nguyen & Nguyen, 2015). These potential conflicts challenge companies as they implement disaster-relief CSR activities. Adding to this, stakeholders including consumers and communities have increased expectations for the CSR activities of firms, particularly large firms, and they typically expect these activities during disasters. So, CSR activities during disasters may not be reciprocated by their actual behaviors of purchasing products and services and investing in companies' businesses, the behaviors that benefit companies practically. Therefore, companies should manage potential conflicts with shareholders and find ways to leverage their social capital.

To overcome these potential challenges, companies should communicate their CSR activities effectively during a crisis with shareholders and target stakeholders. Effective CSR communication raises the awareness of shareholders and stakeholders and maximizes the benefits of companies' CSR activities (Du et al., 2010). Companies should continuously and candidly explain their long-term vision for CSR and the value of their CSR activities to stakeholders to enhance their confidence and trust in the current and future values of the company. The Korean companies investigated in this study communicated their CSR activities openly and regularly using their separate websites and media exposure. Along with strategic CSR activities, companies' continuous communication with stakeholders builds a strong rapport with stakeholders whose decisions benefit the sustainability of the companies.

Companies must also use an agile approach to their CSR activities. The extended crisis of COVID-19 has arguably changed the mindset and decision-making of stakeholders, and they are now more conscious of CSR (He & Harris, 2020). Thus, stakeholders' perspectives and decisions about companies depend considerably on companies' CSR visions and activities, which are now more important for their success and sustainability. Considering these changes in the attitudes and behaviors of stakeholders, companies should strategically design their CSRs by predicting the social needs of the target stakeholders and incorporating them into their CSR plans. As this study indicates, the CSR activities of large Korean companies during the COVID-19 pandemic showed strategic and agile characteristics. These companies discovered the social problems that surfaced during the pandemic or that the pandemic exacerbated, included these problems in their CSR agendas, and implemented CSR activities to solve the problems by using a long-term perspective. Other large companies, as well as small and medium-sized enterprises (SMEs), should also adopt this agile approach. Because SMEs are closer to the local community and promptly make decisions with their informal organizational structure and entrepreneurial character (Fassin, 2008), they should be adept as well at implementing agile CSR activities that benefit their businesses.

Conclusion

Korea has a distinctive history and characteristics in terms of CSR adoption and implementation by companies (Choi & Aguilera, 2009; Kim et al., 2013). This distinctiveness may raise questions on the CSR direction and mindset of enterprises: Are the CSR initiatives of these entities strategically designed, authentic, and sustainable? Investigating the CSR engagement of selected large Korean companies and their behaviors during the COVID-19 pandemic and reviewing the Korean literature (even if they are confined to only some large companies), this chapter attempted to address the issues of interest and provided suggestions regarding the directions to be taken in implementing CSR initiatives. The study showed that the CSR involvement of Korean large companies has evolved into a proactive process. They engage with society using a long-term and problem-solving approach. Companies identify and define the social problems that socially vulnerable individuals or groups face, and initiate long-run and systemic CSR programs to solve these problems. The value behind these initiatives is sustainable coexistence with society. The interdependence and reciprocal relationship between businesses and society enables companies to vigorously fulfill their CSR via disaster relief activities.

Undoubtedly, social engagement through CSR is important, and CSR is a business norm to which companies should comply. It should be a part of their daily operations and closely connected to their business strategies. As highlighted, “companies’ CSR strategies should be incorporated into their business strategies, and they should be improved and evolve corresponding to the anticipations of social needs and expectations. Such an agile and systemic approach to businesses’ CSR activities will benefit society, contributing to creating social values and sustained coprosperity with society” (Kim, 2022, p. 9). The COVID-19 pandemic has tested the commitment of companies to CSR and risk management (Carroll, 2021). How they respond to this crisis will determine the current and, significantly, future sustainability of their businesses. They are advised to espouse an authentic and agile approach to social engagement, as this authenticity – consistent, persistent, and proactive – is expected to reinforce community resilience, which will consequently accrue social capital for their businesses.

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The Importance of Restructuring the Local Food System in the Context of Disaster Management: Lessons Learned from the Effect of COVID-19 on Agricultural Business in Japan

161

Misa Aoki

Contents

Introduction	2450
Agricultural Policy for Food Security and the Actual Situation in Japan	2451
Effect of COVID-19 on Agriculture in Japan	2453
High Value-Adding Products	2453
Crops and Milk for School Lunch	2455
Labor Problems	2455
Programs for Solving the Problems Brought on by COVID-19	2456
Direct Transaction of Crops Between Producers and Consumers	2456
Transaction Based on Solidarity	2457
Efforts of Private Social Enterprises	2458
Conclusion	2458
References	2459

Abstract

The agricultural sector plays various important roles such as supplying food to people, mitigating damage caused by disasters, and conserving the landscape. Food supply, which is essential in daily life, becomes even more significant during times of emergency. Due to the spread of COVID-19, many countries face challenges in ensuring a steady food supply.

In Japan, the spread of COVID-19 caused a great deal of damage to the agricultural sector due to the stagnation of food distribution and labor problems. For instance, farmers who supplied school cafeterias and restaurants had to stop their distribution due to schools and restaurants being closed. On the other hand, the lack of labor is also a significant issue since Japanese farming enterprises were forced to cease employing several foreign workers. In addition to these problems, the decrease in the food self-sufficiency of Japan makes it difficult to ensure a steady supply of food.

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The purpose of this chapter is to show the effects of COVID-19 on agricultural business in Japan and to determine what caused the unstable situation of food supply, with a focus on a short history of agricultural policy in Japan. Based on evidence and the lessons learned from COVID-19, this chapter suggests that restructuring the food supply chain in such a way that will foster trust between producers and consumers is significant for the future food supply. This means that thoughts of community-based disaster risk management could be important even in the aspect of food supply.

Keywords

Agriculture · Food distribution · Food and agriculture policy · Community-based food supply chain · Japan

Introduction

The agricultural sector plays various important roles, such as supplying food to people, mitigating damage caused by disasters, and helping people relax. Food supply, which is essential in daily life, becomes even more significant during times of emergency. Due to the global spread of COVID-19, many countries face challenges in ensuring a steady food supply. According to “Impact of COVID-19 on people’s livelihoods, their health and our food systems,” a joint statement by the ILO, FAO, IFAD, and WHO, the number of undernourished people, which is currently estimated at around 690 million, could increase by up to 132 million by the end of 2020 due to the pandemic. In addition, the Food Security Information Network (2020) reported that more than 800 million people around the world could not properly secure food before this crisis and that an additional 200 million would lose access to basic food and nutrition. Low-income countries or nations that rely on remittance or tourism may encounter more serious problems with regard to food shortages (FSIN, 2020).

Though the concerns regarding food which arose due to COVID-19 are often framed in the context of low- and middle-income countries, developed countries are also facing problems in the food supply. FAO showed that higher-income countries are more likely to face disruptions stemming from the supply side because of their highly integrated global supply chains and agricultural systems, which is based on capitalism. Agricultural production in many European countries and in North America relies on global supply chains to access agricultural inputs and to market their outputs (CCSA, 2020).

Under fear of food shortage and a food crisis, some countries attempted to prevent exporting their crops in order to secure food for their own nations, while others attempted to transfer labor from the third sector to agriculture in order to produce their own food. For instance, Vietnam granted rice export certificates at the end of March 2020 for the purpose of securing domestic demand (Glauber et al., 2020). FAO’s website showed that around 20 countries began imposing food export

restrictions from March to June 2020. Furthermore, the agricultural sector in most countries is also exposed to labor shortages due to mobility limitations (CCSA, 2020). The French government hired jobless people to help farmers in order to cover for foreign laborers who could not enter the country (RFI, 2020).

Japan, which highly depends on imports and foreign labor in its agricultural sector, is also facing various problems regarding food supply and labor, similar to other countries. Though Japan is a high-income country, domestic food production has been in danger of food shortage due to the decrease in the number of farmers. The purpose of this chapter is to show the effects of COVID-19 on the agriculture and food supply in Japan with reference to newspaper articles and short interview surveys and to come up with an alternative food system which will protect food security.

As for disaster management, community-based disaster risk management (CBDRM) is thought to be one of the approaches to reduce damage from any disaster. Van et al. (2018) defined CBDRM as an inclusive, active, and owned community-driven process aimed at addressing the drivers of disaster risk creation, disaster risk reduction, and societal resilience building, within the context of local and indigenous knowledge and wisdom. Though studies on CBDRM focus mainly on earthquake, tsunami, or flood, few mentioned on food supply management from the view point of CBDRM. The evidence this chapter shows from Japan would suggest the necessity of thoughts of CBDRM for food supply under disasters for any nations.

Agricultural Policy for Food Security and the Actual Situation in Japan

According to the Ministry of Agriculture, Forestry and Fisheries (MAFF), the Food, Agriculture and Rural Areas Basic Act issued in 1999 defines food security as ensuring a minimum stable food supply for citizens through increasing domestic food production and mixing the amount of imports and stock. In order to achieve this, MAFF intends to continuously analyze risks in food security in order to increase and ensure domestic food production and to prepare for emergencies. With regard to increasing domestic food production, MAFF highlights the importance of promoting domestic products through food education and the production of high value-adding food mainly for export and to expand agricultural fields which grow wheat, beans, or feed for livestock. During the Abe administration, MAFF prioritized intensifying and integrating farmland use and expanded the demand for Japanese agricultural products at home and abroad (MAFF, 2018). Through these strategies, MAFF set each self-sufficiency ratio targets at 45% for a calorie-based value and 75% for the production value to be achieved by 2030 (MAFF, 2020).

However, the food self-sufficiency ratio in Japan continues to decrease (Fig. 1). The calorie-based ratio was at 37%, while the production value-based ratio was at 66% in 2019, indicating no increase. As the calorie-based self-sufficiency ratio includes feed for livestock, the importation of feed had not declined and the

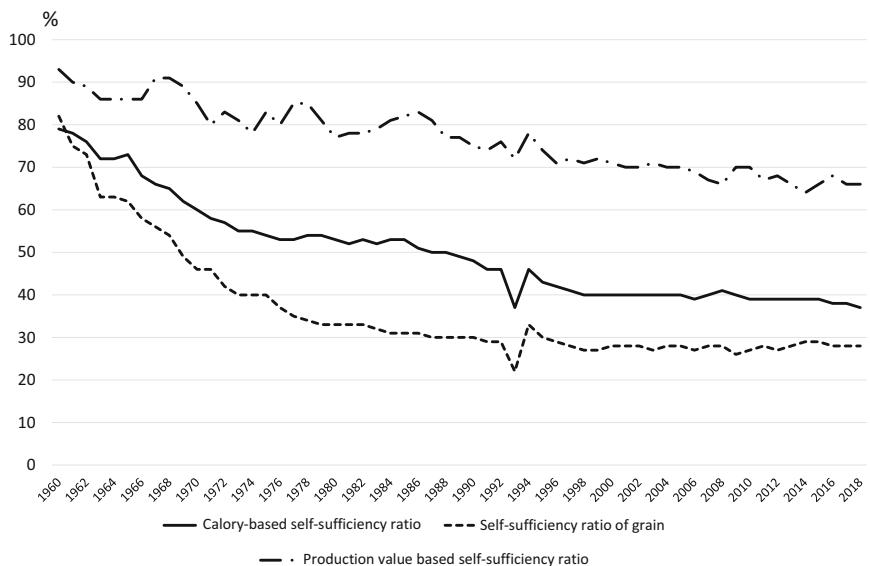


Fig. 1 Transition of self-sufficiency rate of food in Japan (%). (Source: Author created based on Food Balance Sheet of MAFF)

self-sufficiency ratio of grain is still very low. Though the MAFF and Japanese government strongly promote exporting products, the total export values of agricultural and aquacultural products have not increased significantly. Rather, the total import value of those products is much higher than their export value (Fig. 2). Japan's participation in the Trans-Pacific Partnership Agreement or other economic partnership agreements has not helped increase the export values or farmers' income. A fruit farmer in northern Kyoto said that their income from exporting fruits is almost the same as selling their fruits in Japan because exporting fruits is very costly. Despite these difficulties, the Japanese government set a goal of achieving a food export value of up to 5 trillion yen by 2030. The failure of this agricultural policy is accelerating the decrease in the number of farmers and an increase in the average age of farmers because most farmers cannot cover their living expenses by farming alone. According to MAFF (2020), the number of farms decreased to 1.189 million farms, which was lower by 2.6% compared to the previous year and by 19.2% compared to 2014, and the average age of farmers stood at 67 years old in 2019.

Due to this decrease in the number of farmers, particularly young farmers, the Japanese government began promoting the employment of foreign laborers as technical intern trainees (The Technical Intern Training Program was established as a formal program in 1993 based on the good evaluations of training programs conducted by overseas local companies and others in the form of employee education starting in the late 1960s. The objectives and purpose of the Technical Intern Training Program are to transfer skills, technologies, or knowledge ("skills, etc.")

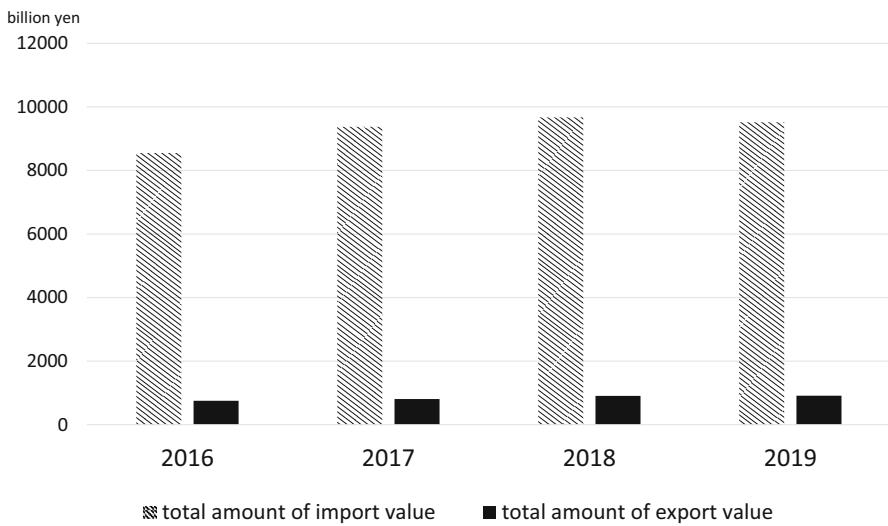


Fig. 2 The import and export values of agricultural and aquacultural products in Japan. (Source: Data was taken from the Trade Statistics of Japan, Ministry of Finance)

accumulated in Japan to developing and other regions and to promote international cooperation by contributing to the development of human resources who can play roles in the economic development of those developing regions (Source from Japan International Trainee & Skilled Worker Cooperation Organization) by deregulating policies regarding foreigners working in Japan. As a result, the number of foreign workers in agriculture is increasing rapidly, and about 90% are technical intern trainees (Fig. 3). In 2018, 27,871 trainees worked in Japan's agricultural sector, which is more than double of that of 2011.

In a way, the Japanese government has shifted agriculture to rely on the global market, which did not aid in achieving MAFF's goals for domestic food security.

Effect of COVID-19 on Agriculture in Japan

High Value-Adding Products

As the number of foreign tourists increased and high value-adding crops were expected to increase farmers' income, the Japanese government promoted farmers to shift to producing high value-adding crops to meet their demand rather than producing these as a daily domestic commodity. However, the COVID-19 pandemic directly damaged these farmers directly since many restaurants and hotels had to be closed under the declaration of emergency, and fewer foreign tourists came to Japan

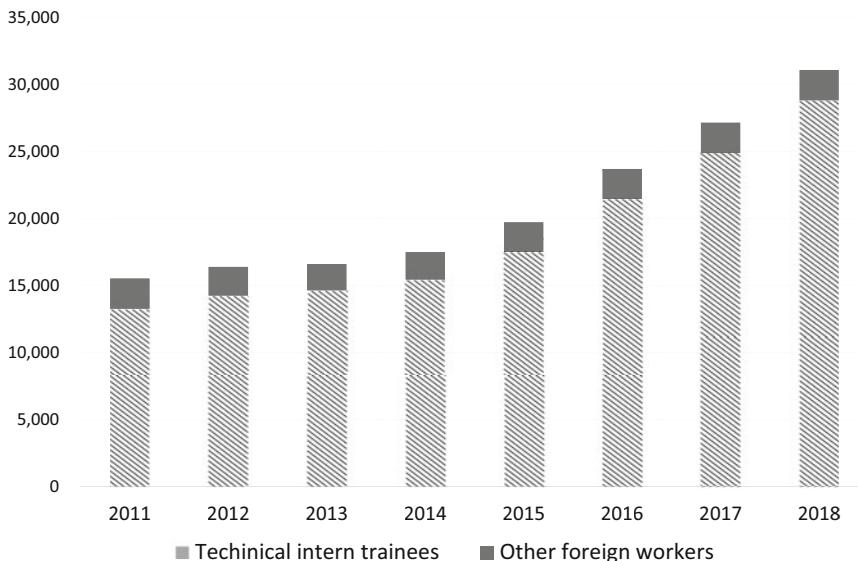


Fig. 3 The transition to foreign workers in Japan's agricultural sector. (Source: Data was taken from the Ministry of Health, Labour and Welfare)

since the Tokyo Olympic games were postponed. In particular, a lot of farmers raising Wagyu are in danger of their businesses failing.

According to MAFF's "Japanese Beef Products Guide Book," (This guidebook was issued by MAFF for the purpose of promoting the export of Wagyu) Wagyu is defined as a variety of beef that satisfies a set of stringent conditions and is incorporated into a traceability system. Though producing Wagyu was expected to increase farmers' income due to the rapid increase in the demand from inbound tourists, the pandemic shut down the distribution of Wagyu both overseas and within Japan. This reduced the price of Wagyu to 1665 yen (about 15 USD) per kg in March 2020, which was more than 700 yen (about 6 USD) less than the price during the same season last year. This means that over 300,000 USD per one Wagyu cattle was lost considering that each cow could provide up to 500 kg of beef (JAcom, 2020).

A Wagyu farmer was disappointed and said that it would be difficult to purchase calves for the next year unless one cow could be sold at over 100,000 USD (Shimotsuke Shimbun, 2020).

Aside from Wagyu, high-grade fruits for export and gifts could not be sold and resulted in losses. For example, the demand for high-grade cherries produced in the Yamagata prefecture rapidly decrease due to the pandemic, so farmers began to develop a new variety to sell as an ordinary domestic commodity. A farmer in the Okayama prefecture who produced large grapes for export mainly to Taiwan and Hong Kong thought of producing grapes for domestic demand (The Japan Agricultural News, 2020a).

Crops and Milk for School Lunch

As the demand for rice, vegetables, and milk for school lunches is usually stable, farmers who produce sufficient amounts of these foods tend to supply and distribute to schools for school lunches. The COVID-19 pandemic seriously affected these farmers since all schools were closed for a few months after a state of emergency was declared by the Japanese government.

Dairy farmers were severely impacted because almost all school lunches are served with milk and many local dairy farmers supply milk to students. For instance, in the Niigata prefecture, the amount of milk production for school lunches abruptly dropped down to 18.5 tons in March 2020, which was only 20% of production from the previous year (The Mainichi, 2020). Similarly, a middle-scale dairy producer in the Fukushima prefecture distributed 40% of their milk for school lunches but lost more than 100 million USD during March and April 2020 (The Japan Agricultural News, 2020b). The effects from the pandemic resulted in the loss of demand for tons of milk; however, farmers could not cease their production in order to meet the demand after schools reopen. While milk plants and the dairy farmers' association tried to use the milk in processed food such as cheese or butter, the MAFF encouraged consumers to purchase one more container of milk for their everyday life.

Besides dairy farmers, vegetable farmers, especially those who distributed their crops to school lunches, encountered difficulties in selling their crops. A farmer who produced Japanese mustard spinach in Tokyo usually supplied three tons of this product, 85% of which went to school lunches; however, he had to dispose of this product until schools reopened. Despite his losses, he had to keep producing these vegetables in preparation for school lunches soon after schools opened again (Sankei Biz, 2020).

Labor Problems

The labor shortage in agriculture and livestock industries is also a serious problem caused by the pandemic. More and more agricultural enterprises started to employ foreign technical intern trainees prior to the pandemic in order to secure a labor force after the Japanese government deregulated foreign labor in Japan. In 2019, the Japan Agricultural Cooperative accepted about 3200 technical intern trainees, and 2200 of them were from China (JAcom, 2020). However, the pandemic prevented about 1900 technical intern trainees from entering Japan (NHK, 2020).

In order to mitigate these problems associated with labor shortage, people who lost their jobs began to help farmers. Some staff of an old hotel in the Hiroshima prefecture went to help the farmers whose vegetables are served to guests at the hotel. They would harvest vegetables after closing the hotel. The president of the hotel thought that this was a good chance for chefs who usually cook the vegetables to appreciate farmers' jobs and their feelings (The Japan Agricultural News, 2020c).

Some private companies also sent their employees to farms in order to help farmers who faced difficulties due to the labor shortage. Japan Airlines (JAL) had to reduce the number of flights due to travel restrictions, so seven members of the Hakodate airport staff aided in harvesting asparagus for about 1 month. One of the JAL staff said that it was good to have a chance to contribute to their region. A farmer who accepted the staff acknowledged their support since few came to help as a part-time job (NHK WEB NEWS, 2020).

Likewise, some local governments supported the laborers in regional agriculture. The Shiga prefecture created jobs in the agriculture and fishery sectors for people who lost their jobs under tourism and restaurants due to the pandemic. The government provided funds for agricultural enterprises to employ temporal workers (NIKKEI, 2020). The Tsumagoi village government in the Gunma prefecture decided to fund cabbage farmers to employ domestic workers instead of foreign technical intern trainees (Jomo News, 2020).

Programs for Solving the Problems Brought on by COVID-19

Direct Transaction of Crops Between Producers and Consumers

For the farmers who suffered losses in distribution due to the pandemic, direct transactions are becoming more important. More farmers shifted to selling their crops in farmers' markets, local super markets, or over the Internet.

Some organizations including MAFF set special websites to connect consumers who would like to support local farmers with farmers who could no longer export their products or distribute to hotels or restaurants. For example, "Tabetyoku" is a website wherein farmers can directly sell their agricultural and aquacultural products with messages to their consumers. From March to July 2020, the number of farmers using the website increased from 750 producers to 2200 producers, and monthly sales also increased to 35 times its original value. This means that direct transactions are attractive for both farmers and consumers especially during the pandemic. Farmers can display the strengths and weaknesses of their crops directly to consumers and also get feedback from consumers. On the other hand, consumers can support farmers with some messages and buy the products they usually do not get from supermarkets. There are some similar websites with an increasing number of users. Toyosu Shijo, which is a wholesale market run by Tokyo City, also directly sells luxurious agricultural and aquacultural products to consumers through the Internet. In order to support these activities, MAFF funded the delivery costs of the transactions for a few months.

Producers also began to sell their crops at farmers' markets. A strawberry farmer who started to sell their product over the Internet said that many consumers who were worried about the future food supply purchased in order to support these farmers. He also set up a temporary farmer's market in front of his strawberry farm, and more consumers came to buy the fruits than was expected (The Japan Agricultural News, 2020d). Many strawberry farmers earn not only from selling

their crops but also through tourism by allowing tourists to experience harvesting strawberries. While this normally boosts farmers' income, the income is much less than before the pandemic. Therefore, the farmers tried to find consumers and local food processing enterprises to sell strawberries at discounted prices (This data is from short interview to a member of farmers' group in Asuka village of Nara prefecture on 24 November 2020).

To promote direct transactions and to distribute crops in order to reduce food disposal, MAFF and some local governments also gave information of farmers and fishermen who had to stop selling their product to their usual consumers and want to sell their products instead of throwing them away. This system benefits not only farmers and consumers but also contributes to building a sustainable food system.

Transaction Based on Solidarity

The ILO, FAO, IFAD, and WHO mention the importance of solidarity to overcome food problems caused by the pandemic in their report on the "Impact of COVID-19 on people's livelihoods, their health and our food systems." The following are examples of how solidarity helps overcome food problems.

The first is "Sanchoku," which is the direct transaction of food between the farmers' cooperative and consumers' cooperative. Most consumers' cooperatives have conducted these transactions for decades in order to deliver healthy food such as organic food, processed food with less food additives, or environmentally friendly food in a stable manner. The farmers who took part in this transaction also wanted to supply safe food produced with less chemical substance and environmentally friendly food to consumers who understood the farmers' business and lives. These cooperatives started making direct transactions at around the 1960s and have established a reliable food supply chain without distributing through the mainstream market (Kwaguchi, 1993). The members of the consumers' cooperative purchase the contracted farmers' products at a slightly higher price than that in surrounding supermarkets. In addition, consumers' cooperatives deliver products to members' houses only once a week, which enables producers to plan well and reduces losses in production. This solidarity of transaction and the delivery system played an important role during the time of the pandemic.

For example, the Ouchiyama dairy farmers' cooperative, which usually delivers milk to local schools for school lunches, could sell most of their milk to members of the Nara consumers' cooperative even though schools were closed (This data is based on short interview survey for staffs of Ouchiyama dairy farmers' cooperative and Nara consumers' cooperative on 27 November 2020). This is because the members of the Nara consumers' cooperative purchased their milk as much as possible to support the dairy farmers who had been consistently supplying milk to the members for more than 40 years. The Daisen dairy farmers' cooperative, which has made direct transactions with the Kyoto consumers' cooperative for almost 50 years, also faced similar challenges due to schools being closed, but were able to sell most of their milk through direct transactions (This data is based on short

interview survey for staffs of Kyoto consumers' cooperative on 4 December 2020). Besides dairy products, farmers producing vegetables or fruits could also consistently sell their product to consumers' cooperatives even during the pandemic without having to decrease their prices.

However, another problem arose. The number of members of consumers' cooperatives suddenly increased which affected the stable food distribution through the cooperative's delivery system. In addition, existing members consumed more products than usual during the pandemic. According to the Japanese Consumers' Co-operative Union (2020), 562,000 people became members of consumers' cooperatives from March to August, which was double than that of the previous year. Furthermore, the total sales amounted to around 226 billion yen from April to September of 2020, which was 115% higher than those of the previous year. This rapid increase in participation resulted in cooperatives not being able to distribute some food products and commodities such as masks or tissue paper to all members who ordered. This means that the continuous direct transaction and the use of this system even though it is slightly more expensive than purchasing the products elsewhere during normal times play important roles in ensuring a stable supply of products during emergencies.

Efforts of Private Social Enterprises

Some private companies aided farmers or fishermen who lost their usual places of distribution due to the pandemic.

MOS Food Services, Inc., which originated in Japan, runs about 1700 hamburger shops in Japan and abroad. The company usually sources the vegetables used in their hamburgers in Japan from domestic farmers. In order to differentiate their hamburgers from those of foreign-oriented establishments, the company has continued to engage in direct transactions with about 2700 domestic farmers who produce organic or environmentally friendly vegetables. The staff of the company and farmers sometimes interact with each other. COVID-19 pandemic damaged these farmers' management as well. The amount of shipments suddenly decreased because they had to cease their distribution to restaurants. In order to support them, the company decided to sell boxes packed with their vegetables and fruits to consumers directly through the Internet. The purpose of this program was to support contracted farmers' management and livelihood in order to ensure a future stable supply and continued customer support (Ryutsuu Biz, 2020).

Conclusion

As stable food supply and food security became a point of focus in many countries following the COVID-19 pandemic, strategies to maintain food security in each country should be considered especially under the expansion of the global market. This chapter showed that food and labor in the agricultural sector have been

globalized mainly due to government policy; however, the pandemic brought on various problems related to food supply in Japan. Evidence of damage caused by the unbalanced supply and demand of domestic food, relying too much on foreign labor, and promoting the exportation of high value-adding food taught us lessons and showed how vulnerable globalized agriculture is especially during times of emergency, even in a developed country.

On the other hand, there are various kinds of activities or programs which help farmers or fishermen who encountered difficulties in distributing their products or securing labor. There are some common features in the examples this chapter discussed. The continuous relationship among farmers and fishermen, retail, and consumers in the local food supply chain enables them to help each other even during this time of emergency. If this relationship made regular in people's daily lives, we can ensure a stable supply chain despite emergencies based on usual production and trust among the people. Therefore, policies for increasing the domestic supply and demand for usual food produced by farmers and those which support the local food system will be more important in countries such as Japan, which relies highly on imported food despite having a good potential for domestic food production.

From the aspect of disaster management, the lessons from Japan suggest that community-based disaster risk management could be significant for food supply management in order to supply food stably even in the pandemic such as COVID-19. To achieve this, participation of various stakeholders including producers, consumers, policy makers, cooperatives, or any social enterprises for restructuring the local food system would be crucial. Sharing information on local food and risks, providing education of food and food system, and building networks among various stakeholders play important roles in supplying food not only at the time of disaster but also at peacetime.

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Times of Crisis: Women and Leadership

162

Teresa Sims Johnson and Stanley Bruce Thomson

Contents

Introduction	2462
Double-Bind	2463
Women and Leadership in Crises	2464
Transformational Leadership	2465
Feminine Societies	2466
Conclusion	2467
References	2467

Abstract

The Covid-19 pandemic has demonstrated that countries with greater women's rights and support for female leadership exhibit more socially progressive policies and competencies when managing crisis. Throughout this tumultuous time, headlines celebrating the success of female leaders' abilities to manage the spread of Covid-19 dominated popular media prompting a reexamination of gender and leadership during times of crisis. Unique to times of crisis, those traits associated with femininity are welcomed and deemed appropriate by communities and corporations alike and are associated with strong leadership abilities. At a time when the likelihood of failure is heightened, women are often promoted into leadership positions (glass cliff). This suggests that they are being set up to fail. Whether the act of setting women up for failure is true or an unconscious gender bias, it must not be assumed that female leaders are ill equipped for the task at hand nor are they naively accepting these fallible roles. Women show a natural tendency for transformational leadership which means

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they have the ability to lead with empathy and integrity and inspire followers to act selflessly for the greater good. These are the very traits that are appropriately suited for leadership roles during crises. This ability to understand followers' needs at a deeper level and act accordingly explains actions that female transformational leaders have made. The barriers in place preventing the rise of women into higher-level leadership positions in business are based on outdated concepts of gender roles. They are not based on merit. Further research needs to investigate the effectiveness of women in leadership roles during crisis situations.

Keywords

Women · Leadership · Crisis · Covid-19 · Transformational leadership

Introduction

In early 2020, the Covid-19 pandemic gripped the business world as lockdowns were launched and stay-at-home orders were commonly issued. Businesses suffered and the threat of economic downturn was felt by many organizations around the world. Throughout this tumultuous time, headlines celebrating the success of female leaders' abilities to manage the spread of Covid-19 and the effects that the pandemic was having on organizations dominated popular media prompting a reexamination of gender and leadership during times of crisis. Despite years of literature that suggests that women are equally fit for positions of leadership to their male counterparts, it is only now during the Covid-19 pandemic that female leadership traits and styles are capturing the spotlight and being applauded. But why?

A McKinsey consulting report, Women in the Workplace 2021, states that “women are rising to the moment as stronger leaders and taking on the extra work that comes with this: compared to men at the same level, women are doing more to support their teams and advance diversity, equity, and inclusion efforts” (Thomas et al., 2021, p. 5). According to the report, women are increasing their representation in corporate offices but are primarily being promoted to comparatively lower levels of management than men. It is likely that this “broken rung” in the employment ladder lies at the heart of the misrepresentation of women in senior positions (Thomas et al., 2021). The story is worse for women of color. Yet, it is female leaders who appear to be strong and vibrant leaders during times of crisis.

Although this chapter focuses on women in business, women political leaders play an equally important role and should not be ignored. Women in both sectors are faced with similar challenges when jockeying for leadership positions, and many political bureaucracies often mirror the structures of large businesses. Therefore, the impact that leaders like Margaret Thatcher, Angela Merkel, and Jacinda Ardern have during times of crisis supports this analysis of women leaders in business during these tumultuous times.

Currently there are 21 women serving as heads of state out of 193 nations globally; and there are only 41 female CEOs of Fortune 500 companies, up from

2 in the year 2000 (Spencer Sairam, 2021; Hinchliffe, 2021). Disturbingly, these numbers highlight an overarching gender imbalance and how slow the progress has been in achieving greater female representation in higher-level leadership roles.

The intent of this chapter is to shed light on why women are rising as exemplars of leadership during times of crisis. To accomplish this we will explore the concept of the double-bind, which explains how perceived gendered traits both cause the aforementioned imbalance based on gender and also how these traits paradoxically propel women into leadership positions during times of crisis. This then leads to a discussion on how women's predispositions for transformational styles of leadership are often welcomed during crisis management efforts. Finally, we will examine how a feminine society can support a greater level of organizational sustainability overall but specifically during times of crisis.

Double-Bind

Mainstream gender discourse is responsible for shaping beliefs and expectations about how men and women should speak, act, and behave (Sunderland, 2004). Traits that are believed to be inherently female are often criticized in business and government, resulting in female leaders finding themselves in what is called a double-bind. Masculine traits such as assertiveness, self-confidence, and ambition, are associated with leadership (Baxter, 2015; Haugen & Pigott, 2017), while those associated with femininity such as getting along with others, being helpful and supportive, and nurturing are seen as being weak and therefore undervalued in leadership settings (Baxter, 2015; Elliott & Stead, 2018; Zenger & Folkman, 2020). The double-bind occurs when female leaders who exhibit traits associated with femininity are seen as having inferior leadership capabilities and those who exhibit traits associated with masculinity are seen as unlikeable, mean, and unfeminine.

Yet, unique to times of crisis, those traits associated with femininity are welcomed and deemed appropriate by communities and corporations alike and are associated with strong leadership abilities (Vroman & Danko, 2020; Windsor et al., 2020). Examples of these inherently female traits have been demonstrated by numerous female political and business leaders during the Covid-19 pandemic (Luoto & Varella, 2021). Erna Solberg, Prime Minister of Norway, held a Facebook Live to explain the pandemic and answer questions from Norwegian children (Johnson & Williams, 2020). New Zealand Prime Minister, Jacinda Ardern, promised an "empathetic government" and urged citizens to be kind and caring (Johnson & Williams, 2020). Ardern has also been seen in Facebook Live addresses in casual attire with her daughter in the background, thus creating a relatable image to public viewers who are also working from home (The Guardian, 2021). Even German Chancellor Angela Merkel, who is known for her fact-based approach, showed emotion during her Covid-19 addresses (Mayer & May, 2021). On the business side, Karen Lynch, chief executive officer of CVS Health Corporation, spoke of the company's mission to be there for individuals, to improve the health of local communities and the nation, and to "[try] to help America prevail against the pandemic" (U.S. News & World

Report, 2021). Mary Barra, chief executive officer of General Motors (GM), shifted the automaker's production lines to help Ventec Life Systems make ventilators. In the company's return to work strategy, Barra asked GM's 155,000 global employees to "work appropriately" (Jones & Burho, 2021; Wayland, 2021).

Women and Leadership in Crises

Despite there being a double-bind for female leaders, in times of crisis women are often promoted into leadership positions (Barratt, 2021). Ryan and Haslam (2005) coined this phenomenon the glass cliff. A glass cliff suggests that women who are promoted to positions of leadership during times of crisis, a time when the chance of failure is highest, are being set up for failure. This can be seen as an act of scapegoating so that poor organizational performance can be blamed on poor leadership, thus providing fuel for the fire that women are not suited for leadership. Whether the act of setting women up for failure is intentional or because of unconscious gender bias, it must not be assumed that female leaders are naively accepting these potentially ill-fated roles or that they are poorly equipped for the task at hand (Barratt, 2021).

A case study conducted by Cosentino and Paoloni (2021) identified female managerial skills as major drivers of success during times of crisis and organizational resilience. Women's attitudes toward change, abilities to promote new initiatives, and abilities to maintain and create strong relationships with stakeholders were cited as being the key characteristics that helped deliver favorable outcomes. Similarly, a survey conducted by Zenger and Folkman (2019) on gender differences in areas of leadership yielded results that indicated that women were rated higher than their male peers in 12 out of 16 areas of leadership. Specifically, they noted that females most greatly outscored males in the areas of taking initiative and driving results, two skills that are required of leaders during times of crisis in both government and business. These results are supported by effective leadership research which also identifies direction-giving, meaning-making, and empathy as being essential for leaders to motivate followers (Mayfield & Mayfield, 2017).

A McKinsey consulting study during the 2008 financial crisis pointed out that organizations with three or more female senior executives scored higher in two key characteristics deemed necessary to successfully come through a crisis. The "leadership team," defined "as the ability of leaders – collectively and at whatever level – to guide and inspire action," was seen as the most important factor (Desvaux et al., 2010, p. 12). "Direction," defined as "the ability to define where a company is heading and the resources needed to get there, and unite its people in achieving this vision," ranked a close second (Desvaux et al., 2010, p. 12). When they asked what types of leadership behaviors would be necessary to propel them through a crisis, nine (9) behaviors emerged – people development, expectations and rewards, role model, inspiration, participative decision-making, intellectual stimulation, effective communication, individualistic decision-making, and control and corrective action. Of these nine (9) behaviors, their study showed that women applied people

development, expectations and rewards, role modeling, applied inspiration, and participative decision-making more than their male counterparts. The report further discovered it was those very types of leadership behaviors displayed by women that were “critical” in guiding an organization not only through a crisis but beyond it (Desvaux et al., 2010).

Despite the existence of a glass cliff and in support of the above findings, there are numerous examples when female leaders prevailed in the face of adversity. Unsurprisingly, the recent Covid-19 pandemic has produced many more. For instance, just a few months into Karen Lynch’s role of managing CVS’s Covid response as executive vice-president, it was announced that she would be promoted to chief executive officer (Peebles, 2021). Under Lynch’s leadership, CVS continues to “outperform expectations” and reported a third quarter sales increase of 10% (Japsen, 2021). In June 2020, Carol Tomé came out of retirement to assume the appointment of chief executive officer of United Postal Service (UPS) (Jones & Burho, 2021). Tomé focused on strengthening logistics for the 2020 holiday season and then later on the delivery of Covid-19 vaccines in the United States (Jones & Burho, 2021). Since the start of the pandemic, UPS has experienced double-digit percentage growth in delivery volumes annually (Jones & Burho, 2021). In February 2021, Jane Fraser was promoted to chief executive officer of Citigroup and is the first female CEO in history to run a major Wall Street bank (Hinchliffe, 2021). Previously, Fraser leads the company’s corporate strategy and mergers and acquisitions during the 2008 financial crisis (Citigroup, 2021). In the political realm, Samia Suluh Hassan was elected president of Tanzania in 2021 whereby she reversed her predecessor’s stance on Covid-19 by acknowledging it as a serious public health threat, encouraging masking, testing, social distancing, and securing vaccinations (Juma, 2021).

Transformational Leadership

Just as traits can be interpreted as being gender specific, they also align with characteristics of leadership styles. Female traits like empathy and nurturing are present in transformational, democratic, and authentic styles of leadership, whereas male traits of confidence and assertiveness are present in transactional and situational styles of leadership (KPMG, 2019). The McKinsey report similarly found that male leaders were most likely to utilize individualistic decision-making, control, and corrective action (Desvaux et al., 2010). Kotter (1990) warns that leadership styles that are aligned with rewards, like transactional leadership, become ineffective during times of crisis (Brown & Nwagbara, 2021). The parallels between gendered traits and styles extend beyond theoretical discourse as practitioner-based reports from McKinsey consulting and KPMG displayed similar findings. KPMG surveyed female executives who described their own leadership styles as being authentic, democratic, or transformational, and 58% believed that transformational leadership was required to reach senior executive levels (KPMG, 2019).

Women show a natural tendency for transformational leadership which means they have the ability to lead with empathy and integrity and inspire followers to act selflessly for the greater good. These are the very traits that are appropriately suited for leadership roles during crises (Bass, 1985; Bass et al., 2003). This is because transformational leaders often understand followers' needs at a deeper level which stems from the fact that the leaders' personal values often mirror the values held by those they lead (Brown & Nwagbara, 2021). This connection explains the actions that female transformational leaders have made (Howell & Avolio, 1993).

New Zealand Prime Minister Jacinda Ardern identified school closures as a "last resort" citing that not only do these public health measures disproportionately affect women and low-income families but also that there are negative health and educational consequences that school closures can have on children (Trevett, 2022; Aldrich & Lotito, 2020). As a woman and mother, herself, this was a decision that was likely made to help working mothers remain active in the workforce and to curtail the widening inequities between households (Aldrich & Lotito, 2020; Trevett, 2022).

This deeper level of understanding both stakeholders' and organizations' values is why we see transformational leaders in business, like Karen Lynch and Mary Barra, excel in their roles as CEOs. Karen Lynch of CVS, who as a young child lost her mother to suicide and later her aunt and guardian to failing health, is dedicated to providing access to healthcare for millions of Americans (U.S. News & World Report, 2021). Mary Barra, who started at GM in 1980 as a co-op student, has worked her way up through the ranks to the top position as CEO (GM, n.d.a, b). Due to her technical training as an engineer and years of experience understanding the company, its people, and its stakeholders' needs, it is clear why Barra continues to drive GM's success. This notion is exemplified in her simple and empowering directions for employees to "work appropriately" and "dress appropriately" (Duke Fuqua School of Business, 2021; also see Wayland, 2021). Finally, research supports that transformational leaders, as a whole, tend to deliver the best organizational outcomes (Brown & Nwagbara, 2021).

Feminine Societies

What the Covid-19 pandemic has demonstrated is that more feminine societies fare better overall (Windsor et al., 2020). Countries with more socially progressive policies, healthier citizens, greater women's rights, and support for female leadership have demonstrated greater competencies when managing crises (Windsor et al., 2020). For instance, proactive policy implementation allowed Taiwan's Tsai Ing-wen to take swift action to prevent the spread of Covid-19 early in the pandemic because of the country's experience managing the 2003 SARS outbreak (Cheng, 2021). She was also able to appeal to cultural values of citizens by stating that Taiwan would be playing an important role during this pandemic by manufacturing masks and medical supplies for the global community (Mayer & May, 2021). Nordic countries (Iceland, Finland, Denmark, Norway, and Sweden), which are known for

their progressive-social policies and world-class healthcare systems, represent 4 out of the 21 female-led countries in the world (Spencer Sairam, 2021). All of the Nordic countries have been applauded for their management of the pandemic, with the exception of Sweden which received criticism early on, as then Prime Minister Stefan Löfven opted for a herd immunity approach to managing the disease. It is estimated that this approach resulted in a death rate 3 to 10% higher when compared to other Nordic countries (Guenot, 2021). From a corporate perspective, Mary Barra (GM) advocates that by providing employees with a place of employment which allows them to feel respected and valued and provides equitable access to all opportunities, GM will be more competitive on the global scale (Duke Fuqua School of Business, 2021). Notably, GM is a leader in diversity, equity, and inclusion in the workplace and is one of the most diverse automakers globally (GM, n.d.a, b). Barra is the only female CEO of a major automaker in history, and nearly half of their Board of Directors are women. The takeaway here is that these societies and organizations are better equipped to manage crises precisely because of the diverse perspectives and skills that have resulted from equitable opportunities for women in leadership roles. It is evident that societies and organizations who wish to perform and achieve a greater level of sustainability in times of crisis would be wise to embrace female leaders, their voices, and attributes that are feminine and egalitarian.

Conclusion

Throughout the twentieth and into the twenty-first century, women have struggled to break through the glass ceiling that has kept them from executive positions in business. Gender discourse and social norms about women's abilities to lead are antiquated and continue to stifle opportunities for women to fulfill their leadership potential. In spite of the glass cliff phenomenon and the heightened chance of failure, women are highly competent leaders when presented with leadership opportunities. This may be in part due to women's natural tendency toward a transformational leadership style, a style that is ideal during times of change and uncertainty. Therefore, it is only logical that businesses should actively invite women into leadership roles especially during times of uncertainty that are brought about by crises. Upon further contemplation of this topic, we must ask, if women have the abilities to be successful leaders when the odds are against them, why are organizations still failing to provide them with opportunities for higher-level leadership under normal circumstances?

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Sustaining and Shielding Business from Disasters: Assessing Indian Experiences of COVID-19 Pandemic Disaster Management

163

Rajesh Kumar

Contents

Introduction	2472
Prolonged Lockdowns and Colossal Business Losses	2473
COVID-19 Pandemic and Its Fallout	2474
Migrant Workers and Job Losses	2475
Government of India Measures for the Handling of COVID-19 Pandemic Disaster	2476
Administrative and Financial Measures	2476
Shielding Businesses: Government's Action Plan for Micro, Small, and Medium (MSMEs) Enterprises	2478
Repercussions of Prolonged Lockdown on Businesses (Post-Financial/Relief Package) ..	2479
Major Policy Interventions for Sustaining of Business	2480
India's Resolve Under "Self-Reliant India" (<i>Aatma Nirbhar Bharat</i>) Program	2480
Challenges for Policies Dealing with Pandemic Disaster	2480
Policy Slippages	2480
Election Results in Five Indian States Validated the Satisfaction of Beneficiaries of Government Measures in Post-COVID-19 Situation	2481
Conclusion	2482
References	2483

Abstract

Countries across the globe have been struggling hard to fully recover from the COVID-19 pandemic fallouts. The economies, including global supply chains at international level, are yet to stabilize and are still grappling with serious disruptions in the production of goods. Several UN reports of 2020–21 have corroborated the fact about a serious deterioration in socioeconomic conditions of diverse communities in many parts of the world, including India. India, with a population of 1.4 billion, had been caught unprepared on multiple fronts during the two waves of the COVID-19 pandemic; such as poor health infrastructure, complete

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failure in preventing the death of more than half a million citizens, stopping the spread of the pandemic despite prolonged lockdown, leading to a serious breakdown in production and approximately 40 million job losses (ILO Report, 2020), and delay in procuring and rolling over supplies of vaccines in time across the country despite invoking of disaster laws in the country. This chapter provides an understanding of the Indian government's capabilities in handling the COVID-19 pandemic disaster. This work presents public policy perspectives and examines the impact of the disaster on business and traders, and decline in socioeconomic status of masses because of job losses and prolonged lockdowns. It analyzes various factors leading to awarding of financial stimulus packages for improving overall business atmosphere and schemes like free-food grain schemes and vaccination to eligible masses. The principal aim of this work is to explore the disasters providing a chance for India to turn the challenges of the pandemic into opportunities. On the whole, it highlights policy analysis, implementation slippages, political intent, and capacity to deliver. The chapter was completed under the assumption that disasters of any nature are likely to compound the problems of government agencies in a populated country like India. The qualitative research methods like case studies and content analysis of literature available in the public domain were used in the completion of the study.

Keywords

Lockdown in India · COVID-19 pandemic · Free-food scheme · Job losses in India · Aatma Nirbhar Bharat · Vaccination in India

Introduction

Countries across the globe have been struggling hard to fully recover from the consequences of three consecutive waves of the COVID-19 pandemic for two long years that engulfed the world from March 2020 to as late as March 2022. The economies world over are yet to stabilize fully even as of today, in the aftermath of serious disruptions in the production of goods and global supply chains. One of the fallouts of the COVID-19 pandemic disaster as per the UN and Indian government reports of 2020–22 has been serious deterioration in socioeconomic conditions of diverse communities in several parts of the world, including India (ILO, 2020). Manufacturing activities, along with transport movements, public or private, came to a grinding halt because of prolonged shutdowns and invoking disaster laws for effective handling of pandemic fallouts. The job losses of millions of workers because of financial instabilities, often attributed to the enforcement of stringent lockdown conditions during the pandemic disaster, resulted in the eruption of a massive migration crisis involving around 50 million workers from Mumbai in Maharashtra and Delhi to states like Uttar Pradesh, Madhya Pradesh, Odisha, West Bengal, and Bihar, thereby handling of health safety measures for masses and stopping the spread of pandemic to many other parts of the country became very difficult for the administration that precipitated the existing crisis as the road

transport sector, along with railways, was completely shut down on a countrywide basis (ILO, 2020).

India, as the second largest populated country of the world, had been caught unprepared on multiple fronts during the second wave of the COVID-19 pandemic; such as poor health infrastructure, complete failure in preventing the death of more than half a million citizens, stopping the spread of the pandemic despite prolonged lockdown, leading to a serious breakdown in production and approximately 40 million job losses (ILO, 2020), and delay in procuring and rolling over supplies of vaccines in time across the country despite invoking of disaster laws in the country.

The impact of two consecutive years (2020–21) of the pandemic disaster and devastating lockdowns in India resulted in the imposition of indefinite curfews, forced closure of schools, colleges, universities, and courts, besides businesses and other recreational places. The losses on the part of average masses in a country like India having a 1.4 billion population have been colossal on multiple accounts such as unemployment; serious disruptions in businesses; second highest number of COVID-19 deaths at the world level; loss of education; and millions slipping back to below poverty line levels.

The precipitation of a huge humanitarian crisis leading to the second highest COVID-19 deaths of children and adults attributed to the COVID-19 pandemic disaster is analyzed here by focusing on government's efforts in mobilizing men and material resources for the protection of basic human rights of masses and their right to life and personal liberty based upon dignity.

The main objectives of this research chapter are

1. To provide public policy perspectives and examine the impact of biological disaster on business and traders and decline in socioeconomic status of masses
2. To analyze various factors leading to awarding of financial stimulus packages for improving overall business atmosphere and schemes like free-food grain schemes and vaccination to eligible masses
3. To provide an understanding of the Indian government's capabilities in handling the COVID-19 pandemic disaster
4. To explore the disasters providing a chance for India to turn the challenges of the pandemic into opportunities

The chapter was completed under the assumption that disasters of any nature are likely to compound the problems of the government agencies in a populated country like India. The qualitative research methods like case studies and content analysis of literature available in the public domain were used in the completion of the study.

Prolonged Lockdowns and Colossal Business Losses

It was on March 25, 2020, that a complete lockdown was ordered in the country and a curfew-like situation was imposed throughout the length and breadth of the country. As India is a federal country, the union government invoked the provisions

of National Disaster Management Act (NDMA) 2005 in enforcing the social distancing norms as a measure for controlling the pandemic disaster on a countrywide basis. Realizing the gravity of the spread of the pandemic, the Government of India took immediate measures to prevent the spread of the COVID-19 pandemic, which included marking of containment zones; self-isolation or self-quarantine for COVID-19 patients; travel restrictions; restrictions at interstate borders; screening at airports; establishment of COVID Test centers; and lockdown of cities, districts, and rural areas; complete closure of schools, colleges, temples, malls, shopping complexes, local bazaars, gymnasiums, cinema halls, and other important facilities of public nature (The Indian Express, 2022). One positive outcome of the COVID-19 pandemic was a new innovation of allowing employees of both public and private sectors to avail work-from-home (WFH) options. This led to the birth of several new digital platforms. It also proved that digital platforms helped the government immensely in getting the right kind of information disseminated among the public so as to avoid misinformation from getting spread to the masses.

As discussed, the lockdown imposed several restrictions on the country, which included the closure of nonessential businesses in the country. It halted the movement of road transport completely, leading to serious disruptions in supply chain. India's overall economic problem got worsened because of the beginning of a year-long farmer's agitation parallel to the COVID-19 lockdown period demanding repealing of three federal farm laws, also, leading to complete rail and road blockades in and around India's capital city of Delhi. Government reports pointed out that India's real GDP growth decelerated to its lowest in over 6 years in third quarter 2019–20, and the COVID 19 pandemic posed serious difficulties to the country's economy. One of the most important steps that were taken to stop the spread of the pandemic was the imposition of national lockdown (Government of India, 2020) that was sufficient to have brought all kinds of economic activities throughout the country to a grinding halt. As a result of the pandemic disaster, very few sectors of the economy could protect themselves from the disruptions in global supply chain.

It is important to have a broader classification of essential and nonessential businesses, in general, and India, in particular.

COVID-19 Pandemic and Its Fallout

The Indian society saw a considerable impact of COVID-19 in the socioeconomic scenario. According to the International Labour Organization (ILO), almost 2.7 billion people were affected around the globe due to lockdown measures undertaken by various governments till May 2020. The ILO report identified some economic sectors that were labor intensive and employed millions of often low-paid, low-skilled workers as among the worst affected. As a result, there was a drastic reduction in working hours, wages, and layoffs, which affected around 1.25 billion workers worldwide (ILO, 2020). A high proportion of these informal workers were without access to healthcare and social protection, particularly in low- or middle-income countries, and India was no exception.

Soon after the imposition of lockdown instructions on March 25, 2020, on the basis of TV news channels reporting, one could ascertain the closure of nonessential businesses, and a large number of businesses, including industries, began experiencing a heavy decline in their sales and daily turnover. Income losses became a common feature on part of most of the businesses. As the COVID-19 pandemic showed no signs of getting controlled during the months of March–May 2020, the Indian administration had the only option of continuing with the imposition of prolonged national lockdown by invoking NDMA 2005 on a countrywide basis for preventing the spread of the pandemic (Vyas, 2020). The net result of the lockdown was forced closures of businesses without having the option of any government-supported policy programs for reversing their business losses.

Invariably, business owners had the option to either close down or remove their workers from their work till the pandemic situation was to normalize. It is pertinent to mention here that businesses like healthcare, pharmaceuticals, e-commerce, information and communications technology (ICT) services, and essential retail witnessed a considerable rise in their revenues. The digital companies were the largest beneficiaries of office work switching over to “Online Meeting” mode for decision-making across organizations. Another biggest impact of the ICT businesses was experienced when education through “online mode” was implemented all over the world in view of the safety of children during the COVID-19 pandemic. The pandemic disaster threw up opportunities for companies that were ready to develop capabilities to adapt to new challenges of a data-driven world (Hoyne, 2022). However, this chapter does not dwell upon the business prospects in terms of revenue earnings or losses as it largely focuses on pandemic disaster policy analysis, implementation slippages, political intent, and capacity to deliver.

Migrant Workers and Job Losses

A community that took the largest hit because of the prolonged lockdown while handling the pandemic disaster has been the “migrant workers” community. The problems of the “migrant workers” community are discussed next. As per one of the leading national dailies of the country, 18 lakh migrant workers had registered officially with the Punjab government during the lockdown in 2020 for going back to their native states like Uttar Pradesh, Bihar, West Bengal, Odisha, and Madhya Pradesh. However, only 5.64 lakh out of these registered migrants returned back to their native states. The most important fallouts of this pandemic disaster were that around half a million migrant workers lost their jobs and daily wages as they left Punjab and moved to their native states.

The scenario was much more fearful in the states of Maharashtra and Delhi. The business people irrespective of being big or small were faced with the problem of raising money and making salary payments to their employees. In order to compensate their losses, they had started retrenching their employees in large numbers. The consequences of job losses had serious repercussions for daily wage workers as their daily/monthly incomes evaporated fast as they could not reach up to the places of

their work because of the imposition of curfews, leading to complete transport shutdown and extension of curfews in towns and cities all over the country. The retrenchment of workers on a massive scale during the pandemic disaster resulted in the eruption of a massive migration crisis involving around 50 million workers from Mumbai in Maharashtra and Delhi to states like Uttar Pradesh, Madhya Pradesh, Odisha, West Bengal, and Bihar (*The Hindu*, 2021). This resulted in the mass exodus of migrant workers from the states of Maharashtra, Delhi, and Punjab to their native states, thereby precipitating the crisis of migrant workers on a large scale. All such negative developments were sufficient to eclipse any economic growth in the country in months to come.

The exodus of migrant workers on a large scale resulted in the raising of a hue and cry over the assembly of lakhs of workers along with their families and small children who remained stuck in the middle of national highways and expressways. The problem remained unresolved for weeks because of complete failure of the administration in arranging any type of road or rail transportation for safe exit of migrant workers because of stringent lockdown conditions. The crisis had snowballed into a humanitarian crisis, resulting in the deaths of several workers on roads and rail tracks as they were forced to undergo hardships in summers and were left to suffer by spending several nights in the open on highways without proper food and water. The precipitation of a humanitarian crisis exposed the serious weaknesses of federal as well as state administrations in the handling of a pandemic disaster in a country that is world's second largest populated country. It resulted in inviting severe criticism at the domestic as well as international levels. The problem took an ugly turn when thousands of workers began walking down to their villages covering a distance of more than a thousand miles, often involving several weeks of on-foot journey, at times without water and food. An Indian national leading daily *The Hindu*, dated November 24, 2021, highlighted the severity of hunger problem during the pandemic disaster and stated that 80% of India's population is solely dependent on federal schemes for free distribution of food grains till March 31, 2022 (*The Hindu*, 2021). One of the consequences of the prolonged losses to business and industries since the outbreak of COVID-19 was the rise in demand for an economic package being given to businesses comprised of micro-, semi-, and medium enterprises (MSMEs) by the government.

Government of India Measures for the Handling of COVID-19 Pandemic Disaster

Administrative and Financial Measures

The Government of India had operationalized the important provisions under Section 10(2)(h) and (i) of the National Disaster Management Act (NDMA) 2005 for containing of pandemics in all 28 states and 8 union territories of the country. The Indian government, since the invoking of NDMA 2005, introduced an “all-of-the-government approach” for handling of the pandemic. The Prime Minister’s Office

(PMO) reviewed the situation on a regular basis and made constructive interventions whenever the need arose. An innovative approach was adopted by the formation of 11 Empowered Groups for taking up speedy decisions and ensuring effective implementation of various response measures (NDMA, 2020). The immediate measures in response to the pandemic included the announcement of financial package for mitigating the problems of masses by the federal government besides enforcing lockdown provisions, social distancing norms, self-isolation, self-quarantine, declaration of containment zones, and putting in place adequate health infrastructure. As a result, to the hue and cry raised by opposition political parties and civil society organizations over migrant workers crisis on a countrywide basis, the Government of India announced a fiscal stimulus to a tune of Rs. 1.75 lakh crore besides other measures like reduction in corporate tax and extension in moratorium period to business houses and traders (NDMA, 2020). Some important policy measures announced are discussed subsequently.

- The financial package titled *The Pradhan Mantri Garib Kalyan Yojana* (PMGKP) announced by the federal government was targeted largely toward the poor migrant workers who had become jobless during national lockdown as a welfare measure. *The Pradhan Mantri Garib Kalyan Yojana* (PMGKP) package was an important financial intervention involving a sum of Rs. 1.70 lakh crore for the poor to help them fight the battle against the Coronavirus (PIB, 2020). The package that was announced in March 2020 was expected to help the poor by giving them the much-needed food and instant cash for meeting their other essential expenditure. The other highlights of the package announced on March 30, 2020, are as follows (PIB, 2020):
 - The government announced an insurance cover of Rs. 50 lakh for health workers in case of their death while on duty till April 2021.
 - The federal government decided to provide 800 million poor people 5 kg of food grains under the *Pradhan Mantri Kalyaan Anna Yojna* besides 1 kg of pulses free of cost from March 2020 till March 2022, with three extensions in November 2020, and May and June 2021.
 - Providing free food grain to 800 million people for close to 24 months continuously by the federal government was one of the largest food relief programs announced ever since India's independence in 1947. It must be mentioned here that this single measure of the federal government saved the lives of thousands of people across the country that helped the poor in maintaining their immunity level against the COVID-19 infection.
 - Another highlight of the grand package announced was the decision to transfer Rs. 500 directly to the bank accounts, known famously as the *Jan Dhan Account*, of poor needy females numbering 200 million in the entire country for six consecutive months.
 - The federal government also announced an increase in *Mahatma Gandhi National Rural Employment Guarantee Act* (MNREGA) wage to Rs. 202 a day from Rs. 182, which was to provide immediate help to 136.2 million families.

- The announcement of a relief of Rs 1000 to 300 million poor senior citizens, poor widows, and poor disabled was another hallmark of the financial package that was announced by the federal government.
- In order to provide relief to the farmers of the country, the government also paid Rs. 2000 in cash as a direct benefit to transferee (DBT) to farmers in the first week of April 2020 under the existing PM Kisan Yojana to benefit 87 million farmers.
- The federal government gave strict orders to the state governments to use the Building and Construction Workers Welfare Fund to provide relief to the construction workers.

The decision of providing food grains to the masses on account of the COVID-19 pandemic has been the most successful policy measure that paid rich political dividends to a political party that has been ruling at the center as well as state level in the recently concluded state assembly elections of February–March 2022.

Shielding Businesses: Government's Action Plan for Micro, Small, and Medium (MSMEs) Enterprises

In the light of negative fallouts on account of the exodus of workers and forced lockdown leading to a prolonged closure were sufficient for making a huge dent in the output of MSMEs, which are known for acting as a bulwark for the Indian economy. The MSMEs in India faced closures largely because of the reduction in orders, besides staff suffering on the account of COVID-19 infections and isolations. Many MSMEs experienced reduction in revenues through 2020–2021. Most of the MSMEs in India experienced lower productivity because of the nonavailability of temporary workers on a daily wage basis as most of the migrant workers working in MSMEs had left for their villages. As a result, MSMEs were forced to shut down their plants and run them at half capacities so as to match with reduction in demands or overcome shortage of workers. The International Labour Organisation Report highlighted the problems being faced by 1000 MSMEs surveyed from eight countries across four continents (ILO, 2020).

On demands being made from several quarters like industrial houses, various industries, and commerce chambers of the country, the union government announced a series of measures for the MSMEs only. The Ministry of MSMEs, Government of India, released a policy guideline document titled “Efforts to Fight COVID-19 by Ministry of MSME & its Attached/Subordinate Organisations” containing several measures for the affected businesses. The measures taken by the Government of India in this direction covered issues like improving cash flows by providing interest-free loans; payment of cash for loss of wages to workers; and dissemination of information to MSMEs for dealing with the COVID-19 pandemic besides training MSMEs for producing new products such as sanitizers, PPE kits, face masks, and other essential medical equipment for which demands during the pandemic had increased (MSME Report, 2020–21). The measures announced by the Government of India for the MSMEs were expected to help MSMEs to sustain their businesses on

a medium- to long-term basis. It is important to mention here that one of the important positive fallouts of the COVID-19 pandemic disaster on Indian MSMEs was that many of the MSMEs with government support switched over to manufacturing medical products such as N-95 face masks, PPE kits, sanitizers, gloves, and face shields for which there was a huge surge in global demands for such medical products besides pressure for meeting domestic demands. The net result has been that many innovations were experienced on the part of Indian business houses that had a positive impact on sustenance of business on a long-term basis besides an increase in their business turnovers.

The role of the Reserve Bank of India also has been important for the sake of fighting COVID-19 fallouts. The RBI Governor Shaktikanta Das introduced new measures to tackle the second wave of COVID-19 on May 5, 2021. The governor announced on-tap liquidity funding of Rs. 50,000 crore as a credit facility to be offered to banks, non-banking finance companies (NBFCs), and other lending institutions. This funding support has been in the form of incentivized loan schemes that was offered to the enterprises engaged in the healthcare, manufacturing, and logistics sectors. It was added that vaccine manufacturers, hospitals, medical equipment makers, as well as patients shall be offered loan schemes by the private and public sector banks, NBFCs, micro finance institutions (MFIs), and small finance banks (SFBs). As analyzed in the preceding paragraphs, the government had enough reasons to remain satisfied that losses to the economy will be halted after the disbursal of relief package to the business houses and other entrepreneurs. However, the overall predictions about the economy were not very satisfactory as discussed subsequently.

Repercussions of Prolonged Lockdown on Businesses (Post-Financial/Relief Package)

Reports of economic think tanks like the Centre for Monitoring Indian Economy (CMIE) cast serious doubts about the resumption of normal operations on part of a large number of companies expected to be capital-intensive sectors such as real estate, consumer durables, and jewelry were to see a considerable decline in their demand for several months to follow. Data from the Consumer Pyramid household-level survey of the CMIE showed a loss of 122 million jobs in India during the first month of the pandemic. “The employment rate was 39.1% on 22nd March, 2020 which declined to 26.4% on 3rd May, 2020 before improving to 37.8% on 21st June, 2020. A survey by Azim Premji University showed that 57% of rural workers and 80% urban workers lost work during lockdown. Around 77% of the households consumed less food than before. Thus, livelihoods of millions of workers were affected and it would take longer time for them to recover from this economic shock” (Vyas, 2020).

Mahesh Vyas, a noted economist, further added that “a large number of firms will however struggle to survive. They have to pay rents, salaries, debts etc., even as their revenues will steadily keep falling as people change lifestyles and cut back on expenditures. Many of these firms will end up defaulting on their loans due to

persistent fall in revenues" (Vyas, 2020). Going by the forecasts made by CMIE, one could conclude that besides domestic problems, the Indian economy was to continue to get affected by the disruptions in global supply chain, leading to recession for the next several months to follow.

Major Policy Interventions for Sustaining of Business

India's Resolve Under "Self-Reliant India" (*Aatma Nirbhar Bharat*) Program

Despite the continuance of border crisis with China, India in tune with its foreign economic policies undertook several federal legislative measures so as to emerge as an alternative global supply chain hub, and it announced "Self-reliant India" (*Aatma Nirbhar Bharat*), a policy framework for making India a self-reliant country. There was a line of thinking that COVID-19 has thrown up important opportunities for the country. India has the potential to emerge as an alternative to China against whom the Western world was skeptical because of its alleged role in not alerting the world about the leakage of Coronavirus from Wuhan Lab in October/December 2019. As discussed in the earlier MSME section that the Indian government gave a number of incentives to companies for switching over to producing face masks, PPE kits, and sanitizers for which there was a surge in global demand. The pandemic disaster mitigation plan provided the federal government an opportunity to get a series of economic, banking, and labor laws enacted, including the farm laws, during the pandemic despite opposition parties accusing the government of bypassing parliamentary norms of not having carried out intense discussions over important bills inside the parliament.

Prime Minister Narendra Modi on May 12, 2020, announced the special economic and comprehensive package of Rs. 20 lakh crore, whereby he called for *Aatma Nirbhar Bharat* or Self-Reliant India Movement. The five pillars of *Aatma Nirbhar Bharat* – Economy, Infrastructure, System, Vibrant Demography, and Demand – were also put forward by the prime minister (PIB, 2020). However, prolonged lockdown and shutting down of several MSMEs, tour, travel and entertainment industry, including job losses on part of millions of people, resulted in a major embarrassment for the federal government.

Challenges for Policies Dealing with Pandemic Disaster

Policy Slippages

Things happened contrary to the Indian government's line of thinking as it was upbeat after the announcement of a big relief package for the micro, small, and medium sector under the impression that relief package will lead to turning around of MSMEs. The government was also hopeful that any turning around in the MSME sector has the potential to strengthen the socioeconomic growth of the nation by

providing solution to the unemployment problem of the country at local level. The policymakers were of the view that such measures will decrease the inequalities between the geographic areas in terms of economic imbalances. Further, the inclusive pattern of sustainable growth of the MSME sector will provide employment opportunities at the local level, which will lessen the population load at megacities. It would not be wrong to say that the COVID-19 pandemic preceded slowing down of India's overall GDP growth, and unemployment had emerged as one of the worst challenges to the country's economy.

While governments world over, including the Indian government, were busy mitigating the challenges of COVID-19 by announcing a series of measures for stopping the spread of the pandemic and getting the rehabilitation program for migrant workers implemented, India got stuck with its largest northern neighbor China over precipitation of a border crisis in East Ladakh in May–June 2020, leading to the deaths of more than two dozen Indian soldiers in June 2020. The crisis in the Line of Actual Control (LAC) area continues even as of today in April 2022. The crisis in the LAC area has witnessed mobilization of more than a hundred thousand Chinese soldiers faced with around 60,000 Indian soldiers with heavy weaponry and setting up of several hundred permanent structures on both sides of LAC, thereby turning the Line of Actual Control (LAC) area into a permanent battle front as of April 2022. It can be added here that even after 22 months of Galwaan crisis and the culmination of 15 rounds of talks for de-escalation and disengagement of forces from the LAC, stalemate continues between India and China over complete withdrawal of forces pre-May–June 2020 period that has not taken place yet. The developments in Afghanistan after the exit of US forces in August 2021 have also contributed to disturbing the peace and security in the South Asian subcontinent.

All these developments severely curtailed India's capacity of handling the COVID-19 pandemic for the next several months to follow. It is unfortunate to mention here that while governments are today still busy handling the third phase of the COVID-19 pandemic in January–February 2022, another war between Russia and Ukraine had started in March 2022, raising a serious disruption in international order. A vertical split has taken place between countries having faith in the maintenance of a liberal international order versus those opposed to the existence of a liberal international order as champions of authoritarian policies. The ongoing war between Russia and Ukraine has led to the announcement of imposition of several economic sanctions by the United States and its western allies against Russia, which in turn has resulted in a panic situation in stock markets world over besides raising the prices of oil and gas across the world.

Election Results in Five Indian States Validated the Satisfaction of Beneficiaries of Government Measures in Post-COVID-19 Situation

It is pertinent to mention here that a prominent think tank of India, the Centre for Study of Developing Societies-*Lokniti* (CSDS-*Lokniti*), which is known for conducting pre-poll and post-poll surveys in India for the past several decades,

validated the satisfaction of average beneficiaries of government measures implemented during and after the COVID-19 situation in all five states of India that underwent State Assembly Elections in February–March 2022. Going by the media reporting for the past several months, there was a strong undercurrent that the ruling Bhartiya Janata Party (BJP)-led governments in at least four Indian states – Uttar Pradesh, Uttarakhand, Manipur, and Goa – will lose State Assembly Elections in February–March 2022 massively because of anti-incumbency factor attributed to the mishandling of the COVID-19 pandemic. However, as per the post-poll survey conducted by CSDS-Lokniti in the largest populated state of India, i.e., Uttar Pradesh having a population of 230 million, where the highest number of COVID-19 deaths took place, the ruling BJP party won elections and formed government again by overcoming anti-incumbency factor in all four states – Uttar Pradesh, Uttarakhand, Goa, and Manipur, except Punjab state (*The Hindu*, March 12, 2022). As per the CSDS-Lokniti post-poll survey, people in all five states expressed their satisfaction with the union government's measures of cash transfer and distribution of food grains to almost 80% of households in the country, including states where elections were held in February–March 2022. It was surprising to know from the CSDS-Lokniti survey that people exonerated the government of its mishandling of the COVID-19 pandemic disaster, telling that it was divine force that was responsible for the outbreak of the pandemic for which no government can be blamed (*The Hindu*, 2022). Hence, the majority of people voted for the same ruling BJP party. Going by the outcomes of March 2022 elections, it can be inferred that the people of the country are ready to forget the past mistakes of government agencies and once again are ready to refocus their energies on building a safer, economically sound, and disaster-resilient India.

Conclusion

The COVID-19 pandemic resulted in major disruptions in a country, which is the world's second largest populated country. The disruptions were attributed to the mass exodus of migrant workers resulting in a huge shortage of workforce all over the country. The largest sufferers were those working in the construction sector, transportation sector, and unskilled manufacturing sector. The prolonged lockdown broke the financial spinal cord of most of the MSME sector. There has been a long spell of instability in the stock market. A large amount of FII investment left the country. Even the foreign exchange reserve of the country came down by several billion dollars. Different restrictions on international trade also led to a massive disruption in global supply chains. On the whole, economy got badly affected, and it aggravated the unemployment crisis besides the demand problem. Government agencies tried their best to cope with the situation but the problem was monstrous and corresponding relief measures were inadequate. The personal losses on part of the average masses were immense. To date, masses are passing through the psychological trauma of COVID-19 pandemic in the country. People are guilt-conscious about having failed in saving precious lives of their family members/relatives, but

because of inadequate health infrastructure in the country millions of lives could not be saved. At times, even a dignified burial could not be given to the departed souls.

Things might be getting normalized as we approach April 2022, but the memories are still fresh. Innovation in the case of digital platforms besides development of several versions of COVID-19 vaccines has been the highlight of the entire pandemic period. However, children world over have lost immensely as they remained out of school education process for almost 2 years, thereby crippling their several learning abilities on a long-term basis. The pandemic disaster mitigation plan provided the federal government an opportunity to get a series of economic, banking, and labor laws enacted, including the farm laws, during the pandemic despite opposition parties accusing the government of bypassing parliamentary norms of not having held intense discussions over important legislative bills. India's problem had got further worsened because of the beginning of a year-long farmer's agitation demanding repealing of three federal farm laws also leading to complete rail and road blockades in and around India's capital city of Delhi. It can be concluded that the COVID-19 pandemic was indeed a disaster of the twenty-first century that must have reminded humanity across continents to still remain awakened to the idea of not destroying the planet before we ourselves get destroyed.

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How Food and Beverage Industry Overcome the Impacts of the COVID-19 Pandemic in Hong Kong?

164

Man Chung Wong and Huong Ha

Contents

Introduction	2486
The COVID-19 Pandemic and Hong Kong's F&B Industry	2487
Measures Taken to Address Issues Associated with the COVID-19 Outbreak	2487
Disaster Risk Management Framework	2489
Findings and Discussion	2490
Four Stages of Disaster Risk Management	2490
F&B Industry and the COVID-19	2491
Managerial and Practical Implications	2492
Conclusion	2493
References	2494

Abstract

The food and beverage (F&B) industry in Hong Kong has faced a very difficult situation during the pandemic. Dining in F&B establishments is considered one of the major channels to spread virus as people must remove face masks when they are having meals. Lockdown's direct impact on F&B industry has been phenomenal. Thus, there have been much restrictions to the F&B industry during this time. In 2020, the receipt value index of F&B establishments dropped by nearly 30%, but the receipt value index increased by 43% in Q3 of 2021 as social distancing measures have been relaxed. It showed that the industry could overcome the impact of the COVID-19 pandemic by implementing appropriate approaches. Thus, this chapter aims to review the COVID-19 impacts on the F&B industry and the measures imposed by the Hong Kong SAR Government on the operations of the F&B industry. It also discusses how the F&B industry in Hong Kong responds to the impacts of the COVID-19 pandemic. Secondary data

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used in this chapter were collected from government reports, publications by public agencies and trade associations, etc. Overall, it is important to analyze how the F&B industry in Hong Kong has responded to the pandemic to stay afloat and what factors can contribute to help F&B establishments recover from the COVID-19 pandemic.

Keywords

F&B industry · COVID-19 pandemic · Disaster risk management · Crisis · Hong Kong

Introduction

The COVID-19 pandemic first started in late December 2019 and quickly spread all over the world in 2020. It has not only been a health issue but has also caused much adverse impact on the global economy as well as the daily life of people across countries. It has been a “disaster” to the whole world.

Hong Kong, as an international city, has been inevitably affected by the unfavorable impact on the global economic environment. The economy in Hong Kong was contracted by 5.5% in 2020 (Hong Kong SAR Government, 2021a). It was noted that the impact of the COVID-19 pandemic on the economy of Hong Kong was across all industries and sectors and at both national and international levels.

In order to prevent the spread of COVID-19, the Hong Kong SAR Government has implemented various social distancing and safe management measures, for example, prohibition of large group gathering, etc. (Hong Kong SAR Government, 2021b). Most of the business sectors have been greatly affected by the pandemic situation. Food and beverage (F&B) establishments (e.g., restaurants, food courts, etc.) have been considered as one of the major platforms in spreading virus as people could not wear face masks when dining at F&B establishments. Hence, some strict measures have been imposed on the operations of the F&B industry, including limited number of customers per table, limited total number of customers, and also restriction of the opening hours for dine-in services, etc. Thus, the value of receipts or the revenue in the F&B industry decreased by 29.4% in 2020 (Hong Kong SAR Government, 2021c).

The pandemic situation in Hong Kong was alleviated in the second half of 2021. The number of confirmed cases mainly was imported cases since 1 July 2021. There were only a few local cases from 1 July to 13 November 2021 (Hong Kong SAR Government, 2021d). These cases were discovered early, and they were under quarantine, and thus the possibility of spreading the virus to others was not high. Given the situation, F&B establishments have taken several measures to manage the adverse impacts caused by the pandemic in order to stay sustainable. As a result, the value of receipts in the F&B industry increased 10% and 43.8% in Q2 (the second quarter) and Q3 (the third quarter) of 2021 (comparing with those in 2020), respectively. The actual value of receipt in Q3 of 2021 was just 5.6% less than Q4 of 2019

(i.e., before the outbreak of pandemic) (Hong Kong SAR Government, 2021d). It showed that the F&B industry has gradually recovered from the impact of the COVID-19 pandemic.

The following sections are intended to illustrate how the Hong Kong SAR government has prepared for disasters and crises and the measures stipulated by the government to respond to the COVID-19 pandemic. It is important to discuss such measures as they have affected the operations of the F&B industry. Specific measures taken by the F&B industry to mitigate the negative impact of COVID-19 pandemic are also discussed. In addition, this chapter also proposes some recommendations for the industry to deal with future crises or pandemic situations.

In general, the global economy and Hong Kong's economy become uncertain under the current situation when Hong Kong is overwhelmed with new waves of COVID-19. Thus, it is important to understand the effectiveness of current measures taken by the F&B industry in order to propose how the industry can better prepare for the current and future outbreaks.

The COVID-19 Pandemic and Hong Kong's F&B Industry

The F&B industry plays an important role in Hong Kong's economy. Although the contribution of the F&B industry to the GDP was around 1.9% in 2019 (Hong Kong SAR Government, 2021e), the percentage of employees in accommodation and food services sectors was 7.6% of the total employees in 2019, which was higher than the number of employees in the finance industry and the top five industries (Hong Kong SAR Government, 2021f). Thus, when the F&B industry faced difficult phase in the pandemic and decreased its revenue, it had a great impact on the unemployment rate in Hong Kong. After the outbreak of the COVID-19 pandemic, the number of employees in the industry was reduced to around 52,000 from 2019 to 2020, which was around 1.5% of the total number of employees in Hong Kong (Hong Kong SAR Government, 2021f). In other words, the F&B industry is a major player in the labor market in Hong Kong.

Due to the measures taken by the government and customers' declined incentives to dine in F&B establishments, the total revenue of the F&B industry declined from HK\$26,001 million in Q4, 2019, to HK\$19,729 million in Q1, 2021, and the F&B industry's unemployment rate increased from 5.2% to 11.3% (Hong Kong SAR Government, 2021c). This reflected that the F&B industry has faced many challenges in the pandemic.

Measures Taken to Address Issues Associated with the COVID-19 Outbreak

Since the confirmed case was reported on 23 January 2020 (Hong Kong SAR Government, 2021h), the Hong Kong SAR Government has taken various measures to prevent the spread of the virus. Due to the unfamiliarity with the virus and the

scale and the prolonged pandemic, Hong Kong people felt stressful and anxious (Kwok et al., 2020), and they have taken many measures, at the personal level, to mitigate the impact of the virus. As mentioned earlier, the measures taken by the Hong Kong SAR Government deemed effective as of the end of 2021 as the number of local cases were three only from 1 July to 13 November 2021 (Hong Kong SAR Government, 2021d).

The Hong Kong SAR Government has imposed several measures to restrict the operational mode and working arrangements, including the operations hours of dine-in services, the number of customers per table, and the total number of customers in each outlet (Hong Kong SAR Government, 2021g). Those measures have been changed from time to time based on the pandemic situation in Hong Kong. As a result, the F&B industry has tried to adapt to government regulations in terms of changing the operational arrangements, and it has become more flexible and agile in the last two years.

One of the objectives of the preventive measures is “to clear infected case” in Hong Kong. Therefore, some of the measures were very strict and mandatory. For example, the period of quarantine measures for inbound travelers is around 14–21 days based on the place where travelers board the plane (Hong Kong SAR Government, 2021i). This is one of the longest quarantine periods in the world. In addition, the Hong Kong SAR Government has also imposed restrictions on dine-in services at F&B establishments in Hong Kong, including the operating period for dine-in services, the maximum capacity of customers for dine-in services, the number of customers per table, and the requirements for air-conditioning systems, because a number of confirmed cases were considered as being infected when dining in F&B establishments. However, in some periods of time, some strict measures were imposed that aroused a lot of negative comments and objection by stakeholders, for example, no dine-in service provided by F&B establishments. However, the Hong Kong SAR Government immediately lifted the ban (Yu, 2020). Yet, many preventive measures, including limiting the maximum capacity of F&B establishments, vaccination requirements on customers and staff, the number of diners per table, the functions and setup of air-conditioning systems, and others, still affected the operations and revenue of the F&B industry during the pandemic period.

F&B establishments have been considered one of the major channels to spread the virus of COVID-19 because customers must remove face masks in the F&B outlets when having meals. As a results, some customers have not been willing to dine in. To respond to the current situation, some F&B establishments took initiatives to implement several specific measures to mitigate the impact of the government’s safe management measures. For instance, F&B establishments’ owners and managers put some plastic boards on large tables to subdivide the large tables into several small tables in order to accommodate more customers as well as minimize contact among customers. Customers were encouraged to use hand sanitization when entering the premises. In addition, they provided more discount for take-away orders in order to attract customers who feared dining in the premises. Some F&B establishments provided instructions on how to cook at home as their food could only be served and consumed immediately right after being cooked.

Disaster Risk Management Framework

Disasters, including unexpected and unavoidable events, could be man-made or natural. Both types of disasters would produce huge negative impact on society (Faulkner, 2001; Ha, 2014a, b; Ha et al., 2019, 2020; Moore & Lakha, 2006). In view of the great damages caused by disasters, academics, researchers, and industry practitioners always ask stakeholders for better preparation and readiness to deal with such disasters. Khorram-Manesh (2017) suggested that preparation, damage mitigation, rehabilitation, relief, and reconstruction could be included in the disaster risk management cycle. Other scholars suggested similar stages and elements in the disaster risk management cycle (Oktari et al., 2020; Alexander, 2019; Pheng et al., 2006), for example, disaster preparation, relief, reconstruction, and damage mitigation. The United Nations (2004) also developed a framework for disaster risk reduction, including preparedness, early warning, risk assessments, recovery, knowledge development, and responses. International professional bodies, such as the International Organization for Standardization (2021), also developed standards, for example, ISO22320:2018 (Guidelines for Incident Management), for organizations to adopt and to prepare emergency management. This chapter adopts the simplified four-stage framework of disaster risk management, namely, mitigation/prevention, preparedness, response, and recovery, discussed by the World Health Organization (n.d.) (Fig. 1).

It is important for the governments, industries, and organizations to well prepare for risk and managing disasters because individuals rely on the instructions and advices from the authorities and relevant organizations during the occurrence of disasters. It was highlighted that individual preparedness could help to reduce the damages caused by disasters (Adams et al., 2019; Sawalha, 2020).

Hong Kong went through the outbreak of severe acute respiratory syndrome (SARS) in 2003, and thus the Hong Kong SAR Government and the Hong Kong people have vast experience in handling the issues of containing the spread of virus. However, the speed, COVID-19 variants, and the channels of spreading of the COVID-19 virus are unconventional and thus have affected the effectiveness of the preparation taken by the respective stakeholders.

In this chapter, secondary data was collected for analysis. The data was gathered from the publications of the Hong Kong SAR Government, international organizations, public agencies, and trade associations. All data is available to the public. Special care was taken to avoid ethical issues arising from data collection, use, analysis, storage, and retrieval.



Fig. 1 Four stages in disaster risk management

Findings and Discussion

Since the outbreak of the COVID-19 in early 2020, Hong Kong's economy has suffered, and the gross domestic product (GDP) decreased by 5.5% in 2020 (Hong Kong SAR Government, 2021a). The private consumption in 2020 decreased by 9.4% which, in turn, greatly affected the F&B industry. In addition, the preventive measures imposed on the F&B industry has heightened the burden of the industry as the capacity and operating hours have been greatly reduced besides a small demand. Thus, the revenue of the F&B industry decreased by 29.4% in 2020 (Hong Kong SAR Government, 2021c).

Even though the measures taken by the Hong Kong SAR Government seem strict, they were considered effective with regard to managing the pandemic situation. Most of the confirmed cases were from inbound travellers, and there were just a few local cases (Hong Kong SAR Government, 2021d). Given the stable situation, the Hong Kong SAR Government removed some of the preventive measures on the F&B Industry with some conditions, for example, F&B establishments' employees must be fully vaccinated, employees and customers must use the "LeaveHomeSafe" mobile application, etc. When the F&B establishments fulfilled the stipulated conditions, the operating time and the maximum capacity can be restored.

Four Stages of Disaster Risk Management

The disaster risk management framework (Fig. 1) discussed previously is used to analyze the measures and responses by the Hong Kong SAR Government to the COVID-19 pandemic.

In the first stage of risk mitigation or prevention, the Hong Kong SAR Government has taken actions in advance. The preventive measures might not be very effective in the early stage. Thus, the government has adjusted the respective policies and imposed more restrictive measures in order to reduce the number of confirmed COVID-19 cases in Hong Kong. Some of the restrictive measures might affect the life of many people in Hong Kong, both locals and foreigners, for instance, the extension of quarantine period for inbound travellers and those who have close contacts with infected cases, the requirements to undergo COVID-19 testing, the introduction of the vaccination program, etc. (Hong Kong SAR Government, 2021b, 2021i). This aimed to mitigate the impact of the COVID-19 pandemic in Hong Kong. This demonstrates the ability and willingness to fulfil one of the stages of the disaster risk management process which is risk mitigation. Therefore, the number of confirmed cases and death cases did not increase significantly comparing with those in other countries (World Health Organisation, 2021). As the situation became stable and normal in Hong Kong, the Hong Kong SAR Government relieved some of the measures, and the life of Hong Kong people returned to the normal situation, except outbound travel. As a result, private consumption in Q2 and Q3 of 2021 increased by 6.3% and 6.5%, respectively (Hong Kong SAR Government, 2021c), and the F&B industry started picking up in sales.

The second stage in the disaster risk management framework is preparedness. Even though the outbreak of the COVID-19 pandemic was unexpected, Hong Kong had already prepared for the outbreak of similar situations after the SARS outbreak in 2003. Such preparation includes the establishment of an infection disease control center, investment in manpower, training for infection control, and increase in the stock of personal protective equipment (Hong Kong SAR Government, 2003). This aims to help Hong Kong to combat with the COVID-19 pandemic. Other than the government's measures, having gone through the SARS outbreak, F&B industry's employees have taken proactive measures to maintain personal hygiene during the COVID-19 outbreak, including wearing face masks whenever necessary, using hand sanitizer, keeping social distances, etc.

In the third stage of response, the Hong Kong SAR Government has addressed the issue promptly by the implementation of social distancing measures and the restriction of inbound travellers. In addition, the Hong Kong SAR Government has searched and purchased medical equipment from around the world as well as provided subsidy for local manufacturers to produce epidemic preventive necessities such as face masks.

In the last stage of recovery, to revive the economy from the outbreak of COVID-19, the Hong Kong SAR Government has introduced several policies to stimulate private consumption and protect jobs, including *Consumption Voucher Scheme* and *Employment Support Scheme* (Hong Kong SAR Government, 2021j, k). The effectiveness of these two schemes could be reflected via economic growth. The GDP in the first three quarters in 2021 increased to 7.7%. At the same time, the unemployment rate in 2021 decreased from 7.2% to 4.1% (Hong Kong SAR Government, 2021l, o). It exhibited that Hong Kong's economy has been rebounding after being hit by the *COVID-19* pandemic (Lee, 2021).

F&B Industry and the COVID-19

Besides measures introduced by the Hong Kong Government, the F&B industry has also taken industry-specific measures to mitigate the impact caused by the COVID-19 pandemic. As dine-in service has been restricted by safe management measures and other government policies, and the demand for dine-in has also declined, the F&B industry has tried to expand their take-away services in order to sustain their business. Due to manpower shortage, food quality, and cost considerations, few F&B establishments focused on take-away service in the past. However, they had to look for alternative ways to maintain their business. Recently, online shopping has become a popular trend, and more Hong Kong people have made online purchases, especially during the pandemic. More than 2.6 million Hong Kong people have experienced in online shopping, and around 650,000 people have purchased and/or ordered food online (Hong Kong SAR Government, 2021m). In addition, some online food delivery companies, such as Foodpanda and Deliveroo, have expanded their operations in Hong Kong. This has helped F&B establishments deliver their food to their customers and to reduce the manpower requirements.

F&B establishments have also rearranged the setup and layout of their outlets/premises to fulfil the requirements stipulated by the government and cater to the needs of customers as well as create a safe dining environment for their customers and employees. Moreover, many establishments have modified their cooking styles and food packaging in order to maintain food quality for take-away service. Some establishments have reduced the floor areas and the size of the tables in order to contain costs. The number of licences issued to general restaurants and light refreshment restaurants increased at the end of 2020 (Hong Kong SAR Government, 2021n). It demonstrated that the F&B industry has gradually recovered. The recovery of the F&B industry from the impact of the COVID-19 pandemic is supported by the statistics published by the government. The revenue of F&B establishments in Q3, 2021, was around 5% less than the one in Q4, 2019 (before the COVID-19 outbreak) (Hong Kong SAR Government, 2021c). It was expected that the F&B industry would reverse to the normal situation by the end of 2021 (Magramo, 2021).

Overall, the Hong Kong SAR Government has prepared for future pandemics after the SARS outbreak in 2003. As the preparation for risk and damage mitigation was in place and well organized, the implementation of relevant policies was more effective. Importantly, the F&B industry has demonstrated their resilience and adaptability in terms of changing their operating mode, cooking styles, food packaging, and other arrangements to respond to changes in the external environment. It should be noted that technology adoption and the internet have greatly contributed to building the F&B industry's capabilities that enable it to stay competitive and be sustained. The emergence of online food delivery applications and the trend of online shopping have also helped the industry expand their take-away service. However, the effort and activities of the F&B industry have centered around the response and the recovery stages (the third and the fourth stages) in the disaster risk management framework.

Managerial and Practical Implications

Disasters and crises could occur anywhere and at any time. It is very difficult to predict the occurrence and reoccurrence of such incidents. A good understanding of disaster risk management would help government officials, managers, and other stakeholders well prepare for disasters and crises. Even though preparation might not be able to prevent damages, it could help countries and industries mitigate the damages caused by such disasters or crises. At the industry level, the F&B industry needs to prepare for future disasters in a more proactive and effective manner. The industry needs to start the preparation from the mitigation state (the first stage of the disaster risk management process), and it should be ready to respond to disasters and crises any time.

In addition, the adaptability and flexibility of an industry and its members are very important in today's business environment. Technology innovation and implementation, including AI, big data, and data analytics, could help organizations to adapt to changes in the external and internal environment (Ha, 2014a, b). Thus, the

industry should encourage F&B establishments to increase technology adoption in order to lighten their manpower needs in terms of acceptance and delivery of orders, creating new menus to provide more options for take-away orders, etc. Operational analytics should also be applied to help them improve their operational efficiency, especially during times of crisis.

In order for F&B establishments to adopt technology to respond to adverse situations in an innovative manner, for example, improving packaging which can help to maintain the quality of food when delivering to a remote destination, improving the customer queueing system, calculating the duration required for dining in by each customer, etc., trade associations in the F&B industry can help to coordinate and support the development and implementation of industry-specific technology. Importantly, training and education can help operators of F&B establishments to be ready for change and be more confident in operating new technology. Training and retraining employees are also critical in improving employees' competency and skill sets that, in turn, can help them improve their employability.

Finally, some big establishments faced more difficulty during the COVID-19 pandemic because their operational costs were too high and take-away services could not cover the sharp decrease in their revenues in dine-in services. As a result, it is important for F&B business owners and managers to look for alternative business opportunities as well as become more adaptive and flexible in doing business, i.e., exploring business diversification.

Conclusion

Disaster risk management is very important in today's business. This chapter discusses how the F&B industry has been impacted by the COVID-19 outbreak and safe management measures. It also elaborates how the F&B industry has responded to the COVID-19 pandemic by complying with the measures stipulated by the Hong Kong Government as well as adopting measures that are specific to the industry. It should be noted that early and ongoing preparation for all the four stages of the disaster risk management framework could help the country and the industry to combat the pandemics and stay competitive during the turbulence.

One of the limitations of this study is data collection. The data collected in this chapter was up to the end of 2021. As the COVID-19 pandemic situation has been ongoing, new situations will emerge, and new data need to be gathered. This limitation can be addressed by longitudinal research studies in this area. Another limitation is the measurement of the effectiveness of the measures adopted to respond to the pandemic. Safe management measures have been implemented across F&B establishments and across sub-sectors (e.g., food delivery, food catering, etc.) in the F&B industry. However, each sector may require specific measures. A measure may be effective in one sector, but it may not take effect in others. Thus, further research should examine the suitability and effectiveness of common measures implemented across sectors and specific measures implemented by individual sectors.

Finally, it is critical to frequently review the measures adopted by the F&B industry in a country and to examine the effectiveness of the measures as such review can help the government, the industry, and other stakeholders to revise them in order to deal with the latest development of the pandemics. Due to the ever-changing nature of the disasters and crises, the measures which have been effective in the past or at the present may not be relevant to address the situations in the future. Therefore, continuous evaluation and revision of the policies and measures could help all stakeholders to effectively respond to disasters and crises as well as mitigate potential and actual damages to people, business, and industry.

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Behavioural Insights, Organizational Resilience, and Disaster Preparedness

165

Yuan Zhi Seah and Huong Ha

Contents

Introduction	2498
BI and Nudging	2499
Disaster Preparedness	2500
BI, Organizational Resilience, and Disaster Preparedness	2501
Anticipation	2502
Coping	2504
Adaptation	2505
Conclusion	2506
References	2506

Abstract

Massive and unpredictable business disruptions caused by waves of conflict, crises, and disasters reinforce the need for businesses to take on a proactive approach to disaster preparedness. Failure to do so will result in a loss of market share and customer goodwill, damaged reputation, and regulatory and legal liabilities. Considering that high-stake and difficult business decision-making often relies on mental shortcuts or heuristics, behavioral approaches to enable businesses to prepare for disasters are required. Behavioural Insights' use of behavioral science to explain and alter patterns of behavior can be an important tool in business disaster preparedness. In the business context, the use of Behavioural Insights has been found to increase employment rate, retirement savings, emergency agency response effectiveness, workplace flow, and acts of

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prosociality. In this chapter, we focus on how BI can help businesses build greater organizational resilience through interventions and nudges before, during, and after a disaster. We conclude by calling for the need to consider the types of business (e.g., SMEs versus MNCs) when planning BI interventions for disaster preparedness.

Keywords

Behavioural Insights (BI) · Business continuity (BC) · Disaster preparedness · Nudging · Organizational resilience

Introduction

The *Global Crisis Survey 2021 Singapore Report* by PwC (2021) found that 15% of organization respondents had no plans for crisis response or business continuity and only 26% of them had a pandemic response plan. Furthermore, only 56% of organizations had a crisis response plan (PwC, 2021). When polled about the COVID-19 pandemic, only 35% of Singapore organizations felt that their organizations had a crisis response plan that was “very relevant,” i.e., most of them did not have plans that can help them effectively weather the crisis (PwC, 2021).

Businesses are increasingly subjected to disruptions (Worley & Jules, 2020). Due to the accelerated globalization of business activities and its accompanying complexities and uncertainties, it is often not possible to predict the nature, frequency, scale, and time of such disruptions (Park et al., 2016). To protect themselves against the outcomes of disruptions, businesses need to adopt proactive approaches that are informed by decision support frameworks (Sahebjamnia et al., 2015).

Having a well-prepared crisis management plan and up-to-date technology can help businesses reduce negative impact, minimize costs during crisis, as well as sustain their business operations (PwC, 2021). On the contrary, a lack of proactive business continuity and disaster response planning may lead to loss of reputation and market share, poor customer service, business process failure, increased regulatory liability, and increased resumption and restoration periods (Duchek, 2020; Sahebjamnia et al., 2015; Thun et al., 2011).

Central to the successful execution of crisis response plans is optimal decision-making (Duchek, 2020). Yet, research suggests that in time pressure situations (Blair & Mumford, 2007) and in the absence of complete information, people often resort to mental shortcuts, or heuristics, when making high-stake and difficult decisions, such as those relating to a disaster (Zhao & John, 2021). While we use heuristics most of the time (Marchiori et al., 2017) because of our lack of time, motivation, and mental resources to deliberately think through day-to-day decisions (e.g., what to eat for lunch), we have long known (e.g., Tversky & Kahneman, 1974) that heuristics can lead to cognitive biases and suboptimal decision-making.

More recently, the prospect of exploiting cognitive biases to enhance decision-making during disasters has been proposed (e.g., Linnemayr et al., 2016). Cognitive

biases can be utilized to change business leaders' perceptions and behaviors, which, in turn, can improve the quality of decision-making. This takes on the behavioral science approach, a growing effort to examining behavior through the combined lens of multiple fields such as economics, psychology, sociology, and neuroscience (Ruggeri et al., 2021). Findings from behavioral science are referred to as Behavioural Insights (BI).

According to Linnemayr et al. (2016), while BI has been adopted to make behavioral changes in a wide range of contexts, it has not been widely used in disaster preparedness and response. This is surprising as we have known since the 9/11 event that while dealing with, or replacing, lost and damaged equipment and infrastructure may be difficult, the largest loss involves people and their psychology (Castillo, 2004). The loss of key personnel due to the 9/11 event, either through death, injury, trauma, shock, or grief, made resuming business operations extremely difficult. Howe (2011) found, in a study of community businesses adapting to storm surge floods, that business leaders' responses to psychological questionnaire items measuring risk perception and information-seeking behaviors explained more than 50% of the business' current state of disaster preparedness. Indeed, the World Bank (2020) asserted that a behavioral approach could help countries understand and identify barriers to people's decision in terms of disaster preparedness, communication, evacuation, etc. Clearly, BI offers the potential to help businesses better prepare for and respond to disasters.

This chapter (i) provides an introduction to BI and nudging and (ii) discusses how BI and nudges can be used to aid business disaster preparedness through greater organizational resilience. This chapter seeks to provide insights to relevant stakeholders, including policy makers, businesses, investors, researchers, etc., and encourage further research into the use of BI to support business disaster preparedness.

BI and Nudging

Beyond explaining behavior, BI has been used to alter behavior patterns, often through *nudging* that was first defined as "any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives" (Thaler & Sunstein, 2008, p. 6). Multiple definitions of nudging have since been proposed (Zimmermann & Renaud, 2021). At its core, nudges are deliberate attempts to change behavior by "modifying the cues in the physical and/or social context in which they act" (Marchiori et al., 2017, p. 3). To qualify as a nudge, no options can be forbidden. Nor can economic incentives, such as rewards or penalties, be changed significantly.

This preservation of free choice, while steering the decision-maker toward a beneficial action, is known as *libertarian paternalism*. Libertarian paternalism is regarded as one reason why cross-cultural research have found evidence that nudges are widely supported and trusted internationally (Sunstein et al., 2018). It should be pointed out that BI is not just nudges (Hansen, 2019). Unlike nudge's libertarian

paternalism, BI interventions can involve forced choices and significant changes to economic incentives (e.g., rewards and punishments). BI interventions may also go beyond the Type 1, automatic thinking and decision-making processes that nudges are often dependent on (Banerjee et al., 2021).

BI interventions, which crucially are properly considered and implemented (de Ridder et al., 2020), may deliver results more quickly, potentially less expensively, and more effectively than traditional methods (Sunstein, 2014). Hummel and Maedche's (2019) quantitative review found a median effect size of 21% for nudges. Wu and Paluck (2021) found that the pasting of golden coin decals on the production floor of a Chinese factory led to an immediate and enduring drop in production floor clutter. Gosnell et al. (2016) found that giving fuel consumption feedback to Virgin Atlantic pilots led to a saving of \$553,000 over 8 months. Considering that the feedback system cost less than \$1000, the authors described the cost, relative to the benefit, as "astonishingly low" (Gosnell et al., 2016).

For disaster preparedness, BI offers the potential for more practical interventions. For example, one of the most consistent findings on disaster preparedness is that larger firms tend to be more prepared than smaller ones (Ha et al., 2022). Yet, this finding has no practical implication – changing the size of the firm is not a feasible way to better prepare companies for disasters. A more practical and actionable intervention for businesses might be to change risk perceptions (Howe, 2011), something we discuss in the second half of this chapter.

While BI intervention research is relatively new (Leong & Howlett, 2022), a considerable body of BI intervention research has already accumulated in the domains of health, environment, personal finance, energy use, and policy making (Hummel & Maedche, 2019). Following Linnemayr et al.'s call (2016), this chapter contributes to BI intervention research in the domain of disaster preparedness.

Disaster Preparedness

Countries worldwide have witnessed a multitude of natural and man-trigger disasters varying in types and scales. Such disasters have caused huge damages and disruptions to businesses and communities and resulted in loss of human life, as well as socioeconomic and environmental losses (Torani et al., 2019). Many researchers have observed that the lack of disaster preparedness has contributed to ineffective responses to disasters (Hoffmann & Muttarak, 2017; Kohn et al., 2012). Crucially, it is important to promote disaster preparedness to individuals, organizations, and countries as such multilevel preparations can facilitate individuals' and organizations' capability and resilience to respond effectively to disasters, in turn saving lives and resources (OECD, 2017; Paton, 2003).

In his book *Disaster Management: A Disaster Manager's Handbook*, published by the Asian Development Bank, Carter (2008) defined disaster preparedness as various "measures which enable governments, organisations, communities, and individuals to respond rapidly and effectively to disaster situations. Preparedness measures include the formulation to viable disaster plans, the maintenance of

resources, and the training of personnel” (p. 215). Dahlhamer and D’Souza’s (1997) definition is simpler: any activities that can save lives, and mitigate the adverse effect of disaster events, especially in the context of business preparation for disasters. Evidently, these processes require an all-of-company effort which involves all stakeholder groups and organizational functions (e.g., policies, strategy, human resources).

Specific types of problems that have been found to occur during the process of disaster preparedness include (Carter, 2008; UNDP, 2013):

- *Organization and planning problems:* Having a poor organizational structure, lack of policy direction, and absence of counter-disaster plans and strategies for disaster risk management are examples of organization and planning problems. In many cases, organizations may have plans but they are not up-to-date. For instance, PwC’s (2021) Global Crisis Survey 2021 found that only 56% of the organization respondents felt that their business had a very relevant crisis response or business continuity plan. A key organization and planning issue is the lack of a relevant disaster response plan.
- *Resource problems:* Having adequate resources, high levels of debt, and sufficient stockpiles are examples of resource problems. Beyond physical resources, social resources (Duchek, 2020) such as clarity of work roles, effective relationships, and trust are crucial during disasters.
- *Coordination problems:* Coordination is one of the most important tasks in disaster risk management because poor coordination may lead to varying levels and standards of preparedness within the same organization. Different departments may have different criteria, approaches, and priorities in disaster preparedness. Different organizations may also experience different coordination problems.
- *Readiness problems:* Related to a lack of a relevant response plan are readiness problems such as a lack of emergency equipment (e.g., power generators, alternative devices for Internet connection, and emergency communication devices). A lack of training to prepare employees for disaster response is also a perennial issue.

While these problems are diverse, BI and greater organizational resilience can address all four types of problems. We discuss how so now.

BI, Organizational Resilience, and Disaster Preparedness

Organizational resilience is a multidisciplinary concept combining sustainable development, emergency management, psychology, economics, and supply chain management research (Corrales-Estrada et al., 2021). It is closely related to business continuity management and organizational sustainability and typically seen as an adaptive capability used in preparation to and during disruptions and disasters (Azadegan et al., 2020). Duchek (2020) conceptualization of organizational

resilience includes three stages: anticipation (before the unexpected event), coping (during the unexpected event), and adaptation (after the unexpected event). According to this conceptualization, various organizational capabilities underlie each stage.

Anticipation

Organizational and planning problems (Carter, 2008; UNDP, 2013) are the key disaster preparedness issues during the anticipation stage. Central to organizational and planning problems is the lack of a relevant response plan (Ha et al., 2022; PwC, 2021). Business owners and managers often do not have disaster response plans because they either do not believe a disaster would happen or they feel that they can rely on their years of experience and industry knowledge to effectively respond to disasters (Ha et al., 2022). The environment also affects what businesses focus on. Worley and Jules (2020) argued that pre-COVID-19 pandemic, the strong economy and positive business environment led businesses to focus on growth and efficiency at the expense of disaster preparedness and contingency planning. With reference to Google's experiences, they point out that organizations need to embrace paradoxes, such as the need for disaster preparedness during times of growth, in order for the business to be sustainable. Furthermore, businesses need to consistently and competently apply the tools of sensing and perceiving to thrive.

Sensing is a central component of Duchek's (2020) anticipation stage. Business leaders who engage in effective sensing are also more likely to develop a relevant response plan, directly addressing organization and planning-type problems. Here, organizations should strive to develop the three abilities to *observe internal and external developments, identify critical developments and potential threats*, and, as far as possible, *prepare for unexpected events*. The first two abilities involve environmental scanning – the recognition of early signals of disruption and the looking out for weak signals. The third ability echoes Sahebjamnia et al.'s (2015) recommendation for business to proactively plan internal and external resources such that disasters can be coped with efficiently.

BI can aid in the development of these three abilities. The lack of motivation to engage in environment scanning for internal and external developments and threats may be attribute to our discounting of the future. When they put off or avoid environment scanning, managers are engaging in time discounting, a cognitive bias in which we assign exponentially more weight to immediate or present choices, costs, values, or options than those in the future (Chabris et al., 2010). The further in the future the event or option is judged to be, the greater the discounting of the threat, and therefore, the lower the motivation to look out for internal and external developments and threats.

This discounting is an outcome of a large psychological distance between disaster preparedness actions and outcomes. A key barrier preventing businesses from taking steps to prepare for disaster is the mismatch in costs and benefits in terms of timeframe and certainty. Preparedness actions such as talking to employees about

what to do in an event of an earthquake (Han & Nigg, 2011) has an immediate cost (e.g., employees and business leaders have to stop work to have such talks) but an uncertain future benefit (i.e., probably better preparedness if a disaster were to happen). Disaster preparedness messaging can be made more persuasive by directly connecting disaster preparedness behaviors to outcomes that are current and immediate (Loewenstein et al., 2013). Benefits should also be presented as certain, if possible. For example, another activity considered to be vital for business disaster preparedness during an earthquake is learning first aid (Han & Nigg, 2011). In order to emphasize the immediate and certain benefits of first-aid training, employees can be told of how they are able to save lives immediately after first-aid training. Psychological distance can be further reduced by emphasizing how first-aid training can also be used to ensure the safety of their family and loved ones – that is, first-aid training will benefit people they care about, rather than just for the continuity of business. When psychological distance is judged to be small (e.g., the likelihood of disaster occurring is judged to be higher, or the benefits of engaging in disaster preparedness activities are clear and evident), adequate resources will correspondingly be devoted to disaster preparedness, addressing *resource-type disaster preparedness problems* (Carter, 2008; UNDP, 2013).

Additionally, the more in the future an event, such as a future disaster, is judged to be, the more abstract our representation of the event (Trope & Liberman, 2003). In terms of disaster preparedness, this means that distant future events are viewed in more abstract terms (e.g., are there alternative suppliers for a given stock?), while nearer events are viewed in more concrete terms (e.g., who are the specific suppliers for a given stock and how much can they supply us?). Clearly, the relevance of disaster preparedness planning is dependent on the specificity and concreteness of the plan. In both cases, a BI-informed intervention would seek to reduce the judged temporal distance of the potential disaster. Organizational members should also be encouraged to think of disaster planning in specific concrete terms, rather than in the form of abstract plans.

The third ability, the planning of resources, can also be supported with BI interventions. Social resources such as prosociality and employee well-being can be cultivated using BI interventions. In one field study, Spanish employees of Coca-Cola were assigned to either give or receive acts of kindness at work over a period of 4 weeks (Chancellor et al., 2018). The study found that both receivers and givers displayed increases in personal competence, happiness, work autonomy, and job satisfaction – all social resources vital for disaster preparedness. Another form of social resource, team psychological safety, the feeling that one is safe to share ideas and opinions and admit their errors, has been shown to increase with BI interventions (Grant et al., 2014). Human resource, in the form of employees who can double-hat, can also be encouraged through BI interventions that encourage workplace learning. One example comes from Google, which uses a 10-week, 10-nudge micro-learning email intervention aimed at helping managers build leadership skills (Newhouse & Getz-Kikuchi, 2017). The planning of resources can also be simplified with cognitively simpler (less mentally complex) checklists. The United States Chamber of Commerce produces business preparedness guides (US Chamber of Commerce

Foundation, n.d.). One of its top tip is to “keep it simple” – a goal enabled by well-designed checklists. All of these can apply to planning and managing disaster risk.

Coping

Central to coping with disasters is a recognition that there is a problem. Business leaders have been documented to avoid exploring nightmare scenarios and extreme possibilities (Worley & Jules, 2020). Sullivan-Taylor and Branicki (2011) note how resilient organizations have managers who are prepared to, without undue delay, make decisions and take actions to reduce the exposure and impact of disaster. Indeed, the *ability to accept a problem* is, alongside *the ability to develop and implement*, the capability posited by Duchek (2020) for the coping stage of organizational resilience.

At this stage, resilience is the coping with unexpected dangers that have now surfaced. Catalan and Robert (2011) propose three components of this ability to accept a problem: (i) businesses need to have an understanding of the operating environment; (ii) there is a reference state available for businesses; and (iii) there is an awareness and acceptance of failures. As we shall subsequently see, BI interventions can address all three components.

The second coping-stage ability, the ability to develop and implement, is a crucial capability at this stage. To be successful, businesses have to combat *coordination-type problems* (Carter, 2008; UNDP, 2013). One solution is to implement clear step-by-step guides. Ha et al.’s (2022) study of businesses coping with Tennessee wildfires in December 2016 found that franchised businesses responded better to the wildfires because of the step-by-step guides provided by their parent companies/ brands. Step-by-step guides are useful applications of BI because they demonstrate the usefulness of low cognitive load interventions – interventions that do not require much thinking and analyses. In times of disaster, businesses and communities are typically in shock and less able to engage in deep analytical thinking. Business should develop simple step-by-step instructional guides which can be crucial during a disaster.

At the coping stage, business will also likely have to adapt to the situation by developing ad hoc solutions (Duchek, 2020). Sensemaking, the understanding of reality through efforts to create order and sense retrospectively, requires employees to be accountable to each other and to continually share information and make meaning. Improvising and solving problems creatively are important processes here (Weick, 1993).

Previous research has demonstrated that creativity can be fostered through BI interventions such as social labeling (Agogué & Parguel, 2020), increasing knowledge about creativity (Cropley & Cropley, 2020), and the sharing of mental models (Reiter-Palmon & Paulus, 2019). Similarly, the ability to implement plans involves the willingness of employees to change – a propensity that has been found to increase with greater organizational commitment (Duchek, 2020). A simple

BI-informed intervention to increase organizational commitment is to have an employee stock option program (Lampel et al., 2014).

BI can also address the key issue at this stage – business leaders' willingness to accept that there is a problem. Optimism bias, the tendency to underestimate the probability of unfortunate events happening to oneself, is one reason why businesses often wait till too late to accept that there is problem. To combat optimism bias, businesses can declare implementation intentions to deal with disasters once certain conditions are met (Ebert & Freibichler, 2017). For example, a wholesaler may have a declared rule that if stocks were to drop below a certain percentage, then they are to implement a series of prepared remedy actions (e.g., order a stock top-up, source for alternate suppliers).

Another reason why businesses may not readily accept that there is a problem is that they have limited past experience to disasters. The use of availability heuristics, the tendency to judge the probability of an event occurring based on how easily such events can be brought to mind (Tversky & Kahneman, 1974), when businesses have had limited past experience to disasters, will lead to an underestimation of the probability of encountering the disaster. In such cases, BI interventions should focus on increasing businesses' vicarious experiences and knowledge of disasters so that such events are more readily brought to mind, correcting any underestimation due to the use of availability heuristics.

Adaptation

The final stage of Duchek's (2020) three-stage organization resilience model describes an offensive-type resilience. The central problem type being addressed at this stage is *readiness-type problems* (Carter, 2008; UNDP, 2013). Whereas anticipation and coping can be seen as defensive, damage prevention and loss minimization, adaptation, and the making of adjustments following crises can be a source of competitive advantage where crises may present opportunities, not just threats. Reflecting this offensive potential are the two capabilities of *reflection and learning* and *organizational change*. Both capabilities will lead to greater future readiness.

Reflection and learning capability refers to an organization's ability to reflect on the disaster episode and incorporate gained insights into its knowledge base. Subsequently, it should involve the acting on this knowledge to produce change. Small business post-disaster survival has been found to be dependent on the business owners' ability to recognize changes in business opportunities and to change their businesses accordingly (Ha et al., 2022). BI interventions here might include the use of defaults and the rewarding of learning to support organizational agility. Previous models of organizational resilience often exclude this stage, adaptation (Duchek, 2020). This illustrates the underweighting of reflection and learning that businesses sometimes exhibit after exiting a disaster situation. One way to ensure that businesses reflect is to have employees and managers reflect on challenges by default. For example, organizations can require employees to provide regular feedback or

reflections, as a matter of standard policy. Doing so would facilitate post-disaster reflection and learning.

The other ability, organizational change capabilities, is what happens after the event is reflected upon, and the insights and resulting strategies are saved. At this stage, the organization needs to change by acting on these insights. The transition from strategy formulation to implementation can be aided through leadership nudges (Tawse et al., 2019) such as implementation intentions (discussion in the coping section above), celebrating small wins, and the intentional framing of messages. Illustrating the power of framing, Zhao and John (2021) were able to nudge homeowners to engage in natural disaster risk mitigation and purchase insurance through calls to action that were framed as gains.

Conclusion

This chapter introduced the potential of BI interventions to increase organizational resilience before, during, and after disasters. While research into the use of BI interventions to support disaster preparedness is young, this chapter echoes Linnemayr et al.'s (2016) supposition that BI can be used in disaster preparedness and response. We showed specific ways in which BI interventions can do so in this chapter.

We end with two important caveats. The first is that we have not distinguished between businesses of various sizes and in different industries in this chapter. Yet, just as entrepreneurial marketing is a special form of marketing (Morrish & Jones, 2020), businesses of different sizes will find that BI solutions, suitable to one type of business, may not be useful for others (Sullivan-Taylor & Branicki, 2011). Indeed, as we have pointed out, larger businesses have consistently been found to be more prepared for disasters (Ha et al., 2022). Similarly, businesses in different industries have been found to vary in terms of general disaster preparedness (Han & Nigg, 2011). We call for future research into BI interventions for disaster preparedness to investigate the differences in outcomes for firms of different sizes, industry, and capacities. Our second caveat is one often raised by BI researchers (e.g., Hummel & Maedche, 2019). While BI has the potential to support disaster preparedness, BI is not a panacea. BI cannot singularly solve complex and deep-seated disaster preparedness issues. Used as an addition tool though, BI can provide an extra push for businesses to better prepare for disasters.

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Leadership and Crisis Management for Businesses Globally: The Role of Leadership in Business Sustainability in a Crisis Environment

166

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Contents

Introduction	2512
Functions of Leadership in Business in Times of Crises	2514
Leadership and Sustainability	2514
Leadership in Times of Crisis	2515
Conclusion	2516
References	2517

Abstract

The reach of businesses is expanding, customers' needs and wants are increasing, and natural and man-made disasters permeate the business environment causing tremendous financial implications on business productivity. Given these crises, there is the need for business leaders to develop leadership skills or adapt different leadership approaches to mitigate the negative effects of crisis and disaster in order to maintain business effectiveness. Considerable literature on disaster management seeks to aid business leaders on how to address/manage disasters in business. This conceptual chapter explores leadership approaches that leaders can implement in times of crisis. We suggest that a leadership function in a crisis environment intensifies the impact of management functions. The chapter concludes by examining the implications of leadership approaches. This then leads us to a discussion of business sustainability and the impact of decision-making on leadership. Although the literature states that transformation is the best in times of

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crisis, we opine that situational leadership is more appropriate in the dynamic environment of a crisis.

Keywords

Leadership · Situational leadership · Crisis management · Financial resources · Business sustainability · Functions of management

Introduction

There is no doubt the COVID-19 pandemic affected business negatively across the globe. The impact of COVID-19 on the global economy was increased because of the geographic spread of the virus. A survey conducted by Bartik et al. (2020) between 28 March and 4 April 2020, to explore “expectations of business owners at a critical point in time when both the progression of COVID-19 and the government’s response were quite uncertain” (p. 1) revealed that of more than “5800 small businesses that are members of Alignable, a network of 4.6 million small businesses” (p. 1) were impacted negatively.

... 43% of businesses had temporarily closed, and nearly all of these closures were due to COVID-19. On average, the businesses reported having reduced their active employment by 39% since January, where 54% of firms were closed and employment was down by 47%. Impacts also varied across industries with retail, arts and entertainment, personal services, food services, and hospitality businesses all reporting employment declines exceeding 50%; in contrast, finance, professional services, and real estate-related businesses experienced less disruption, as these industries were better able to move to remote production (p. 2).

A survey conducted by Dun and Bradstreet (provider of commercial data, analytics, and business insights) stated that 82% of small businesses experienced a negative impact and 70% believed that the recovery demand will be approximately 1 year (Dun & Bradstreet, 2020). The COVID-19 pandemic saw a financial fragility of business’ operation that caused massive layoffs. According to Donthu & Gustafss (2020), the disruption was unprecedented and caused challenges in business entities, cash flow, marketing and sales, supply chain, customer demand for product and service, health and safety, and education. However, it also exposed a call for businesses to be resilience in their operations. The negative impact on business called for a change in business processes, adaption to technology, and change leadership/change management.

The development of business strategies to mitigate the negative effects of disaster for business continuity include preparedness and resilience, recovery, and solutions to achieve business financial viability. Business leaders in crisis situations should ensure that in the event of a disaster or crisis occurring, the impact is minimal. This then raises the need in leaders for personnel efficiency, effectiveness, knowledge, and flexibility to be adhered to obtain the best solution (Teutsch, 2010). The negative impact of COVID-19 on business saw the closure of many businesses through the

lack of mission and vision for the business, and the failure of leadership to have scanned the political, economic, social, technological, environmental, and legal (PESTEL) framework to improve their business processes. Strategic management principles call for a continuous monitoring of a business's ongoing processes, internal and external events, and timely change. Adapting to change in business organization forces an organization to assess internal capabilities and resources (human, financial, and material resources). Businesses that were able to adapt were positively impacted. For many this meant focusing more on their online presence in the global marketplace. For many they have seen massive growth in areas of online communication, entertainment, and shopping (Donthu & Gustafsson, 2020). The adaptation to change in business stability during the pandemic forced business managers to effectively formulate, implement, monitor, and evaluate their strategies to achieve continued economic and financial growth. Thus, business strategies to mitigate the negative impact of a disaster/crisis to maintain business effectiveness becomes an important determinant of success.

Change management theories addressed the need for change alignment to business paradigm and success. Lewin's model emphasizes the need for change in business organizations to *unfreeze, change, and refreeze* (Lewin, 1947). *Unfreeze* in organizations calls for a change in the existing processes and procedures that were counterproductive to business operations; the pandemic ushered the prime factor of several businesses. Business entities have to *change* their perspective, perceptions, and processes to include an online space or presence for continued capitalization on their market share and growth rate to include training of their staff complement or workforce. *Refreeze* sees business entities change their business culture and norm based on lessons from the pandemic.

Business managers' inclusion in their strategic plan or business plan of their organization/business the need for change management for business survival. This will hold managers accountable for the endowment, contingency implications, and confirmation of the profitability of the business. Chinoperekweyi (2020) supported that "there is need to make change management part and parcel of the business plan, and not an add-on that is managed independently; and ensuring managers are accountable for making sure change happens and certain behaviors are rewarded or punished" (p. 6). The pandemic forced business organizations into a contingency approach for continued viability in the marketplace of goods and services offerings. Organizational practices should be consistent with the demand of the organization (McLoughlin & Clark, 1988). Business managers are the nucleus of organizational change. They need to act upon the responsibilities for the direct functions of the organization in a manner that will boast profitability and yield a return on investment, which includes people and other resources.

The frequency of disaster occurring globally affects people's lifestyle, business operations, and strategic planning of business/organizations. The need for the tools, resources, and best practices to effectively provide the technology to develop business strategies to mitigate the crises of disaster to maintain business effectiveness is vitally important. Successful business strategies need integrate organizational change to sustain and shield business from disaster. People are the most effective and

profitable means of production in organization. For organizations to be sustainable to manage change in 2020 and beyond, the need for “agility, embracing digital, customer centrisim, and innovation” (Chinoperekweyi, p. 6) should be intertwined with the philosophies of change management and the technical perspective. The key for creating that agility and intertwining change management lies within the leadership of the organization. Therefore, leadership is the key component to successfully navigate through a crisis environment. Thus, this chapter will focus on leadership and explore the functions, sustainability, and leadership approaches in a crisis environment.

Functions of Leadership in Business in Times of Crises

The management of any business operations calls for effective planning, organizing, controlling, staffing, and leading to manage disasters. The functions of management are relevant prior, during, and after any pandemic. Maintaining the functions of management was not easy during the pandemic. For example, Middaugh (2020) found that the fundamental functions of management are often forgotten before and during a disaster and stressed its application and revision before and during such times. Leaders/managers with technical, critical thinking, and conceptual skills should lead the organization. Leadership is grounded in technical, human, and conceptual skills (Northouse, 2015). The technical relates to proficiency in the product, service, and regulations (Katz, 1974; Yukl, 2006). Human relates to how the manager’s interpersonal initiative influence and motivate team members to accomplish the goal of the business (Katz, 1974; Yukl, 2006). Conceptual skills refer to the problem solving and critical thinking skills of the manager (Northouse, 2015). The functions of management for any organization liaise with how effective the manager can use this technical, human, and conceptual skills to turn around the organization and to shield it from negative impact, especially in times of crises.

Leadership and Sustainability

Before a discussion on leadership, it is necessary to frame our discussion of sustainability within this chapter around the definition of sustainable business practices. In the literature, business sustainability is commonly aligned with the definition of sustainability, which refers to the concerns surrounding the impact of business decision-making on environmental, social, and economic factors through resource depletion (both physical and natural) (Benkert, 2021; Mollenkamp, 2021). Haanaes (2016) states

. . .sustainability is a business approach to creating long-term value by taking into consideration how a given organization operates in the ecological, social and economic environment. Sustainability is built on the assumption that developing such strategies foster company longevity (p. 1)

However, Mollenkamp points out that sustainability, at its root level “refers to the ability to maintain or support a process continuously over time” (Mollenkamp, 2021, p. 1). The two definitions illustrate the need to clearly state a definition of sustainability. For this chapter we define business sustainability as “a long-term approach in decision-making to maintain/support business activity that ensures organizational longevity.”

For us the key to the definition is “decision-making.” Within any business organization, key business decisions and/or strategic business decisions are made by organizational leaders. Decisions made in times of crisis are often made under less than ideal situations. Decision makers often have little or no data to base decisions on. To add to the difficulty, time is often of essence. Under normal conditions, research has shown that the leadership approach impacts decision-making (Northouse, 2015; Uzonwanne, 2015). Thus, it is only logical that when exposed to a crisis such as natural disasters (e.g., the pandemic or earthquakes), leadership will significantly impact the outcome. This then leads us to our investigation of leadership approaches in times of crisis and in particular during the COVID pandemic.

Leadership in Times of Crisis

Crisis management has been defined as a term that “broadly captures organizational leaders’ actions and communication that attempt to reduce the likelihood of a crisis, work to minimize harm from a crisis, and endeavor to re-establish order following a crisis” (Bundy et al., 2017, p. 1663). As can be seen in the definition and supported by numerous authors, leadership is a key aspect of crisis management (Bundy et al., 2017; Kalra et al., 2021; Kielkowski, 2013). This then leads us to the question of whether or not one particular leadership style leads to business sustainability in the face of a crisis?

The research on leadership styles during the COVID-19 pandemic delves into democratic leadership (Agusta & Nurdin, 2021; El Gharib & Elnahas, 2021; Sanusi et al., 2020), integrative leadership (democratic and transformational) (Agusta & Nurdin, 2021), transactional/authoritarian (Azizah et al., 2020; El Gharib & Elnahas, 2021; Frangieh & Rusu, 2021; Purnomo et al., 2021; Sanusi et al., 2020), and transformational leadership (Azizah et al., 2020; Bojadjiev & Vaneva, 2021; Brown & Nwagbara, 2021; El Gharib & Elnahas, 2021; Noureen et al., 2020; Purnomo et al., 2021; Sanusi et al., 2020). The common finding was that a transformational style was best suited for a crisis situation. This is due to its focus on change and encouraging and developing an attitude of the acceptance of change. Also, another common finding was the importance of open and transparent communication during a crisis. And here again, it was pointed out that open and transparent communication is a characteristic of transformational leadership (Bojadjiev & Vaneva, 2021). So, it would appear that transformational leadership is best suited for times of uncertainty – a crisis.

However, studies comparing leadership styles, such as Sanusi and co-authors (Sanusi et al., 2020), El Gharib & Elnahas (2021), Frangieh & Rusu (2021), and Purnomo and co-authors (2021), found that a transactional leadership style was also effective. In fact, Sanusi and co-authors (2020), El Gharib & Elnahas (2021), and Purnomo and co-authors (2021) found that multiple leadership styles had a positive impact on organizational performance. The research indicated that there was a strong need for leadership that had a clear vision of the future and the steps required to realize that vision. This meant that at times a different leadership approach may be applicable and more effective. This brings forth the concept of situational leadership.

In the context of situational leadership, the leadership style is contingent on the situation (Blanchard & Hersey, 1996). Therefore, the leader adapts to the environment and the interactions of the players in that environment. This means that at one point a transactional approach may be more effective to achieve the desired results of that moment. This then starts to explain the seemingly contradictory results of the research in leadership and crisis management.

Although it may be fair to say that no one style is more appropriate than another, it does appear that a transformational leadership style would be more effective. However, research also indicates that those that prepare for a crisis and have plans in place fair better and are more resilient (Bundy et al., 2017; Kielkowski, 2013). Therefore, business sustainability relies on strong leadership not only during a crisis but in pre-crisis preparation and post-crisis recovery.

Conclusion

Literature on the effects on sustaining, minimizing, shielding, and preventing business from the negative impact of disaster explores systems change, formulation of institutional and operational policies to overcome the losses of production, while improving consumption pattern to boost countries economic (Kumar et al., 2020) is minimal. The literature fails to provide strategies and procedures to fully address aspects of how to sustain, minimize, shield, and prevent business from the negative impact of disaster through the lens of leadership. Leadership needs to implement and mitigate loss through the implementation of strategies designed to shield and preserve organization vitality – business sustainability. However, business leaders can and need to engage in crisis management to reduce the risk and outcome of a crisis to create business sustainability effectively and efficiently.

According to the World Economic Forum's Global Risks Report (2020), there are critical risks manifesting the global economy and cited examples of stagnation, climate change, and cyberspace threats. Other risks for companies that the report highlighted were prolonged recession of the global economy, surge in bankruptcies of big firms and SMEs, waver of industry consolidation, weakening of fiscal positions in major economies, and increase in inflation globally. Leadership and business sustainability work hand-in-hand to prevent, implement, and resolve issues rising from crises. Crisis management needs strong leadership utilizing transformational leadership but with the realization of the need to adapt leadership approaches

to the situation. Building sustainability in business during the COVID-19 pandemic calls for support and collaboration to sustain, minimize, shield, and prevent business from the negative impacts of disaster. Business sustainability is therefore urgently needed to rebuild, adapt, and solve the business and economic challenges resulting from the COVID-19 pandemic.

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Impact of COVID-19 Pandemic and Natural Disasters on Businesses in the Pacific: Preparing for Unknown Future Disruptions

167

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Contents

Introduction	2520
Disruptions in the Pacific	2521
Impact of COVID-19 on Businesses in the Pacific	2521
Impact of Natural Disasters in the Pacific	2521
Fostering Social Media to Promote Traditional Economy of Bartering: An Innovation by Ordinary Citizens to Meet Community Needs during Market Disruptions and Lockdowns	2524
Managing Disruptions	2524
Preparing for Disruptions	2526
Managing Disruptions	2528
Overcoming Disruptions	2531
Learning Outcomes	2532
Teaching Methods	2532
Conclusion	2532
References	2533

Abstract

The global economy continues to struggle with the disruptions caused by the COVID-19 pandemic over the last 2 years. Apart from the pandemic, the Pacific region is highly vulnerable to technological, political, and climate change-induced disruptions and natural disasters. This chapter focuses on managing the

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impacts of the COVID-19 pandemic, natural disasters, and other disruptions in the Pacific, as well as preparing for unknown future disruptions. The chapter begins by reviewing the impact of COVID-19 on businesses in the Pacific and the effects of climate change-induced natural disasters. It then details the needs of Pacific Island countries for preparing, managing, and overcoming disruptions and presents a training model for business schools throughout the Pacific, to help them future-proof the region. One of the key elements for improving the resilience of businesses is the development of business continuity plans (BCPs), which are discussed here in some detail.

Keywords

COVID-19 Pandemic · Managing Disruptions · SIDS · Business Continuity Plan · Training

Introduction

The global economy has continued to struggle from the disruptions caused by the coronavirus disease (COVID-19) pandemic for more than a year. Some economies showed signs of rebounding in 2021, but the continued threat of new waves of COVID-19 remained a primary concern, with most of the developed economies ramping up vaccinations while other economies were reinstating partial containment measures to deal with new outbreaks. Apart from the pandemic, we live in an era of other disruptions such as technological, political, and climate change-induced natural disasters.

This pandemic, which is a once in a 100 years event, had taken businesses, as well as business schools, off guard in managing such a rare phenomenon. It has resulted in the “great global lockdown” by countries closing borders, banning travel, and disrupting supply and value chains. But it also changed how we live, study, and work. Interestingly, the world has also seen ingenuity and innovation from ordinary citizens who have had no or minimal education. These people have been handling this crisis with needs-based eco-solutions, both for communities and for their own selves, demonstrating that human beings have intrinsic abilities for survival even in extreme situations.

Developing countries consisting wholly of small islands are often called Small Island Developing States (SIDS). They are particularly vulnerable to climate change because they are small and remote and have a large land-sea interface proximate to their population centers. When Scandurra et al. (2018) analysed the vulnerability dynamics in SIDS from 2009 to 2014, using a comprehensive dataset including 32 variables, they found that the vulnerability of SIDS to climate change was related to their small size, isolation, and the hazards they faced, but each country was affected in different ways and to varying degrees.

This chapter, therefore, discusses the impacts of the COVID-19 pandemic and other natural disasters on SIDS in the Pacific, how they may best be managed, and how to prepare these countries for unknown future disruptions.

Disruptions in the Pacific

Before the advent of the COVID-19 pandemic, the socioeconomic characteristics of SIDS in the Pacific were highly sensitive to world markets, financial instabilities, and disruptions caused by environmental disasters. These factors impacted the livelihoods and economic performance of the societies involved. They were compounded by the heavy reliance of the economies on foreign investment and trade, remittances from abroad, foreign aid, and often on tourism. For example, the Asia-Pacific region experienced 75% of the global disaster-related mortality rate over the years from 1970 to 2011 (United Nations Economic and Social Commission for Asia and the Pacific, 2012, p.5).

This section provides highlights from business perspectives on two types of disruption that have impacted the Pacific in recent times, namely, the COVID-19 pandemic and other natural disasters.

Impact of COVID-19 on Businesses in the Pacific

According to the Pacific Trade Invest (PTI) (2021), businesses in the Pacific have been highly affected by COVID-19 restrictions. PTI commissions regular Pacific Business Monitor surveys across the Pacific region. In the 14th survey by PTI (2021), responses were gathered over the period from 3 to 16 May 2021, from 106 businesses. The survey showed that 91% of businesses reported a decline in revenue. Fiji had been particularly badly hit by the crisis, with 94% of businesses reporting a significant decline in sales and revenue. The survey found the following: 84% of Pacific businesses reported a negative impact from COVID-19; 88% reported a decline in revenue; and 69% believed that their businesses would survive the crisis (compared with 58% in the previous month) (PTI, 2021). The survey found the three highest-rated challenges facing businesses due to the COVID-19 pandemic were as follows: “the impact of closed international borders” (91%), “poor cashflow” (91%), and “not knowing how long the crisis will last” (89%) (PTI, 2021, p.4). The survey went on to report that the top four initiatives businesses required assistance with were as follows: “access financial support” (57%), “access to new markets locally and overseas” (38%), “diversifying their business” (36%), and “improve/implement online-commerce capabilities” (31%) (PTI, 2021, p.4).

Impact of Natural Disasters in the Pacific

Pacific SIDS are particularly vulnerable to all kinds of natural hazards, including those exacerbated by climate change, such as cyclones, storm surges, rises in sea level, droughts, and wildfires, as well as hazards less affected by climate change, such as earthquakes, tsunamis, and volcanic eruptions. These hazards add to the enormity of dealing with the COVID-19 crisis. Many disasters resulting from these hazards are linked in severity to global temperatures, which in turn are affected by

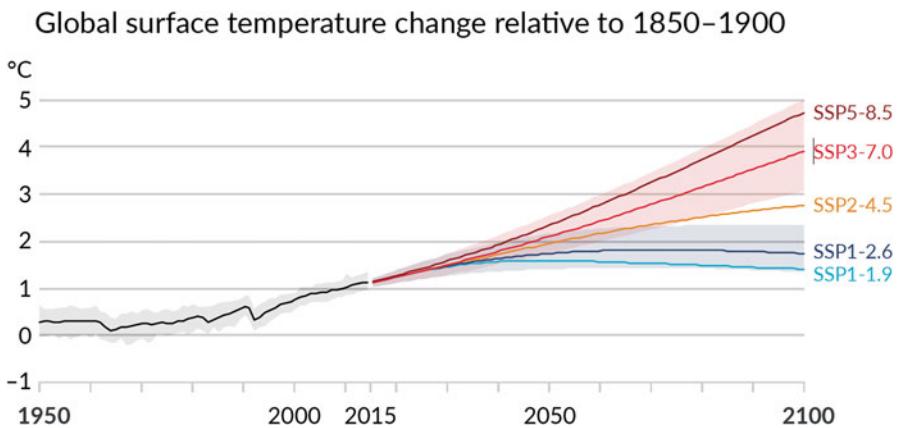


Fig. 1 Global warming scenarios. (Source: IPCC (2021))

global warming. Figure 1 shows the prognosis for the global temperature trends under two illustrative scenarios (IPCC, 2021): unrestricted fossil fuel use (SSP3–7.0, the pink band) and fossil fuel phaseout (SSP1–2.6, the blue band). The “unrestricted fossil fuel use” scenario assumes global annual emissions doubling by 2100, while the “fossil fuel phaseout” scenario assumes annual emissions falling below zero by 2075.

The forecast temperature trend, shown in Fig. 1, under an “unrestricted fossil fuel use scenario,” rises to nearly 4 degrees above preindustrial levels (the 1850–1900 average) by 2100. The “fossil fuel phaseout” scenario assumes a straight-line reduction in fossil fuel use starting in 2022, leading to zero fossil fuel use by 2075. The result, shown in Fig. 1, is a temperature in 2100 that is restricted to below 2 degrees above preindustrial levels.

These temperature rises will mean that sea levels will rise by about 0.6 m over 1900 levels under the fossil fuel phaseout by 2100 and by about 0.85 m under the unrestricted fossil fuel use scenario. More importantly, the trend in rise of sea level predicted for each scenario is still strongly upward at the beginning of the next century due to reaction lags. Sea levels will continue to rise well into the twenty-second century, even under the fossil fuel phaseout scenario.

With global warming, modeling suggests that there will be no upward trend in the *number* of cyclones in the Pacific, but there will be an increase in the average *severity* of these storms. This increase in severity will lead to an increase in the damage done by cyclones on SIDS. In addition, rising sea levels will mean that these storms will batter coastlines with greater ferocity in the future. Global warming will also lead to the increase in the severity of other short-term hazards in the Pacific, such as heatwaves, floods, and droughts. Sea-level rise will threaten low-lying islands and cities and adversely affect drinking water sources, particularly for atolls. This is not a sudden disaster, but a long-term disaster, extending to the end of the century after this one or longer.

Another long-term disaster is heat-induced coral bleaching, which threatens to wipe out coral reefs in the region before too long. This will adversely affect tourism, fish harvests, and protection of low-lying land and communities from storm surges. The continuing long-term rise in ocean acidity is another threat to corals but also to shellfish – another harvest from the ocean.

The World Bank calculated that for the South Pacific, the average direct losses resulting from natural disasters in the period from 1831 to 2009 have risen from US\$100 million per year to US\$400 million per year (World Bank, 2012). Despite this high and increasing exposure to natural hazards and now with the COVID-19 pandemic crisis, most people in the region are uninsured. For instance, the penetration rates of insurance are 12% in Fiji (Reserve Bank of Fiji, 2015), 13% in Tonga (National Reserve Bank of Tonga, 2016), and 5% in Vanuatu (Pacific Financial Inclusion Programme, 2016). Further, because many governments of Pacific SIDS do not belong to some sort of risk pool, they are unable to take advantage of rapid resourcing of recovery finances after a natural disaster.

Instead, such countries can only resort to measures such as budget reallocation, international emergency aid, and accumulating additional credit. These measures may help in the short term, but they affect the long-term economic performance of the country (Nath, 2019). Additionally, the lack of access to affordable insurance solutions and other disaster risk financing instruments for businesses has impacted the growth and investments of Pacific SIDS.

The table below (Table 1) shows the economic outcomes of major cyclones in Fiji, Tonga, and Vanuatu. It presents the losses in the agricultural sector and the amounts paid by the national governments toward recovery, donations from foreign

Table 1 The experiences of three countries (Fiji, Tonga, and Vanuatu) after major cyclones

After Tropical Cyclone Winston in Fiji (2016)	After Tropical Cyclone Pam in Vanuatu (2015)	After Tropical Cyclone Gita in Tonga (2018)
<i>US\$216 million</i> in losses by the agricultural sector (Ministry of Economy, 2017)	<i>US\$53 million</i> in losses by the agricultural sector (government of Vanuatu, 2015)	<i>US\$43 million</i> in losses by the agricultural sector (government of Tonga, 2018)
<i>US\$220 million</i> was given by the government to ordinary Fijians to rebuild	<i>US\$450,000</i> was given by the government for emergency relief operations	<i>US\$47.3 million</i> was given by the government for over 3 years for rebuilding
Government received <i>US\$64 million</i> from the international community	Government received <i>US\$4.1 million</i> from the international community	Government received <i>US\$11.2 million</i> from the international community
The government of Fiji had to take out a <i>US\$50 million</i> loan from the World Bank (World Bank, 2016)	PCRIC paid out <i>US\$1.9 million</i> (World Bank, 2017)	PCRIC paid out <i>US\$3.5 million</i> (ReliefWeb, 2018) The total economic value of the effects was estimated to be approximately <i>US\$164.1 million</i>

Source: Pacific Financial Inclusion Program (PFIP) – <http://www.pfip.org/>

sources, and payouts from the Pacific Catastrophe Risk Insurance Company (PCRIC). Clearly, each country has been left with a substantial loss from the cyclone events. Of more concern, perhaps, is that many affected people were not able to recover their livelihoods and income streams. This made it almost impossible for large sections of the populations to sustain themselves when the COVID-19 pandemic caused further loss of businesses and income.

Fostering Social Media to Promote Traditional Economy of Bartering: An Innovation by Ordinary Citizens to Meet Community Needs during Market Disruptions and Lockdowns

Hundreds of barter trades, as in Fig. 2, are taking place across Fiji using the Facebook page “Barter for Better Fiji.” These came as a response to the early period of the pandemic in 2020, after sharp falls in employment. The page now has more than 180,000 members, in a country with a population of less than 900,000.

Examples of the posts to the site include the following:

Two piglets, two sacks of casava and 2 roosters for an iron corrugated roof for the house, a taxi fare in exchange for fresh produce, hot cross buns for online tutoring, an old carpet for a professional photography session, vegetable seedlings for homemade pies, have backyards cleaned for prayers. (Tora, 2020)

“The primary reason for setting up the Facebook group was to help offer a solution to the current economic situation,” said Marlene Dutta, founder of *Barter for Better Fiji* (Darmadi, 2020). “For many people across the world and Fiji, money was harder to come by and even harder to stretch out. The idea is to have an avenue where people get some things they need or want without spending money and that will help a lot and save their limited cash for bills, utilities, transport and other things that they need money for.”

The idea of bartering via Facebook has caught in other Pacific SIDS, with “Barter for Change” in Tonga, “Barter for Nambawan Life Vanuatu” in Vanuatu, and in Samoa – “Barter for Better Samoa” and “Le Barter Samoa” (Tora, 2020).

Managing Disruptions

Having given a snapshot of the impacts of disruptions due to natural disasters in the Pacific, along with need-based innovative solutions to economic hardship which are founded by ordinary citizens, it is important to review how business schools can better deliver education to address the issues discussed here. We need to ensure that business schools and their curricula are responsive to the challenges faced by local businesses, while meeting the broader needs of the society.

Here we suggest a suitable structure for how training in business management can be made both relevant and resilient to both internal and external disruptions. While most business management courses address economic disruptions to some extent,

8 May at 9.35 am

Bula Vnaka To All BFBF....members
I have a son...and am without a job...during this Covid19 crisis...
I would like to trade two Pigs....n 2 Sack of Cassava...with 2 Roosters n 2 Hens....
In Exchange with 15...12'x42 corrugated roofing iron
That really needs to be fully completed roof of a house...since there is a lot of rain.
m Located in Eāngton, Rakiraki
inbox if u r interested
Vnaka.

The collage consists of five images. The top row contains two images of chickens walking on a grassy hillside. The bottom row contains three images: the left one shows a pig being fed from a trough; the middle one shows a close-up of a pig's head; and the right one shows a pig lying down on a brick-paved surface.

Fig. 2 Example of a post to “Barter for Better Fiji.” (Source: (Tora, 2020))

they tend to be fragmented throughout the various subjects, rather than being concentrated within a single module of an undergraduate or postgraduate program.

The suggested curriculum for a module or course, we call here “managing disruptions,” has three major units:

- (i) Preparing for disruptions
- (ii) Managing disruptions
- (iii) Overcoming disruptions

Preparing for Disruptions

Businesses and economies around the world were already under a multitude of stresses before the COVID-19 pandemic occurred. It has become abundantly clear that business leaders, in both public and private sectors, need to make more urgent and determined efforts to adapt to, and develop resilience to, the many stressors they face, and they will need to make major efforts to reduce the risks of disruptions. This will need a more detailed understanding of the specific vulnerabilities peculiar to each sector and each geographic location, the development of the appropriate skills and capabilities of the stakeholders, a vast improvement in communications at all levels and under conditions inherent in the wake of disasters and other disruptions, and a means to provide an inclusive society where all members contribute to building viable solutions to complex problems as they occur.

There are already a variety of digital tools that businesses can use to try and maximize their efficiency under normal conditions, including artificial intelligence, algorithmic business thinking, and digital solutions to complex supply and value chain problems. However, under the conditions pertaining in Pacific Island countries, evidence-based assessments suggest that the most important tool for helping both businesses and governments cope with the disruptions and issues they face is the designing and implementation of a simple business continuity plan (BCP).

A BCP reflects “the capability of an organisation or business to continue the delivery of products or services at pre-defined acceptable levels following a disruptive incident” (ILO 2021, unpublished). A BCP ensures that business processes and procedures continue without significant disruptions during a disaster and helps businesses to survive, rather than suffer total shutdown. They are based on detailed analyses and identification of critical business processes, whether they relate to a manufacturing plant or a small business trading in goods and services. To be clear, a *Business Continuity Plan* is a plan of action that will try to ensure that a business continues to function during and after a disruption. This is different to a *Disaster Recovery Plan*, which is a plan of action to restore vital support systems after a disruption and is a subset of the business continuity plan (Dobran, 2018).

However, the recent International Labour Organization’s (ILO) rapid assessment surveys on the impact of COVID-19 on businesses and employment in six Pacific Island countries revealed the startling reality of the low prevalence of BCPs in Pacific Island businesses. These data are illustrated in Table 2.

These data demonstrate that the prevalence of BCPs in Pacific Island countries is dangerously small. This needs to change, especially in the face of COVID-19 and the impacts of climate change, not to mention the globalization of economies. The only way forward is for business schools in the Pacific area to focus on training future business leaders and decision-makers on the fundamentals of creating and implementing BCPs.

To this end we suggest a major unit of a course in business studies, “preparing for disruptions,” that addresses the knowledge and skills required to create, maintain, and implement a BCP.

Table 2 A snapshot of BCPs in select Pacific Island countries

Country	BCP status
Fiji	<p>59% of the Fiji Commerce and Employers Federation's (FCEF) members surveyed had a BCP in place. However, many businesses did not include pandemic response in the BCPs</p> <p>39% of members comprising majority of Micro, Small, and Medium Enterprises (MSMEs) did not have a BCP</p>
Palau	Nearly two third of businesses had no business continuity plan, but 90% of businesses were comfortable with moving forward with COVID-19 safety protocols and business continuity training to reopen their businesses
Republic of Marshall Islands (RMI)	<p>More than two third of the businesses surveyed did not have any business continuity plan, while 22% of the businesses did have a BCP</p> <p>Of the 22% of the businesses that had a BCP, more than two third of them had planned their continuity for more than 3 months, while others planned only between 1 and 3 months</p> <p>Of the businesses that had a BCP, nearly half of them had staff assigned and made aware of the concept and process of BCP, while another half of them had not assigned their staff to manage the BCP. For the latter, even though they had a BCP, its application and implementation would be useful only if their staff were fully aware and assigned with roles and responsibilities to plan for disasters, undertake impact analysis, manage continuity plans, and deploy recovery mechanisms to overcome unforeseen disasters</p> <p>Two third of the businesses surveyed that did not have any kind of business risk protection were mainly sole proprietorship and self-employed businesses. Lack of awareness and cost of risk protection may have been the reason for these businesses not protecting their business operations</p>
Samoa	<p>82% of enterprises did not have any continuity plans in place and were completely overwhelmed by COVID-19. Enterprises had previously been exposed to natural disasters and climate change, but they were ill advised about pandemics</p> <p>Over half of the enterprises surveyed were “not insured,” and these were typically MSMEs</p>
Solomon Islands	<p>Majority of the businesses did not have a BCP. More than half of the businesses surveyed were poorly prepared for the pandemic-induced emergency, while nearly 11% were very poorly prepared. On the other hand, 44% businesses were well prepared, with 3% extremely well prepared</p> <p>60% of businesses were not insured, while one third were fully insured. Cost of insurance and awareness were the main reasons for not insuring their businesses</p>
Tonga	More than two third of the businesses in all the three sectors (manufacturing, agriculture, and tourism) did not have a business continuity plan before COVID-19. Seventy-four percent of businesses in agriculture sector, 68% in manufacturing sector, and 76% in service sector did not have any kind of BCP, and they had no readiness or preparedness to manage businesses during the pandemic or any natural disasters

(continued)

Table 2 (continued)

Country	BCP status
Tuvalu	Only 29% of the businesses surveyed in Tuvalu had a business continuity plan before the COVID-19 pandemic broke out. Of these, 11% reported that the BCP helped “significantly,” 45% said it helped “moderately,” and 44% said it helped “slightly.” This suggests that businesses need training in the usefulness of BCPs and how to make them effective

Sources: Rapid Assessments on Impact of COVID 19 on Employment and Business 2020–2021 conducted by the ILO Office for Pacific Island Countries (unpublished & IOM, 2021).

“Preparing for disruptions” should include the following elements:

- Definition and introduction to the business continuity plan
- The business continuity plan structure and the key strategies involved
- The difference between *business continuity plan* and *disaster recovery*
- The business continuity team responsible for managing disruptions and training staff
- Stages in developing a business continuity plan, including business impact analysis, gap analysis, options and trade-off analyses, efficiency and efficacy, and business continuity management

Managing Disruptions

The ongoing success of a business depends not only the efficiency under business-as-usual conditions but increasingly on managing the business through disruptions. Businesses in the Pacific, particularly MSMEs, are often badly affected by any disaster. But the greatest impacts of disasters are felt in the informal economy, where work is carried out by individuals or families just to subsist. The recent COVID-19 pandemic and other natural disasters have exposed the vulnerabilities of small businesses which are unable to rely on the support from any government grants or stimulus packages. Since insurance is relatively expensive and beyond the means of most small businesses, these businesses face cumulative losses from the recurring pattern of disasters experienced in recent years. It is vital, therefore, that business managers are trained in overcoming and working through disruptions and in undertaking “in-crisis” needs assessments. This requires an understanding of the holistic system they work within, from the world economic environment and national enterprise system down to the processes they use in their business every day.

Crises are described as being “sudden, inconceivable, damaging, sensitive, and unique,” so that there are no rules governing their management, and solutions to the problems they present need to be determined on the fly, often using unconventional methodologies. This calls for flat hierarchical societies. A flat hierarchical society is one of the six principles of resilience listed by Barnett (2001). The other five attributes of resilience are as follows: homeostasis, where feedback mechanisms

which assure effective communication channels are integrated into daily life (including community meetings, education, and exchange of traditional gifts); omnivory, where resources are sufficiently diversified to withstand shocks to individual parts (whether resource-specific or geographical); high flux, where movement of resources through the society is at a high rate (due to diverse or efficient transport methods); buffering, where resource surpluses help withstand perturbations (perhaps due to traditional preservation means); and redundancy, where there is significant overlap of resources that provide alternative means for achieving the same ends.

Haldane et al. (2021) reflected on the resilience requirements for health systems in the face of pandemics like COVID-19. They proposed four major categories: *activate comprehensive responses*, including whole of government approaches, training in infection prevention, purchase agreements for medical products, surveillance, and isolation procedures; *adapt health system capacity*, including public-private agreements, supports for health workers, recruitment of health workers or their reallocation from other fields, use of appropriate digital technologies, creation of additional healthcare facilities, and option of postponing elective procedures at times of greatest need; *preserve health system functions and resources*, including cost-effective procurement of medical supplies, guidelines to optimize medical resources, production of test and protective equipment, strategy for reaching local populations, support for primary care, and consultation with community in planning health services; and *reduce vulnerability*, including adoption of effective financing mechanisms for providing relief, leveraging skills and knowledge of local populations, strengthening manufacturing capacity, testing and contact-tracing strategies, and communication strategies.

In Fiji, for instance, thousands of people lost their jobs, many of whom were in the tourism industry. According to Raisel (2021), the traditional ways, called *Solesolevaki*, were a means for overcoming the outcomes of disaster. *Solesolevaki* involved the community working together to achieve the greatest benefit for the community. This illustrates how important it is to use multiple viewpoints to building resilience and to take note of both traditional and western ideas.

In a crisis situation, the physical infrastructure of the society is often disrupted or destroyed entirely. This means that planning based on access to communities by roads, availability of drinking water, or the use of electrical power may become redundant in the face of the actual conditions. A business or community would need to understand the options they have available to them for overcoming these limitations. The answers are often commonplace in communities which regularly suffer a particular type of hazard event. For instance, those who are regularly flooded might have boats handy, life jackets, emergency kits, routes marked out to higher ground, early warning sirens, two-way radios for communication, and backup generators to supply power when needed. These basic contingencies need to be shared with other vulnerable communities who might not have suffered such disasters in the recent past. This kind of sharing of ideas and options helps to make communities resilient.

Resilience is often thought of as the ability of a system to bounce back from a disruption to the level of functioning it had before the disruption. This is often interpreted as the need to make certain parts of the system robust to failure, rather

than the whole system. Further, the objective of returning to a previous state is clearly going to be insufficient to handle the same kind of disruption they are trying to recover from. A resilient system needs to be able to accept the precariousness of the environment that exists now and into the future and to ensure all parts of the system (including social, technological, political, ecological, and spatial) are robust to the likely disruptions they will face (Sakurai & Chughtai, 2020).

There is also the issue of time. Some disruptions, like cyclones and earthquakes, are sudden and need an immediate response. Other disruptions are long term, like climate change and sea-level rise, and need a prolonged response often termed “adaptation.” In the case of COVID-19, for instance, the response may be either short term or long term. In the short term, a community needs to adapt to the present situation; the healthcare system needs to handle the immediate numbers of severe cases and dead bodies, as well as handle all other medical needs. In the long term, communities would need to adapt to the realization that not only is COVID-19 likely to be with us forevermore, but other pandemics are likely to sweep the globe, and there are lessons learned from the present pandemic that need to be heeded in order to prepare for future pandemics.

Even the concept of making a SIDS community resilient in the face of the consequences of climate change loses meaning when there are no options for indefinite survival in their own country. This is the case, for instance, in Tuvalu, which is so low-lying that there are no safe places to retreat to in case of flooding. This will mean, in the long term, that migration will become the only remaining option. Unfortunately, there are no provisions under international law to fund or facilitate such mass migrations (Taupo, 2018).

We suggest a major unit of a course in business studies, called “managing disruptions,” should address the knowledge and skills required to build a knowledge base of the options that may be available in crisis situations, how to make assessments of the effects of a crisis, how to carry out a needs analysis, how to communicate and what to communicate, how to establish collaborative networks for cohesive and meaningful actions during a crisis, and how to coordinate leadership in a crisis.

In brief, “managing disruptions” training should include discussions of the following:

- What is “in-crisis” disaster needs assessment?
- The important elements of resilience.
- How to coordinate and collaborate to achieve greater resilience.
- Leadership and allocation of responsibility at all levels.
- Communications – means and strategies.
- Establishing public-private networks and community partnerships.
- Completeness of assessments.
- Timeframes and means of conducting relevant assessments.
- Responding to the outcomes of the assessments.
- Preparing a comprehensive financial plan for recovery.
- How international law relates to managing disruptions.

Overcoming Disruptions

In the aftermath of a sudden onset crisis or disruption, there needs to be both a planned and a reactive systematic process for recovery. The planned response is to follow the processes outlined in the BCP as best as possible under the prevailing conditions. Since many of the specific conditions are, by definition, unforeseen in a crisis situation, the community will respond in the ways that make best sense to them with the resources on hand. For instance, in instances where information systems break down under crisis conditions, businesses have often made use of “frugal information systems” that relied on available resources, such as using Microsoft Excel spreadsheets, or even pen and paper, to track transactions. When cities have had information systems disrupted by crises in the past, local IT businesses have helped businesses find ways to reestablish information and communications technology (ICT) capability (Sakurai & Chughtai, 2020).

In order to overcome disasters and address means of insurance, it is critical to understand the risk of future crisis events. To measure risk there needs to be a thorough understanding of the vulnerabilities of the Pacific Island countries. It has been argued that this should be based on four dimensions (Turvey, 2007): *coastal index* (length of coastline divided by land area), which measures the risk of inundation, *peripherality index* (insurance and freight debits as a proportion of imports of merchandise) as a measure of remoteness and insularity, *urbanization indicator* (proportion of people living in urban areas), and *vulnerability to natural disasters* (based on the proportion of a population disrupted by natural disasters over a specific time period).

Singh et al. (2021) argued that SIDS need to develop reserve funds as part of their annual budgetary process and contribute all unused allocated funds to the reserve fund. They say that each of the SIDS would likely need to revise their legislation to accommodate the extreme risks to their economies and livelihoods. And they recommend the development of appropriate insurance policies to address the losses to businesses from disasters.

Inevitably, there will be actions or processes that could have been handled better in retrospect. It is, therefore, essential for communities and businesses to capture the lessons learned and fold them into their BCPs. While this may seem obvious, the changes to planning need to be tracked with the associated rationale; otherwise the impetus for change in planning will gradually dilute as new people who are unaware of the rationale for the changes in question are tasked with revising the BCP. Multibillion dollar space programs, for instance, have suffered catastrophic failures through the loss of knowledge of design choices or system processes that had resulted from lessons learned.

We suggest a major unit of a course in business studies, called “overcoming disruptions,” should address the following:

- Understanding and determining risks of disruptions
- Addressing the issues and obstacles involved in overcoming disruptions
- Options for disaster risk financing

- Restructuring an organization to promote resilience to future disruptions
- Building a coherent network of stakeholders with a vested interest in business success and resilience (including suppliers, partners, distributors, and customers)
- Provision of comprehensive staff training and building a culture of continuous improvement across all levels of the organization
- Promote a person-centered culture for supporting staff well-being throughout the business, especially in the aftermath of a disruption or disaster

Learning Outcomes

A course based on the above principles would seek to equip managers and decision-makers in private and public sectors with the tools and knowledge they need to prepare for, manage, and overcome the effects of major disruptions to their businesses. It would help them understand the possible effects of disruptions and how they can survive the impacts. The course will help participants to use the appropriate tools and techniques to prepare for and address disruptions; carry out an “in-crisis” needs assessment in a disruption scenario and coordinate an effective response in real-time consideration of infrastructure failures; develop analysis skills through analysing disruption scenarios; prepare a business continuity plan for an MSME in a specific sector (tourism/hospitality, agro-processing, manufacturing, or industry of choice), to overcome crisis situations; and develop policy recommendations for executive management on preparing Pacific SIDS for future disruptions.

Teaching Methods

The course would make use of various learning methods, such as informational lectures, in-class discussions, practical demonstrations, field trips, engaging with experts on their experiences of managing previous disasters, video presentations from international experts, presentations by participant on simulated crises and resulting disruptions, case studies, and group work projects.

Conclusion

Innovation and resilience grow out of appropriate learning and skill development and collaboration with peers and the global community. The development of these qualities is critical today more than ever, with the ongoing COVID-19 pandemic and the effects of global warming. It is important that future generation of managers in disaster-prone and vulnerable SIDS are highly skilled in preparing, managing, and overcoming disruptions through appropriate training and education.

The world needs business leaders who can negotiate the vicissitudes of the increasing frequency and intensity of natural hazards and prepare their businesses for an uncertain and unpredictable future. They need to be proactive in empowering

their people, giving them the requisite training and skills, while caring for their health and well-being in stressful times. The *next generation of managers* needs to be equipped with the best and most up-to-date tools and techniques for managing the *new normal* of extreme disruptions.

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Index

A

- Aadhaar, 1581
Aadhaar-based biometric authentication (ABBA), 1581, 1583
Aapda Mitra, 1058
Aardram mission, 382
Aarogya setu app, 1500
Abandoning of pets, 113–115
Abhyāranya, 203
Abolition of Forced Labor Convention, 1957, 2015
Abortion, 295
Abuse Bill, 1566
Academic libraries
 disaster management practices of, 1225
 instituting recognition of disaster management in, 1226
 librarians working in, 1225
 typhoon Haiyan effect on, 1224
Access, 2130–2132, 2135
 to information, 1414
 to justice, 1809, 1811, 1815, 1816
 to welfare, 151–154
Accessibility, 633–634
Accord for Fire and Building Safety in Bangladesh, 2016
Accountability, 843, 1650, 1652, 1656, 1663, 1815–1816, 1884, 1914, 1918, 1919
Accredited Social Health Activists (ASHA), 297
 workers, 1025
Aceh Tsunami (2004), 2380–2382
Action research, 856
Activate comprehensive responses, 2529
Active learning paradigm, 488
ActivityStreams 2.0 Core Syntax (AS2), 578
Act of Disaster management, 1442
Act of God, 1650–1655, 1658
Adaptation, 2505, 2530
 strategies, 1960
Adapt health system capacity, 2529
“Adaptive resilience” approach, 465
Addictions, 1563
Addis Ababa Action Agenda, 397
Aditi, 207
Administer/manage disasters, 1276
Administrative Reform Commission (ARC), 213, 1041
Administrative Training Institutes (ATIs), 1041, 2072
Advanced Land Observing Satellite (ALOS), 713
Advertising budgets, 1506
Advisory services, 1709
Advocacy journalism, 1317
Aerospace Industries Association (AIA), 526
Aerostat drag coefficient, 523
Aerostats, 521–523
Afghanistan
 COVID in, 2027
 humanitarian aid in, 2027
 humanitarian crisis in, 2025
 humanitarian relief in, 2027
 hunger crisis, 2025
African Charter on Human and Peoples’ Rights (AFCHPR), 1914
Agency, 1237
Agenda for Sustainable Development of 2030, 397
Agenda setting, 1474
Age of the New Normal, 126, 137
Age-related discrimination, 1449, 1452
Agni, 202, 208
Agricultural business, 2366
Agricultural Information Service (AIS), 1303
Agricultural labour, 877–879

- Agricultural policy, for food security, 2451–2453
 Agricultural production, 2450
 Agricultural sector, 2450, 2451, 2453, 2454, 2458
 Agriculture, 2150, 2197
 livestock, 943
 sector of Bangladesh, 2145
 Agro processing industries, 942
 AI-based data analytics systems, 480, 482, 494
 AIDR system, 532, 538
 Aila cyclone, 1298, 1299, 1599, 1774, 1778, 2204, 2206–2208
 Ain-o-Salish Kendra (ASK), 1888
 Air (*vāyavya*), 199
 Akshara, 2132
 Alaknanda River, 713
 Alcohol addicts, 1569
 Alliance for Bangladesh Worker Safety, 2016
 All India Agricultural Workers Union (AIAWU), 879
 All India Radio (AIR), 175, 1521
 ALOS PALSAR DEM, 716
 Aluminized Mylar sheets, 525
 Amateur radio, 1393
 Amazon, 1440, 1512
 American Convention on Human Rights (ACHR), 1914
 American Standard Code for Information Interchange (ASCII), 714
 Amphan cyclone, 957, 1298, 1333, 1334, 2108, 2204, 2206, 2207, 2209, 2210
 challenges faced by senior citizens during, 959
 COVID-19 pandemic, 1337, 1339
 crops, 1336
 dwelling units, 1337
 economic loss, 1335
 food security, 1341
 government, 1342
 health system, 1338
 livelihood and nutrition security, 1336
 livestock population, 1336
 post-cyclone health services, 1338
 post landfall, 1332
 relief and restoration work, 1335
 respondent's opinion about disaster resilience during, 961
 stakeholders, 1335
 stress on the senior citizens, 960
 survivors, 1339
 West Bengal and Odisha, 1333
 Analysis of variance (ANOVA), 751
 Ancestral domain, 306
 Andaman and Nicobar Islands, 1553
 Andhra Pradesh, 229
 Anganawadis, 1568
 Anganwadi workers, 382, 1025
 Animal Birth Control (ABC) Program, 10, 22
 Animals (*paśu*)
 air (*vāyavya*), 199
 ancient Indian texts, 198
 in ancient literature, 203–206
 description, 198
 duty of human being, 201
 in forest (*āranya*), 199
 in national policy framework, 388–389
 natural disasters, 200–201
 protection, 201–203
 types, 199–200
 in village (*grāmya*), 199
Animal Welfare Board of India v. A. Nagaraja & Ors., 110
 Annual budgetary process, 2531
 Annual Development Plan (ADP), 994
 Annual Investment Program (AIP), 893
 Anthropocene, 1238, 1239
 Anthropocentric approach, 1728
 Anthropological theory of art, 1237
 Anthropomorphic disasters, 841
 Anticipated Risk (AtR), 1099
 Anticipation, 2505
 Anti-Corruption Law, 1831
 Antyodaya Anna Yojana, 1579
 Ānūpa, 200
 Anxiety, 2153
 Aotearoa New Zealand, 1706
 Apache Lucene, 486
 Apada Mitra, 1025, 2183, 2185
 Application programming interfaces (APIs), 486, 575, 577–584, 588
 Appraisal process, 1613
 ArcGIS 9.3, 225
 Archeological Survey of India (ASI), 2319, 2322
 Argentina, 54–56, 61
 Aristotle, 1236
 Armed conflicts
 on civilians, 1996, 1997
 consequences of, 1996
 hostilities in, 1996
 international, 2000
 legal framework governing, 1997–2000
 non-international, 2002
 of Sri Lanka, 2003
 Armed forces, 259
 Armed Forces Divisions (AFD), 1883

- Article 18A, 1955
Article 141A, 1881
Articles 141A–C, 1881
Articles on Responsibility of States for Internationally Wrongful Acts 2001 (ARSIWA), 1857
Artificial intelligence (AI), 19, 236, 246, 472–474, 1431
 AI-based systems, 534, 535, 547
 AI-driven vehicles, 17
 AI-infused ICTs, 630, 637
 geo-referencing information, 638
 image content, leveraging, 638
 network data, 639
 privacy issues, 639–640
 textual content, leveraging, 637–638
Artificial Intelligence for Disaster Response (AIDR), 637, 758
ArtofLiving, 601
Art therapy, 1156
ASHA workers, 383
Asian Development Bank (ADB), 1784, 2244, 2369
Asia-Pacific Disaster Report 2022, 2358
Asia-Pacific Island nations, 1551
Asia-Pacific region, 838, 839
Aspect ratio (AR), 524
Assam, 2190
Assam State Disaster Management Agency (ASDMA), 2198
AstraZeneca vaccine, 2148, 2149
Atharvaveda, 199
Atma-Nirbhar Bharat, 2480
Atomic Energy Regulatory Board (AERB), 265
Atomicity, Consistency, Isolation, and Durability (ACID), 486
Atomic power, 1928
Audio-visual medium, 1379
Authenticity, 547
Authorized equipment, 526
Automated emergency alerts, 632
Automated Web Text Mining (ESA-AWTM) system, 1441
Autonomy, 971, 977, 978, 980–982
Auxiliary Midwife Nurse (ANM), 1025
Availability-tweets, 598, 599, 602–604
Avalanche warning, 521
Aviation laws, 1886
Awaaz-e-Niswaan, 2132
Ayurvedic medicine, 1501
Ayushman Bharat, 1719
Azimuthal directions, 732
Azimuthal distribution, 739
- B**
Badan Nasional Penanggulangan Bencana, 2363
Balad, 1144
Baliyanala landslide, 712, 716
Bangabandhu-1, 1217
Bangladesh, 182, 183, 185, 188, 1210, 1296, 1297, 1774, 1776–1779, 1788–1790, 1800, 2012, 2015–2017
 access to legal support for GBV protection during disasters, 1809–1812
 adopted legislations, 1955
 Bangladesh Atomic Energy Regulatory Act 2012, 1925, 1928
 Bangladesh Atomic Energy Regulatory Authority (BAERA), 1927, 1928
 Bangladesh Bank, 2144, 2150, 2154
 Bangladesh Climate Change and Gender Action Plan, 2013 (ccGAP), 1958–1959
 Bangladesh Climate Change Resilience Fund (BCCRF), 1958
 Bangladesh Climate Change Strategy and Action Plan (BCCSAP), 1777, 1957–1958, 1970
 Bangladesh Climate Change Trust Fund (BCCTF), 1958
 Bangladesh Delta Plan 2100 (BDP), 993, 995, 1959
 Bangladesh Environmental Lawyers Association (BELA), 1887
 Bangladesh Environment Conservation Act, 2018, 2020
 Bangladesh Environment Rules, 2018
 Bangladesh Garment Manufacturers and Exporters Association (BGMEA), 2019
 Bangladeshi migrant workers, 2141, 2144, 2145
 Bangladesh Knitwear Manufacturers and Exporters Association (BKMEA), 2019
 Bangladesh Labour Act, 2016, 2017, 2020
 Bangladesh Legal Aid and Services Trust (BLAST), 1888
 Bangladesh Meteorological Department (BMD), 1299, 1885
 Bangladesh National Disaster Management Guidelines, 1777
 Bangladesh Petroleum Corporation (BPC), 2020
 Bangladesh Planning Commission, 992, 994, 995

- Bangladesh (*cont.*)
- Bangladesh Telecommunication Regulatory Commission (BTRC), 2020
 - Bangladesh Textile Manufacturers and Exporters Association (BTMEA), 2019
 - Bay of Bengal, 1880
 - climate change (*see Climate change*)
 - commitments under international law, 2015
 - community preparedness, 1304
 - community radio and capacity building, 1303, 1308
 - community radio intervention, 1305, 1306
 - Constitution of Bangladesh, 2017
 - cyclone, 2116
 - cyclones and evacuation in, 1298, 1299
 - cyclone warning campaign, 1299, 1300
 - disaster management, 1881–1889
 - Disaster Management Act, 2018
 - disaster management programme, 1807
 - environmental laws, 2018
 - evacuation during disaster, 1304
 - fundamental rights under the Constitution, 2017
 - Government's regulatory framework, 1807
 - housing and economic conditions in Kachia village, 1802
 - international agreements and state implementation, 1809
 - international safety law, 1924–1929
 - labor laws, 2017
 - legal framework, 1880
 - national and international disaster laws, 1962
 - National Disaster Management Policy, 2015, 2019
 - Parliament, 1880
 - peoples' responses, 1300
 - Rana Plaza disaster, 2016
 - safety during cyclone, 1305
 - safety from cyclone and community radio, 1307, 1308
 - Standing Orders on Disaster (SOD), 1808, 2020
 - study design, 1301
 - See also* Dhaka
- Bangladesh Atomic Energy Commission (BAEC), 1926, 1928, 1929
- Order 1973, 1925
- Bangladesh Betar*, 1266
- Bangladesh, COVID-19 pandemic, 2140–2149, 2151–2154
- basic necessities, housing and education, 1900–1901
- development and protection of disability rights, 1894–1896
- disability-inclusive pandemic management framework, 1897–1899
- employment, 1901–1902
- healthcare, 1899–1900
- intersectional PWD and vulnerability, 1902–1903
- social security measures, 1902
- Banks facilities restoration, 1010
- Barak valley, 2190, 2192, 2197
- floodplain region, 2192
- Barangay Climate Change Action Plan, 893
- Barangay Emergency Response Team (BERT), 892
- Barangay (Village) Disaster Risk Reduction and Management Committees (BDRRMCs), *see* BDRRMCs in disaster prevention and mitigation
- Barrang Lompo Island, 326
- Basamadi, 1625, 1629, 1633
- Basic Act on Disaster and Safety Management, 1118
- BASIL (basic structure of international law), 1987
- Basti Bachao*, 1630
- Batiphota*, 1241
- Bayesian network approach, 691
- Bay of Bengal, 185, 187
- BDRRMCs in disaster prevention and mitigation
- data gathering, 891
 - issues and concerns, 897
 - level of performance, 888, 889, 892, 893, 897
 - LGUs and communities, 887
 - MLRA, 896
 - policies and plans, 894
 - recent advances, 889
 - research design, 890
 - research environment, 890
 - respondents, 891
 - statistical tools, 890
 - structures and systems formation, 894
- Beamed power application, 522
- Brhaspati*, 208
- Behavioural Insights (BI), 2499–2503, 2505, 2506
- in disaster preparedness, 2367
 - intervention research, 2500
 - interventions, 2500, 2503–2506
- Beijingpass, 1252
- Betchora Headman Para landslide, 713, 719

- Bharat Sevashram Sangha, 1583
Bhola cyclone (1970), 74, 1298
Bhopal Gas Tragedy, 258, 1264
Bhuj earthquake, 2109
Bhūṣaya, 200
Big Data, 246, 2492
 management, in crisis, 611
“Big” heritage, 1612
Big social data, 574, 575, 577, 588
Bihar State Disaster Management Authority, 220
Bihar Veterinary University, 391
Bike app, 1145
Bio-diversity, 1955
Biological disaster, 1938, 1939, 2140, 2142,
 2146, 2153, 2154
 guidelines, 276, 277, 280
Bishyari, 416
Block Disaster Management Committee
 (BDMC), 2198
Boar (*Varāha*), 206
Bollywood, 1460, 1468
Boolean queries, 576
Bootleg Fire, 462, 463
Bounce back time, 86, 92
Bourdieu’s institutional sociology, 51
BoVW-based techniques, 539
Brahmaputra, 185, 186
Brand communication, 1275, 1425
 advertisements, 1426
 brand awareness, 1426
 brand resilience, 1426
 4 C’s, 1425
 customer interactions and positive brand
 attitudes, 1426
 messages, 1425
 role, 1425
Brands, 1505, 1506
 advertising in India, 1427
 collaborations, 1428
 during first wave of COVID, 1426
 messages, 1425–1427
 digital presence, 1430–1431
Breach, 168, 169, 174–176
Bribing practice, 61
Brihanmumbai Municipal Corporations
 (BMC), 975
Bruhat Bengaluru Mahanagara Palike
 Act, 978
Brushfire, 304
Bubonic plague, 275
Buddha paintings, 1167–1169
Buffering, 2529
Buffer zones, 305
Build Better program, 1512
Building Back Better (BBB), 298, 1056–1057,
 1759, 1762, 1764
Building disaster-resilient cities, 1373
Building Resilience and Capacities
 for Emerging Disasters (BRACED),
 375
Bulbul cyclones, 1303
Bull (*yrsabha*), 206
Bureaucracy, 127
Bureaucratic norms, 127
Bureau of Fisheries and Aquatic Resources
 (BFAR), 307
Bush fires, 1415, 1416
Business
 ecosystem, 2440
 leaders, 2512
 managers, 2513
 strategies, 2512, 2513
 sustainability, 2514–2517
Business and human rights
 basic principles, 2013
 history, 2013
 UNGP’s in disasters, 2014, 2015
Business continuity (BC), 2498, 2501
Business continuity plans (BCPs), 135, 136,
 2528, 2532
 designing and implementation, 2526
 Pacific Island Countries, 2527–2528
 preparing for disruptions, 2526–2528
Businesses during the COVID-19 pandemic
 agricultural business in Japan, 2366
 behavioural insights in disaster
 preparedness, 2367
 business model innovation, 2361
 challenges, 2359, 2361
 communication strategy, 2369
 CSR in Korea, 2364
 cyber risk, 2369
 disaster risk management framework, 2370
 food security in Singapore, 2366
 Indonesia’s legislative reform and
 development for disaster
 management, 2363
 job offers, 2362
 leadership, 2368
National Disaster Management Authority
 (NDMA), 2364
Singapore National Co-operative
 Federation’s platform, 2365

- Businesses during the COVID-19 pandemic
(cont.)
 in supply chains, 2362
 tourism industry in Indonesia, 2365
- Business Schools, 2524
- C**
- Cagayan de Oro River Basin (CDORB),* 886
- Calamity (*āpadā*), 201, 209
- Calamity Relief Fund (CRF), 1007
- Calculus of Consent, The*, 16
- Camera techniques, 1491
- Camp Fire, 455, 459, 460
- Canterbury earthquake sequence, 1707
- Canterbury Earthquakes Insurance Tribunal, 1710
- Capacities, 867
- Capacity building, 1632, 1757, 1759–1763, 2071–2075
- Capital funding, 2408
- Capsule network-based approach, 540
- Carbon dioxide emission, 1727
- CARE International, 422
- CARE Nepal, 422
- Cargo lifter, 522
- 1984 Cartagena Declaration on Refugees (CDR), 1990
- Cash assistance, 948
- Cash for Work (CFW), 948
- Catastrophes, 1393
- Catastrophic event, 1078, 1087
- Catchment, 169, 174, 175, 178
- Category-wise beneficiary, 931
- Cattle losses, disasters and, 386
- Cautiousness, 1411
- Center for Environmental and Geographic Information Services (CEGIS), 1971
- Central Crystalline rock types, 713
- Central Electricity Regulatory Commission (CERC), 1673, 1675, 1682
- Central Environmental Authority, 1322
- Central police forces (CPFs), 1042
- Central Transmission Utility of India Limited (CTUIL), 1673
- Centre for Research on Energy and Clean Air, 1670
- Centres for Disease Control and Prevention (CDC), 296, 1286
- Certified Emergency Manager® (CEM), 490
- Certified Emergency Response Teams (CERTs), 636
- Chakaria Sundarbans, 349
- Change management, 2513, 2514
- Character-level embeddings, 599
- Chardham project, 250
- Charland people, 1554
- Chemical, Biological, Radiological and Nuclear (CBRNs), 260
- Chennai floods (2015), 213, 216, 2119
- Chepangs, 1628, 1630, 1631
- Chernobyl disaster, 6, 1264
- Chitrakar, 1242
- Chittagong-Tripura Fold Belt, 713
- CHMV equipment, 508
- Cholera epidemic, 800–807
 clinical results, 810, 811
 clusters, 801, 802
 deaths, 801
 digital image processing techniques, 807
 files conversion, 808
 historical paradigm, 802
 image format, 805, 806
 Mirebalais source region, 803, 804
 NASA/LANDSAT5&7, 805
 reporting centers, 801
 waterways in source region, 803, 804
- Cinema, 1460, 1464
- Cities and disasters, 2334
 ambient temperature, rise in, 2336
 demand for water and water scarcity, rise in, 2335
 increased occupancy, in hazard prone areas, 2335
 increased vulnerability, 2335
 poor urban planning and management, 2335
- Citizen-Helper system, 637
 active learning paradigm, 488
 adaptability, 484
 challenges, 495
 COVID-19 implementation, 491
 customizability, 484
 data annotation, 486–488
 data collection, 485
 data storage, 486
 data visualization, 489
 disaster response and mitigation, 490
 extensibility, 484
 interactivity, 484
 modularity, 484
 preparedness via practitioner exercises, 492, 493
 simplicity, 484
 supervised learning algorithms, 488
 technical components, 485
 unsupervised learning algorithms, 488

- City-centered satellite sequences, 689
City-Share, 581, 582
Civil and political (CP) rights, 1804
Civil Aviation Act 2017, 1886
Civilian causalities
 agricultural facilities, 2042
 agricultural property, 2042
 air attacks, 2043
 burden sharing responsibility, 2050
 conflict-induced-disaster, 2041
 criminal tribunals, 2041
 direct and collateral damage, 2043
 general principles of international law, 2041
 human population, 2040
 IHL frame-works, 2041
 international and internal armed conflicts, 2041
 live-stocks, 2042
 nature of state responsibility v armed forces' responsibility, 2046, 2047
 post-war casualty management, 2048, 2049
 reparation, 2047, 2048
 state's responsibility, 2044, 2045
 worth-mentioning incident, 2040
Civilians
 Article 54, 2002
 conflicts on, 1996
 injury to, 1998
 involvement of, 2000
 NIACs, 2000
 protection of, 1996, 2000, 2006
 Sri Lanka, 2005
Civil liability, 1729
Civil society, 144
Civil Society Organization (CSO), 887, 893
Class-based summary, 616, 620–623
Class-I and Class-II Towns, 230
Classifiers, 600
“Clean India Campaign,” 1195
Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants (CCAC), 1930
Climate change, 182–193, 260, 306, 455, 456, 463–465, 744, 779, 780, 793, 794, 840, 988, 989, 992, 995, 1652, 1659, 1663
 disaster management, 1955–1969
 disasters risk, 1954
 policies and disaster, 1955
 South Asia women, 2115–2124
Climate change adaptation (CCA), 1955, 1960, 1966, 1969–1972
Climate Change Adaptation Program, 305
Climate Change Agreement, 1777
Climate change migration
 context of, 1979
 DHD drivers and, 1980
 disaster-driven displacements and, 1987
 legal protections in, 1990–1991
Climate Change Trust Fund Act 2010 (CCTFA), 1958
Climate crisis, 1513
Climate Fiscal Framework, 1960
Climate Fiscal Policy-making, 1960
Climate-induced displacements, 189
Climate refugees, 183–192
Climate-related disaster, 1367, 1576
Climate-related hazards (CRHs), 887–889, 896, 898, 899
Climate Resilience Program, 1960
Climatically displaced migrants (CMDs), 1982
protection to, 1985
Closure of schools, 1424
Cloud-based metadata storage, 493
Cloudburst in IHR
 categories, 782
 Cba and CBb events, 783
 impacts, 778
 mini-cloudburst (MCB), 783
 past study of mini-cloudburst (MCB), 783
 present state of activities, 793
 remote sensing and geospatial techniques, 791
 simulation of cloudburst events, 792
 topography, 781
Coalition for Disaster Resilient Infrastructure (CDRI), 1020, 2185, 2186
Coastal
 abrasion, 325, 329, 332
 areas, 224
 cities in Indonesia, 316–317
 communities, 2261–2264, 2267, 2269–2271, 2273, 2274, 2277, 2278
 district GIS database, 225
 ecosystem services, 2260
 erosion, 440–441
 index, 2531
 islands of Bangladesh, 1554–1555
 livelihoods, 227
 settlements, 227
 states, of India, 226–227, 233
 urban areas, 225
 urbanization, 230
 waterlogging, 989
Coastal regulation
 CRZ-III subject to compliance with, 102
 demolition of constructions in violation, 102
 in India, 99
 legislative framework on, 96, 99–100
 momentous for, 96

- Coastal regulation (*cont.*)
 prohibition of construction under, 101
 and promotes sustainable development, 100
 regime in India, 96
 Zone notifications, 97
 zoning, 98
- Coastal Regulation Zone (CRZ), 232–234
- Coastal Regulation Zone Act, 918
- Coastal Regulatory Zone Notifications, 1657
- Coastal resilience
 Class-I and Class-II Towns, 230
 coastline, 224
 CRZ, 232–234
 data and methodology, 225–227
 in India, 226–227
 metro cities, 230
 study area, 224
 urbanization, 230
- Coastal Zone Management Laws, 17
- Coastal Zone Management Regulations, 17
- Coastlines, 2260
- Cochin International Airport, 1051
- Code White, 132
- Code word system, 1566
- Coexistence, 2443
- Cognitive biases, 2499
- Cognitive processes, 1283
- Collaboration, 1428, 1514
- Collateral damage, 293
- Collection, identification, maintenance, multiplication and evaluation (CIMME), 854
- Colonial mindset, 1238
- Colonisation, 230
- Come, learn and keep safe (*Esho Jani O Bachhi*), 1306
- ‘Command and control’ policies, 19
- Commerce, 1512
- Common Property Resources, 942
- Common service centers, 253
- Communicate evidence-based information, 1289
- Communication, 130, 631–634, 640, 641, 1353, 1374, 1400, 1426, 1427, 1438
 AIR’s disaster management, 1524
 channels, 1436
 in disaster management, 1497, 1518
 and information dissemination, 1390
 radio, 1522
 and space-based technologies, 1438
 strategy, 2369
- Communication technology, 1392, 1416, 1436, 1448, 1451, 1453, 1455, 1456
 in disaster management practices, 1436
 media and disaster, 1437–1439
 social media, 1436
- Communicative system, 1320
- Communitas, 1622, 1624, 1625, 1629, 1634
- Community, 887, 889, 893, 894, 896–898, 1053, 1056, 1058, 1059, 1598, 1601–1604, 1607
 action, 1496
 awareness, 176–178
 care, 1451–1456
 disaster fatigue, 1698–1701
 engagement, 1500, 1501
 organizing, 859
 participation, 242, 253
 preparedness, 1297, 1303–1305
 sensitive reconstruction approach, 949
- Community-based disaster management (CBDM), 1016, 1603, 1604, 1777–1779, 2063
- Community Based Disaster Preparedness (CBDP) programme, 90
- Community-Based Disaster Risk management (CBDRM), 2075, 2367, 2451
 aims, 847
 description, 848
 into local governance, 855–858
 people’s resiliency to disaster risk and climate change, 849–853
 resilience building sustainable agriculture, 853–855
- Community Based Disaster Risk Reduction (CBDRR) Program, 1631
- Community-based eco-tourism, 942
- Community-based efforts, 375
- Community based flood early warning systems (CBFEWS), 251–252
- Community-based knowledge, 2101
- Community-based organisations, 1598
- Community-driven solutions, 142, 143
- Community ecological governance, 1741–1742
- Community Emergency Response Teams (CERT), 490
- Community healthy centers (CHC), 382
- Community leadership
 focuses on, 1688
 local, 1691
 personal preparation guide for, 1693–1697
 positions, 1688
- Community-level disaster risk resilience, 2063–2064
- Community participation, in Nepal
 challenges, 1632, 1633
 communitas, 1625
 field and methodology, 1625
 gender concerns, 1630
 liminality, 1624, 1625

- revisiting, 1628
spatial and cultural diversities, 1626
- Community radio, 1296, 1297, 1301, 1303, 1304, 1306–1312
intervention, 1305, 1306
policy, 1306
- Community resilience, 172–174, 319, 359–361, 2192, 2204, 2205, 2444
- Community resilient mechanisms, 2198
- Community response grids (CRGs), 247
- Community vulnerability, 2204–2215
- Company stakeholders, 2438
- Comparative analysis, 1786
- Compensation, 408, 410
- Competitiveness, 2444
- Complexity theory
disasters, 1078
earthquake, 1079
epidemic crises, 1079
features, 1078, 1080
mega-disasters, 1079
meteorology, 1078
power law, 1078, 1080, 1081
power law measures, 1078
- Republic of Korea, 1079
- stock market, 1079
- supply of hard disks, 1079
- Thailand floods (2011), 1079
- Compliance, 1924–1929
- Compound annual growth rate (CAGR), 1671
- Comptroller and Auditor General (CAG), 279
reports, 216
- Computer-assisted information processing for disaster management, 479, 480
- Conflictual federalism, 976
- Constitution 64th Amendment Bill 1990*, 970
- Constitutionalism, 16
- Constitutional protection for animals, 115
- Constitutional recognition, 1747–1748, 1751
- Constitution of India, 2319
- Construction of Cyclone Risk Mitigation Infrastructure, 2178
- Consumer behaviour, 1425, 1426
- Content analysis, 489
- Context-dependency, 587
- Contingency plans, 135, 136
- Contingency theory, 19
- Continuity planning, 129, 136, 137
- Continuity policy framework, 130
- Convention on Nuclear Safety (CNS), 266
- Convention on the Elimination of All Forms of Discrimination Against Women 1979 (CEDAW), 1894, 2015
- Convention on the Rights of the Child 1989 (CRC), 1894
- Convolutional Neural Networks (CNNs), 540, 600, 1415
- Co-operatives
corporate-owned sharing economy into, 2401
digital ecosystem, 2406
ecosystem, 2406
roles of, 2407
platform, 2398
in Singapore, 2403–2408
- Co-operativism, 2397
- Coordinating search and rescue, 632–633
- Coordination, 213, 1970
- Coping, 356, 2504, 2505
- Copyrights, 547
- Corona Rakshasa, 1162
- Corporate digital responsibility (CDR), 2370
- Corporate organisation, 1349, 1357
brands, 1348
CSR regulations, 1350
in flood management cycle, 1354
involvement, 1350
mitigation, 1355
recovery phase, 1356
- Corporate social responsibility (CSR), 144, 1272, 1429, 1430, 1506, 2438
activities, 2364
definition, 2439
during disasters and COVID-19, 2441–2442
effective CSR communication, 2445
initiatives, 2438
practices and programs, 2438
programs, 2439
and risk management, 2446
social capital-accruing function, 2440
social engagement, 2438
in South Korea, 2439–2441
- Corporation
v. Caledonia Railways, 1653
social capital, 2441
- Corruption, 1581, 1582
collapsed bridge as result of natural force by suspected, 54–57
practices in procurement of bridge repairs and construction, 58–62
in procurement, 53–54
- Cost-effective procurement, 2529
- Cost-reflective tariff, 1682
- Council on Energy, Environment and Water (CEEW), 2207
- Country Investment Plan for Environment, 1960
- Country Investment Plan for Environment, Forestry, and Climate Change (CIP-EFCC), 1959

- Courts on executive immunity, 1831, 1832
 COVAX, 2149
 COVID-19, 17, 30–32, 159, 186, 271, 370, 372, 380, 383, 384, 490, 634, 638, 879–880, 1136, 1242, 1267, 1272, 1274, 1362, 1364, 1365, 1367, 1377, 1417, 1424, 1426–1428, 1499–1502, 1506, 1531, 1532, 1716, 1756, 1797, 1936, 2128, 2131–2135, 2311, 2414–2420, 2422, 2423, 2428, 2430, 2431, 2433, 2434, 2438, 2442, 2444, 2446, 2455, 2458, 2465, 2512, 2515, 2517
 acceptability, 1945–1946
 accessibility, 1945–1946
 applications of smart city technology, 1138–1142
 availability, 1945–1946
 businesses in the Pacific, 2521
 challenges faced by municipalities, 975–979
 communication, 1284
 crisis, 1881
 deaths at world level, 2473
 determinants of right to health, 1946
 direct health impacts, 1940
 disability-inclusive COVID-19
 preparedness and response plans, 1897
 as disaster, 1937
 disruptions, 2521–2524
 effect on agriculture in Japan, 2453–2456
 engendered recovery and reconstruction, 298–299
 F&B industry, 2486–2492
 FEMA, 284
 feminine societies, 2466
 food security in India (*see* Food security in India during pandemic)
 on food security in Singapore, 2430–2431
 gender differentiated impact, 290–291
 growth prospects of Indian MSME sector, 1065
 and Health for All, 1796
 helpline, 1508
 Hindi film industry, 1465, 1467, 1468
 on higher education (*see* Online teaching)
 humanitarian crises, 2025
 humanitarian relief, 2033
 human-rights based disability models, 1893–1894
 indirect impact, 1940
 in Indonesia, 1822–1828, 1830, 1832, 1833, 2384–2387
 lack of agency in administrative relationship with state government, 980
 lack of agency in financial relationship with state government, 981
 LMICs, 292–293
 mental or emotional health, 296–297
 municipalities role, 972–975
 negative impact on business, 2512
 NDMA, 276–278
 pandemics and epidemics, 291
 perceived solutions, 296–297
 pervasiveness of, 1064
 policy frameworks, 291
 power sector (*see* Power sector during pandemic)
 pre-pandemic global and regional disaster guidance, 1896
 public health and vulnerable people, 1939–1940
 quality healthcare, 1945–1946
 and radio communication, 1524
 refugee population, 2025
 reproductive and sexual rights, 293–296
 response, 2465
 rights-based approach to disaster management, 1947–1948
 safety protocols, 1365
Samaj and, 1604–1606
 smart city technology adoption prior to advent of, 1142–1143
 smart city technology application throughout, 1143–1147
 social impacts, 1939
 spreading, 1289
 State obligations, 1943–1945
 States' international obligation to assist, 1946–1947
 strategies, in Bangladesh, 1899–1903
 test services, 2145
 vaccinations, 2149, 2520
 vulnerable people's right to health, international law, 1941–1943
 vulnerable people's right to health, States' failure, 1945–1947
 Covid-19 Emergency Response and Pandemic Preparedness Project, 2151
 Covid-19, in Bangladesh
 deaths, 2141
 development and protection of disability rights, 1894–1896

- disability-inclusive pandemic management framework, 1897–1899
- education sector, 2142
- financial and non-financial organisations, 2151
- GDP growth, 2143
- household income, 2145
- poverty, 2142
- private hospitals, 2147
- Readymade Garments Industry (RMG), 2143
- Rohingya camp, 2141
- tertiary educational institutions, 2150
- test services, 2145
- travellers, screening, 2147
- vaccination, 2148, 2149
- COVID-19, in India
- aftermath of, 2482
 - challenges, 2481
 - decision making during, 1073
 - deterioration in socio-economic conditions, 2472
 - economic impact of, 1072
 - election results in post COVID-19 situation, 2481
 - fallouts of, 2472
 - flow of money, 1067
 - Government handling of, 2476
 - mishandling of, 2482
 - MSME sector, 1065, 1075, 2478, 2481
 - outbreak of, 2476
 - policy slippages, 2480
 - positive outcome of, 2474
 - prevention of spread, 2474
 - in risks and disruptions, 1070
 - safety of children during, 2475
 - second wave of, 2473
 - third phase of, 2481
 - vaccines, 2483
 - waves of, 2472
- COVID-19, in Singapore
- and digitally based new economy, 2396
 - economic and social benefits to businesses, 2398
 - social distancing, 2398
 - virtual meetings, 2405
- COVID Support Fund (CSF) initiative, 1506, 1508
- Cow (*Gau/dhenu*), 203–204, 207
- Criminal liability, 1729
- Crisis, 1425, 2462–2464, 2528
- and organizational resilience, 2464
 - image benchmark dataset, 533, 539
- incidents dataset, 533
- informatics, 574–576
- management, 1501, 1604–1606, 2463, 2515, 2516
- maps, 648–649
- Crisis communication, 1375
- processes, 1368
- CrisisDPS, 759
- Crisis Emergency Risk Communication (CERC) model, 1281
- Crisis information summarization
- big data management, 611
 - summarization algorithm, 614–616
 - summarization scheme (SCC), 616–624
 - tweet summarization, 610–611
- CrisisMMD, 538
- Crisis multimodal dataset (CrisismMMD), 533
- Crisis-related social media images, 540
- Crisis Response Management Team (CMT), 1897
- Critical after-action analysis, 479
- Critical event management, 707
- Critical infrastructures of smart cities, 1129
- Critically Vulnerable Coastal Areas (CVCAs), 232
- Cross-subsidy surcharges, 1682
- CrowdMonitor, 581
- Crowdsourced data, 480
- Crowdsourcing, 636–637
- Crown Proceedings Act of 1947, 1658
- Cultural capital, 63
- Cultural diplomacy, 2329
- Cultural heritage, 1610, 1612, 1616, 1618, 1619
- history of, 502
 - locations, 513
 - management, 2316
 - monitoring, 511
 - protection, 500
 - resilience, 500, 503
 - role in disaster prevention, 506
 - vulnerability of, 501
- Cultural Heritage Monitoring Vehicle (CHMV), 505
- Cultural patterns, 2118
- Cultural resilience, 1532
- Cultural rigidities, 2118
- Cultural tangibles, 2317, 2319, 2323
- CURE framework, 1154
- Current Food Grains Stocking Norms, 1581
- Curriculum, 1382

- Customary international law (CIL), 1984, 1985, 1987, 1992
- Customisation, 1430
- Customs Act 1969, 1885
- Cyber risk, 2369
- Cyber-security threats, 2349
- Cyclone, 233–235, 1015, 1022, 1023, 1025, 1332, 1931, 2204, 2206–2210, 2212, 2213
- Aila, 186
 - aftermath of, 1224
 - Amphan, 186, 274, 1272
 - Bulbul, 186
 - Fani, 186, 1222, 2108
 - Hudhud, 186
 - large-scale disasters initiated by, 1222
 - on library, impact of, 1228–1229
 - Phailin, 186, 219, 2108
 - post-cyclone responses and recovery efforts, 1229
 - preparation before, 1228–1229
 - Sidr, 186
 - tropical, 1225
 - Yaas, 186
- Cyclone/Flood Shelter Management and Maintenance Committees (CSMMC/FSMMC), 401
- Cyclone Preparedness Programme (CPP), 1296, 1304, 1305
- Cyclone-resistant houses, 193
- Cyclone Risk Reduction (CRR) strategy, 1308
- Cyclone Shelter Construction, Maintenance, and Management Policy (CSCMMP), 1963
- Cyclone warning, 401, 410
- campaign, 1299–1301
 - system, 1309
- D**
- Damage assessment, 706
- Damage Assessment Dataset (DAD), 533, 535
- Damage-mitigation, 2489
- Damage Multimodal Dataset (DMD), 538
- DANIDA, 1301
- Darjeeling, 1599–1602, 1604–1606
- Darjeeling District Disaster Management Authority (DDDMA), 1600, 1601, 1603
- DArt 1, 1851
- Data
- analytics, 2492
 - annotation, 486–488, 547
 - collection, 308, 485, 547, 2267, 2493
 - gathering, 583
 - mining, 1431
 - operations, 588
 - security, 486
 - storage, 486
 - tables, 489
 - transmission, 486
 - visualization, 489, 1129
- Databases, 486
- Dataset, 535, 598
- Davao Regional Development Plan 2017–2022, 307–308
- Debris flow, 711, 712, 714–717, 719–722
- Deccan Sahadri hills, 710
- Decentralisation, 213, 317, 968–970, 972, 974–978, 982
- Decision-makers, 638
- Decision-making, 532, 533, 1822, 2515
- Deep learning (DL) models, 539, 540, 663–664, 669, 690
- Defence Research and Development Organisation (DRDO), 259, 266
- Defensible space, 455, 459, 460, 462, 465
- Delayed dispute resolution, 1706
- Delays, 1708–1710, 1712
- Delta Dynamic Integrated Emulator Model (ADIEM), 995
- Democratic leadership, 2515
- Demographic database, 225
- Demographic features, 489
- Department of Agriculture (DA), 307
- Department of Atomic Energy (DAE), 261, 265
- Department of Disaster Management and Civil Defense, 1599
- Department of Environment and Natural Resources (DENR), 307
- Department of Land Conservation and Development (LCD), 447, 449, 450
- Department of Revenue, Agriculture & Commerce, 275
- Dependency parsing, 601
- Depression, 1563, 2143
- De-prioritization, 293
- DEPSUB, 614, 616–619
- Desertification, 346
- De Soto, H., 40, 42
- Devdaha, 1625
- Development, 868
- organizations, 2263, 2264, 2277, 2278
- Developmental Association for Human Advancement (DEHAT), 429

- Devolution Report*, 977, 978
Dhaka, 1208
actions for improvement, 1216–1219
airport, 2147
city services, 1214–1216
criminality and violence, 1216
DAP, 1216
disaster governance and policy, 1217
earthquake, 1211
fire, 1213
floods in, 1210–1211
transportation, 1213
wetlands, 1211
Dhalbhanga village, 1309
Diaspora, 1617
Digital and New Media, 1465
Digital elevation models (DEMs), 690, 714, 715, 717, 718
Digital or internet skills, 1448
Digital platforms, 2361, 2364, 2365
benefits of, 2397
as business model, 2396
challenges of, 2397
collaborative economy, 2396
co-operativism, 2397
co-ops, 2398, 2400
definition, 2396
platform economy, 2396
platform monopolies, 2397
sharing economy, 2396
Singapore government, 2397
Digital technology, 841
Digital tools, 1500, 1501
Digital transformation, 1128, 1430
Digitization, 19–20
Dignity, 1756, 1757
DIRAJ (Disaster Risk Reduction Network of African Journalists), 1438
Direction, 2464
Directive Principles of State Policy, 1718
Direct sensor feed, 486
Direct subsidy system, 1682
Direct transactions, 2456, 2457
Disability and COVID-19 pandemic
development and protection of disability rights, in Bangladesh, 1894–1896
disability-inclusive COVID-19 preparedness and response plans, 1897
disability-inclusive pandemic management framework, in Bangladesh, 1897–1899
human-rights based disability models, development of, 1893–1894
pre-pandemic global and regional disaster guidance, 1896
strategies, in Bangladesh, 1899–1903
Disability awareness, 1541, 1542, 1544
Disability Discrimination Ordinance, 1536, 1543
Disability inequity, 1540–1542
Disability Information System (DIS), 1895
Disaster, 225, 235, 296, 636–637, 1014, 1264, 1368, 1372, 1391, 1401, 1506, 1563, 1575, 1579, 1581–1583, 1638, 1668, 1669, 1675, 2489
adverse social effects, mitigation of, 1639–1640
and crises, 2492
definition, 1577, 2062, 2099
events detection, 543
government information dissemination systems and processes, 1496–1502
and human civilization, 2099
impacts, 374
learning from past to prepare for future, 1640–1641
mapping, 1441
mitigation, 1415, 1757, 2059
preparedness and challenges, 1196, 1197
prevention, 2058
psychology, 1610, 1611, 1616, 1618
reporting, 1364, 1474
resilience, 2334
and settlement planning, 1641–1644
survivors, 1618
types of, 1015
vulnerability, 2333
Disaster and We, The (*Durjoge Amra*), 1306
Disaster Assistance and Protection Program (DAPPED), 1795, 1796
Disaster communication, 1320, 1383, 1394, 1400, 1401, 1411, 1496, 1499, 1500
management, 1497
in Vietnam, 1401
Disaster displacement, 1865
and human rights, 1872–1874
policy options, 1866–1867
special needs of displaced persons, post-displacement vulnerability, 1866
Disaster-driven human displacement (DHD), 1797
Disaster fatigue
collective, 1689
at community level, 1697, 1698, 1701
as phenomenon, 1689

- Disaster governance, 212, 213, 864–866, 1775
 Amphan cyclone, 2108
 command-and-control, 26
 Covid19 and Indian Courts, 32–34
 critical factors in Indonesia, 314–316
 current disaster management in India, 2108
 Disaster Governance of India, 871–873
 in disaster management, 2102
 DM Act, 29–32
 Fani cyclone, 2108
 international strategies for, 2102–2107
 operational choices, 29
 Phailin cyclone, 2107, 2108
 resilience thinking in, 870
 restrictive approach in the USA, 27
 rights-based approach of ECtHR, 27
 sovereign immunity, India, 28, 29
 strategy in coastal cities in Indonesia, 316
 unravelling accountability, 34–36
- Disaster Image Retrieval from Social Media (DIRSM), 544
- Disaster journalism
 disaster strikes, 1363
 freedom and space reporters, 1363
 media institutions, 1364
 post-disaster recovery, 1363
 pre-disaster phase, 1363
 role, 1362
- Disaster law (DL), 9, 1886
 equity, 1658–1659
 history of growth, 1651–1652
 International humanitarian law (IHL), 1662
 need for adoption of, 1650
 public trust, doctrine of, 1656–1657
 subsidiarity, 1659–1661
 from supernatural origin to origin in governance decisions, 1652–1655
 transdisciplinarity, 1661
 vicarious liability, 1656, 1657
- Disaster management, 212, 213, 215–218, 358–359, 396, 405, 410, 612–613, 837, 839–843, 1195, 1373, 1381, 1383, 1397, 1400, 1436–1438, 1440, 1441, 1443, 1650, 1655, 1658–1662, 1757, 1781, 1782, 2068, 2098–2101, 2176–2179, 2182–2186, 2451, 2459
 Amphan cyclone, 2108
 authorities, 1373
 Bangladesh, 1265, 1789
 build back better, 1764
 calamities, 1390
 communication, 1390
 comparative analysis, 1786
 concept, 1784
 crisis maps, 648–649
 current disaster management in India, 2108, 2109
 deep learning model, 663–664
 direct law, 1758
 disaster prevention, mitigation and adaptation, 1763
 disaster risk reduction and damage control, 1763
 e-governance application in, 243–244
 and emerging technologies, 246–247
 European Union, 1270–1276
 eyewitnesses, 653
 Fani cyclone, 2107, 2108
 financial mechanism, 1764
 gazetteer-based approaches, 661
 geographical information system, 244–246
 geolocation inference, 649–654
 geospatial technologies, application of, 704–705
 geospatial tools, 704–705
 Hyogo Framework, 1759
 impact maps, 653
 India, 1266–1269, 1788
 Indian perspectives, 1759–1760
 indirect laws, 1757
 information, India's, 1497–1499
 institutional apparatus, 247–248
 institutional arrangement, 1967–1969
 institutional mechanism, 1765
 international strategies for disaster governance, 2102, 2103
 Japan, 1269
 of library, 1224
 locational focus prediction, 650
 location mention disambiguation (LMD), 655, 666
 location mention prediction (LMP), 649, 650, 654–655
 location mention recognition (LMR), 654–657, 664–666
 machine learning-based approaches, 661–662
 named entity recognition (NER), 658–659
 next location prediction, 652
 Pakistan, 1786
 Phailin cyclone, 2108
 phases, 478, 479
 policies, 840
 population mobility maps, 653
 principles of operational framework, 1762
 rationale for the study, 1783

- research methodology, 1783
research questions, 1783
resources maps, 653
response planning maps, 653
rights-based approach, 1947–1948
Sendai Framework, 1759
significance of governance in, 2102
situational awareness maps, 652
South Asian Region, 1785
Sri Lankan, 1269
structural and operational framework, 1760
sustainable development, 1390
technological resources, 1390
technology for, 248–252
three-tier disaster management authorities, 1767–1768
tweet location prediction, 650
Twitter, 649–657, 671–673
USA, 1270
user location prediction, 652
user movement modeling, 652
Yokohama Strategy, 1759
- Disaster Management Act (DMA), 28–32, 159, 275–281, 399, 1016, 1018, 1020, 1021, 1025, 1109, 1266, 1721, 1777, 1962–1965, 2064, 2100, 2103, 2107, 2131, 2177, 2182, 2184
2005, 212, 213, 217, 221, 972–974, 1577
2012, 1807, 1883, 2018, 2019, 2021
- Disaster Management Committees (DMC), 1628, 1632, 1633
- Disaster management, in Darjeeling hills
formal institutional arrangement, 1598, 1601
Samaj (*see Samaj*)
- Disaster management laws and conventions, 1883–1885, 2120
- Disaster Management Plan, 1600
- Disaster Management Policy 2015, 993, 1883, 1966
- Disaster Medicine, 803, 812
- Disaster Mitigation and Recovery Techniques, 270
- Disaster planning, 129, 1225
- Disaster preparedness, 2059, 2104, 2105, 2499–2503, 2506
and disability, 1537–1538
disability inequity in, 1540–1542
property managers' mind, 1538–1539
- Disaster-related imagery, 544, 547
- Disaster-relevant information, 577
- Disaster relief, 2059, 2438
CSR activities, 2442, 2443
operations, 1351
- Disaster Relief and Emergency Assistance Act of 1988, 282
- Disaster rescue, 631, 636, 637
- Disaster research, 4, 2056
- Disaster resilience, 158, 159, 162, 957, 961, 1047, 1183–1184, 1236, 2073, 2076, 2101
concepts of, 1194
DRM, 1193
natural and human, 1194
in smart cities, 1195, 1196
sustainable development, 1193
underprivileged (*see Underprivileged*)
urban population, 1194
- Disaster Resilience Index (DRI), 2073, 2074
- Disaster Resilience Smart Cities, 162
- Disaster response and recovery strategies, 479, 483, 489, 490, 1419, 1420, 1757, 2059
- Disaster risk, 324, 326–328, 338, 744, 2262–2264, 2267, 2269, 2270, 2272–2274, 2277
governance, 1414, 2071, 2283, 2290, 2292
preparedness, 2321
resilience, 158
- Disaster risk management (DRM), 352, 500, 1193, 1196, 1419, 1893, 1894, 1896–1898, 1902–1904
cycle, 2489
preparedness, 2491
recovery, 2491
response, 2491
risk mitigation/prevention, 2490
social media policy, 1419
stages, 2489
system, 1078
- Disaster Risk Reduction (DRR), 34, 291, 306, 317–319, 344, 351, 870, 872, 1016, 1036, 1253, 1254, 1374, 1496, 1498, 1639, 1759, 1760, 1762, 1763, 1769, 1774–1778, 1787, 1892, 1894, 1896, 1897, 1903, 1954, 1955, 1962, 1965–1967, 1969–1972, 2098, 2099, 2101, 2103–2110, 2120, 2121, 2204, 2288–2291, 2316, 2320–2321
concept of, 1911
framework in, 1912
IHRL in, 1911
initiatives for, 1230
integrated approach in, 1912
international framework for, 1222
management, 305

- Disaster Risk Reduction (DRR) (cont.)**
- planning, 1796
 - policy, 952
 - training programmes for police (*see* Police training, DRR)
- Disaster Risk Reduction and Management (DRMM), 308, 418, 1622, 1623
- Disaster Risk Reduction National Strategic Action Plan, 1623
- Disasters and Disaster Risk as Development Challenge, 258
- Disaster Unemployment Assistance program, 375
- Discoms, 1669, 1674–1676, 1680–1683
- Discourse network analysis (DNA), 313
- Discrimination Convention, 1958, 2015
- Discussion-based exercises, 492
- Displacement of people, 1640, 1643
- Dispute resolution, 1706–1712
- Disruptions, 1505
 - COVID-19 impact, 2521
 - natural hazards in Pacific, 2521–2523
 - social media, 2524
- Distressed Area, 1777
- Distributive justice, 141
- District Disaster Management Authorities (DDMAs), 20, 31, 213, 218, 220, 221, 263, 1005, 1041, 1042, 2068, 2072, 2100, 2178, 2198
- District Disaster Management Officers, 838
- District Planning Committees, 977
- Disturbance storm time, 734
- Doctors For You, 597
- Doctrine of public trust, 1656–1657
- Domestic tourism, 2419
- Domestic violence (DV), 1531, 1562, 1563, 1567–1569, 1800, 1805, 1811, 1814, 1815, 2129–2135
 - behaviour, 1564, 1565
 - definition, 2129
 - and disaster, 2130–2131
 - gender-based violence, 1560
 - guidelines, 1570–1572
 - human rights, 1560
 - vs. LGBTQIA++ community, 1560
 - lockdown (*see* Lockdown)
 - public health problem, 1560
 - and transmission of violence, 1560
 - UNDOC study, 1560
- Doppler Weather Radar System (DWRS), 243
- Double-bind, 2463, 2464
- Dowry, 1805, 1811, 1813
- Draft Articles, 1857
- Draft Articles on the Protection of Persons in the Event of Disasters (DAPPED), 1850, 1857
 - DArt 1, 1851
 - DArt 2, 1852
 - DArt 4–6, 1852
 - DArt 5, 1852
 - DArt 7, 1853
 - DArt 9, 1853
 - DArt 10, 1853
 - DArt 11, 1853
 - DArt 12(1), 1853
 - DArt 12(2), 1853
 - DArt 13, 1853
 - DArt 14, 1854
 - DArt 15(1), 1854
 - DArt 15(2), 1854
 - DArt 16, 1854
 - DArt 17, 1854
 - DArt 18(1), 1854
 - DArt 18(2), 1854
 - history, 1851
 - normative framework, 1854–1856
 - Preamble, 1851
- Drainage, 171, 174–178, 917
- Dr. Maya D. Chablani v. Radha Mittal and Others*, 119
- Drones, 17, 247
- Droughts, 1265, 2343
 - risk coping, 2080, 2089
 - socioeconomic impacts, 2343–2344
- Dry-Coulomb-type friction, 715
- Dubai, 1130
- Durant, J.H., 1265
- Duty of solidarity
 - disasters through, 1839
 - after emergency, 1845
 - before emergency, 1844
 - under international law, 1837
 - under international laws, 1840
- Dynamic capability theory, 2441
- Dynamic safety model, 1093
- E**
- Early Warning and Dissemination Systems (EWDS), 407, 2178, 2182, 2184
- Early warning systems (EWS), 692, 1765, 1767, 1769
 - definition, 73
 - indigenous knowledge on (*see* Indigenous knowledge)
- Earth's water, 159

- Earth jurisprudence, 1738, 1739, 1741
 community ecological governance, 1741–1742
 constitutional recognition, 1747–1748, 1751
 judicial recognition, 1749–1750
 legal personhood and rights of nature, 1740–1741
 legislative recognition, 1748–1749, 1751
 MV X-Press Pearl disaster, 1743
 philosophical and theoretical origins and development, 1739–1740
 restorative justice, 1742–1743
- Earthquake, 816, 1211, 1265, 1266, 1271, 1552, 1707–1709
 in Gyeongju city, 510–511
 in Pakistan, 1474
 precursor, 729, 739
- Earthquake Hazard Zonation Map, 816
- Eastern coast region
 Andhra Pradesh, 229
 Orissa, 229
 Puducherry, 229
 Tamil Nadu, 229
 West Bengal, 229
- Eastern Visayas Regional Medical Centre (EVRMC), 132
 continuity planning for the future, 134
 hospital census, November 7–22, 2013, 135
 inventory of EVRMC staff after the typhoon, 134
 loss and damage, 133
 medical contributions, 132
 preparation, 132
 recovery efforts, 134
- Ebola crisis, 292
- Ecological balance, 306
- Ecological journalism, 1323
- Ecological refugee, 183
- Ecological vulnerability indicators, 765
- E-commerce, 1351, 2146
- Economic capital, 63–65
- Economic cost, 1938
- Economic indicators, 822
- Economic recovery, 1706
- Economic resilience, 159
- Economic stunting and inflation, 1505
- Economic violence, 1560
- Economic vulnerability, 763, 767, 770, 773
- Economic, social and cultural rights (ESC rights), 1874
- Ecosystem, 94, 1960, 2344
- Ecuador, 1747–1748
- E-governance
 application in disaster management, 243–244
 as critical disaster mitigation techniques, 249–252
- 8th Five Year Plan (2020–2025), 993, 995, 1961
- Elasticsearch, 486, 489
- Electricity connectivity, 1009
- Electricity Regulatory Authority of India, 1669
- Electricity Regulatory Commissions (SERCs), 1668, 1675
- El Nino Southern Oscillations (ENSO), 780
- EMD dataset, 540
- Emergency
 funding, 1655
 kits, 2529
 law, 1822–1824, 1826, 1830, 1831
 management, 1692
 managers, 635
 power, 1881–1882
 response, 1774–1777
 planning, 706
 services, 580–582
 systems, 526
- Emergency Events Database (EM-DAT), 274
 report, 711
- Emergency Response Coordination Center (ERCC), 1271
- Emergency Service Interface (ESI), 582–584
- Emergent norms, 127
- Emotional violence, 1560
- Empathy, 1425, 1431
- Employment, 147, 148, 1901–1902
- Empowerment, 1816, 1913, 1918, 1919
 programme, 1352
- English tweets, 598
- Enlightenment epistemology, 1236
- Entertainment media, 1272
- Entrepreneurial self-efficacy, 1075
- Environmental challenges, 1270
- Environmental degradation, 1238, 1530, 1726, 1727, 1730
- Environmental harm, 1727–1733
- Environmental Impact Assessment (EIA), 1775, 1930
- Environmental indicators, 820, 822, 823
- Environmental journalism, 1317
 disaster, 1321
 environmental crisis, 1319
 natural/man-made disasters, 1319
 policymakers, 1319
 in Sri Lanka, 1322

- Environmental journalists, 1320, 1322, 1327
 credibility and fairness, 1317
 disasters, 1319
 journalism, 1316
 media organizations, 1318
 media views, 1316
 psychological and professional problems, 1318
 television, 1316
- Environmental laws, 2122
- Environmentally sensitive development model, 941
- Environmental pollution, 2421
- Environmental protection
 agencies, 104
 compelling message for, 102
 vs. development pursuits, 102
 enforcement of, 102
- Environmental Protection License (EPL), 1729
- Environmental safety, 1930–1931
- Environmental Systems Research Institute (ESRI), 714
- Environmental taxation, 1733
- Environmental vulnerability, 765, 2262
- Environment and Social Impact Assessment, 22
- Environment-development interface, 2263
- Environment Impact Assessment (EIA), 1790, 2018
- Epidemic Diseases Act (EDA) of 1987, 277, 972, 1577, 1716, 1721
- Epidemics, 1424, 1499
- Epidemics Diseases Act, 1897, 275
- Equality, 1813–1814
- Equality of Treatment (Accident Compensation) Convention, 1925, 2015
- Equal Remuneration Convention, 1951, 2015
- Equity, 1658–1659
- Ethical aspect of smart city, 1184–1186
- Eurocentric liberal perception, 1239
- European Convention on Human Rights (ECHR), 1914
- European-Mediterranean Seismological Centre (EMSC), 734
- Evacuation, 400, 401, 405, 407, 410
- Evaluations' philosophy, 584
- Excessive rainfall, 1954
- Executive branch, 1823, 1826, 1828, 1833
- Executive immunity, 1828–1832
- Executive powers, 1826–1828
- Ex-gratia amount to victims, 1010
- Ex-gratia assistance, 278
- Export Development Fund (EDF), 2150
- Export Processing Zones (EPZ) Labor Act, 2017
- External appraisal, 1615
- Extraction economy, 2160
- Extra-legal effort, 1924
- Extremely low frequency (ELF), 729
- Extremely severe cyclone (ESC), 399
- Extremely severe cyclonic storm (ESCS), 399
See also Fani cyclone
- Extreme rainfall, 778, 779, 781, 782, 791–793
- Eyewitnesses, 653
- F**
- Facebook (FB, now Meta), 575, 597, 605, 634, 635, 1271, 1414, 1440
 Facebook Graph API, 578
 safety check feature, 1419
- Fake corona test results/certificate, 2146
- Fake News, 1268
- False Warning, 1267
- Family planning, 294
- Famines, 275
- Fani cyclone, 214, 216, 219–221, 945, 946, 949, 1018
 central team visit, 409
 cost of damages in the departments, 403
 cyclone shelter, 407
 damage and loss assessment, 2249
 damage to housing, 2249–2250
 devastation due to, 403
 early warning, 407
 evacuation, 407
 media report, 407
 mitigation, 405
 multipurpose cyclone /flood shelters, 404
 preparedness, 401, 405, 406
 prevention, 401
 recovery and reconstruction, 408
 relief distribution, 409
 resilient housing, 2251
 response forces, 406, 407
 restoration work, 409
 track of, by IMD, 400
 vulnerable districts, 402, 404
- Fashion, 1504
 brands, 1505, 1506, 1508, 1509, 1511, 1512
 industry, 1505, 1506
- Fatalities, 1335
- Fear, 2153
- Federal Disaster Management Agency, 1117
- Federal Emergency Management Agency (FEMA), 275, 282–284, 375, 437
- Federal government agency, 266

- Federalism, macro-level challenges to, 140
Federal Republic of Yugoslavia, 2043
Federation of Bangladesh Chambers of Commerce and Industries (FBCCI), 2019
Fifteenth Finance Commissions for 2020–21, 981
Fiji, 2523
Fiji Commerce and Employers Federation (FCEF), 2527
File-based storage, 486
Film distribution, 1464
Film production, 1464
Filter information, 576
Finance Commission, 981
Financial crisis, 2464, 2465
Financial resources, 2513
Fire & Emergency Services (F&ES), 1005
FIRESENSE project, 502
Fire suppression, 454, 455
First responders, 1036
Fiscal decentralization, 1016
Fisher's life (*Moto Jibon*), 1306
Fishermen, 356
Fishery, 944, 2197
Fish v. Chapman, 1653
Flash floods, 778, 919, 1473
Flickr, 575
Flight Level 600, 526
Flood, 233–235, 534, 535, 538, 543–546, 1265, 1266, 1352, 1954, 2190, 2192, 2198, 2336
 agricultural crops, 2195
 calamity, 380
 damages, 176
 data, 2192
 evacuation and mitigation, 176
 forecasting, 910
 frequency, 2192
 hazard mapping, 910
 history, 168–169
 in Imphal, 174–175
 livelihood, 2194
 management plans, 838
 in Manipur, 174, 177
 mitigation policies, 2190
 monitoring, 691–692
 risk assessments, 169–170
 seasonal hazards, 169–170
 severity estimation, 543
 socio-economic impacts, 2336–2339
 and waterlogging conditions, 2192
Flood action plan (FAP), 1209
Flood-affected communities, 2196
 commercial rice cultivation, 2195
 livelihood, 2194
 livelihood options, 2194
 local communities, 2194
 respondents, 2193
 social and institutional support, 2196
 unemployment, 2195
Flood-affected villages, 2192
Flood Classification from Social Multimedia (FCSM), 545
Flood Detection in Satellite Imagery (FDSI), 544, 545
Flood Forecasting & Warning Centre (FFWC), 1971
Flooding, 1048, 1050, 1051, 1058, 1328
Flood Insurance Rate Maps (FIRM), 437
Flood Inundation Mapping (FIM) program, 437
Flood Management and Border Areas Programme (FMBAP), 1348
Flood mapping
 hybrid satellite imagery, 690–691
 optical imagery, 689–690
 for synthetic aperture radar imagery, 684–689
Floodplain mapping, 443
Flood plain zoning methods, 909
Flood vulnerability, 919, 1348
 approaches to reduce, 919–922
 non-structural measures, 921–922
 structural measures, 920
Flood vulnerability mapping
 bibliographic search, 747
 coastal region, 753–755
 flood type, 748, 750, 761–773
 non-traditional data sources, 756–760
 non-traditional indicators, 758
 paper selection process, 748
 region type, 748
 riverine region, 754–756
 rural region, 753–754, 765
 selection criteria, 749, 750, 761–773
 social media indicators, 758
 social vulnerability indicators, 768
 traditional indicators, 758
 urban region, 752–753
Flying Leaf (FL) architecture, 524, 526, 527
Flying Leaflets (FLTs), 525
Focussed Group Discussions (FGD), 1626
Food
 availability, 1531
 distribution, 2456, 2458

- Food (cont.)**
- insecurity, 1531, 2078, 2080, 2083
 - packets, 1009
 - resilience, 2431, 2433, 2434
 - self-sufficiency, 2434, 2451
 - systems, 2450, 2451, 2457, 2459
- Food and Agricultural Organization (FAO), 1303
- Food and Beverage (F&B) industry, 2366, 2486–2488, 2490–2494
- Food Corporation of India (FCI) website, 1580
- Food security, 146, 147, 2366, 2426–2434
- Food security, in India during pandemic
- corruption, 1581
 - food supply chain, 1577
 - government initiatives, 1578
 - public distribution system (PDS), 1580
 - Right to Food, 1579
- Food supply, 2450, 2451, 2458
- chain management, 1576–1578, 1581, 2426, 2427, 2431, 2433, 2457
 - disruption, 2430, 2433
 - management, 2451
- Forbes Coaches Council, 2368
- Force Majeure event, 1674
- Forest (*āranya*), 199
- Forest fire, in Gangwon-do, 508
- Forest Fire Management Victoria, 1415
- Forest Investment Plan 2017–2022, 1960
- Forestry and Climate Change 2020–2025, 1960
- Forest Survey of India (FSI) statistics, 350
- Formal institutional arrangement of disaster management, 1598
- Forward v. Pittard*, 1652
- Fossil fuel, 2522
- Foundational disappointment, 214
- 4IR technology, 1419
- Fragile ecology, 942
- Freedom from fear, 1756
- Free-Food Scheme, 2476, 2477
- Frictional resistance forces, 715
- F-score, 600, 602, 603
- Fuel stocks, 1009
- Fukushima nuclear disaster, 1264, 1269, 1617
- Fukushima Prefecture, 1617
- Functional efficiency, 1970
- Functional Resonance Analysis Method (FRAM), 1094
- Functions of management, 2514
- Fundamental principles of state policy (FPSPs), 2017
- Fundamental rights under the Constitution, 2017
- G**
- Gadgil Committee, 1049
 - Gain connectivity, 633
 - Game theory, 18, 23
 - Gangwon-do forest fire, 508
 - Gas leakages, 1266
 - Gawad Kalasag (Shield) National Award*, 132
- Gazetteer, 601
- Gazetteer-based approaches, 659–661
- Gender, 290–291, 2078–2080, 2085, 2095
- Gender-based violence (GBV), 1560, 1565–1567, 1804–1806, 2119
- access to legal support for protection during disasters, 1809–1812
 - challenges in framework during disaster, 1809
 - legal aids affecting disaster induced, 1812–1814
- Gender-responsive initiatives, 1958
- Gender-sensitive approach, 2115
- Gender sensitive climate policies, 2122
- General Economics Division (GED), 1959
- Geneva Convention, 2000, 2044
- Geographical activity, 489
- Geographical information, 1441
- Geographical locations, 601
- Geographic Information System (GIS), 87, 244–246, 282, 328, 501, 70–705, 716, 751, 1393
- Geolocation inference, 649–654
- Geo-location information, 547
- Geomagnetic anomaly, 734
- Geomagnetic field, 734
- Geomagnetic signal processing system, for
- pre-earthquake anomaly detection
 - direction estimation, 731, 736
 - earthquake searches, 736
 - functionalities and interface, 734–737
 - geomagnetic field data extraction and pre-processing, 736
 - input data, 732–733
 - precursor detection, 730–731, 736
 - software package, 732–738
- Geomatics, 704
- Geo-referencing information, 638
- Geospatial technologies, 8, 706
- damage assessment, 706
 - emergency communication, 706
 - emergency response planning, 706
 - hazard mapping, 706
 - healthcare, 707
 - insurance, 707

- post-disaster recovery, 706
public awareness, 706
real estate, 707
resource management, 706
risk assessment, 706
search and rescue, 706
societal problems, 707
Geospatial technology, 714, 1419
German's Federal Supreme Court, 2045
Gestalt theory, 1489
Ghazipur landfill, 371
Gini index, 567, 569
Glacial Lake Outburst flood (GLOFs), 710, 711
Glasgow Conference 2021 (COP-26), 190
Glasgow Loss and Damage Finance Facility, 190
Glass cliff, 2464, 2465, 2467
Glitter Belt architecture, 524
Global
atmospheric data analysis, 704
compacts, 1951 UNCSR with 1967 AP, 1985, 1986, 1989
disadvantages, 633–634
environmental movement, 43
geomagnetic indices, 738
policy, 2321
temperature, 2522
urban population, 2332
Global Climate Change Alliance Plus (GCCA+), 1958
Global Climate Risk Index, 2158
Global Facility for Disaster Reduction and Recovery (G.F.D.R.R.), 173
Global Forest Watch (GFW), 1129
Global Gender Gap, 297
report 2021, 2116
Global Humanitarian Response Plan, 1897
Global human rights frameworks (GHRF), 1983–1989
Globalization, 235
Globalized agriculture, 2459
Global Navigation Satellite System (GNSS), 704, 705, 707
Global precipitation measurement (GPM), 791
Global warming, 1270
COVID-19 pandemic, 2532
modelling, 2522
scenarios, 2522
Goa, 228
Good governance, 2102, 2104, 2107, 2110
Goods and Services Tax (GST), 981
Google, 1440
Gorai River Dredging and Bank Protection Project, 995
Governance, disaster management agencies, 840–841
bottom-up approach, 842–843
financial probity, 842
non-state actors, 841–842
technology and benefits, 843–844
Government
agencies, 1440
communication, 1500
information systems, 1500
procurement, 53
Government of Bangladesh (GoB), 1894, 1895, 1902, 1903, 1958
Government of India (GOI), 275, 1568, 2128
Government of Kerala (GOK), 1568
Government Organization Act, 1114
GPS, 703–705
Gradient Boosted Decision Trees (GBDT), 599
Graham, Philip L., 1264
Gram Sabhas, 381
Gram Niyojan kendra, 427–428
Gram Panchayat Development Plan (GPDP), 2072, 2075
Gram Panchayats, 2066
Gram Sabha, 1660
Graphical user interface (GUI), 729
Great Bhola cyclone, 1778
Great East Japan Earthquake, 1612
Greater Christchurch Claims Resolution Service (GCCRS), 1709, 1710
Great Global Lockdown, 2520
Great law, 1741
Green energy, in India, 1669–1671
Gross Domestic Product (GDP), 1195
Ground-up deployment, 490
GSDP Uttarkhand
economic activities, 939
industrialisation, 940
primary sector, 938
working population, 940
Guidelines, 1566, 1570–1572
Guiding Principles on Business and Human Rights (UNGPs), 2013, 2014
Guiding Principles on Internal Displacement, 1868–1869
Gujarat, 228
earthquake, 275, 930
Gujarat Industrial Development Corporation, 934
Gujarat State Action Plan on climate Change, 2261

- Gujarat (*cont.*)
 Gujarat State Disaster Management Authority (GSDMA), 279
 state disaster management plan, 2262
- Gujarat earthquake (2001), housing reconstruction
 assistance for housing recovery, 2241–2242
 community driven housing recovery, 2241
- Gujarat Reconstruction and Rehabilitation Policy, 2239
- implementation arrangements and outcomes, 2242–2243
 politics of aid, 2244–2245
 priorities in reconstruction, 2243
 public private partnership, 2243–2244
 tax concession to industries, in Kuchh, 2243
- Guwahati, 1250
- Gyeongju earthquake, 510, 511
- H**
- Habitat-for humanity India, 962
- Haiti Earthquake, 1474
- Haji Camp, 2147
- Halo in Kuki indigenous knowledge, 79
- HAM radio, 408, 1392
- Handikhola, 1625, 1629–1631, 1633
- Ha Noi conference, 2122
- Haor* wetlands, 1554, 1779
- Hashtag segmentation, 601
- Hazard, 52, 224, 225, 235, 2062–2067, 2069, 2070, 2075, 2333
 mapping, 706
- Hazard, Risk and Vulnerability (HRV) assessment, 1603
- Head-words, 601
- Healing, 1154, 1155, 1236
- Health and WASH, 149–151
- Health budgets, 296
- Healthcare, 1899–1900
- Health disasters, 292, 1844
- Health emergency
 federal countries, 1722
 healthcare service, 1716
 Indian healthcare system, 1722
 legal framework, 1717
 lockdown, 1716
 “rights-based” approach, 1722
 violent acts, 1716
- Health insurance, 294
- Health quarantine, 1824
- Health-related disasters, 1843
- Health sub centers, 382
- Heller’s analysis, 44
- Heritage smart city, 2324
- High Altitude Long Endurance (HALE)
 platforms, 520
 vehicles, 523, 524, 527
- High contracting parties, 2044
- High court earthquake list, 1711, 1712
- Higher education institutions, 1532
- High flux, 2529
- High-level summary, 616
- High-Powered Committee (HPC), 275, 282, 2103
- Himalayan landslides, 711
- Hindu Kush-Himalayan (HKH) region, 5
- Hiroshima and Nagasaki, 1264
- Historical map, 500, 506, 512
- HIV AIDS, 293
- Homeostasis, 2528
- Hong Kong, 2486
 COVID-19 pandemic and F&B industry, 2487–2488
 disaster risk management framework
(see Disaster risk management)
 economy, 2486, 2487, 2490
 pandemic situation, 2486
 SAR government, 2487
 spread of COVID-19, 2486
- Hooghly, 186
- Horizontal and Vertical coordination, 219
- Horse (*asva*), 204–205, 208
- Hospital Emergency Preparedness, Response, and Recovery Plan (HEPRP)
 2014–2015, 135
- Hospitality, 1424, 1430
- Hospital recovery or rehabilitation plans, 135
- Hotspots, 1959
- Housing projects, 284
- Housing reconstruction, 2238, 2239, 2255
 Fani cyclone 2019, 2249–2251
 Gujarat earthquake, 2001, 2239–2245
 Kerala floods, 2018, 2247–2248
 Uttarakhand floods, 2013, 2245–2247
- Human activities
 adverse effects, 1727
 manmade natural disasters, 1728
- Human-AI collaboration, 481–483
- Human-centered AI
 challenges, 494
 Citizen-Helper system (*see* Citizen-Helper system)
 future directions, 495
 limitations of AI technologies, 481, 482
 overview of, 481

- practitioners involvement in system design, 482, 483
vs. traditional method of AI system, 483
- Human-centered evaluation, 586
- Human-centered leadership, 2362
- Human crisis, 290
- Human Development Index (HDI), 1047, 1192
- Humanitarian access, 2030, 2033
- Humanitarian Assistance Disaster Relief (HADR), 1054
- Humanitarian categories, 608, 612–616
- Humanitarian crisis, 293, 2025
- Humanitarian organizations, 473
- Humanitarian relief
- access of, 2026
 - access-related issues, 2029
 - in Afghanistan, 2027
 - barriers to, 2026
 - in context of Covid-19, 2034
 - delay/pause, 2034
 - Indian government, 2029
 - indirect impact on, 2032
- International Committee of Red Cross, 2031
- international humanitarian law and, 2034
- kinds of, 2034
- legal provisions, 2033
- migrant labourer issue, 2029
- principle of safety and protection, 2031
- selfless force, 2031
- in Syria, 2029
- and Taliban group, 2027
- war crime under Article 8, 2032
- Humanitarian workers, at international level, 2028
- Human law, 1741
- Human-made climate change, 2161
- Human Poverty Index (HPI), 2212
- Human resource, 2503
- Human rights, 279, 1721, 1867, 1870–1872
- accountability, 1918
 - AI challenges to, 1983
 - with algorithmic transparency, 1983
 - defenders, 1982
 - in developing countries, 1838
 - of DHD persons, 1979
 - and disaster displacement, 1872–1874
 - vs. disasters, 1915
 - DRR plan, 1911
 - enjoyment of, 1914
 - fundamental, 1840, 1915
 - and International law, 1837
 - legal form on inherent, 1913
- with public health emergencies, 1836
- subjugation of, 1838
- violations, 1837, 1979
- Human Rights and Peace for Bangladesh (HRPB), 1888
- Human Rights Committee, 184
- Human rights violation, 1560, 1866, 1871
- Human settlements, 40
- Human training, 487
- Hunting, 202
- Hurricane Dorian, 540
- Hurricane Harvey in Houston, 633
- Hurricane Katrina, 15, 128, 1474
- Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPPLIT) model, 793
- Hybrid working mode, 2362
- Hydro metrological data, 793
- Hyogo Framework for Action 2005–2015 (HFA), 7, 214, 955, 1551, 1598, 1654, 1655, 1658, 1759, 1775, 1776, 1797, 1966, 2059, 2063, 2104, 2105, 2290
- I**
- I&PR functionaries, 1384
- Ice Storm in Ottawa, 1474
- Identification, 1765
- of risk, 1764
- Idā*, 207
- Image-based News Topic Disambiguation, 545
- Image retrieval, 537
- Immunity rights, 1831, 1832
- Impact maps, 653
- Impact of pandemic factors, 1424
- Imphal city, 170–171
- Inadequate knowledge sharing, 1971
- Incepta Vaccines Ltd, 2149
- Incident Command System (ICS), 893
- Incident dataset, 539
- Inclusive built environment, 1536
- Inclusive governance
- access to welfare, 151–154
 - community-driven solutions, 142, 143
 - community-led committees, 144
 - CSR, 144
 - factors, 143
 - information and communication, 142
 - PDS functional, 144
 - rural economy, 144–148
 - structural integration, 143
 - urban economy, 148–151

- Inclusive strategy, 84, 91, 92
 India, 189, 1237, 1239, 1241, 1242,
 1749–1750, 1787–1790
 Bhadrak district of Odisha, 2064, 2065
 capacity building, 2071–2075
 CBDM, 2063
 coastal states of, 226–227
 community for disaster preparedness,
 2069–2071
 conservation and heritage management,
 2319–2320
 Covid-19 related restrictions, 2034
 DDMAs, 2072
 Disaster Management Act, 2064
 disaster risk governance, 2071
 disaster risk reduction, 2320–2321
 diverse cultural heritage and disaster risks
 challenges, 2317–2319
 drought area type, sources of irrigation in
 study area, 2081
 drought impacts and household coping,
 2083–2085
 GPDP, 2072
 gross domestic product, 2078
 household food consumption, 2092–2095
 household resource allocation and
 occupational changes, 2086–2088
 humanitarian relief, 2029
 Indian Constitution, 968, 969
 institutional set-up to manage disasters, at
 local level, 2067–2069
 migrant labourer crisis, 2028
 National Disaster Management Act, 261,
 1599, 2067
 National Disaster Management Authority
 (NDMA) 2005, 261, 1599, 2067
 NDRF, 2069, 2071
 NIDM, 2071
 NIRDPR, 2072
 NPDM, 2062
 Nuclear Disaster Management Planning,
 262, 263
 ODRAF, 2069
 OSDMA, 2067
 policy suggestions, drought, 2095
 power exchange, 1683
 SDMAs, 2067
 SIRDs, 2072
 ULBs, 2075
 Indian arts and crafts, 1156
 Buddha paintings, 1167–1169
 Madhubani Paintings of Bihar, 1157–1161
 Pattachitra Paintings, 1162–1163
- Phad paintings of Rajasthan, 1166–1167
 Warli paintings, 1165–1166
 India National Multidimensional Poverty Index
 Baseline Report, 1581
 Indian economy, 1424
 Indian fishers, 356
 fish-farmers, 357
 profile of, 357–358
 public policy for welfare of, 363–364
 social security by the State, 364
 Indian Himalayan region (IHR), 779, 780
 cloudburst distribution over, 781
 historical cloudburst events in, 784
 present state of activities on account of
 cloudbursts, 793, 794
 remote sensing and geospatial techniques, 791
 simulation of cloudburst events, 792
 SRTM-DEM, 780
 topography, 781
 Indian Institute of Remote Sensing, 715
 Indian Legal Framework, 190–192
 Indian Meteorological Department (IMD), 219,
 399–401, 410, 783, 1048
 Indian National Action Plan on Climate Change
 (NAPCC), 2158
 Indian National Centre for Ocean Information
 Services (INCOIS), 843
 Indian National Trust for Arts and Cultural
 Heritage (INTACH), 2320
 Indian Ocean Tsunami, 520, 1241, 1474
 Indian Ocean Tsunami Ready Programme, 2108
 Indian Penal Code (IPC), 1716
 Indian population and production indices, 1580
 Indian Remote Sensing satellite (IRS), 714
 Indian Renewable Energy Development
 Agency Limited (IREDA), 1679
 Indian Space Research Organization (ISRO), 1285
 Indicator-based assessment models, 746
 Indigenous aesthetics, 1237
 Indigenous art, 1236–1239, 1241, 1243
 Indigenous communities, 1236–1241, 1243
 Indigenous cultural communities/indigenous
 peoples (ICCs/IPs), 305, 306
 Indigenous epistemologies, 1240
 Indigenous knowledge and practices (IKP),
 1533, 1551, 1776
 aware of, 1551
 Bhola cyclone (1970), 74
 contributions of, 1554
 definition, 72
 disaster risk reduction specialists, 1555
 on early warnings, 80
 floods and droughts in Malawi, 75–77

- halo in Kuki, 79
and international agencies, 73–74
Smong in Simeulue Island, 77–78
strategies, 1554
- Indigenous Mapuche communities, 2170
Indigenous women's protest movements, in Odisha, 2159
- Indo-Nepal Tarai region, 415
disaster induced and other vulnerabilities in, 416–417
institutional structure and mechanisms, 417–425
local NGOs, 429–432
national institutions, 425–429
- Indonesia, 312, 1253, 2414, 2415
Aceh Tsunami (2004), 2380–2382
alternative revenue sources, 2421–2422
business environment and COVID-19, 2384–2387
catastrophes in, 2378
courts on executive immunity, 1831, 1832
COVID-19 policy impact on business, 2391–2392
critical factors of disaster governance in, 314–316
disaster management Law, 2379
disaster risk reduction, 317–319
earthquake in, 2378
economic growth (GDP), 2417–2418
economic impact of COVID-19 disaster in, 2390–2391
employment rate, 2417
environmental consciousness, in tourism norms, 2418
environmentally sustainable lifestyle, 2421
executive immunity during public health emergency, 1828–1831
Indonesian Constitution, 1822, 1824, 1829, 1832
Indonesian Disaster Management Law, 1823
Indonesian Hotel and Restaurant Association, 2365
Indonesian Travel Agent Association, 2365
labour market, 2417
law disaster management in, 2387–2389
local tourism, 2420
mitigating climate change impacts in coastal cities, 316–317
Mount Merapi Eruption on Central Java (2010), 2383–2384
natural disasters in, 2378
nonnatural disaster under Indonesian laws and COVID-19, 1823–1824
- Padang Earthquake on West Sumatra (2009), 2382–2383
state emergency v public health emergency, 1824
tourism and supporting industries, 2416–2417
tourism infrastructure, lull period, 2421
Tsunami in, 2378
- Industrial Development Corporation (IDCO), 405
- Infection of Covid-19, 2141, 2147, 2148, 2152
- Influenza pandemics, 1823
- Informal sector, 371
- Informal settlements, 40, 42, 44
- Information, 142, 1395
dissemination, 543
processing, 479, 480
sharing, 1436, 1438, 1443
summarization, 577
systems, 1496
technology, 1054
- Information and communication technologies (ICTs), 142, 243, 630, 1192, 1195, 1246, 2531
AI-infused, 637
and disasters, 640–641
- Information Extraction methods, 598
- Information-processing systems, 480
- Information quality, 575, 587
- Information retrieval (search) methodologies, 599
- Infrastructure, 159, 633
- Instagram, 575, 1440
- Institute for Economics and Peace, 184
- Institute of Epidemiology, Disease Control and Research (IEDCR), 2141
- Institutional Committees and their Responsibilities for DRM, 1967–1969
- Institutional complexity, 465
- Institutional coordination, 217, 218
- Institutional linkage, 1970
- Institutional reform, 1108, 1109, 1112, 1118, 1120
- Institutional resilience, 159
- Institutional response, 415, 2176–2178, 2182
- Institutional restructuring, 151–154
- Institutions, 143
- Instrumental validation of shear strength, 719
- Insurance, 707
- Intangible cultural heritage, 2317
- Integrated Command Control and Response (ICCR), 262

- Integrated Research and Action for Development (IRADE), 259
- Integration, 1955, 1960, 1961, 1970–1972
- Integrative leadership, 2515
- Intelligence, 1199
- Intensive agriculture, 1415
- Interactive data tables, 489
- Interactive Kibana-based interface, 494
- Interactive visualization, 494, 576
- Inter-agency coordination, 214–221
- Inter-Agency Standing Committee (IASC), 1897
- Inter and intra-generational equity, 1727
- Intergovernmental Panel on Climate Change (IPCC), 351, 1014, 1030, 1050, 1880, 2122, 2269
- Internal displacement
- Guiding Principles on Internal Displacement, 1868–1869
 - regional instruments, 1869
- Internal Displacement Monitoring Centre (IDMC), 1865
- Internal disturbance, 1881
- Internalisation, distribution, explanation and action, 1280
- Internally Displaced Persons (IDPs), 1797, 1864–1869, 1872–1874
- International Air Transport Association (IATA), 2144
- International Atomic Energy Agency (IAEA), 262, 1924
- guideline, 1928
- International Center for Space Weather Science and Education (ICSWSE), 732
- International Civil Aviation Organisation, 526
- International Covenant of Economic, Social, and Cultural Rights, 1718
- International Covenant on Civil and Political Rights (ICCPR), 184, 1914, 2013, 2015
- International Covenant on Economic, Social and Cultural Rights (ICESCR), 1871, 1874, 1941, 2013, 2015
- International Criminal Court for the former Yugoslavia (ICTY), 2045
- International Criminal Court (ICC), 2047
- International Decade for Natural Disaster Reduction (IDNDR), 1265, 1911, 2099, 2102, 2103
- International Disaster Law (IDL), 1796–1798, 1850, 1854, 1856
- International Disaster Response Law (IDRL), 1662, 1663, 1864, 1869, 2379, 2387–2389
- Draft Articles on the Protection of Persons in the Event of Disaster, 1870–1872
- Guidelines, 1795, 1797, 2363
- human rights and disaster displacement, 1872–1874
- international cooperation and assistance, 1874–1875
- obligation of the States, 1872
- International Energy Agency (IEA), 1670, 1677
- International Federation of Red Cross and Red Crescent Societies (IFRC), 1663, 1795, 1869
- International Food Policy Research Institute (IFPRI), 1578, 2119
- International ‘gerontological’ discourses, 1451
- International humanitarian law (IHL), 1662–1663, 1797, 2030–2032, 2034, 2040
- principles of, 1998
- International Human Rights Law (IHRL), 1796, 1869, 1871–1873, 1875
- International Labour Organisation (ILO), 1897, 2013, 2526
- International law
- compliance to, 1837
 - corpus of, 1845
 - and human rights, 1837
 - interconnectedness of, 1836
 - wide range of, 1836
- International Law Commission (ILC), 1796, 1850, 1851, 1856, 1857, 1865, 1869, 1871
- International legal instruments, 1882–1883
- International media, 1473, 1478, 1479, 1482–1484
- International Media Support’s (IMS), 1378
- International Obligations, 266, 267, 1997
- International Organization for Migration (IOM), 184, 1967
- International Relief Union, 1796
- International Sociological Association (ISA), 1530
- International sociological research, 1530
- International Water Management Institute, 2343
- Internet, 1400, 1448, 1449, 1453, 1454
- Internet of Things, 19
- Intimate Partner Violence (IPV), 294
- Inventory, 1352
- Ionizing radiation, 1931
- Irrigation and Flood Control Department, 215

Israel, 1130
Italy earthquake, in 2016, 598

J

Jaṅgāla, 200
Jagratha committees, 383
Jalaja, 200
Jalecara, 200
Jammu and Kashmir (J&K) floods 2014, 213–216, 219, 220, 1008, 1273
 earthquake, 2118
 challenges for journalists, 1482
 government role during crisis, 1481
 intensity of floods, 1473
 international media coverage, 1473
 media coverage, 1475, 1476, 1481
 militarized coverage, 1473
 representation of stories international media, 1478
 role of social media, 1480
 sources of information used by masses, 1479
 stories of interest, 1481
 themes used by international media, 1478
 types of sources used by international media, 1479
Japan Airlines (JAL), 2456
Japan Bosai platform, 242
Japan earthquake and Tsunami
 Disaster Emergency FM Radio Station, 2227
 individual and local community response to disaster, 2224–2225
 leadership of municipality, response and reconstruction planning, 2227–2228
 responses of civil society, 2226
 in Rikuzentakata (see Rikuzentakata)
 Rikuzentakata and neighbouring towns, destruction of, 2223–2224
 supports, 2232
 TOMODACHI Initiative, 2234–2235
Japan International Cooperation Agency (JICA), 1301
Jarawa communities, 1553
Jawaharlal Nehru National Solar Mission (JNNSM), 1671
Jildung, 80
JN Contemporary Art v. Phillips Auctioneers LLC, 1654
Job losses in India during COVID-19 pandemic
 consequences of, 2475
 and COVID-19 pandemic, 2472
 migrant workers community, 2475–2476

Joint Rapid Damage and Needs Assessment (JRDNA), 1052
Joint Rapid Disaster Needs Assessment, 1053
Joint Typhoon Warning Center (JTWC), 401
Journalism, 1317
Journalistic reporting, 1490
Journalists, 1472, 1473, 1475, 1482
Jubo Shilpogushthi, 1242
Judicial approach, 1886–1889
Judicial recognition, 1749–1750
Judicial statements, impact of, 96

K

Kachchh, Gujarat, India
 Agariyas, 2275–2276
 areas of engagement of organization, 2269–2270
 Maldharis, 2276–2277
 organizations' approach, 2272–2273
 Pagadiyas, 2274–2275
 study area, 2264
 vulnerability and vulnerable livelihoods, 2270–2272
 vulnerability to disaster risks, 2268–2269
Kachuptra bazaar (market), 1309
Kakchira villages, 1309
Kaliyasaur landslide, 712, 716, 717
Kalubir, 1241
Kamaiya, 1628
Kampinu, 1241
Kangchup hills, 168
Karnataka, 228
Karnataka Municipal Corporations Act, 1976 (KMC), 978
Kashmir, *see* Jammy and Kashmir (J&K)
Kasturi Rangan Committee report, 917
Kathmandu Valley Development Authority (KVDA), 1252
Kedarnath disaster, 15
Kerala floods 2018, 15, 20, 213, 214, 228, 250, 1046–1048, 1276, 1416–1417, 2247–2248
 agriculture, 1052
 BBB, 1056–1057
 calamity, 380
 causes of floods, 1048–1051
 community healthy centers (CHC), 382
 convergence of damage and loss assessment techniques, 1056
 COVID management, 383
 COVID tests and vaccination, 383

- Kerala floods 2018 (*cont.*)
 dam/reservoir management, 916
 damage and loss assessment, 1051–1053
 dearth of rain gauges and flood forecasting, 910–911
 effective dam management, 1057–1058
 empowerment of community, 1058
 encroachment of river space, 918
 fisheries and animal husbandry, 1052
 hazard and vulnerability profile, 1047–1048
 hazard mapping, 910
 high development indicators, 1047
 high literacy rate, 1047
 human fatalities, 1052
 inadequate flood management provisions, 908
Kerala Disaster Management Plan, 1047
Kerala Institute of Local Administration (KILA), 1569
Kerala Municipalities Act, 977
Kerala People's Plan campaign, 381
Kerala State Disaster Management Authority (KSDMA), 1054
Kerala State Disaster Management Plan (KSDMP), 905
Kerala State Planning Board, 381
Kerala's public health system (PHS), 382
 lack of master plans, 909
 land use policy and plan, 1056
 legislation regarding flood plain zoning, 909
 Nipah virus, 380
 panchayat during natural calamities, 382, 383
PDNA, 1052–1053
 primary health centers (PHC), 382
 primary health system (PHS), 382
 protection of ecosystem and natural resources, 1058
 rapid response team (RRT), 383
 rehabilitation and recovery, 1054–1055
 response and relief, 1053–1055
 role of technology, 1057
 sand and stone quarrying, construction activities and deforestation, 916
 several flood relief camps, 383
 shrinking wetlands, 918
 women as disaster responders, 1056
Kerwani, 1625, 1632
Keynoting, 127
Keyword-based filtering, 583
Khabi river, 169
Khadi industry, 943
Khankho, 79
Khenyei v. New India Assurance Co. Ltd. & Ors, 1657
Khujairok river, 169
Kibana, 486
Knowledge bases, 486
Knowledge strategy, 1957
Kohbar Painting, 1160
Kolkata, 185–189, 191–193
Kongba river, 177
Korea, *see* South Korea
Krishi Radio, 1301, 1303, 1306, 1309, 1311
Krol Limestone, 712
Kudmabasree health volunteers, 382
Kudumbashree worker, 382
Kukis, 78
Kyoto Protocol, 1970
- L**
Lab-grown food products, 2433
Labour market, 2421
Labour shortage, 2451, 2455, 2456
Lack of equality, 2117
Ladakh floods 2010, 213
Lakshmpur, 1625
Lama Bus Station landslide, 713, 719
Land
 administration systems, 374
 degradation, 346
 tenure, 371–376
Land management, 344
 DRR, 344
 ecosystems, 344
 global frameworks, 344
 man-made changes, 344
 terrestrial ecosystem services, 344
Land mismanagement, 348
 cities and urban areas, 350
 degradation, 346
 desertification, 346
 development and economic growth, 345
 disasters, 348
 ecological fragile zone, 348
 habitat, 345
 practices, 349
 socio-economic destruction, 350
Landslide, 441, 1046–1048, 1050, 1052, 1265, 1266, 1599–1604, 1606, 1607, 2339–2343
 Baliyanala landslide, 712, 716
 Betchora Headman Para landslide, 713, 719
 comprehensive assessment, 722
 Himalaya landslides, 710, 711
 Kaliyasaur landslide, 712, 716
 Lama Bus Station landslide, 713, 719
 Langsi landslide, 713, 718
 locations of, 712

- Malari landslide, 713, 717
satellite data, 713
socio-economic impacts, 2340–2343
Landslide Hazard Zonation (LHZ), 711
Landslide Lake Outburst Flood (LLOFs), 711
Land surface temperature, 779, 790–792, 794
Langsi landslide, 713, 718
Language model-based information retrieval
(search) methodologies, 599
Large-scale wildfires
Bootleg Fire, 462–464
Camp Fire, 459–461
Thomas Fire, 461–462
Laws, 2114, 2115, 2117, 2119–2123
Leadership, 130, 275, 279, 280, 282, 283, 285,
2368, 2462
crisis management, 2515
double-bind, 2463
functions of management, 2514
gender differences, 2464
nudges, 2506
skills, 2514
and sustainability, 2514–2515
team, 2464
and women in crises, 2464–2465
'Learn and live' (*Jene Nijeke Roksha Kori*),
1306
Learning-based model, 669
Learning capability, 2505
Learning digital skills, 1448
Least Developed Countries (LDCs), 1897
Legal aid, 1802, 1810
Legal and institutional development of DM,
275
Legal consciousness, 1801, 1810
Legislations, 1955, 1962–1964, 1967, 1971
Legislative action, 2177
Legislative recognition, 1748–1749, 1751
Legitimate care receivers, 1561
Lesbian, gay, bisexual, transgender, queer and
intersex (LGBTQI) people, 2122
Letter of award (LoA), 1673
Lewin's model, 2513
LGBTQIA++ community, 1560
Library disasters
equipment with plastic and waterproof
materials, 1228
history of, 1222
impact of cyclone, 1228
Iraqi libraries, 1224
Library of Alexandria, 1223
Library of Congress, 1223
library of Nalanda University, 1223
management, 1224
management plan, 1226
Norfolk and Norwich Central Library, 1223
Oriental Library in Shanghai, 1223
Licencing, 1465
Life-jackets, 2529
Lightening, 1266
Lighter Than Air (LTA) vehicles, 521, 523
Liminality, 1624, 1625, 1634
Linear Imaging Self Scanning Sensor
(LISS-IV), 714
Line of Actual Control (LAC), 261
Livelihood, 2210–2212
insecurity, 1339
restoration, 933, 949
hood support, 947
Livelihood Promotion, 947
Livelihood Security Project, 935
Livelihood support programme
agriculture sector, 932
primary sector, 929
reconstruction exercise, 929
repair and reconstruction cost, 932
self-employed people, 928, 932
Stamp Duty exemption, 933
Local Adaptation Program of Action (LAPA),
1961
Local and Indigenous Knowledge Systems
(LINKS), 1550
Local community organisations
funding for, 1691
importance, 1690
leaders of, 1688
Local Disaster Risk Reduction and
Management Councils (LDRRMCS),
307
Local governance, 18, 19
Local governments, in disaster management, 22
community-based disaster management,
1016
DMA of Government of India, 1020
institutional architecture, 1018
institutional framework in Odisha, 1021
international collaboration, 1019
leadership, 1019
location of the study area, 1019
national-level disaster management, 1020
Panchayat Disaster Management
Committee (PDMC), 1030
panchayat disaster management plan,
1030
Panchayat Disaster Response Fund, 1030
separate department for, 1025

- Local governments, in disaster management
 (cont.)
 state disaster management policy, 1021
 traditional disaster governance skills, 1017
 Village Disaster Management Committee (VDMC), 1030
- Local marketing and processing support (LMPS) program, 854
- Local Self Government (LG), 390
- Local self-governments (LSGs), 1568, 2064
- Locational focus prediction, 650
- Location Based Alert System (LBAS), 407
- Location mention disambiguation (LMD), 655, 666
- Location mention prediction (LMP), 649, 650, 654–655
- Location mention recognition (LMR), 654–657, 664–666
- Lockdown, 277, 278, 1424, 1505, 1506, 2128–2135, 2141–2148, 2151, 2153
 behaviour, 1564, 1565
 on businesses, repercussions of prolonged, 2479–2480
 and colossal business losses, 2473
 intimate partner violence, 1562, 1563
 management, 1565–1572
 prevalence, 1561, 1562
 triggers, 1563–1564
See also COVID-19 pandemic, in India
- Locust infestations, 1265
- Locust invasions, 275
- Logic of Collective Action*, 16
- Lohachara, 186
- Lokobetar, 1301, 1305–1307, 1309
- Lokobetar* community radio station, 1309
- Long-term access (LTA), 1673
- Long Term Climate Risk Index, 1954
- Lotabaria* villages, 1309
- Low-and-Middle-income countries (LMICs), 292–293, 295
- Luxury brands, 1506
- M**
- Macajalar* Bay Development Alliance (MBDA), 886
- Machine learning (ML), 19, 547, 693, 1431
- Machine learning-based approaches, 661–662
- Madhubani Paintings of Bihar, 1157–1160
- Madrid International Plan of Action on Ageing (MIPAA), 955
- Magnetic Data Acquisition System (MAGDAS), 732, 733
- Mahābhārata*, 208
- Maharashtra, 228
- Maharashtra Pollution Control Board (MPCB), 2288
- Mahasen* cyclones, 1300
- Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), 147, 148, 1054, 2067, 2073
- Mahuli, 365
- Mainstreaming, 1971
- Maiti NGO, 430
- Major cyclones, 2523
- “Make in India,” 1195
- Makrahar, 1625, 1632
- Malari Avalanche chute, 713
- Malari landslide, 717
- Malawi, 76
- Managed fire, 464
- Management of domestic violence during lockdown
 global scan, 1565–1567
 guidelines, 1570–1572
 in India, 1567, 1568
 in Kerala, 1568–1570
- Management programs, 305
- Management tasks, 1436
- Managing disruptions, 2528–2531
 learning outcomes, 2532
 overcoming disruptions, 2531–2532
 preparing, 2526–2528
 teaching methods, 2532
- Manav Seva Sansthan SEVA, 428
- Mandatory insurance policy, 2243
- Mangalkavyas, 1242
- Manipur
 communities, 168
 districts, 168
 flood history, 168–169
 Imphal city flood, 174–175
 location, 168
 Manipur Baptist Church (MBC), 178
 Manipur Flood Plain Zoning Act 1978, 178
 socio-economic indicators, 171
 tourist hotspots, 171
- Man-made disasters
 vs. natural disasters, 52–53
Tucumán failed bridge case (*see* Tucumán failed bridge case)
- Manmade natural disasters, 1727–1730, 1732–1734
- MANP Policies, 307
- Mapping apps, 636
- Maradu* case, 96
 on environmental jurisprudence, 96
 facts, 97

- impact on environmental jurisprudence, 102–104
law, 97
Municipality appeal, 97
Marine environmental disaster, 1739
Market, 1672, 1677, 1680–1683
Market-Based Economic Dispatch (MBED), 1681
Marketing
and branding strategies, 1424, 1425
communication, 1425
crisis, 1425
Maruts, 206
Masculine traits, 2463
MASIPAG, 854
Masks, 1144, 1500, 1507, 1508
Mass awareness, 1971
Mass communication, 1320
Mass information dissemination, 1497
Mass media definition, 1437
Matakota application, 1254
Matching method, 596, 600, 603, 604
Matching need-tweets, 604
Material grants, 948
Maternal health, 294
Maternal mortality rates (MMR), 291, 292
Mayyil Panchayat in Kannur, 383
M. C. Mehta v. Kamal Nath and Others, 1657
Media, 9, 1316, 1326, 1378, 1391, 1395,
1397, 1438, 1461, 1463, 1465–1467,
1469
activism, 1472, 1483
analysis, 1351
and communication channels, 1394
as communication technology, 1439
definition, 1437
in disaster communication, 1439
(see also Radio)
in disaster management, 1525
and disaster reporting, 1474–1475
ethics, 1364
information, 1376
institutions, 1364, 1366
Kashmir floods 2014, 1475, 1476
literacy, 1490
management, 1499
narrative, 1483
organizations, 1318
Pune flood, 2019, 1476
role of, 1438, 1519
Vardah cyclone, 1476
Media and communication, 1391
entertainment media, 1272
online news portal, 1268
OTT streaming platforms, 1275
social media platforms, 1271
sources news, 1271
spreading false information, 1267
MediaEval
emergency response for flooding events
(2018), 538, 545
flood-related multimedia task (2020), 545
multimedia satellite task (2017), 544
multimedia satellite task flood severity
estimation (2019), 545
natural disaster use-case (2021), 545
Medical disasters, 802
MEDIC dataset, 533, 539
Medinipur floods, 1242
Mega-delta, 1954
Megha, 206
Meghana
rivers, 185
waters, 186
Memorandum of understanding (MOU), 2166
Mental disorders, 296
Mental health, 1563, 2360–2362
Mental Healthcare Act, 1719, 2017
Mental trauma, 296

- Micro, small, and medium-sized enterprises (MSMEs), 2358, 2364, 2478, 2479, 2527
 decline in networking, 1072
 definition of, 1066
 employee absenteeism in, 1071
 GDP in India, 1064
 pandemic on, 1071
 response mechanism of, 1072–1074
 risk and resiliency, 1066–1067
 sustainability of, 1064
- Microsoft Excel spreadsheets, 2531
- Micro watershed, 909
- Mid Day Meal Scheme (MDMS), 1579
- Middle East Respiratory Syndrome (MERS), 291
- Migrant labour, 370, 371
- Migrant labourers, 1567
 in agriculture and allied activities, 876
 challenges of, 880–881
 male labourers, 1568
 policy implications, 882
 socio-economic conditions of agricultural, 878
- Migrant workers, COVID-19 pandemic, 2475–2476
- Migration, 182
 adaptation-focused mitigation, 192
 challenges, 188
 climate, 182
 climate change, 185
 disaster, 183–192
 displacement, 182
 from Sundarbans, 193
- Millennium Development Goals (MDG), 1652
- Milling, 127
- Mini-cloudburst (MCB), 783, 785
- Minimum Age Convention, 1973, 2015
- Minimum core obligation, 1936
- Minimum standards of relief, 278
- Ministry of Agriculture, Forestry and Fisheries (MAFF), 2451–2457
- Ministry of Disaster Management and Relief (MoDMR), 1299, 1898, 1963, 1965
- Ministry of Environment and Forests (MoEF), 1956, 1957
- Ministry of Health and Family Welfare (MoHFW), 276, 1898
- Ministry of Home Affairs (MHA), 218, 275
- Ministry of Homeland Security, 1108
- Ministry of New and Renewable Energy (MNRE), 1672, 1675
- Ministry of Power (MOP), 1675
- Minnowbrook Conference, 1655
- Mirebalais source region, 803, 804
- Missing person summary, 616, 623, 624
- Mission Essential Functions (MEFs), 129
- Mithila Art, 1157
- Mitigating information overload, 586–587
- Mitigation, 115–116, 478, 490, 492, 1757, 1759, 1760, 1762, 1763, 1767, 1769, 1962, 2130
- Miyagi Prefecture, 1612
- Miyagi Shiryō Network (MSN), 1612
- Mobile-based technologies, 1288
- Mobile devices
 communication, 631
 coordinating search and rescue, 632–633
 global diffusion, 631
 mobile alerts and warnings, 631–632
 mobile infrastructure and reliance, 633
 mobile phone location services, 633
 possibilities and challenges during disasters, 633–634
 researchers, 631
 social media, 634–635
 under-resourced, 631
- Mobile Emergency Resource Support (MERS), 1270
- Mobile health integrating, 632
- Mobile infrastructure, 633
- Mobile network, 1448
- Mobile phones, 630, 632
- Moderna, 2148, 2149
- Modular software system, 484
- Module of National Disaster Management Authority, 1042–1043
- Mohr-Coulomb failure behavior, 720
- Mora* cyclones, 1300
- Mos Food Services, Inc., 2458
- Mount Merapi Eruption on Central Java (2010), 2363, 2383–2384
- Mt. Apo Natural Park (MANP)
 DRMM, 308
 GMP 2013–2023, 305–306
- Mujib Climate Prosperity Plan (MCPP), 1960
- Multi-billion-dollar space programs, 2531
- Multi-channel imagery, 502, 503, 514
- Multi Country Report, 2121
- Multi-dimensional systemic risk response framework
 elements, 1098
 identify risk management flow, 1098, 1099
 risk management flow, 1099–1101
 RMF and SRM, 1101
- Multidimensional vulnerability index, 562–563

- “Multi-hazards” approach, 1966
Multimodal data collection, 493
Multimodal event identification, 493
Multimodal Flood Level Estimation, 545
Multi-platform gathering, 585–586
Multi-platform service, 575, 587, 589
Multi-platform SMA, 577–584
Multi-platform tools, 577
Multiple and intersectional vulnerabilities, 1563
Multiple Linear Regression Analysis (MLRA), 890, 896
Multi-purpose cyclone shelters, 2183
Multi-resilience indicators assessment
 economical indicators, 827, 828
 economic indicators, 822
 environmental indicators, 820, 822–824
 physical indicators, 827, 830
 social indicators, 821, 825
 study area, 818
Multi-rotor UAV drone, 714
Multi-tier and natural disaster warning system, 248
Mundaka Upanishads, 1662
MUNI bonds, 982
Municipalities
 challenges during pandemic, 975–979
 role during COVID-19 pandemic, 972–975
Mushroom culture, 2197
MV X-Press Pearl disaster, 1743
Myanmar Rohingya Refugees, 2141
My Posts, 579
- N**
- Naga tribes, 1241
Naive Bayes (NB), 600
Nalchira *Haat*, 1309
Nambul river, 168, 169, 175
Named entity recognition (NER), 601, 658–659
Nanjing Autonomous Institute of Water
 Conservation and Hydrology in
 China, 410
Nansen Initiative Protection Agenda, 1865
NASA/Landsat, 805
National Adaptation Plan (NAP), 189,
 1960–1961
National Adaptation Programme of Actions
 (NAPA), 1777, 1956–1957, 1970
National and State Action Plans, 191
National Board of Revenue (NBR), 1885
National Building and Research Organization
 (NBRO), 2340
National Business Review Article, 1317
National Calamity Contingency Fund (NCCF),
 1006
National Calamity Management Act, 275
National Centre for Coastal Research (NCCR),
 346
National Centre for Disaster Management
 (NCDM), 427
National Commission for Women (NCW), 297,
 1567, 2133
National Commission of India, 2130
National Continuity Policy (NCP), 129
National Crime Records Bureau (NCRB), 2129,
 2131
National Cyclone Risk Management Project,
 91, 2178, 2182
National Disaster Communication Network, 1498
National Disaster Management Act 2005
 (NDMA), 213, 260, 409, 1498, 2476
National Disaster Management Agency, 1825
National Disaster Management Authority
 (NDMA), 218, 220, 262–264, 266,
 267, 274, 276–282, 391, 418, 425,
 1196, 1380, 1442, 1577, 1599, 1717,
 1788, 2067, 2100, 2107, 2124,
 2177–2180, 2184–2188, 2320
National Disaster Management Center, 1117
National Disaster Management Commission
 (NDMC), 1787, 1789, 1883, 1884
National Disaster Management Institute of
 India (NDMI), 2099
National Disaster Management Plan (NDMP),
 214, 263, 264, 280
National Disaster Management Policy, 1310,
 2015, 2019
National Disaster Response Force (NDRF), 8,
 191, 218, 266, 267, 281, 389, 406,
 426, 1054, 1197, 1499, 1602, 2069,
 2071, 2179–2181, 2185
The National Policy on Flood Control (1954),
 178
National Disaster Response Fund (NDRF),
 1005, 1007, 1008, 1019, 1623
National Disaster Risk Reduction, 887, 888
National Disaster Risk Reduction and
 Management Authority
 (NDRRMA), 427
National Disaster Risk Reduction and
 Management Policy 2018, 1623
National Emergency Management Agency
 (NEMA), 1081, 1112
National Essential Functions (NEFs), 129
National Executive Committee (NEC), 30, 276,
 277, 280, 281, 285, 1788

- National Family Health Survey (NFHS), 1582
 National Family Health Survey-5 (NFHS-5), 1560
 National Flood Insurance Program (NFIP), 437, 438, 443
 National Food Security Act (NFS), 1579, 1580
 National grid of India, 1683
 National Human Rights Commission (NHRC), 279, 1722
 National identity card (NID), 2149
 National Institute of Disaster Management (NIDM), 191, 389, 711, 1038–1039, 1043, 1197, 2071, 2100, 2178, 2179, 2187, 2320
 National Institute of Rural development and Panchayati Raj (NIRDPR), 2072
 National-level disaster management, 1020
 Nationally Determined Contributions (NDCs), 1959
 National media, 1473, 1476, 1479, 1482
 National Municipal Accounts Manual (NMAM), 982
 National nuclear legal systems, 1925
 National Plan for Disaster 2016–2020, 1883
 National Plan for Disaster Management (NPDM), 1266, 1776, 1777, 1808, 1898, 1966
 National Policy for Senior citizens (NPSC), 956
 National Policy on Disaster Management 2009 (NPDM), 2062
 National Response Framework (NRF), 1117
 National Solar Mission (NSM), 1671
 National Strategy on the Management of Disaster and Climate-Induced Internal Displacement (NSMDCIID), 1966
 National Trades Union Congress (NTUC), 2403
 National Water Mission, 161
 National Water Policy (NWP), 164, 908
 National Water Resources Council, 164
 Nation Online project, 1303
 Natural and man-made disasters, 2178, 2179
 Natural calamities, 200–201
 Natural disaster, 396, 397, 556, 557, 562, 608, 839, 841, 1373, 1396, 1436, 1437, 1439, 1443, 1823, 1938
 management, 1443
 Natural Disaster Reduction (NDR), 2103
 Natural disaster-related social media imagery, 543
 Natural hazard, 414, 1866
 planning, 446, 451
 Natural hazards and disasters, in United States
 coastal erosion, 440–441
 coastal vacation home, 444–445
 earthquakes and Tsunamis, 439
 floodplain, dwelling in, 443
 forest land, dwelling on, 445–446
 industrial facility/seismic fault, 444
 landslide-prone area, community in, 445
 landslides, 441
 Oregon approach, 446–451
 riverine and coastal flooding, 436–439
 wildfires, 441–442
 Natural Language Processing, 597, 598
 Natural resources, 1955
 Nature-based solutions (NbS), 2348
 Nava Kerala (New Kerala), 382, 1055, 1057
 Need-tweets, 598–604
 Negative heritage, 1617
 Nepal disaster management, 1251, 1623
 challenges, 1632, 1634
 communitas, 1625
 disaster policy and governance, 1623, 1624
 field locations, 1625
 gender concerns, 1630, 1631
 liminality, 1624
 revisiting community participation, 1628, 1630
 spatial and cultural diversities, 1626–1628
 Earthquake (NEQuake), 598, 612, 613, 1475
 National Emergency Operation Centre's Standard Operating Procedure 2015, 1623
 Nepal-quake dataset, 604
 Nepotism, 63
 Netflix, 1275
 Network data, 639
 New Delhi Municipal Council, 976
 New normal, 126, 137
 News disambiguation, 543
 News media, 1267
 Newsprint industry, 1287
 New Zealand, 1706, 1748–1749
 Next Generation of Managers, 2533
 Next location prediction, 652
Nicholes v. Marshland, 1653
Nighāñtu, 207
 Night Light Development Index (NLDI), 567

- Night-time lights, 564–569
Nipah virus, 380
NITI-Aayog, 981, 1583
Non-binding policies and guidelines, 1925
Non-derogable human rights (NDHR), 1988
Nonessential health care, 295
Non-Governmental Organizations (NGOs), 1025, 1601
Non-natural disaster, 1823, 1824
Non-refoulement, principle of, 1985
Non-seismic techniques, 728
Non-state actors, 841–842
Non-Western art, 1237
Non-Western cultures, 1237
Normal accident theory, 1093
North Atlantic Oscillations (NAO), 780
North-east India, 2190
NoSQL database, 486
Notified disaster, 159
Notre Dame Global Adaptation Index (ND-GAIN Index), 992
Nuclear-based power plant, 1930
Nuclear Command Authority (NCA), 266
Nuclear Damage Commission, 1930
Nuclear disaster
 accidents at nuclear power plants, 260, 261
 climate change, 268, 269
 CNG/LNG based thermal power plants, 270
 COVID-19 pandemic disaster, 259, 265
 disaster mitigation plan, 259
 Disaster Resilient Cities, 270, 271
 India's Nuclear Disaster Management Planning, 262, 263
 management, 264, 265
 nuclear energy, 259
 policy interventions, 260
 role of DRDO, 266
 South Asia, 261, 262
 treatment of radioactivity exposed patients, 268
 use of nuclear weapons, 261, 262
Nuclear Disaster Management Authority (NDMA), 218–220, 259
 in animal welfare promotion, 389
Nuclear Disaster Management Guideline-Nuclear, Radiological and Nuclear Emergencies (NDMG-NRE), 264
Nuclear-powered, and Biochemical (NBC) combat, 2109
Nuclear Power Plant Act 2015, 1925
Nuclear power plants (NPPs), 269, 1929
Nuclear programme, 1925
Nuclear reactor, 1926
Nuclear Safety, 1927
Nuclear Safety and Radiation Control (NSRC) Rule, 1925, 1928
Nuclear war, 261, 262, 271
Nudging, 2499, 2500
Numerical simulation, 711, 713–719, 722
Numerical weather prediction (NWP) model, 792
- O**
- Odisha (Orissa), 229, 2107
 cyclone (*see* Fani cyclone)
 disaster management in, 1024
 disaster-resilient community, 90–91
 disaster resilient infrastructure, 91
 as disaster vulnerable state, 84–85
 drought, 1024
 fire services, 89–90
 floods, 1022
 heat wave, 1022
 inclusive strategy, 92
 integrated approach, 92–94
 lessons learnt from Super Cyclone of 1999, 86
 lightening, 1024
 location, 398
 Odisha Disaster Management Authority (OSDMA), 1019
 Odisha Disaster Rapid Action Force (ODRAF), 87–88, 2069
 Odisha Fire & Disaster Response Institute (OFDRI), 90
 Odisha Fire and Disaster Response Academy (OFDRA), 89
 Odisha Forest Development Corporation (OFDC), 406
 Odisha Grama Panchayats Act (OGPA), 1022
 Odisha Panchayat Samiti Act (OPSA), 1022
 Odisha Rural Development and Marketing Society (ORMAS), 405
 Odisha's disaster management policy, 1021
 Odisha State Disaster Management Authority (OSDMA), 87–88, 399, 401, 403, 405, 2067, 2176, 2182, 2184
 Odisha State Disaster Response Forces (ODRAF), 1024
 Odisha State Medical Corporation Limited (OSMCL), 405

- Odisha (Orissa) (*cont.*)
 Odisha Super Cyclone, 275
 Odisha University of Agriculture and Technology (OUAT), 405
- Office for the Coordination of Humanitarian Affairs (OCHA), 1663
- Office of the Civil Defense (OCD), 132
- Official development assistance (ODA), 1652
- Older adults, Covid-19
 age-related discrimination, 1452
 cognitive well-being crisis, 1451
 cultural effects on older women, 1455
 loneliness, 1452, 1453, 1455
 mental well-being, 1450
 physiological and psychological requirements, 1451
 rights and needs, 1456
 shifts in the lifestyle, 1450
 social media/internet, 1453–1454
- Omicron variant, 2141
- Omnivory, 2529
- Onagawa, Japan, 737, 739
- One Sun One World One Grid (OSOWOG), 254
- Ongees tribe, 1553
- Online archives, 1482
- Online data, 1568
- Online learning strategy, 2151
- Online news portal, 1268
- Online social media (OSM), 596, 597, 599
- Online teaching, 1589
 advantages, 1593
 challenges to, 1590
 concerns about, 1591
 disadvantages, 1593
 happy feel, 1592
 modern technology in, 1592
 motivation, 1592
 strategies to enhance the quality of, 1594
 successfulness of, 1593
 support, 1592
 on workload of lecturers, 1591
- Open Market Sales Scheme (OMSS), 146
- OpenStreetMap, 601
- Operational adjustments, 480
- Operational life cycle, 1929
- Operation Karuna, 1054
- Operation Madad, 1054
- Operations-based exercises, 492
- Optimal decision-making, 2498
- Oregon, United States
 coordination, 448
 implementation, 447
 natural hazard planning, 446
- new hazard information, 447
- planning program, 451
- Organisational and planning problems, 2502
- Organisational resilience, 2499, 2501, 2502, 2504–2506
- Organisation of the Disabled Persons (DPOs), 1895
- Organization for Economic Co-operation and Development (OECD), 1927, 2369
- Organization of Petroleum Exporting Countries (OPEC), 1652
- Other Displaced Persons (ODPs), 1990
- OTT platforms, 1428
- Outpatient department treatment (OPDs), 294
- Overcoming disruptions, 2531–2532
- Over the Top (OTT) platforms, 1275, 1465–1467
- Oxford-AstraZeneca vaccine, 2148
- Ozone layer, 1727
- P**
- Pacific Asia Travel Association (PATA), 2144
- Pacific Catastrophe Risk Insurance Company (PCRIC), 2524
- Pacific Trade Invest (PTI), 2521
- Padang Earthquake on West Sumatra (2009), 2363, 2382–2383
- Paddy cultivation, 2195
- Padma, 186
- Paitkar, 1237, 1242
- Pakistan flood (PFlood), 612, 1786, 1789, 1790
- Palam Air Force Station, 1367
- Palli Karma Sahayak Foundation, 2150
- Palli Sanchay Bank, 2150
- PALSAR 12.5m DEM, 713
- Pāñcatantra, 208
- Panchayat Disaster management Committee (PDMC), 1030
- Panchayat Disaster Response Fund, 1030
- Panchayati Raj Institutions (PRIs), 1016, 1018, 1025, 1031, 2075
- Panchayati raj system, 382
- Panchayat level war rooms, 383
- Panchayats, 380–384
- Panchayat Samiti Disaster Response Fund, 1030
- Panchayats Extension to Scheduled Areas (PESA) Act, 1660
- Pandemic, 1424, 1716, 1717, 1719, 1720, 1722
 brand collaborations, 1428–1429
 brand communication, 1425–1427

- definition, 1576
economic and structural reforms, 140
on food security, 2427
impact, 1424
and inclusive governance (*see* Inclusive governance)
reporting, 1365
SARS-CoV-2, 141
urban areas, 141, 142
See also COVID 19 pandemic
- Panic buying, 2428–2431, 2433
- Pan-India wholesale electricity market, 1683
- Paper selection criteria, 683–684
- Paradigm shift, 1775, 1777–1779
- Paris Agreement, 397, 1663, 1672, 1776
- Parjanya*, 207
- Participatory capacity and vulnerability analysis (PCVA), 851
- Participatory Ethnographic Method (PEM), 1626
- Participatory Learning and Action (PLA), 2067
- Particularly Vulnerable Tribal Groups (PVTG), 1581
- Partner violence, 1562, 1563
- Part-Of-Speech (POS) Tagger, 601
- Patal Ganga Valley, 713
- Patchitra*, 1242
- Patient monitoring devices, 632
- Patriarchal mindset, 2116
- Pattachitra Paintings, Odisha, 1162–1165
- Pattachitras*, 1237
- Pattern matching methods, 596, 600
- Patuas*, 1241, 1242
- PDS systems, 146
- People's Archive of Rural India (PARI), 2210
- Peoples' evacuation, 1296–1299, 1303, 1305, 1310, 1311
- People's participation, 847, 856
- Performance evaluation, 603
- Peridar Kaala Vaanoli* station, 1297
- Peripherality index, 2531
- Peripheral Services Market regulation, 1681
- Personal Attitude Construct (PAC), 1613
- Personal digital assistants (PDAs), 632
- Personal preparation guide, 1693–1697
- Personal Protection Equipment (PPE), 972, 1722, 2142, 2151, 2153
- Persons with Disabilities (PWD), 1892–1904
- Perspective Plan (2021–2041) (PP2041), 1961–1962
- Pet Evacuation and Transportation Standards Act (PETS), 10
- Petric v. Lamont*, 1657
- Pets and homeless animals
abandoning of pets, 113–115
inflicting harm to pets and strays by committing an act, 111–112
mitigation, 115–116
preparedness to protect, 117–118
recommendations, 115–120
response steps to protect, 119–120
welfare during COVID-19 pandemic, 110–115
- Pfizer–BioNTech vaccine, 2149
- Phad paintings of Rajasthan, 1166–1167
- Pharmacy, 1428
- Philippines
CBDRM (*see* Community-based disaster risk management (CBDRM))
emergency response to building community capacity, 847–848
vulnerability to hazards, 846–847
- Photography, 1488
- Phulparasi, 1625, 1633
- Physical distancing, 1500
- Physical fashion, 1510
- Physical insecurity, 1318
- Physical violence, 1562
- Physical vulnerability, 746, 765, 771
- Physiography of India, 346
- Pisciculture, 176
- Pixel-wise spatial matching technique, 716
- Platform co-operative models, 2397
- Platform co-operativism, 2401
- Poetics*, 1236
- Polderisation, 990
- Polders, 989, 990, 994
- Pole and Corridor System, 230
- Police training, DRR
Administrative Training Institutes, role of, 1041
disaster impact, 1041
disaster risk management, 1037
emergency management, 1042
fire safety, 1042
National Institute of Disaster Management, role of, 1038–1039
police academy, role of, 1039–1041
training need analysis, 1037–1038
- Policies, 1955
BCCSAP, 1957–1958
BDP, 1959
ccGAP, 1958

- Policies (*cont.*)
 Climate Change Trust Act 2010, 1958
 NAPA, 1956–1957
 NDCs, 1959
- Policy change
 administrative effort, 1112, 1114, 1117
 catastrophic events, 1106
 focusing events, 1107–1109
 large-scale disaster, 1106
 major policy change, 1114, 1117, 1118
 major policy changes, 1112, 1115
 policy implications, 1118, 1119
 political leadership, 1111, 1113, 1116, 1117
 problem identification, 1111, 1113, 1116
 public need, 1111, 1112, 1115
 window of policy, 1107–1109
- Policy Change After Disaster (PCAD) Model, 1109–1111, 1120
- Policy framework of disaster governance, 871
- Policy gaps, 1971
- Policy implementation
 digitization of disaster management, 19–20
 essentials of, 18
 local governance, 18
 perspective findings, 16–17
 and political expediency, 20–22
- Policy makers, 298
- Political, economic, social, technology, and legal (PESTEL) framework, 2513
- Political decentralization, 1016
- Political expediency, 20–22
- Political vulnerability, 766
- Politics, 279–285
- Polluter pays' principle, 1657, 1730–1732, 1734
- Polycentric governance system, 980
- Population ageing, 952
- Population Fund of India, 294
- Population mobility maps, 653
- Port cities, 232
- POSCO *Pratirodh Sangram Samiti* (Anti-POSCO Campaign), 2168
- Positive attitudes, 1615
- POS (Parts-of-Speech) tagger, 601
- Post-Amphan scenario
 customized search engine, 1339
 media, 1340
 sentiment analysis, 1340
- Post-disaster assistance
 industrial units, 934
 sector-wise estimated damage, 935
 SEWA, 935
- Post-disaster disputes, 1708
- Post-disaster needs assessment (PDNA), 382, 936, 946, 1052–1053
- Post-disaster period, 2059
- Post-disaster resource management, 596, 597, 605
- Post-disaster tourism recovery, 543
- Post-Katrina Emergency Management Reform Act of 2006, 283, 1117
- Power beaming, 523
- Powered aerostat, 520
- Power generation capacity, 1671, 1677
- Power law distribution
 analysis method, 1086
 coefficients, 1081, 1083
 estimated parameters, 1086
 European countries, 1087
 Korea Disaster data, 1081
 natural and social disasters, 1084, 1087
 natural disasters and casualties, 1086
 policy makers, 1087
 program implementation, 1083
- Power purchase agreement (PPA), 1673
- Power sector during pandemic
 challenges, 1671–1674
 green energy in India, 1669–1671
 Ministry of New and Renewable Energy (MNRE), 1675
 Ministry of Power (MOP), 1675
 renewable energy sector, 1677–1679
- Pradhan Mantri Awas Yojana (PMAY), 1054
- Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY), 1582
- Pradhan Mantri Shram Yogi Maan-Dhan, 881
- Prajapati*, 206
- Prasaha*, 199
- Pratuda*, 200
- Preamble, 1851
- Precipitation, 778–781, 791, 792, 794
- Precision, 600, 602, 603
- Precursor detection, 730–731
- Precursor environmental parameter, 802
- Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), 748, 749
- Preparedness, 397, 401, 405, 406, 1757, 1760, 1762–1765, 1767, 1769, 1770 plans, 135
- Preparing for disruptions, 2526–2528
- Prescribed burning, 463–465
- Preserving cultural heritage, 1610, 1612, 1616, 1618, 1619
- Pre-Shipment Credit Refinance Scheme, 2150

- Press Information Bureau (PIB), 1267
Press Trust of India, 2130
Prevention, 1757, 1760, 1762, 1767, 1769
Prevention and Anticipation Measures of the Financial System Crisis, 1823
Prevention of Epidemic Diseases Amendment Act 2020, 1716, 1717
Prevention of Infectious Disease, 1822
Primary health centers (PHC), 382, 383
Primary Mission Essential Functions (PMEFs), 129
Prime, 1275
Principal component analysis (PCA), 751
Print media, 1474, 1476–1478
Privacy issues, 639–640
Private platforms, 634
Private property
— advocacy in 21st century, 42–43
— in historical perspective, 40–42
Privatization of land, 44
Probsahi Kalyan Bank, 2150
Programming Division/Bangladesh Planning Commission, 994
Project Affected Persons (PAP), 2288
Property management, 1537, 1539–1542
Property rights for disaster recovery, 40
— forms of property, 43
— private property, 40–43
Protected Area Management Board (PAMB), 305
Protection against Accidents (Dockers) Convention, 1932, 2015
Protection gap, 1979, 1988
PROtection of European Cultural HERitage from GeO-hazards (PROTHEGO) project, 501
Protection of Human Rights Act (PHRA), 279
Protection of oceans, 1739–1743, 1747, 1750, 1752
Protection of Women from Domestic Violence Act, 2005, 2129
Protective Action Decision Model (PADM), 1300
Provincial Disaster Management Commission [PDMC], 1787
Provincial governments, 1017
Proximity score, 603
Psychological Care and Vulnerability Reduction, 2180
Psychological counselling services, 1566
Psychological trauma and stress, 2180
Psychologists, 1613–1616
Psychosocial support
— external measure, 1615
— family and community, 1615
groupings, 1614
individuals and communities, 1610
interconnectivity, 1611
principles, 1611
PT, 1613–1616
salvaging, 1612–1613
“small” heritage, 1613
town administration, 1617
Public affairs, 1533
Public agencies, 838
Public Assistance (PA) Grant Program, 284
Public awareness, 1927
Public communication, 1500–1502
Public Distribution System (PDS), 1580, 1581
Public governance, 841
Public health, 1722, 1939, 1941, 1943–1946, 1948
— disasters, 1843
— professionals, 1288
— responses, 290
Public Health Emergency, 1723, 1822, 1824–1826, 1828–1830, 1833
— in complex relationship, 1836
— definition, 1836
— economic stalemate during, 1846
— human rights observance in, 1840
— stop human rights violations during any, 1841
Public Health Engineering Department (PHE), 215, 2196
Public Health Law, 1720
Public Interest Litigation (PIL), 2134
Public management approaches, 18
Public–private partnership, 2243–2244
Public’s distrust, 1411
Public Service Continuity Plans (PSCPs), 129, 131, 136
Public’s skepticism, 1410
Public’s trust, 1409
Public warning, 707
Public Works Department (PWD), 1055
Public works employment schemes, 949
Puducherry, 229
Pūsan, 202
Pune flood, 1476, 2019
- Q**
QUAD, 254
Qualitative descriptive approach, 1157
Quality assurance, 488
Quality of life, 1199
Quarantine, 1822, 2139, 2145

R

- R. v. Commissioner of Sewers for Essex*, 1653
 Radiation safety, 1926
 Radio, 1287
 apps, 636
 community radio stations, 1522
 disaster communication, 1518
 in disaster mitigation, 1519–1521
 in global public health emergency, 1524
 private radio channels, 1522
 Radioactive contamination, 1924
 Radio Naf, 1301, 1303, 1306
 Radio Sagor Dwip, 1301
Raghuvaniśa, 208
 Rainfall threshold models, 711
 Rainfall-triggered landslide models, 711
 Rain gauges, 910
Rakshakali avatar, 1241
 Ramakrishna Mission, 1583
Ramalinga Nadar v. Narayana Redilier, 1654
Rāmāyana, 208
 Ramification, 295
 Rana Plaza disaster, 2016
 Random Forest algorithm, 587
 Rapes and sexual assaults, 2119
 Rapid Clearance Procedure, 1885
 Rapid Mass Movement Software (RAMMS), 713, 715, 716, 719
 Rapid Response NGO, 428
 Rapid response team (RRT), 383
 Readymade Garments Industry (RMG), 2143
 Rebuild Kerala Initiative (RKI), 1055
 Recall, 600, 602, 603
 Reconstruction, 1762
 agriculture and hospitality, 931
 assessment reports and financial resource, 928
 damage and loss assessment, 929
 livelihood restoration, 929
 policy document, 929
 Recovery, 1706
 Red Crescent Cyclone Preparedness Programme, 74
 Red Cross, 1265
 Reddit, 575
 Redundancy, 2529
 Refugees, 184
 Regional agriculture, 2456
 Regional Integrated Multi-Hazard Early Warning Systems (RIMES), 401, 410
 Regional Response Centres (RRCs), 267
 Regulations, 1669, 1674, 1675
 Regulators, 1668, 1669, 1673, 1674, 1676, 1682, 1683
 Regulatory mapping (RegMAP) method, 313
 Rehabilitation, 842, 1757, 1760, 1762, 1764, 1768–1770, 1893, 2489
 policy, 929
 process, 543
 relief and, 1008
 Rehashed disappointment, 214
 Relational database, 486
 Relevance, 547
 Reliance, 633
 Relief, 1048, 1054, 1056
 and rehabilitation, 1008
 relief centric approach, 1759, 1762
 Relocating homeless people, 284
 Relocation, 1642
 Remittance, 2144
 Remote leadership, 2362
 Remote sensing (RS), 702–704, 707, 1393
 definition, 555
 for flood mapping, 683–691
 for flood monitoring, 691–692
 framework in crisis response, 556
 paper selection criteria, 683–684
 UNOSAT satellite image processing services, 557–559
 Remote working, 1424
 Renewable energy, 1670, 1677, 1679
 Renewable Energy Country Attractiveness Index (RECAI), 1677, 1678
 Reproductive and sexual health, 293–296, 298
 Rescue and relief operations, 543, 1054
 Research and Development (R&D), 2427, 2429–2433
 Research methodology, 1783
 Research questions, 1783
 Reserve Bank of India (RBI), 976
 Residential Advisory Service (RAS), 1709
 Resilience, 84, 91, 380, 867, 1127–1130, 1169, 1610, 1611, 1613, 1616, 1618, 2334, 2504, 2529
 community, 172–174, 1692
 concept of, 501
 cultural assets, 500
 definition, 501, 817, 849
 indicator, 819
 responsiveness of community, 176–178
 sustainable agriculture, 853–855
 theory, 1067
 Resilience of Nations and Communities to Disasters (HFA), 2120
 Resilience thinking, 867
 business as usual approach, 868
 in disaster governance, 870
 Disaster Governance of India, 871–873

- Resilient city, 1257
evolution of, 1248
integrated approach, 1249–1255
- Resilient livelihoods, 946
- Resilient urban development, 2347
- Resource, 2118
availability, 600
depletion, 2514
embeddings, 603
management, 596, 597, 605
maps, 653
names, 603
similarity score, 603
- Response management, 1091, 1093, 1096, 1102
- Response planning maps, 653
- Response plans, 135
- Responsibility, 1411
- Restorative justice, 1742–1743
- Restore Denuded Areas, 306
- Reverse migration, 878, 879, 882
- Rickshaws, 1213
- Rights and Protection of Person with Disability
Act (RPPDA), 1892, 1894–1896,
1898, 1900, 1902, 1903
- Rights and Resources Initiative (RRI), 2166
- Rights-based approach (RBA), 1804,
1806–1807, 1816, 1937, 1947–1948
- Right to food, 1579
- Right to health
epidemic, 1719
facets, 1717
impact of lockdown, 1720
in India, 1718, 1719
legal framework, 1721
public health emergency, 1720
public health legislations, 1720
well-fitting comprehensive policy, 1717
- Right to Organize and Collective Bargaining
Convention, 1949, 2015
- Rigveda*, 199
- Rikuzentakata
AidTAKATA, 2226
destruction of, 2223–2224
gift from Singapore, 2233
inclusion and accessibility, 2230
international community and global
assistance, 2232
leadership of municipality, response and
reconstruction planning, 2227–2228
- Recovery & Reconstruction Plan,
2228–2231
- Risk
assessment, 706
factors, 1562
floods, 686, 919
- governance, 865
identification, 1759
information, 1288
reduction, 1757, 1759, 1762, 1763, 1769
- Risk communication, 1278, 1501
approaches, 1290
attempts, 1279
campaign, 1286
CERC model, 1281
classical notion, 1279
cycle, 1321
government-expert communication, 1281
India, 1284
step, 1279
strategies, 1278
visuals and infographics messages, 1281
- Risk management, 1093, 1414
- Riverine floods, 50, 436
- Road communication, 1010
- Roanu* cyclones, 1298, 1300
- Rohingya camps, 2141
- Roles and Responsibilities (R&R), 1101
- Rooppur Nuclear Power Plant (RNPP), 1925
- ROSATOM, 1929–1931
- Rudra, 202
- Rudraprayag Formation, 712
- Rumour circulation, 127
- Rupandehi district, 1625–1627, 1630–1632
- Rural economy, 879–880
agriculture sector in India, 144
challenges, 145
employment, 147, 148
food security, 146, 147
Indian Council of Agricultural Research
(ICAR), 144
measures, 145, 146
- Rural Industries Development Centre, 932
- Rural–urban migration, 348
- Rural waterlogging, 989
- Russia–Ukraine war in 2022, 1272
- Rylands v.Fletcher*, 1653
- S**
- SAARC Disaster Response Agreement, 1885
- SAARC Rapid Relief in Natural Disasters
(SARRND), 1663
- Sagor Dwip radio station, 1305
- Saheli Women Resource Centre v. Commr of
Police Delhi, 1658
- Salvaging, 1612
- Samaj*
and Covid-19 pandemic, 1604–1606
in disaster management, 1602–1604
role, 1601

- Samhita (Charak)*, 1662
 Sampoong Department Store, 1109
 Sanchi stupa, 1242
Sanchoku, 2457
 Sanskrit texts, 198
Sarasvati, 207
Saraswati Parabhai v. Grid Corp. pf Orissa & Others, 1654, 1658
 Sarlahi district, 1627
 SARS-CoV-2, 141, 1278
 centre-state-local cooperation, 143
 in India, 140
 SARS outbreak, 2366
Śatapatha Brāhmaṇa, 198, 206
 Satellite
 communications, 1393
 data, 713
 images, 554, 558, 560, 561
 phones, 87, 405, 408
 television, 1287
 Satellite Based Mobile Data and Voice Terminals (SBMDVT), 407
 Scenario specific summarization, 616
 Schedule commissioning date (SCOD), 1673
 Schema, 487
 SDMAs, 213, 220, 221
 Sea level rise (SLR), 992, 1051
 Search and rescue, 1054
 Search engines, 576
 Seasonal hazard analysis, 170
 Seasonality, 1513
 Second Administrative Reforms Commission, 212, 282, 980
 Second wave of COVID-19 pandemic, 1578
 Second World War, 2040, 2042
 Secure Sockets Layer (SSL) method, 486
 See Now Buy Now, 1513
 Self Employed Women's Association (SEWA), 935
 Self-identity, 1613
 Self-reporting system, 1884
 Self-supervised learning framework, 689
 Semi-structured interview technique, 1626
 Sendai Framework for Disaster Risk Reduction
 2015–2030 (SFDRR), 7, 26, 214, 291, 358, 360, 371, 397, 907, 956, 1015, 1091, 1551, 1582, 1598, 1658, 1663, 1759, 1775–1777, 1797, 1892, 1954, 1963, 1971, 2063, 2099, 2106, 2321, 2346
 Senior citizens
 challenges faced during Amphan cyclone disaster, 959
 opinion about disaster resilience during Amphan cyclone disaster, 960–961
 socio-demographic profile of, 958
 vulnerability during disaster, 953–954
 Sensing, 2502
 Sentiment analysis, 544
Sentinelese communities, 1553
 Sericulture office construction, 177
 Settlement, 232
 Seventh Five Year Plan, 2143
 73rd and 74th Constitution Amendments Acts (CAAs), 141, 970
 Severe Acute Respiratory Syndrome (SARS), 291, 292, 2489
 Severe cyclonic storm (SCS), 399
 Sewol Ferry Accident, 1115
 Sexual and reproductive health services, 296
 Sexually transmitted diseases, 295
 Sexual violence, 294, 1562, 2135
 Shakti, 1241
Shantiparva, 1662
 Sharecroppers, 1628
 Shared Google docs, 636
 Sharing of information, 1414
 Shear strength, 715, 720, 721
 Sheep (*avi*), 205–206
 Shelf-Help Groups, 1025
 Shelter homes, 1568
 Shuttle Radar Topography Mission (SRTM)-Digital elevation model (DEM), 780, 781
 Shyam Sunder v. Rajasthan, 28
 Sidhakali, 1629
 Sidr cyclone, 1298, 1774, 1778
 Signal-to-noise ratio (SNR), 732
 Silo-based approach, 2329
 Silver Caregivers Co-operative Limited (SCCL), 2403
 Simeulue Island, 77
 Singapore, 2426, 2427
 co-operatives in, 2403–2408
 COVID-19 pandemic on food security, 2430–2431
 digital transformation journey, 2397
 food security and resilience, 2427, 2429–2430
 governance of co-operatives in, 2404
 platform co-operatives in, 2397
 Singapore National Co-operative Federation (SNCF), 2365, 2402, 2403
 Sinopharm's Covid-19 vaccine, 2149
 Siracusa Principles, 1944
 Situational awareness, 582–584, 637, 758
 maps, 652

- Situational leadership, 2516
Sixth Assessment Report (AR6), 1014
Skill matrix, 89
SLC (Scan Line Correction) malfunction, 805
Sloping agricultural land technology (SALT), 853
Slow-onset natural disaster, 1865
Small and medium-sized enterprises (SMEs), 2358–2362, 2365, 2370, 2445
Small businesses, 2512
'Small' heritage, 1612
Small Island Developing States (SIDS), 2520–2523, 2530–2532
SMART, 1192
Smart Cities Mission (SCM), 1250
Smart city, 158, 161, 162, 370, 1126–1130, 1176, 1246
access and affordability, 1200, 1201
Beijing, 1252
concept of, 1179–1183, 1192, 1194
contact tracking and monitoring, 1140–1141
definitions, 1177–1179
development, 1193, 1194
dimensions of, 1137
disaster (*see* Disaster resilience)
disaster preparedness and challenges, 1196, 1197
e-learning and teleworking, 1141
elements/components of, 1138, 1182
ethical aspect, 1184–1186
evolution of, 1247
Guwahati, 1250
ICT, 1192
ideology, 1197
integrated approach, 1249–1255
mission, 1195
Nepal, 1251
projects, 1138
reviews, 1179–1183
smart environment, 1141
smart healthcare, 1140
smart mobility, 1141
smart monitoring, 1142
soft/non-physical assets, 1256–1257
Surabaya, 1253
Takamatsu city, 1254–1255
technology application, COVID-19 pandemic, 1138–1142
underprivileged (*see* Underprivileged)
urban development, 1199
Smartening Tehran, 1136
challenges of adopting smart city technologies, 1145–1148
technology adoption prior to advent of COVID-19, 1142–1143
technology application throughout COVID-19 pandemic, 1143–1147
Smart enough cities, 1130–1131
Smart Nation initiative, 2397
Smartness, 1178, 1183, 1184
Smartphone, 278
Smart water, 159, 162, 163
Smong, 77
Social accountability, 2440
Social Action Center (SAC) of Infanta, 849
Social Amplification Risk Framework (SARF), 1281, 1290
behavioral reactions, 1283
information source, 1283
receiver, 1283
signals, 1282
social communication, 1282
stages, 1283
temporal and spatial scales, 1283
Social behaviour, 1615
Social capital, 1611, 1616, 1618, 2440
Social construction, 2117
Social contract, 1757
Social distancing, 1500, 1507, 2141, 2142, 2146–2148, 2154, 2360, 2364–2366
Social engagement, 2438, 2440, 2446
Social Impact Assessment (SIA), 1775
Social inclusion, 1199, 1200
Social indicators, 821
Social infrastructure, 1643
Social isolation, 297, 2141
Socially responsible behaviour, 1429
Social media, 472–474, 485, 532–535, 540, 543–547, 575–577, 630, 632, 637, 757, 1288, 1379, 1415, 1448, 1450, 1453–1456, 1488, 1490–1492, 2524
applications, 1439
assessment, 579
campaign, 1428
as catalyst in disaster risk governance, 1414–1420
challenges, social media governance, 1418–1419
in communication technology, 1439
copyrights issues, 547
crisis-related social media images, 540
CrowdMonitor, 581
data, 480, 585
data analytics, 490
data collection and annotation, 547
datasets, 535, 539, 598

- Social media (*cont.*)
- in disaster communication, 1401
 - disaster events detection and information dissemination, 543
 - emergency managers, 635
 - extracting contact, 601
 - extracting geographical locations, 601
 - extracting quantities, 601
 - extracting resources, 601
 - extracting sources, 601
 - features, 1440
 - floods severity estimation, 543
 - future directions, 605
 - geo-location information, 547
 - governance, 1418
 - identification and classification of needs of affected individuals, 543
 - matching based on resource embeddings, 603
 - matching based on resource-names, 603
 - matching resource-needs with appropriate resource-availabilities, 598
 - MediaEval, 544, 546
 - messages, 587
 - models, 539
 - monitoring and facilitating rescue and reconstruction operations, 543
 - multiple channels of communication, 1441–1442
 - needs of resources or availability of resources, 597
 - news disambiguation, 543
 - performance evaluation, 603
 - platforms, 278, 574
 - proximity score, 603
 - quantification of disasters' impact on the infrastructure, 544
 - reachability, 1439–1441
 - relevance and authenticity, 547
 - resource similarity score, 603
 - retrieval methods, 599
 - seriousness, 635
 - services, 574
 - situational awareness and emergency response, 1439
 - sorting, 636
 - and technology, 1420
 - unsupervised pattern matching, 599
 - users, 639
 - visual sentiment analysis, 544
- Social Media API (SMA), 575, 577–584
- Social Media Observatory (SMO), 583
- client application, 578
- Social media policy
- for disaster risk management, 1419
- in India, 1419
- Social networking platforms, 1439
- Social networks, 1448
- Social norms and beliefs, 1560
- Social-QAS integration, 579
- Social Quality Assessment Service (Social-QAS), 579
- Social resilience, 159
- Social resource, 2503
- Social Safety Net Programmes (SSNP), 993
- Social schemes, 192
- Social sector organisations, 1349
- Social security measures, 1902
- Social systems, 1318
- Social value, 2438, 2446
- Social vulnerability, 761, 766, 772, 2262
- Social welfare schemes, 32
- Social wellbeing, 1643
- Socio-economic deprivations, 294
- Socio-economic impacts
- droughts, 2343–2344
 - floods, 2337–2339
 - landslides, 2340–2343
- Socio-economic indicators, 171–172
- Socio-economic profile, 2192
- Socioeconomic vulnerability, 746
- Sociological studies, 296
- Soil erosion, 187
- Solar Energy Corporation of India (SECI), 1679
- Solar generators, 1678
- Solar PV, 1671, 1677
- Solesolevaki*, 2529
- Solid waste management, 1215
- South Asia
- climate change impact on women, 2115, 2116, 2118, 2119, 2121, 2123, 2124
- South Asian Association for Regional Cooperation Agreement on Rapid Action against Natural Disasters, 22
- South Asian Association for Regional Cooperation (SAARC), 423–425, 1785
- South Asian Disaster Management Exercise (SAADMEx), 424
- South Korea, 1106
- COVID-19 and coexistence with society, 2442–2444
 - disaster relief CSR activities, 2438, 2442, 2443
 - Korean companies, 2439
 - Korean firms, 2442–2444
 - Korea Forest Service (KFS), 509

- Sovereign States
 obligations of, 1996
- Space technology, 803
- SPADE, 597
- Special privileges, 1885
- Special Relief Organization, 401
- Spring Renewable Energy Pvt Ltd (SEPL), 1673
- SPSS software, 1614
- Sri Lanka, 1323, 2349
 climate and weather, 1326
 climate change, 1323, 2348
 Constitution, 1744–1746
 droughts, 1323, 2343–2344
 dry zone areas, 1324
 Fisheries and Aquatic Resources Act, No. 02 of 1996, 1746–1747
 floods, 1325, 2336–2339
 improved environmental governance, 2347
 integration, inclusiveness and knowledge sharing, strengthened urban management with, 2348
 landslides, 2339–2343
- Marine Pollution Prevention Act, No. 35 of 2008, 1746
- media channels, 1328
- NbS, 2348
- oxygen levels, 1325
- political mediations, 1327
- smart cities and IT solutions, 2349
- Sri Lanka Disaster Management Act
 No. 13 of 200, 1269
- Sri Lanka Land Development Corporation, 2347
- water related disaster management, challenges in, 2344–2346
 women, 1324
- Srinagar Air Force station, 1367
- Stakeholders, 212, 1374, 1381, 1382
- Standard dispute resolution processes, 1707
- Standard operating procedures (SOP), 267, 1267, 1273, 1387, 1499
- Standard pre-processing techniques, 600
- Standing Orders on Disasters (SOD), 1963–1964
- Standing Regulatory Orders, 1808
- State Disaster Management Act, 275, 279
- State Disaster Management Authorities
 (SDMAs), 218, 263, 276, 277, 285, 389, 1197, 1599, 2067, 2100, 2178
- State disaster management plan, 2107
- State disaster management policy, 1021
- State Disaster Response Force (SDRF), 267, 1005–1007, 1019
- State Election Commission, 971
- State emergency v public health emergency, 1824, 1825
- State Finance Commission, 971, 981
- State Institute of Public Administration and Rural Development (SIPARD), 1041
- State Institutes of Rural Developments (SIRDs), 2072
- State Level River Authority, 909
- State of Municipal Finances in India, 978
- State scheme PDS cards, 147
- State's ecological debasement, 215
- State specific action plan, 161
- State Water Policy (SWP), 908
- Statistical word segmentation algorithm, 601
- Statutory Regulatory Order (SRO), 1885
- Stockholm Declaration, 1726
- STORM Programme, 424
- Storm surge, 131, 2204, 2207, 2209, 2213
- Storm Warning Centre (SWC), 1299
- Strategic management, 2513
- Strategic Preparedness and Response Plan (SPRP), 1897
- Stratified random sampling method, 2081
- Stress Disorders, 1563
- Stress process model, 960
- Strict Protection Zone (SPZ), 306
- Studio, 1460, 1461, 1463, 1464, 1466–1469
- Sub-event detection, 608–610, 612–614, 617–619
- Subsidiarity, 1659, 1661
- Substance abuse, 1563
- Sudden-onset natural disaster, 1865
- Suicidal attempts, 1563
- Summarization algorithm, 614–616
- Summarization scheme (SCC), 616–624
- Summer Follower missions, 525
- Sundarbans, 182, 185–188, 192, 193, 2204, 2205
 community vulnerability, 2207–2215
 demographic information, 2211
 Disaster Management Plan, 2020-21, 2213
 embankment, 2209–2210
 inaccessible communication, 2212
 livelihood, 2210–2212
 mangroves, 348
- Sundarpur, 1625
- Sun Synchronous Orbits, 805
- Super cyclone (1999), 220, 398, 399, 406, 409, 410, 1954

- Supervised learning algorithms, 488
 Supply-chain disruption, 2144
 Support Vector Machines (SVM), 539, 600
 Supreme Court, 278, 280
 Surabaya, 1253
 Surface water temperatures (SWTs), 2207
Sūrya, 208
Suśruta Saṃhitā, 200
 Sustainability, 291, 869, 1199, 2514, 2515
 Sustainable coexistence, 2443, 2444, 2446
 Sustainable crisis response plans, 1904
 Sustainable development, 848, 869, 1192, 1193, 1196
 Sustainable Development Goals (SDGs), 7, 263, 291, 371, 870, 880, 956, 1198, 1652, 1663, 1777, 1894, 1963, 2263, 2358
 Sustainable economic growth, 1960
 Sustainable food system, 2457
 Sustainable global growth, 158
 Sustainable livelihood, 2328
 Sustainable urban development, 1199
 SWAYAM, 2132
 Synthetic control method, 566–568
 Syria
 in COVID-19, 2028
 crisis in, 2025
 humanitarian access, 2029
 refugee crisis, 2025
 Systemic disaster risk
 black swan and cascading disasters, 1092
 classical risk analysis, 1090
 COVID-19, 1090, 1095
 crises, 1090
 GAR 2019, 1095
 large-scale disasters, 1090
 modern society, 1090
 multi-dimensional emergency plan, 1102
 risk types, 1096, 1097
 safety-related risk, 1096
 safety science, 1093–1095
 strategic response map, 1102
 traditional disaster response method, 1102
 System-Theoretic Accident Model and Processes (STAMP), 1094
- T**
Tagoloan River Basin (TRB), 886, 888, 889, 891–893, 895–898
 Takamatsu city, 1254–1255
 Tamil Nadu, 229
 Tamil Nadu Veterinary & Animal Sciences University (TANUVAS), 391
 Tampere Convention of 1999, 1497
 Targeted Public Distribution System (TPDS), 1576, 1579, 1719
 “Tassie Fires—We Can Help (TFWCH)” (Facebook page), 1416
 Tata Relief Committee (TRC), 1356
 Taxation laws, 1885–1886
 Tax Exemption, 933
 Taysan United Homeowners Association (TUHOA), 852
 Tech-centric, 1131
 Technical assistance for Risk Management, 2178
 Technological innovation, 1057
 Technology implementation, 2492
 Technology innovation, 2492
 Tehran Data View system, 1143
 Telecommunication, 1009
 companies, 1355
 networks, 1501
 Telemedicine, 1140, 2152
 Television, 1492
 Temporal trend, 489
 Tethered Aerostat Radar System (TARS), 521
 Tethyan sequence, 713
 Te Urewera Act, 1748
 Textual content, 637–638
 Theory of posttraumatic growth, 1169
 Thermal scanner, 2147
 Thomas Fire, 461, 462
 Thongjaorok river, 169
 Three-tier disaster management authorities, 1767–1768
 Threshold approach, 1733
 Tidal river management (TRM), 993–995
 Time media institutions, 1364
 Tohoku Earthquake, 1271
Tols, 1629
Tomngaina, 79
 Tonga, 2523
 Tools and technologies, 1395
 Total Scheduled Castes (TSC), 2210
 Total Scheduled Tribes (TST), 2210
 Tourism industry and COVID-19 pandemic in Indonesia, 1424, 2365
 alternative revenue sources, 2421–2422
 economic growth (GDP), 2417–2418
 environmental consciousness, in tourism
 norms, 2418
 environmentally sustainable lifestyle, 2421

- local tourism, 2420
tourism and supporting industries, 2416–2417
tourism infrastructure, lull period, 2421
Tour Operators Association of Bangladesh (TOAB), 2144
Trace Together program, 1140
Tracking, 1140
Traditional rice farming systems, 2197
Traffic control system, 1143
Training, 2524, 2526–2530, 2532, 2533
Training and retraining employees, 2493
Transboundary cooperation, 420
Transco PLC v. Stockport Metropolitan Borough council, 1654
Transdisciplinarity, 22, 1276, 1661, 1662
Transformational leadership, 2465–2467, 2515
Transgenders, 1569
Transmission charges, 1674
Transmission of diseases, 291
Transparency, 1814–1815
Trauma, 1154, 1156
Traumatic stress, 1339
Tropical Rainfall Measuring Mission (TRMM), 791
Trust, 1401, 1409, 1411
 building, 1418
 restoration, 1412
Tsunami, 275, 520, 1242, 1264, 1265, 1269, 1271, 1954, 2065, 2116
 Andaman and Nicobar Islands, 1553
 prone villages, 2183
 Solomon Islands, 1552
 Tsunami Ready, 2107, 2108
Tucumán failed bridge case
 annual precipitation at six meteorological stations, 57
 bridge description, 54
 collapsed bridge by suspected corruption, 54–57
 corrupt practices in procurement of bridge repairs and construction, 58–62
 heavy rains in six meteorological stations, 58
 location of, 56
Tumblr, 575
Tweet location prediction, 650
Tweet summarization, 610–611
“Tweet Tracker” programme, 1441
12th Finance Commission Calamity Relief Fund, 1006
Twenty-first Conference of the Parties (COP-21), 1776
Twister-cyclone, 221
Twitter, 485, 575, 577, 597, 598, 604, 634, 635, 637, 649–661, 671–673, 757, 758, 1414, 1415
 API, 490
 Twitter Search API, 598
Typhoon Hagupit (Hagupit), 612
Typhoon Yolanda, 130
- U**
- UAV-based DEM, 717
Ujjieevani, 1055
Ultra-low frequency (ULF), 729, 730, 732, 736, 739
UN Committee on Economic, Social and Cultural Rights (CESCR), 1874
UN Council for Trade and Development (UNCTAD), 1652
UN Department for Social Affairs (DESA), 1451
Underprivileged
 disaster preparedness
 Indian model, 1201, 1202
 universal model, 1201
 plan smart with sustainability, 1198
 population, 1193
 smart city, 1199
 social inclusion, 1199, 1200
 social inclusiveness, 1193
 society, 1198
UN global compact
 on migrants, 1987
 on refugees, 1986
UN Human Rights Committee (HRC), 1867, 1873
UN Human Rights Council (UNHRC), 2004
Unified Bagobo-Tagabawa Tribe (UBT) ADSDPP 2019–2023, 306–307
UNISEF, 2143
United Nation Disaster Risk Reduction, 419–422
United Nations Convention Against Torture (UNCAT), 2015
United Nations Convention on the Rights of Child (UNCRC), 2015
United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), 1891–1896, 1901–1903

- United Nations Department of Economic & Social Affairs, 2285
- United Nations Development Decade, 1651, 1652
- United Nations Disaster Assessment and Coordination (UNDAC), 1795
- United Nations Framework Convention on Climate Change (UNFCCC), 184, 1776
- United Nations General Assembly (UNGA), 707, 1850, 1851, 1856, 1857, 1911
- United Nations Guiding Principles on Internal Displacement (UNGPID), 183
- United Nations High Commissioner for Refugees (UNHCR), 185, 1984
- United Nations International Strategy for Disaster Reduction (UNISDR), 1795, 1912, 1955
- United Nations Office for Disaster Risk Reduction (UNDRR), 13, 183–192, 348, 745, 1520, 1870, 1896, 2262
- United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA), 601
- United States (US)
- Department of Homeland Security, 283
 - Federal Emergency Management Agency, 526
- United States Geological Survey (USGS), 436, 438
- United Survivors Neighborhood Association (USNA), 852
- Universal Declaration of Human Rights (UDHR), 1882, 1914, 1941, 2013
- University Grant Commission (UGC), 2151
- Unmanned aerial vehicles (UAVs), 247, 474, 714, 716, 722
- Unmanned ground vehicles (UGVs), 474
- UNOSAT satellite image processing services, 557–559
- Unplanned urbanization, 904
- Unrestricted fossil fuel use, 2522
- UN Security Council, 1937
- Unsmart cities, 1127, 1131
- Unsung climate heroes, 2164, 2171
- Unsupervised learning algorithms, 488
- Unsupervised pattern matching, 599
- Upanishads*, 1662
- Upper Airspace Working Group (UAWG), 526
- Urban
- agglomerations, 224, 227, 232
 - aspects, 1199
 - cities, 370
 - DRR, 2283, 2289–2291
 - flooding, 686, 691, 1355
 - governance, in India, 969–971
 - intersectionality, 2286–2288
 - migrants, 371
 - resilience, 2347
 - spatial inequalities, 2283–2286
 - heterogeneity, 2283–2286
 - transformation, 2289, 2291–2292
 - waterlogging, 989
- Urban Development Directorate (UDD), 2020
- Urban Disaster Search and Rescue (US&R) Task Force, 1117
- Urban economy
- access to food, 151
 - component, 149
 - COVID-19 outbreak, 149
 - health and WASH, 149–151
 - nation-wide lockdown, 148
 - Social Science in Humanitarian Action, The, 149
- Urbanization, 40, 230, 347, 1194, 1196–1198, 2323, 2325–2326
- indicator, 2531
- Urban Local Bodies (ULBs), 970–982, 1016, 1018, 1025, 1031, 2075
- Urban risk, 2288–2289
- governance, 2283, 2289–2291
- US Agency for International Development (USAID), 1990
- User-centered tailorability, 588
- User location prediction, 652
- User movement modeling, 652
- Uttarakhand flood/disaster 2013, 213, 214, 218, 219, 249–250, 938, 1475, 2245–2247
- Uttarakhand State Disaster Management Authority, 794
- Uttar Pradesh (UP)
- Apartments Act 2010, 1657
 - Industrial Area Development Act 1976, 1657
- Uttyasu Quartzite, 712
- V**
- Vaccination, 277, 2148, 2149, 2152, 2153
- in India, 2473
- Vanuatu, 2523
- Varāha*, 206
- Varanasi, India, 2316, 2322–2324, 2329
- encroachment of flood plains and river bank, 2326–2327
 - floods, 2325
 - loss of sustainable ecosystems, 2327
 - massive tourist footfall, 2327–2328
 - urbanisation, 2325–2326

- Vardah Cyclone, 2016, 1476
VAWG (Violence Against Women and Girls), 1563
Vedas, 1661
Vedic literature, 201
Vegetation areas flooding, 686
Verbal violence, 1560
Very High Frequency (VHF), 408
Very severe cyclonic storm (VSCS), 399
Veterinary Emergency Response Units (VERU), 389, 391
Vicarious Liability, 1656, 1657
Videos, 1490
Vişkira, 200
Vietnam, 1401, 1402
 National Urban Upgrading Programs (VUUP), 376
 Vietnam Disaster Management Authority, 1401
 Vietnam War, 16
Vighnaharta, 1241
Village and Health Nutrition days (VHNDs), 294
Village Development Councils (VDC), 1625, 1626, 1628–1633
Village Disaster Management Committee (VDMC), 1030
Village (*grāmya*), 199
Violence against women, 2119, 2128, 2129
Virtual Operations Support Teams (VOSTs), 636
Virtual technology, 2152
Visible Infrared Imaging Radiometer Suite (VIIRS) data, 565
VisSenti, 538
Visual arts
 case studies from India, 1157–1169
 post-disaster recovery, 1155–1157
Visual content, 638
Visual imagery, 1490–1492
Visual perception, 1489–1490
Visual sentiment analysis, 544, 545
Voellmy friction law, 715
Volatile organic compounds (VOCs), 2288
Volcanic eruptions, 1265
Volunteer communities, 578–582
Volunteered geographic information (VGI), 756, 1440
Vulnerabilities, 416–417, 554, 555, 563, 866, 868, 1640, 2062, 2063, 2070, 2075, 2261–2264, 2269, 2333
 abrasion disaster, 332, 333, 336, 339
 aquatic environment, 324
 coastal areas, 324
 coastal settlements, 326
 disasters, 325
 economic factors, 325
 environmental carrying capacity, 324
 environmental infrastructure, 325
 indicators, 819
 Indonesia, 324
 land use change, 328–330
 local community, 325
 residential building physical vulnerability, 331
 residential buildings, 325
 residential infrastructure, 331–333
 risk, 327, 328
 social and environmental aspects, 326
 type of adaptation strategy, 326
Vulnerabilities and capacities index (VCI), 2262
Vulnerability of migrants
 during Covid-19 pandemic, 370
 in urban spaces, 371–373
Vulnerable group development (VGD), 993
Vulnerable group feeding (VGF), 993
Vulnerable livelihoods, 2264, 2267, 2273
Vulnerable population, 559
Vulture (*grdhra*), 208–209
- W**
- Wabash Heartland Innovation Network (WHIN), 526
'Wait and see' approach, 1304
Wangjing river, 169
Warli paintings, 1165–1166
Warning, 401, 407, 410
War or external aggression, 1881
Water
 bodies, 171
 conservation project, 1167
 diseases, 176
 drainage, 171
 and electricity, 176
 flow, 169
 Imphal city flood, 174–175
 treatment plants, 1009
Water-borne disasters, 1349
Water-borne diseases, 159, 176
Water Environment and Reuse Foundation (WE&RF), 159
Water Environment Federation (WEF), 159
Waterlogging in Bangladesh
 causes, 990
 climate change, 992
 coastal, 989
 different extent in different years, 990

- Waterlogging in Bangladesh (*cont.*)
 economic losses, 989
 institutional, policy & regulatory framework, 992, 993
 poverty pockets, 991
 projects and programs, 994
 relief and rehabilitation, 993
 rural, 989
 sea level rise, 992
 structural/physical interventions (projects and programs), 993
 success and failures, 994
 urban, 989
- Water-related and climate change-induced natural disasters, in Sri Lankan cities
 droughts, 2343–2344
 floods, 2336–2339
 landslides, 2340–2343
- Water-related disaster management
 mitigation stage, challenges in, 2344–2345
 preparedness stage, challenges in, 2345
 recovery stage, challenges in, 2346
 response stage, challenges in, 2345–2346
- Water Resources Planning Organization (WARPO), 1971
- Waterways in source region, 803, 804
- Web 2.0, 1418
- Web-GIS, 703
- WeChat, 634
- Weibo, 597
- West Bengal, 182, 185–187, 189, 190, 192, 229
- Western coast region
 Goa, 228
 Gujarat, 228
 Karnataka, 228
 Kerala, 228
 Maharashtra, 228
- Western epistemologies, 1237, 1238
- Western Ghats Ecology Expert Panel (WGEEP), 916
- Western wildfire, 456–458
- Wetlands, 918, 1211, 1955
- WhatsApp, 597, 605, 634
- White House Global Covid-19 Summit, 2149
- Whole-of-Government' approach, 1266
- Wildfires, 441–442
- Wildland-urban interface, 462, 465
- Wind generators, 1678
- Wing loading, 525
- Wireless Emergency Alerts (WEAs), 631
- Women, 1801, 1804–1806, 2462
 attitudes, 2464
 in business, 2462
- as climate heros, 2159
 glass cliff phenomenon, 2467
 leadership, 2466
 and leadership in crises, 2464–2465
 transformational leadership, 2466
- Women and domestic violence, Covid-19 pandemic, in India
 counselling services, 2135
 data assembling, 2131
 findings, 2134
 funding and accommodation assistance, 2135
 lack of financial stability, 2131
 personal interaction, 2132–2133
 physical and verbal abuse, 2133
 primary data, 2131
 requirement for police, 2135
 secondary data, 2131
- Women, in South Asia
 Bangladesh cyclone (1991), 2116
 climate change laws, 2122
 cultural patterns into cultural rigidities, 2118
 decision makers in climate change policies, 2122
 decision-making processes, 2115
 disaster management laws and conventions, 2120
 disaster risk reduction (DRR), 2121
 DRM governance, 2122
 future research in climate change, 2124
 gender-based violence, 2119
 lack of equality, 2117
 legislation, 2121
 politics, 2122
 resources accessibility, 2118
 social construction, 2117
 Tsunami (2004), 2116
 vulnerability and susceptibility, 2116
- Women Self Help Groups, 2075
- Women's leadership initiatives, disaster management, 2160
- Women's resistance, 2163
- Women's susceptibility, 295
- Word2vec embeddings, 603
- Word-level embeddings, 599
- Workforce shortage, 2360, 2362
- Working from home, 2360, 2361, 2369
- Workmen's Compensation (Occupational Diseases) Convention, 1925, 2015
- World Bank, 51, 2244
- World Conference on Disaster Reduction, 1654
- World Disaster Report 2018, 597
- World Economic Forum (WEF), 2116

- Worldfloods*, 690
World Health Organization (WHO), 274, 1281, 1610, 2128
World Metrological Organization (WMO), 1348
World Society of Animal Protection (WSAP), 388
Worst Forms of Child Labor Convention, 2015
- X**
XHELP, 579
- Y**
Yaas, 2204–2207, 2209, 2212
Yash Raj Films (YRF)
 entertainment, 1464
 films, 1462
 in-house productions, 1463
- Z**
Zero casualty, 86, 91, 92
- music, 1464
office at Andheri Mumbai, 1462
production unit, 1462
satellite rights, 1464
studio, 1464
subsidiaries of, 1464
survival strategy, 1467–1468
talent, 1465
Yāska, 198
YFCC100M-Dataset, 535
yFX, 1464
Yokohama Strategy, 1759, 1797, 2099, 2103, 2104
YOLO, 540
Youth-Led Adaptation Plan (YLAP), 1961
YouTube, 575