VIRTUAL

INTERNATIONAL CONFERENCE

ON

CHALLENGES TO DISASTER RISK REDUCTION AND RESILIENT HABITAT

ABSTRACT VOLUME

April 5-6, 2022

ORGANISED BY:

CENTRE FOR DISASTER MANAGEMENT STUDIES
SHAHEED BHAGAT SINGH COLLEGE
NAAC ACCREDITED 'A' GRADE
UNIVERSITY OF DELHI, NEW DELHI, INDIA

IN ASSOCIATION WITH
NATIONAL INSTITUTE OF DISASTER MANAGEMENT
MINISTRY OF HOME AFFAIRS
GOVERNMENT OF INDIA

INTERNATIONAL GEOGRAPHICAL UNION COMMISSION
ON HAZARD AND RISK
&
UNITED NATIONS OFFICE FOR DISASTER RISK REDUCTION

KNOWLEDGE PARTNERS

Bournemouth University, UK

University of Huddersfield, UK

Technical University Dortmund, Germany

University of North Texas, US

India Japan Laboratory, Japan

Disaster Management Centre, Jamia Millia Islamia, India

University at Buffalo, New York

Visvesvaraya National Institute of Technology, India

Vellore Institute of Technology, India

Climate Resilient Observing-System Promotion Council

Resilient Communities & Settlement

Integrated Research on Disaster Risk International Centre of Excellence

Disaster Resilience & Research Foundation, India

Sustainable & Adaptation Planning Foundation, India

Resilience Innovation Knowledge Academy, India

University of Manchester

Outsteps

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UNIVERSITY OF DELHI
दिल्ली विश्वविद्यालय

Professor Yogesh Singh
Vice Chancellor

No. DU/VC/2022/70
25 March, 2022

MESSAGE

I am pleased to know that ***Centre for Disaster Management Studies (CDMS)***, Shaheed Bhagat Singh College, University of Delhi in association with National Institute of Disaster Management-Ministry of Home Affairs, Government of India, International Geographical Union Commission on Hazard and Risk and UNDRR is organizing an international conference on "CHALLENGES TO DISASTER RISK REDUCTION AND RESILIENT HABITAT" on April 5-6, 2022 on virtual platform.

I take this opportunity to appreciate this great initiative under the patronage of Prof. Anil Sardana, Principal, Shaheed Bhagat Singh College and Mr. Taj Hassan- Executive Director National Institute of Disaster Management; Conveners Prof. Poonam Sharma- Director CDMS and Prof. Anil K. Gupta- Head ECDRM division, NIDM for organizing this international conference.

I also congratulate all the members of the advisory and organizing committee for organizing this conference on such a relevant theme. I wish the conference a great success.

Yogesh Singh

University of Delhi North Campus, Delhi-110007, India
Tel. : +91-11-27667011, +91-11-27667190, Fax : +91-11-27667049 Email : vc@du.ac.in

जवाहरलाल नेहरू विश्वविद्यालय
JAWAHARLAL NEHRU UNIVERSITY
नई दिल्ली-११००६७
NEW DELHI-110067

प्रोफेसर शांतिश्री डी. पंडित
कुलपति
Professor Santishree D. Pandit
Vice-Chancellor

MESSAGE

Dear Delegates,

I am pleased to learn that an international conference on "**Challenges to Disaster Risk Reduction and Resilient Habitat**" on April 5- 6, 2022 is going to be organized by Centre for Disaster Management Studies (CDMS), Shaheed Bhagat Singh College, University of Delhi in association with *National Institute of Disaster Management* (NIDM), Ministry of Home Affairs, Government of India, *International Geographical Union Commission* on Hazard and Risk and *United Nations Office for Disaster Risk Reduction (UNDRR).*

Disaster risk reduction and resilient habitat activities are designed to increase the resilience of people, society and systems to resist, absorb, accommodate and improve well-being in the face of multiple hazards. There are various challenges related to reducing and managing risks which need deliberations, analysis and planning to reduce disaster. Therefore, building the culture and practice of disaster resilience is very important.

I am sure this two days' conference will provide very useful platform for researchers, practitioners, policy makers and experts from various academic disciplines and development sectors across the world. I take this opportunity to appreciate this great initiative by the organization for planning the conference. I also congratulate all the members of the advisory and organizing committee for their endeavors.

I wish the conference a great success.

Santishree Pandit
(Santishree Dhulipudi Pandit)

Tel.: 2674 1500, 2670 4001 • **Fax**: +91-11-2674 2580 • **E-mail:** vc@mail.jnu.ac.in

Mr. Feroz Khan
Chairman (Governing Body)
Shaheed Bhagat Singh College
University of Delhi,
New Delhi.

MESSAGE

Dear Delegates,

It gives me immense please to welcome you all at this two days international conference on "Challenges to Disaster Risk Reduction and Resilient Habitat" which is going to be held on April 5th -6th, 2022. This conference is organized on virtual platform by Centre for **Disaster Management Studies**, Shaheed Bhagat Singh College, University of Delhi is organising a **virtual conference** on "**Challenges to Disaster Risk Reduction and Resilient Habitat" on April 5-6, 2022** in collaboration with *National Institute of Disaster Management, Government of India, International Geographical Union Commission on Hazard and Risk and UNDRR.*

I take this opportunity to appreciate this great initiative under the guidance patrons of Prof. Anil Sardana, Principal, Shaheed Bhagat Singh College and Mr. Taj Hassan-Executive Director National Institute of Disaster Management; conveners Prof. Poonam Sharma- Director CDMS and Prof. Anil K. Gupta- Head ECDRM division, NIDM for organizing this international conference.

I also congratulate all the members of the advisory and organizing committee for organizing this conference on such relevant theme. I wish the conference a great success.

I wish all the international and national participants a fruitful learning experience at this online event.

Mr. Feroz Khan

SHAHEED BHAGAT SINGH COLLEGE
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NAAC Accredited 'A' Grade
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PRINCIPAL'S MESSAGE

Dear Delegates,

I take this opportunity to welcome you all to this virtual international conference conference on "Challenges to Disaster Risk Reduction and Resilient Habitat" on April 5-6, 2022 organised by Centre for Disaster Management Studies, Shaheed Bhagat Singh College, University of Delhi in collaboration with *National Institute of Disaster Management, Government of India, International Geographical Union Commission on Hazard and Risk and UNDRR.* I am pleased to share that the abstract volume containing abstracts of presentations has dwelt on wide range of topics addressing various issues related to types of disaster such as climate related, bio hazard like corona virus outbreak, impact on different sectors of economy such as agriculture which is one of the very sensitive to climate change, not only challenges but also the techniques and tools that can be used to understand and help in planning like geo-spatial technologies, as well as role of indigenous knowledge, role of media in disaster management etc has been included for presentation during these two days online event. Here, I would like to acknowledge the efforts and interest of CDMS and Department of Geography who have taken the responsibility to conduct this event on such a relevant theme. I congratulate Prof. Poonam Shamra (convener) and CDMS and Department of Geography team of faculty as well as students for dedicated efforts in producing this work as well as organizing this international event. This conference is expected to discuss several issues amongst experts, researchers, and students' community.I welcome all the delegates, subject experts, students, teachers, researchers to this conference and I hope that the discussions during different sessions will definitely explore new dimensions related to the disaster risk reduction and resilient habitats.

I wish this conference a grand success.

(Prof. Anil Sardana)

Principal (Offg.)

Mr. Taj Hassan, IPS
Patron of online International Conference on
"CHALLENGES TO DISASTER RISK REDUCTION AND RESILIENT HABITAT"
5th to 6th April 2022.
& Executive Director,
National Institute of Disaster Management- New Delhi, India.

Message

Dear Delegates,

It is a matter of great pleasure that an online international conference "CHALLENGES TO DISASTER RISK REDUCTION AND RESILIENT HABITAT" is going to be organized by CDMS Shaheed Bhagat Singh College (University of Delhi, New Delhi) in association with National Institute of Disaster Management, Ministry of home Affairs, Government of India, *International Geographical Union Commission on Hazard and Risk and UNDRR* on April 5-6, 2022.

I take this opportunity to congratulate the entire team of organizing committee who have planned and prepared this international event on such a relevant theme. I notice that the theme and sub-themes of the conference, they cover large range of issues focusing on disasters.

I congratulate the patron Prof. Anil Sardana, both the conveners Prof. Poonam Sharma and Prof Anil K. Gupta and faculty as well as students team form CDMS and NIDM for putting their efforts in producing this abstract volume as well as organizing this international event. This conference is expected to discuss several issues amongst experts, researchers, and students community.

I welcome all the national and international delegates and hope that the discussions during different sessions will definitely explore new dimensions related to the disaster risk reduction and resilient habitats.

I wish this conference a grand success.

Mr. Taj Hassan

Department of Geography
Delhi School of Economics
University of Delhi
Delhi -110 007

Prof. Suresh C. Rai
M. Sc., Ph.D.

Head
Department of Geography
Secretary-General
National Association of Geographers, India
Vice President
Asian Geographers Association

Date: 22/03/2022

Message

It is a matter of great pleasure that an international conference is going to be held on the topic "***Challenges to Disaster Risk Reduction and Resilient Habitat***" on 5th to 6th April 2022 organized by CDMS, Shaheed Bhagat Singh College-University of Delhi in association with National Institute of Disaster Management-Ministry of Home Affairs, Government of India, International Geographical Union Commission on Hazard and Risk and UNDRR.

The occurrence of disasters is not new but currently, the intensity and frequency of disasters have increased. Each year loss to infrastructure, life, property, and environment is recorded owing to natural as well as man-made disasters all over the world. Therefore, there arises a requirement for comprehensive analysis of the types and causes of disasters so that millions of lives can be saved and at the same time billions of rupees can be saved which is washed in the post-disaster management process. Over the decades' the UN and many other organizations along with national/local governments have been working intensively on these issues and a lot still needs to be done.

I feel that the conference is on time as it has focused on such an appropriate theme as we have faced various disasters in our country and still facing disaster in the form of Covid 19. I hope that the discussion during these two days' events will expand the horizon of our understanding of disasters and new ideas will come up which will surely help to make the habitats resilient.

I wish the delegates, participants, and organizers a grand success for the forthcoming international conference.

scRai

Prof. Suresh Chand Rai

Professor Michael E Meadows
Department of Environmental and Geographical Science
University of Cape Town
South Africa

School of Geography and Ocean Sciences
Nanjing University
China

GREETINGS

Dear friends,

Greetings to you all from Cape Town, South Africa. It is a great pleasure for me to offer a few words of encouragement to the organisers and participants of the two days international conference on the theme "Challenges to Disaster Risk Reduction and Resilient Habitat" to be held virtually on April 5-6, 2022.

In particular, I wish to congratulate the Centre for Disaster Management Studies (CDMS) Shaheed Bhagat Singh College, University of Delhi, New Delhi and the National Institute of Disaster Management, Government of India, the International Geographical Union Commission on Hazard and Risk and UNDRR for taking up the responsibility to organize this event. Given the increasing frequency and magnitude of environmental, social, economic and health hazards, it is clear that the conference is both timely and highly relevant. I am sure that the presentations and discussions in the conference sessions will enrich our understanding of DRR and help us to address the many challenges that lie ahead. The expertise of the participants should prove of great value to all stakeholders, as disasters in many different guises are posing increasing problems all over the world and require the immediate attention of planners, policy makers and administrators.

I wish the conference every success.

Professor Michael Meadows
President: International Geographical Union

Professor Takashi Oguchi
The University of Tokyo
Japan
Chair, Hazard and Risk Commission
International Geographical Union

MESSAGE

Dear friends,

I am delighted to know that an international conference on "CHALLENGES TO DISASTER RISK REDUCTION AND RESILIENT HABITAT" on April 5-6, 2022 is going to be held on a virtual platform by the Centre for Disaster Management Studies (CDMS), Shaheed Bhagat Singh College, The University of Delhi in association with National Institute of Disaster Management-Ministry of Home Affairs, Government of India, International Geographical Union Commission on Hazard and Risk, and UNDRR.

The conference is on such a relevant theme as in many parts of the world disasters have become common phenomena. I hope the deliberations during this event will really contribute to the management, policy, and future goals of action so that resilient habitats and communities can be built.
I congratulate conveners, Prof. Poonam Sharma from CDMS, Prof. Anil K. Gupta from NIDM, and the entire organizing team on organizing this international conference.

I wish the conference a great success.

Professor Takashi Oguchi

Resilient India : Disaster free India

राष्ट्रीय आपदा प्रबंधन संस्थान
National Institute of Disaster Management
(गृह मंत्रालय, भारत सरकार)
Ministry of Home Affairs, Govt. of India
प्लॉट नं. 15, ब्लॉक बी, पॉकेट 3,
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Sector 29, Rohini, Delhi -110042

डॉ. अनिल कुमार गुप्त
आचार्य एवं अध्यक्ष
ANIL K. GUPTA (Prof./Dr.)
Head of Division, I/c. International Cooperation & Advisory Services
Director of Projects & Centre of Excellence
Professor of Policy & Strategies

Reference:

Date:

Prof. Anil K. Gupta
Head, ECDRM Division,
National Institute of Disaster Management- New Delhi,
India.

Message

Dear Delegates,

I take this opportunity to welcome you all to this online international conference "CHALLENGES TO DISASTER RISK REDUCTION AND RESILIENT HABITAT" being organized by CDMS and Department of Geography, Shaheed Bhagat Singh College (University of Delhi-New Delhi) in association with National Institute of Disaster Management-Ministry of home Affairs, Government of India, *International Geographical Union Commission on Hazard and Risk and UNDRR* on April 5-6, 2022.

I am pleased to share that the abstract volume has been prepared after intensive review and has covered wide range of topics addressing various issues related disaster.

I appreciate the efforts and interest of CDMS and NIDM team who have taken the responsibility to conduct this event on such a relevant theme. I congratulate convener Prof. Poonam Sharma and CDMS team of faculty as well as students for putting their efforts in producing this abstract volume as well as organizing this international event. This conference is expected to discuss several issues amongst experts, researchers, and students community.

I welcome all the delegates, subject experts, students, teachers, researchers to this conference and I hope that the discussions during different sessions will definitely explore new dimensions related to the disaster risk reduction and resilient habitats.

I wish this conference a grand success.

E-mail: anilg.gov.in@gmail.com, वेबसाईट/ Website : www.nidm.gov.in

Prof. Anil K. Gupta

Prof. Poonam Sharma
Conference Convener
Department of Geography
Director, Centre for Disaster Management Studies
Shaheed Bhagat Singh College,
University of Delhi, New Delhi.

MESSAGE

Dear Delegates,

I am pleased to welcome you all to this two days international conference on **"Challenges to Disaster Risk Reduction and Resilient Habitat".** *Centre for Disaster Management Studies (CDMS)*, Shaheed Bhagat Singh College, University of Delhi in association with National Institute of Disaster Management-Ministry of home Affairs, Governm ent of India, International *Geographical Union Commission on Hazard and Risk and United Nation Office for Disaster Risk Reduction* is organizing this event on April 5 -6, 2022 on virtual platform.

Disasters are posing serious threat to people, economy, culture, environment and wildlife in varying intensities. The National Disaster Risk Reduction and Management Plan (NDRRMP) recognizes certain concern areas which encompass four Disaster Risk Reduction and Management priority areas. These incorporate health, human-induced disasters, environmental protection, cultural sensitivity or indigenous practices and the right based approach. Resilience is an essential component of disaster risk reduction activities. It is the system's ability to reduce and recover from the hazardous effects in an appropriate and effective manner. Improved resilience allows better planning and ensures the preservation, restoration and improvement of its indispensable basic structures and functions. However, building the culture and practice of disaster resilience needs great effort.

A lot of work has been happening at international, national and local level and still there is scope and need for more. Therefore, the conference through its various thematic sessions will deliberate on challenges of disaster risk reduction activities and on the ability of system on building resilience with reference to habitat. In order to reduce, prevent, anticipate, absorb and adapt, recover from the effects of a hazardous event in a timely and well-organized manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions.

This volume of abstracts has been prepared after the intensive review and selection procedure. The selected papers are focused on case studies, comparative studies and geo-spatial technology application in DRR etc. I hope this two days event will provide platform to academicians, research scholars, trainers, scientists, administrators, policy makers and media to rethink about the disasters and resilient world in the present context. I am really thankful to patrons of this conference, co-convener, all the members of the working group of CDMS, national and international advisory group, students' team and all the participants for dedicating their time and effort to organize and participate to this online event.

On behalf of *Centre for Disaster Management Studies (CDMS)*, Shaheed Bhagat Singh College I would like to extend a humble welcome in this conference. I would highly value your participation and valuable inputs in the two days event.

Dr. Poonam Sharma

Prof Swati Rajput

Teacher In charge

Department of Geography, Shaheed Bhagat Singh College

Message

Disaster studies have become very relevant in contemporary world. It has become extremely important to analyse and assess the risk associated with disasters and the impact they could have on human lives and property. Considering the current scenario where physical and biological hazards are occurring frequently it's important to adopt scientific and systematic approach to handle such disasters. A global, agreed policy of disaster risk reduction is set out in the United Nations endorsed Sendai Framework for Disaster Risk Reduction 2015-2030, adopted in March 2015, whose expected outcome over the next 15 years is: "The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries". Resilient Habitat is the need of the hour. Resilient habitat should have an integration of biophysical and human structures. It should have bounties of nature and smart technology of mankind to provide best models of disaster risk reduction.

I congratulate Centre for Disaster Management Studies and Prof Poonam Sharma, the convener of the conference, to organise a timely conference on the most relevant theme. I convey my best wishes to the organizing team and all the speakers, guests and participants for a successful international conference.

Best Wishes

Prof Swati Rajput

PROGRAMME SCHEDULE

INAUGURAL CEREMONY	
DAY 1	**5th April, 2022 | Tuesday**
Time: **5th April, 2022 IST** GMT +5:30 Hours *Tokyo (in Japan) 1:00 PM* *Texas, USA (in Houston) 11:00 PM (4th April)* *Manchester(in UK) 5:00 AM* *London (in UK) 5:00 AM* *Germany (in Berlin) 6:00 AM* *Michigan (in USA) 12:00 AM (4th April)* *Bangkok (in Thailand) 11:00 AM* *South Dakota (in USA) 11:00 PM (4th April)* *New Castle (in Australia), 2:00 PM*	Meeting Link: **https://bit.ly/internationalconferencecdms** Platform: **ZOOM** Meeting ID: **837 2088 8176** Passcode: **034028**
Session In-charge ***Dr. VAV Raman | Prof. Swati Rajput | Dr. Krishna Murari | Dr. Rashmi Rani Anand***	
9:30 – 9:35 AM	*Invocation and Welcome to Guests*
9:35 – 9:40 AM	*Welcome Note & Introduction of the Conference by* **Prof. Poonam Sharma**
9:40 – 9:45 AM	*Principal's Address by* **Prof. Anil Sardana**
9:45 – 9:55 AM	*Address by* **Mr. Taj Hassan**, IPS, Executive Director, NIDM
9:55 – 10:05 AM	*Address by* **Prof. Anil Gupta**, Head, ECDRM Division, NIDM
10:05 –10:10 AM	*Release of Abstract Volume*
10:10 – 10:25 AM	*Address by* **Guest of Honour,** **Prof. S.C. Rai,** University of Delhi
10:25 –10:40 AM	Address by **Chief Guest** **Prof. Santishree Dhulipudi Pandit** Vice Chancellor, Jawaharlal Nehru University New Delhi- India
10:40 – 11:10 AM	Address by **Keynote Speaker** **Ms. Ana Cristina Thorland** United Nations Office for Disaster Risk Reduction,(UNDRR)
11:10 – 11:15 AM	**Vote of Thanks** by **Dr. V. A. V. Raman**

11:15 AM	*National Anthem*

DAY 1	**5th April, 2022 | TUESDAY**
PLENARY SESSION I	
Theme: Climate Extremes and Building Disaster Resilience	
Date: **5th April, 2022** Time: **11:30 – 1:00 PM (IST)** GMT +5:30 Hours *Tokyo (in Japan) 3:00 PM* *Texas, USA (in Houston) 1:00 AM* *Manchester(in UK) 7:00 AM* *London (in UK) 7:00 AM* *Germany (in Berlin) 8:00 AM* *Michigan (in USA) 2:00 AM* *Bangkok (in Thailand) 1:00 PM* *South Dakota (in USA) 1:00 AM* *New Castle (in Australia), USA) 4:00 PM*	**Session Chair:** Prof. V. P. Sati, Department of Geography, Mizoram University, India **Co-Chair:** Dr. Netranand Sahu, Department of Geography, University of Delhi, India **Rapporteur:** Dr. Rashmi Rani Anand, Shaheed Bhagat Singh College, University of Delhi Meeting Link: **https://bit.ly/internationalconferencecdms** Platform: **ZOOM** Meeting ID: **837 2088 8176** Passcode: **034028**
Session In-Charge **Dr. Amrita Bajaj | Dr. Suraj Mal | Dr. Vishwa Raj Sharma** Centre for Disaster Management Studies, SBSC, University of Delhi, India	
Panelists	
Dr. Mikio Ishiwatari, Graduate School of Frontier Sciences, The University of Tokyo	
Mr. Amit Anand, Principal Consultant, Price Waterhouse Coopers	
Dr. Ronald Schumann, Department of Emergency Management and Disaster Science, University of North Texas, USA	

TECHNICAL SESSION-I

Theme: Climate Change, Climate Crisis And Disaster Resilience

Date: **5th April, 2022**
Time: **1:45 – 4:15 PM (IST)**
GMT +5:30 Hours

Tokyo (in Japan) 5:15 PM
Texas, USA (in Houston) 3:15 AM
Manchester(in UK) 9:15 AM
London (in UK) 9:15 AM
Germany (in Berlin) 10:15 AM
Michigan (in USA) 4:15 AM
Bangkok (in Thailand) 3:15 PM
South Dakota (in USA) 3:15 AM
New Castle (in Australia), USA) 6:15 PM

Session Chair: Prof. Masood A. Siddiqui, Jamia Millia Islamia

Co-Chair: Dr. Manish Kumar, Central University of Haryana

Rapporteur: Shahid Jamal, Research Scholar, Delhi School of Economics

Meeting Link: **https://meet.google.com/dep-uzwk-pdq**

Session In-Charge: **Dr. V.A.V Raman | Dr. Ganesh Yadav**

S. No.	Author	Papers
1.	Shekhar Kumar, K. Nageswara Rao	Exposure and sensitivity to climate change: A case study of Beas river basin, western Himalaya
2.	Priyanka Biswas, Dr. Nilanjana Das Chatterjee	Climate change induced natural disaster and women susceptibilities to trafficking: A study in the Indian Sundarbans region
3.	Zahid Hossain Khan, Alauddin	Fresh weather for all
4.	Arvind Kumar	Climate Change and vulnerability
5.	Vikrant Mahajan, Riya Sethia, Shashikant Chopde, Nupur Tyagi	Mainstreaming resilience through climate action & disaster risk reduction into the conventional disaster management systems
6.	D. Panda, Rashmi Rani Anand, M. Devi	Impact of tropical vary severe cyclonic storm "yaas" of 2021 in Mayurabhanj district of Odisha
7.	Sarish Khera	Annual, seasonal and monthly rainfall trend analysis in Punjab, India
8	Srinivasa Gopinath GS	Climate change and temperature trends, a case study in Guntur district, Andhra Pradesh
9	Toushif Jaman, K. Dharanirajan, Sohel Rana, Kajal Kumar Mandal	Land use and land cover change detection, a case study of super cyclone (1999) and titli cyclone of Bhadrak district, Odisha, India using geospatial techniques.
10.	Meesha Tondon	Need for focus on India's adaptation agenda

TECHNICAL SESSION-II

Theme: Disasters, Built Environment and Resilient Urban Infrastructure - I

Date: **5th April, 2022**
Time: **1:45 – 4:15 PM (IST)**
GMT +5:30 Hours

Tokyo (in Japan) 5:15 PM
Texas, USA (in Houston) 3:15 AM
Manchester(in UK) 9:15 AM
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Germany (in Berlin) 10:15 AM
Michigan (in USA) 4:15 AM
Bangkok (in Thailand) 3:15 PM
South Dakota (in USA) 3:15 AM
New Castle (in Australia), USA) 6:15 PM

Session Chair: Prof. B. Srinagesh, Osmania University

Co-Chair: Dr. Anupama Dubey Mohanty, IPE, Hyderbad

Rapporteur: Ms. Shipra Singh, Miranda House, University of Delhi

Meeting Link: **https://meet.google.com/tcy-cihw-nsf**

Session In-Charge: **Dr. Rajni Kapoor | Dr. Satyam Mishra | Dr. Janki Jeevan**

S. No.	Authors	Papers
1.	Sujata Kodag	Impacts of smart city initiatives on disaster risk reduction of the cities through spatial planning perspective- A case of Pune city
2.	Divyanshi Vyas	Framework to mainstream disaster resilience into the development process: case of Kollam municipal corporation, Kerala
3.	Gurudutt Maheshbhai Pandya, Rama. U. Pandey	Mainstreaming disaster resilience within the national missions for coastal cities: case of Surat
4.	Arghadeep Dasgupta, Shyamoli Sen	Sustainable urban planning – a resilient approach towards future
5.	Vikas Saharan	Disaster, urbanisation and resilient infrastructure
6.	Rashmi Singh, Poonam Sharma	Green infrastructure and nature based solutions approach in Jaipur smart city
7.	Akhil Francis T, C.M. Bhatt	Monitoring urban green infrastructure change in a rapidly developing metropolitan city of northern India, in the wake of a drastic surge in the number of disasters
8.	Shweta Rani	Disaster Resilient Transport and Disaster Risk Preparedness of Delhi Metro during Fire Hazard: A Case Study of Central Secretariat Metro Station, New Delhi

9.	Talom Taloh, Santanu Kumar Patnaik	Risk assessment of built-up area in Itanagar, Aruncahal Pradesh

TECHNICAL SESSION-III

Theme: Disasters, Built Environment And Resilient Urban Infrastructure-II

Date: **5th April, 2022**
Time: **1:45 – 4:15 PM (IST)**
GMT +5:30 Hours

Tokyo (in Japan) 5:15 PM
Texas, USA (in Houston) 3:15 AM
Manchester(in UK) 9:15 AM
London (in UK) 9:15 AM
Germany (in Berlin) 10:15 AM
Michigan (in USA) 4:15 AM
Bangkok (in Thailand) 3:15 PM
South Dakota (in USA) 3:15 AM
New Castle (in Australia), USA) 6:15 PM

Session Chair: Prof. B. W. Pandey, Department of Geography, University of Delhi

Co-Chair: Dr. B.R. Thakur, Himachal Pradesh University

Rapporteur: Dr. Arif Hussain, SPM College, University of Delhi

Meeting Link: **https://meet.google.com/uyu-cqti-ueb**

Session In-Charge: **Prof. Kavita Arora | Dr. Neha Arora**

S. No.	Authors	Papers
1.	Pravin Prakash Kokane	Conceptualizing emergency preparedness and response system in tier-II city of Maharashtra
2.	Sourav Bhadwal, Tanisha Sharma, Manish Kumar	Spatio-temporal dynamics of urban green space: A case study of Delhi
3.	Tanisha Sharma, Manish Kumar, Sourav Bhadwal	Urban crime mapping and analysis
4.	Vishal Gupta, Ashish kumar Bhanuprasad Upadhyay	Spatial- temporal analysis of land surface temperature; A case study of Ahmedabad city
5.	Satyam Mishra, Santosh Kumar	Tracing disaster preparedness at micro-level in India: An empirical study of boatmen at Magh Mela in Allahabad
6.	Narender Verma, Ramesh Kumar Patel	The study of land use change and its impact on land surface temperature in Kanpur city using Landsat data
7.	Sohel Rana, K. Dharanirajan, Toushif Jaman	Assessment of landslide social vulnerability in the Darjeeling district using MCDA based GIS techniques
8.	Neeraj Kumar, Swarnima Singh	A geo spatial study of urban heat island phenomenon in Lucknow district

9.	Vipin Solanki	Valuing the benefit of urban wetland: A Case Study of Basai wetland, Gurugram

TECHNICAL SESSION-IV

Theme: Covid-19 Pandemic: Monitoring, Health And Managing The Risk Reduction

Date: **5th April, 2022**
Time: **1:45 – 4:15 PM (IST)**
GMT +5:30 Hours

Tokyo (in Japan) 5:15 PM
Texas, USA (in Houston) 3:15 AM
Manchester(in UK) 9:15 AM
London (in UK) 9:15 AM
Germany (in Berlin) 10:15 AM
Michigan (in USA) 4:15 AM
Bangkok (in Thailand) 3:15 PM
South Dakota (in USA) 3:15 AM
New Castle (in Australia), USA) 6:15 PM

Session Chair: Prof. Monika Kannan, Sofia Girls College, Rajasthan

Co-Chair: Dr. P. K. Pathak, Jamia Millia Islamia

Rapporteur: Ekta Raman, Shivaji College, University of Delhi

Meeting Link: **https://meet.google.com/yej-uznf-wbx**

Session In-Charge: **Dr. Amrita Bajaj | Dr. Santosh Kumar | Dr. Chandrakanta**

S. No.	Authors	Papers
1.	Ariyaningsih, Rajib Shaw	How flooding affects covid-19 spread. Case of Balikpapan city, Indonesia
2.	Ganesh Yadav, B.W. Pandey	A spatio-temporal analysis of district composite health profile (DCHP) in selected EAG states of India.
3.	Kalyan Sardar, Jitendra Shukla	Impacts of dual disasters on human lives: a case study of Kultali block, South 24 Parganas, West Bengal.
4.	Vishwa Raj Sharma, Priya Sharma, Shubham Kumar Sanu	Impact of covid-19 on higher education: a case study of Delhi university
5.	Payal Mahato	Covid - 19 pandemic, monitoring and managing the risk reduction
6.	Humayun Sarkar, Sanjeev Kumar	Knowledge, attitude and behavioral changes toward the covid-19 pandemic outbreak: a population-based survey in Dakshin Dinajpur,
7.	Harshita	Implementation of Covid Appropriate Behaviour: A Study of Rohtak Division

8.	Swati Rajput, Neha Arora	Risk management through life insurance: assessing the covid impact

TECHNICAL SESSION-V

Theme: Disaster in Mountainous Environment

Date: **5th April, 2022**
Time: **1:45 – 4:15 PM (IST)**
GMT +5:30 Hours

Tokyo (in Japan) 5:15 PM
Texas, USA (in Houston) 3:15 AM
Manchester(in UK) 9:15 AM
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Germany (in Berlin) 10:15 AM
Michigan (in USA) 4:15 AM
Bangkok (in Thailand) 3:15 PM
South Dakota (in USA) 3:15 AM
New Castle (in Australia), USA) 6:15 PM

Session Chair: Prof. Madhushree Das, Gauhati University

Co-Chair: Dr. Renu Bali, Kamal Nehru College, University of Delhi

Rapporteur: Dr. Pooja Mehtani, Dyal Singh College

Meeting Link: **https://meet.google.com/dph-uxjs-nfd**

Session In-Charge: **Dr. Suraj Mal | Dr. Vijay Pandey**

S. No.	Authors	Papers
1.	Ankur Sharma, Har Amrit Singh Sandhu	Gis-based multi-criteria evaluation of landslide susceptibility using AHP technique in the Himalayas
2.	Hilal Ahmad Parrey, Irshad Ahmad Thoker, Shamim Ahmad Shah	Analysis of climate change induced disaster events in the north western part of Kashmir Himalayas: a case study of Kashmir valley.
3.	Sana Rafi, Amir Ali Khan, Mary Tahir	Analysing climate variability in Srinagar city, a part of Indian Himalayan region
4.	Ishita Raj	Assessment of vulnerability of mountain slope instability hazard using remote sensing techniques - a case study of Rishiganga river basin, Uttarakhand
5.	Sheetal Rana,Sunil Puri, S.S Samant	An investigation of the variation in tree diversity, regeneration, biomass, and carbon storage along an elevation gradient in a temperate forest in western Himalaya: a case study in Shimla district.
6.	Priyanka Parmar	A geospatial mapping and locational analysis of cloud burst in western Himalaya
7.	Saurav Kumar	Impact and mitigation of climate-induced disasters in the Uttarakhand Himalayas: a case study
8.	Chet Ram, B. P. Naithani	An impact of disasters on human lives of Kullu district (Himachal Pradesh): a geographical analysis

TECHNICAL SESSION-VI

Theme: Disaster Risks Management, Sustainable Resources Management

Date: **5th April, 2022**
Time: **1:45 – 4:15 PM (IST)**
GMT +5:30 Hours

Tokyo (in Japan) 5:15 PM
Texas, USA (in Houston) 3:15 AM
Manchester(in UK) 9:15 AM
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Michigan (in USA) 4:15 AM
Bangkok (in Thailand) 3:15 PM
South Dakota (in USA) 3:15 AM
New Castle (in Australia), USA) 6:15 PM

Session Chair: Prof. Santanu Patnaik, Rajiv Gandhi University, Arunachal Pradesh

Co-Chair: Dr. Pravin Kokane, University of Mumbai

Rapporteur: Akash Upadhyay, SPM College, University of Delhi

Meeting Link: **http://meet.google.com/xaj-ovap-qit**

Session In-Charge: **Prof. Swati Rajput | Dr. Rashmi Rani Anand**

S. No.	Authors	Papers
1.	Soumik Das, Jayesh Mukherjee, Milap Chand Sharma	People's perception of risk: an insight of the degraded lands of Sirsa district, Haryana
2.	Jyotirmayee Tudu	Drinking water supply service and disaster risk reduction: a survey of water quality areas of Odisha
3.	Akshay Raj Manocha, Bhart Singh, Uday Bhan, Gaurav Pandey	Sustainable development: future of groundwater management
4.	Caterina Tuci, Gualdemar. Jim Ãnez, Pablo Melo	Intergenerational education challengers in risk management. The case of study: communities of laigua de vargas and laigua de bellavista of the province of cotopaxi ecuador
5.	Arunabh Mitra, Rajib Shaw	Systemic risk from a disaster management perspective: a review of current research

DAY 1	5th April, 2022 | TUESDAY

PLENARY SESSION II

Theme: Round Table and Film Screening: Urbanization, Disaster Risk Reduction & Adaptive Pathways

Hosted by: Manchester Urban Institute, The University of Manchester, UK

Date: **5th April, 2022**
Time: **4:30 – 6:00 PM (IST)**
GMT +5:30 Hours

Tokyo (in Japan) 8:00 PM
Texas, USA (in Houston) 6:00 AM
Manchester(in UK) 12:00 PM
London (in UK) 12:00 PM
Berlin (in Germany) 1:00 PM
Michigan (in USA) 7:00 AM
Bangkok (in Thailand) 6:00 PM
South Dakota (in USA) 6:00 AM
New Castle (in Australia) 9:00 PM
Indonesia (WIB) 6:00 pm

Session Chair: Dr. Joe Ravetz, Leader Future-Wise Cities

Rapporteur: Dr. Neha Arora, Shaheed Bhagat Singh College, University of Delhi

Meeting Link: **https://zoom.us/my/synergistics**

Meeting ID: **6381673776**

Session In-Charge: Prof. Poonam Sharma | Prof. Kavita Arora, Centre for Disaster Management Studies, SBSC, University of Delhi, India

Panelists

Dr. Christoph Woiwode
Indo-German Centre for Sustainability, IIT Madras & RWTH Aachen University

Dr. Loraine Kennedy
French Institute Pondicherry &CNRS-EHESS, Paris

Prof. Ismu Rini Dwi Ari
Financial and Resource Affairs of Engineering Faculty,
Brawijaya University, Indonesia

Dr. Lakshmi Rajendran
The Bartlett School of Architecture
University College of London, IRIS, UK

Prof. Sudhir Chella Rajan
Department of Humanities &Social Sciences, IIT Madras, India

DAY 2	6th April, 2022 | WEDNESDAY

Young Scholar Award

Date: **6/4/2022**
Time: **8:30 – 10:00 AM (IST)**
GMT +5:30 Hours

Tokyo (in Japan) 8:00 PM
Texas, USA (in Houston) 6:00 AM
Manchester(in UK) 12:00 PM
London (in UK) 12:00 PM
Berlin (in Germany) 1:00 PM
Michigan (in USA) 7:00 AM
Bangkok (in Thailand) 6:00 PM
South Dakota (in USA) 6:00 AM
New Castle (in Australia) 9:00 PM
Indonesia (WIB) 6:00 pm

Session Chair: Prof. Ashutosh Mohanty, Madhyanchal Professional University, Bhopal

Co-Chair: Dr. Shruti Kanga, Suresh Gyan Vihar University, Jaipur

Rapporteur: Dr. Gargi Majumdar, SPM College, University of Delhi

Meeting Link: https://meet.google.com/dep-uzwk-pdq

Session In-Charge: **Dr. V.A.V Raman | Mr. Ganesh Yadav**

S. No.	Authors	Papers
1.	Shahid Jamal	The river of life, death, livelihood and pilgrimage: An assessment of Ganges in Varanasi, Uttar Pradesh
2.	Mir Sumira	Geospatial technology and disaster risk reduction-A progressive consortium
3.	Kaushiki Ishwar	Governance, law and inclusive disaster management
4.	K Khusulio	Feasibility study on LHEF (BIS code) and AHP method for landslide susceptibility zonation: A case study of Mao-Maram Manipur
5.	R. Abarna	A Geospatial analysis of multi-hazard built-up risk in coastal plains of Tamil Nadu
6.	Juri Baruah	Vulnerable geography of Salmora, Majuli: the home of Kumars (potters) in Assam
7.	Kavya Agrawal	Migrant college students during covid pandemic: Evidences from the field

DAY 2	6th April, 2022- WEDNESDAY

Poster Presentation

Date: **6th April, 2022**
Time: **8:30 – 10:00 AM (IST)**
GMT +5:30 Hours

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Manchester(in UK) 4:00 AM
London (in UK) 4:00 AM
Berlin (in Germany) 5:00 AM
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Bangkok (in Thailand) 10:00 AM
South Dakota (in USA) 10:00 PM
New Castle (in Australia) 1:00 PM

Session Chair: Prof. Punyatoya Patra, Aditi Mahavidyalaya, University of Delhi

Co-Chair: Dr. Lubna Siddiqui, Jamia Millia Islamia

Rapporteur: Dr. Tara Shanker, Bhim Rao Ambedkar College, University of Delhi

Meeting Link: https://meet.google.com/dph-uxjs-nfd

***Session In-Charge*: Prof. Kavita Arora | Dr. Vijay Pandey**

S. No.	Authors	Papers
1.	Shubham Soni, Pawan Kumar	A geospatial mapping of glacial lake dynamics in the Himachal Himalaya
2.	Alok Kumar Gaurav	Combating covid-19 through network governance: networking models used in India for crisis management
3.	CH. Saiteja, B. Venkateshwar Reddy, Bhargavi CH	Green infrastructure and nature-based solutions approach
4.	Shahid Jamal	Unfolding the realities of tribal community: an assessment of Toto tribe
5.	Komal Devra	"Eco-nomy or Eco-tourism" Strength of Rajasthan

DAY 2	6th April, 2022- WEDNESDAY
PLENARY SESSION - III	
Theme: Nature Based Solution, Critical Infrastructures and Disaster Resilience	
Date: **6th April, 2022** Time: **10:00 – 11:30 PM (IST)** GMT +5:30 Hours	**Session Chair:** Prof. Anuradha Banerjee, CSRD, JNU, New Delhi, India
Tokyo (in Japan) 1:30 PM	**Co-Chair:** Dr. Suraj Singh Gaur,Suresh Gyan University, Jaipur, India
Texas, USA (in Houston) 11:30 AM	**Rapporteur:** Dr. Anandita Sarkar Chaudhary, IP College of Women's, University of Delhi
Manchester(in UK) 5:30 AM	Meeting Link: **https://bit.ly/internationalconferencecdms** Platform: **ZOOM** Meeting ID: **837 2088 8176** Passcode: **034028**
London (in UK) 5:30 AM	
Berlin (in Germany) 6:30 AM	
Michigan (in USA) 12:30 AM	
Bangkok (in Thailand) 11:30 AM	
South Dakota (in USA) 11:30 PM	
New Castle (in Australia) 2:30 PM	
Session In-Charge: Dr. Renu Gupta | Prof. Swati Rajput, Centre for Disaster Management Studies, SBSC, University of Delhi, India	
Panelists	
Name	
Prof. Chris S. Renschler Director, Landscape-based Environmental System Analysis & Modeling (LESAM) Lab, University at Buffalo (SUNY), USA	
Col. Sanjay Srivastava Chairperson, Climate Resilient Observing Systems, Promotion Council	
Dr. Genet Alem Gebregiorgis International Planning Studies, Technical University Dortmund, Germany	

DAY 2	6th April, 2022 | WEDNESDAY

PLENARY SESSION - IV

Theme: Disaster Emergency Response, Technological Innovations and Advancement in Data

Date: **6th April, 2022**
Time: **11:45 – 1:15 PM (IST)**
GMT +5:30 Hours

Tokyo (in Japan) 3:15 PM
Texas, USA (in Houston) 1:15 AM
Manchester(in UK) 7:15 AM
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Berlin (in Germany) 8:15 AM
Michigan (in USA) 2:15 AM
Bangkok (in Thailand) 1:15 PM
South Dakota (in USA) 1:15 AM
New Castle (in Australia) 4:15 PM

Session Chair: Prof. A. R. Siddiqui, Allahabad University, India

Co-Chair: Dr. Swati Thakur, Dyal Singh College, University of Delhi

Rapporteur: Dr. Ankur Srivastav, SPM College, University of Delhi, India

Meeting Link: **https://bit.ly/internationalconferencecdms**

Platform: **ZOOM**

Meeting ID: **837 2088 8176**

Passcode: **034028**

Session In-Charge: Dr. V.A. V. Raman/ Dr. K. P. Meena

Centre for Disaster Management Studies, SBSC, University of Delhi, India

Panelists

Name

Dr. Laura Siebeneck, Department of Emergency Management and Disaster Science, University of North Texas, USA

Prof. Rajib Shaw, Graduate School of Media and Governance, Keio University, Japan

Dr. Ifte Ahmed, School of Architecture and Built Environment, University of New Castle, Australia

TECHNICAL SESSION-VII

Theme: Geospatial Technologies And Innovations In Disaster Management-I

Date: **6th April, 2022**
Time: **1:45 – 4:15 PM (IST)**
GMT +5:30 Hours

Tokyo (in Japan) 5:15 PM
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Berlin (in Germany) 10:15 AM
Michigan (in USA) 4:15 AM
Bangkok (in Thailand) 3:15 PM
South Dakota (in USA) 3:15 AM
New Castle (in Australia) 6:15 PM

Session Chair: Prof. A. Balakishan, Osmania University

Co-Chair: Dr. Shweta Rani, Dayal Singh College, University of Delhi

Rapporteur: Ms. Namita Sharma, Department of Geography, Gauhati University

Meeting Link: http://meet.google.com/xaj-ovap-qit

Session In-Charge: **Prof. Kavita Arora | Dr. Shikha Gupta | Dr. Rashmi Rani Anand**

S. No.	Authors	Papers
1.	Sangita Mahata, Vishwambhar Nath Sharma	Alternative use of abandoned mines for mining tourism: a case study of coal mines in Salanpur Block, district Paschim Bardhaman, West Bengal
2.	Abhinav Galodha, Gnanappazham L.	Geospatial assessment of flood monitoring, vulnerability assessment, reduction and change detection of mangroves and inland wetlands: a GIS and remote sensing approach using QGIS and Google Earth Engine
3.	Uma Bhattacharya	Determining the impact of climate change on doom tourism landscape using geospatial technology: a review
4.	Jiali Song, Takashi Oguchi	Factors influencing Web-GIS applications in educating disaster risk reduction
5.	Hrishikesh Mahadev Rayadurgam, Shweta Dua,Monika Bahl	Blockchain: innovation in disaster resilience
6.	P. Satya Chandra, P. Sri Lakshmi, B. Praveen Kumar, O. Lakshman, K. H.V. Durga Rao	Development of dynamic weather information dashboard (DWID) using FOSS technologies

7.	R. Abarna, S. Leo George, Kumar Arun Prasad, K. Balasubramani	A Geospatial analysis of multi-hazard built-up risk in coastal plains of Tamil Nadu
8.	Maneesha Paswan, Dipak Prasad	An assessment of green infrastructure using GIS and Remote Sensing on Gorakhpur City

TECHNICAL SESSION-VIII

Theme: Geospatial Technologies and Innovations In Disaster Management - II

Date: **6th April, 2022**
Time: **1:45 – 4:15 PM (IST)**
GMT +5:30 Hours

Tokyo (in Japan) 5:15 PM
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Michigan (in USA) 4:15 AM
Bangkok (in Thailand) 3:15 PM
South Dakota (in USA) 3:15 AM
New Castle (in Australia) 6:15 PM

Session Chair: Prof. Devesh Walia, NEHU, Shillong

Co-Chair: Dr. Pankaj Kumar, Department of Geography, University of Delhi

Rapporteur: Dr. Smita Bimal, Swami Sradhanand College, University of Delhi

Meeting Link: https://meet.google.com/dph-uxjs-nfd

Session In-Charge: **Dr. Suraj Mal | Dr. Vijay Pandey | Dr. Janki Jeevan**

S. No.	Authors	Papers
1.	Sanjit Kumar, Jitendra Kumar	Multi-Hazard Assessment and Susceptibility Mapping: A Review
2.	Apperdeep Kaur, Balweender Singh	Mapping of water logged areas using Remote Sensing and GIS along the canal in the districts of Faridkot and Sri Muktsar Sahib in Punjab
3.	Shuaib Ahemed, Mary Tahir,Haseena Hashia, Sandesh Yadav	GIS based Spatio-Temporal and Hotspot Analysis to forest fires in Almora District of Uttarakhand, India
4.	Bharati Gogoi, Bikashita Kalita	Watershed Delineation of Tuni River of Majuli Using Arc Hydro Model
5.	Toushif Jaman, K. Dharanirajan, Sohel Rana, Kajal Kumar Mandal	Kappa Coefficient Analysis and Change detection of Land use and Land cover of Bhadrak District, Odisha, India using Geospatial Techniques.

6.	Hemraj Choudhary	Geo-informatics Basis Assessment of Hydrogeological Changes in Sambhar Lake Catchment Area, India
7.	Mohmad Akbara, M. Shafi Bhat, Amir Ali Khan	Role of geo-spatial techniques for snow avalanche management in Kargil – Ladakh region of trans- Himalayas
8	Alinda Hazowary, Dipak Baruah	Change detection of wetland using geo-spatial techniques: a study on tamranga beel of Bongaigaon district, Assam, India

TECHNNICAL SESSION - IX

Theme: Disaster Diplomacy, Green Climate Fund, Governance and law, Role of Mass Media and Social Media

Date: **6th April, 2022**
Time: **1:45 – 4:15 PM (IST)**
GMT +5:30 Hours

Tokyo (in Japan) 5:15 PM
Texas, USA (in Houston) 3:15 AM
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Session Chair: Prof. Basvaraj Bagade, Rani Channama University, Karnataka

Co-Chair: Dr. Amna Mirza, Shyama Prasad Mukherji College for Women, University of Delhi, India

Rapporteur: Rashmi Singh, Shivaji College, University of Delhi

Meeting Link: https://meet.google.com/dep-uzwk-pdq

Session In-Charge: **Ms. Mita Hussain | Mr. Ganesh Yadav| Dr. Chandrakanta**

S. No.	Authors	Papers
1.	Amna Mirza	Disaster Diplomacy & new developments in State Relations: Case Study of US & China approach to the first wave of Covid Pandemic
2.	Smrity Upadhyay, Kavita Arora, Rashmi Rani Anand	Disaster Diplomacy and India Nepal Cooperation for Disaster Risk Reduction
3.	Rameshwar Prasad Singh	Problems of Natural Hazards and Natural Disaster Reduction in the South-Asia Region; A Case Study
4.	Anil Kumar	Police in Disaster Management
5.	Neha Verma	Environment awareness : role of social media

6.	B.Venkateshwar Reddy, C. H. Saiteja	Impacts of Green Climate Fund
7.	Ashwani Kumar, Seema	Role of Social Media in Natural Disaster Management
8.	Arvind S. Susarla	Uncertainty and blame: An analysis of newspaper reporting in India during the SARS CoV-2 pandemic

TECHNICAL SESSION - X

Theme: Flood Disaster and Resilience

Date: **6th April, 2022**
Time: **1:45 – 4:15 PM (IST)**
GMT +5:30 Hours

Tokyo (in Japan) 5:15 PM
Texas, USA (in Houston) 3:15 AM
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Berlin (in Germany) 10:15 AM
Michigan (in USA) 4:15 AM
Bangkok (in Thailand) 3:15 PM
South Dakota (in USA) 3:15 AM
New Castle (in Australia) 6:15 PM

Session Chair: Prof. Sunil Kumar De, NEHU, Shillong

Co-Chair: Dr. Renu Bali, Kamal Nehru College, University of Delhi

Rapporteur: Dr. Manjit Singh, Miranda House, University of Delhi

Meeting Link: https://meet.google.com/tcy-cihw-nsf

Session In-Charge: **Dr. Rajni Kapoor | Dr. Satyam Mishra | Dr. Santosh Kumar**

S. No.	Authors	Papers
1.	Kajal Kumar Mandal, K. Dharanirajan, Tanushree Sarkar	The application of SAR (Sentinel-1A) data for flood inundation mapping of Maldah district, West Bengal, India and its impact on households
2.	Dilip Kumar, Ranjeet Kaur	Assessment of flood prone area for the preparedness and mitigation plan: A case study
3.	Nitin Rathi, P. K. Joshi, Deep Narayan Pandey	Mapping and Zoning of the Flood Hazard Area using Flood Hazard Index [FHI]: A case study of Delhi Flood 2010
4.	Snehashis Alam a, Mohan Kumar Bera	Flood hazard and gender vulnerability: a case study of Malda District, West Bengal
5.	Satish Kumar Saini, Deep Narayan Pandey	Identifying flood susceptible zones of a flood prone region of Uttar Pradesh, India
6.	Golam Mostafa, Prasenjit Pal	Is flood boon or bane? -- A case study on Hugli district, West Bengal
7.	Gowhar Farooq Wani, Syed Towseef Ahmad, Rayees Ahmed	Identifying and analysing the dominant social factors that encourages people to inhabit flood-prone areas of Srinagar City, India
8.	Ahmad Rashiq, Atul Kumar	Urban flood risk hotspot zonation using GIS based techniques

TECHNICAL SESSION - XI

Theme: Food Security, Smart Agriculture, Indigenous Knowledge for Sustainable Livelihood

Date: **6th April, 2022**
Time: **1:45 – 4:15 PM (IST)**
GMT +5:30 Hours

Tokyo (in Japan) 5:15 PM
Texas, USA (in Houston) 3:15 AM
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Berlin (in Germany) 10:15 AM
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Bangkok (in Thailand) 3:15 PM
South Dakota (in USA) 3:15 AM
New Castle (in Australia) 6:15 PM

Session Chair: Prof. N. C. Jana, Burdwan University

Co-Chair: Dr. Swarnima Singh, D.D.U Gorakhpur University

Rapporteur: Dr. Ravi Joseph, Kamla Nehru College, University of Delhi

Meeting Link: https://meet.google.com/uyu-cqti-ueb

Session In-Charge: **Prof. Swati Rajput | Dr. Neha Arora**

S.No.	Author	Papers
1.	Renu Bali	Community based disaster risk management: study of awareness and preparedness to disasters in rural areas of Rajasthan
2.	Rasing Hanse, Pahari Doley	Broom cultivation as a source of livelihood: a case study at Chirilangso village in West Karbi Anglong district of Assam
3.	Rashmi Rani Anand, Poonam Sharma, Pratyush Sinha	Agrivoltaic Systems: Promising models of Climate Resilient Agriculture and Energy Integration
4.	Prasenjit Das	Climate change and its effect on crop production - a case study of Assam
5.	Vinay Kumar	Environmental Conservation in Indian Culture

VALEDICTOTY CEREMONY

DAY 2 **6th April, 2022 | WEDNESDAY**

Date: **6th April, 2022**

Time: **4:30 - 6:30 P.M. IST**

GMT +5:30 Hours

Tokyo (in Japan) 8:00 PM
Texas, USA (in Houston) 6:00 AM
Manchester(in UK) 12:00 PM
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Michigan (in USA) 7:00 AM
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Meeting Link: **https://bit.ly/internationalconferencecdms**

Platform: **ZOOM**

Meeting ID: **837 2088 8176**

Passcode: **034028**

Session In-charge:
Prof. Kavita Arora | Dr. Suraj Mal | Dr. Neha Arora | Dr. Rashmi Rani Anand

4:30 – 4:35 PM	***Welcome of Guests***
4:35 – 4:40 PM	Address by Principal and Patron **Prof. Anil Sardana**
4:40 – 4:50 PM	Summary of Conference Proceedings by **Prof. Swati Rajput**
4:50 – 5:10 PM	Address by **Guest of Honor**: **Mr. Sanjay Bhatia**, UNDRR/ONEA
5:10 – 5:30 PM	Address by **Guest of Honor: Prof. Kaushal Kumar Sharma**, JNU
5:30 – 6:00 PM	Address by **Keynote Speaker**: **Prof. Takashi Oguchi**, The University of Tokyo, Japan
6:00 – 6:20 PM	Address by **Chief Guest: Prof. Dilanthi Amaratunga**, University of Huddersfield, UK
6:20 – 6:25	Announcement of Best Papers / Poster / Young Scholar Award by **Prof. Anil Gupta**
6:25 – 6:30 PM	Vote of Thanks by **Prof. Poonam Sharma**
	Group Photograph

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Dr. P. K. Khurana, University of Delhi

Prof. Masood A. Siddiqui, Jamia Millia Islamia

Col. Sanjay Srivastava, CROPC

Prof. S.K Sinha, University of Delhi

Prof. Mondira Datta, JNU

Prof. Sudesh Nangia, JNU

Prof. Hariharan Ramachandran, ISID

Prof. Kaushal Kumar Sharma, JNU

Prof. Milap Punia, JNU

Prof. Sameer M. Deshkar, VNIT, Nagpur

Prof. G.P. Ganapathy, VIT, Vellore

Prof. P.K. Joshi, SCDR, JNU

Prof. Vinita Yadav, School of Planning and Architecture, New Delhi

Prof. Mary Tahir, Jamia Millia Islamia

Prof. Sarfaraz Alam, BHU

Prof. Ashutosh Mohanty, Madhyanchal Professional University, Bhopal

Prof. B.C.Vaidya, JNU

Prof. Basvaraj Bagade, Rani Channama University, Karnataka

Prof. N. C. Jana, Burdwan University

Prof. V. P. Sati, Mizoram University

Prof. Anupam Pandey, Allahabad University

Prof. A.R. Siddiqui, Allahabad University

Prof. Atiqur Rahman, Jamia Millia Islamia

Prof. Anisur Rahman, Jamia Millia Islamia

Prof. Anuradha Banerjee, JNU

Prof. Srinagesh, Osmania University

Prof. A. Balakishan, Osmania University

Prof. Shahab Fazal, AMU

Prof. Haroon Sajjad, Jamia Millia Islamia

Prof. Subhakanta Mohapatra, IGNOU

Prof. D.D. Sharma, Himachal Pradesh University, Shimla

Prof. R. C. Joshi, Kumaon University

Prof. Ravinder G. Jaybhaye, Savitribai Phule Pune University

Prof. Devesh Walia, NEHU, Shillong

Prof. Sunil Kumar De, NEHU, Shillong

Prof. J. S. Rawat, Kumaun University, Almora

Prof. B. W. Pandey, University of Delhi

Prof. Subhash Anand, University of Delhi

Prof. P. Jayashree, University of Mysore

Prof. Virendra Nagarale, SNDT Women's University, Mumbai

Prof. Ashis Kumar Paul, Vidyasagar University

Prof. B.S. Chaudhary, Kurukshetra University

Prof. Madhushree Das, Gauhati University

Prof. Anindita Datta, University of Delhi

Prof. Santanu Patnaik, Rajiv Gandhi University, Arunachal Pradesh

Prof. Sachin Deore, SNDT Women's College, Pune

Prof. R. Jaganathan, University of Madras

Prof. Aprajita De, University of Delhi

Prof. A. K. Saha, University of Delhi

Prof. Ashok D. Hanjagi, Bangalore University

Prof. Anjan Sen, University of Delhi

Prof. Monika Kannan, Sofia Girls College, Rajasthan

Dr. Pravin Kokane, University of Mumbai

Dr. B.R. Thakur, Himachal Pradesh University

Dr. Saleha Jamal, AMU

Dr. Pankaj Kumar, University of Delhi

Dr. P. K. Pathak, Jamia Millia Islamia

Dr. Kiran Bhairanvar, University of Delhi

Dr. Sanjeev Sharma, JNU

Dr. Lubna Siddiqui, Jamia Millia Islamia

Dr. Anupama Dubey Mohanty, IPE, Hyderbad

Dr. B.C. Jat, Government College, Redawas, Jaipur

Ms. Meesha Tondon, SAPF, New Delhi

Dr. Mukta Girdhar, DRRF, New Delhi

ABOUT THE CONFERENCE

Disasters have emerged as the most defining challenge of the 21st century. It is affecting all realms of mother Earth, natural phenomenon and processes which are collectively having adverse impact on human habitat. Each part of the world faces specific vulnerabilities to climate change, extreme events or disasters related to climate crisis. Rising temperatures disturb the local weather systems and propel environmental degradation, bringing natural disasters and weather extremes, causing food and water insecurity, economic disruption, resource conflict, and terrorism.

Globally more than 200 million people are affected by natural disasters every year with those living in the low income countries being more affected as those of high income nations. There are dynamic challenges faced by world for disaster preparedness and risk reduction. Having a thorough knowledge of the complexities in Disaster management will allow individuals and communities for practical disaster preparedness, risk reductions, and setting humanitarian response. Understanding disaster risk, strengthening disaster risk, governance to manage disaster risk etc. are important for risk assessment, prevention, mitigation and response.

Today we need to be more concerned about the disaster preparedness, risk reduction and resilient habitat more than ever before as the frequencies of natural disasters have increased. Food crisis, water crisis, energy crisis etc. requires strengthening of governance to manage disaster risk and require strengthening resilience. In future we will be adding more cities in the world, particularly in Asia and Africa. And the haphazard and unplanned growth will make these cities more vulnerable to suffer most. Natural disasters would adversely affect available resources, efficiency and productivity of various sectors. Rising temperature and growing urban heat islands will give rise to vector and water borne illnesses, and cause psychological trauma and mental illness. Therefore, it will affect the human habitat adversely. Hence, we need

a holistic approach to address the issue, and built resilient habitats in order to strengthen the capacity of individuals, communities, institutions, businesses and systems within a city to survive, adapt and grow.

The conference aims to highlight the challenges linked to disaster preparedness, risk reduction, resilient habitat and problems of implementation due to lack of local level capacities. This conference also intends to provide platform for the discussions to explore how we can improve resilience against disaster and secure our habitat or mitigate risks related to disasters. It highlights on resilient human habitat and emphasizes on making our cities and habitats safer for living, resisting damage and recovering faster.

ABOUT HOST ORGANIZATION

SHAHEED BHAGAT SINGH COLLEGE, UNIVERSITY OF DELHI

Shaheed Bhagat Singh College, named after the great martyr of India, Shaheed-e-Azam, Sardar Bhagat Singh, was established as a co-educational institution in 1967 as a constituent college of University of Delhi. The College takes pride in having accomplished faculties in eight departments including Geography. The college is fully equipped with digital library, computer labs and Geography lab with latest GIS and Remote Sensing equipment's and impressive infrastructure. Over a period of fifty years, the college has distinguished itself in diverse academic and professional fields by providing a vibrant and intellectually stimulating academic culture and promoting independence of thoughts and visions.

CENTRE FOR DISASTER MANAGEMENT STUDIES (CDMS)

The Centre for Disaster Management Studies (CDMS) at Shaheed Bhagat Singh College has been working very actively to develop the centre. The Centre aspires to work as Centre of excellence in disaster management research, training and creating awareness for disaster preparedness, risk reduction and mitigation. The CDMS regularly organize events which include lectures, short-term courses, training and workshops for students, staff and other participants. It also takes up research projects and publications to address various aspects of disaster management. The Centre organizes events in collaboration with institutions and organizations working in the domain of disaster management.

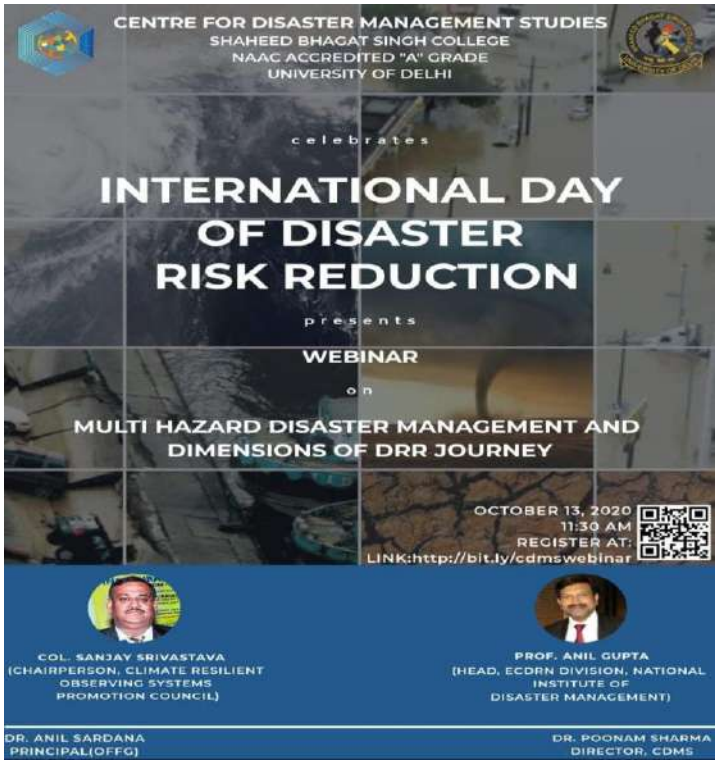
NATIONAL INSTITUTE OF DISASTER MANAGEMENT (NIDM)

The National Institute of Disaster Management (NIDM) was constituted under an Act of Parliament with a vision to play the role of a premier institute for capacity development in India and the region. The efforts in this direction that began with the formation of the National Centre for Disaster Management (NCDM) in 1995 gained impetus with its re designation as the National Institute of Disaster Management (NIDM) for training and capacity development. Under the Disaster Management Act 2005, NIDM has been assigned nodal responsibilities for human resource development, capacity building, training, research, documentation and policy advocacy in the field of disaster management.

NIDM has performed a crucial role in bringing disaster risk reduction to the forefront of the national agenda. The Institute believes that disaster risk reduction is possible only through promotion of a "Culture of Prevention" involving all stakeholders. The Institute works through strategic partnerships with various ministries and departments of the central, state and local governments, academic, research and technical organizations in India and abroad and other bi-lateral and multi-lateral international agencies. NIDM provides Capacity Building support to various National and State level agencies in the field of Disaster Management & Disaster Risk Reduction. The Institute's vision is to create a Disaster Resilient India by building the capacity at all levels for disaster prevention and preparedness.

CDMS ACTIVITIES

WEBINAR ON MULTI-HAZARD DISASTER MANAGEMENT AND DIMENSIONS OF DPR JOURNEY



The Centre for Disaster Management Studies, Shaheed Bhagat Singh College organised the inaugural webinar on the theme, “Multi-Hazard Management and

Dimensions of DPR Study." The webinar marked the occasion of International Day of Disaster Reduction. The guests for the occasion were Col. Sanjay Srivastava, Chairperson, Climate Resilient Observing Systems Promotion Council and Prof. Anil Gupta, Head, ECDRN Division, National Institute of Disaster Management. The speakers eloquently presented their views on the aforementioned themes and reflected on the fact that it is the need of the hour to make communities and governments across the globe more proactive and adaptable in the face of a disaster. The webinar drew participation across universities and institutions across the country, laying the foundation for upcoming events, activities and initiatives of CDMS.

DISAT 'O'PEDIA

Centre for Disaster Management Studies, SBSC, organised the event- "Disast'O' Pedia': Digital Picture Story Competition. The theme centered around nature,

environment and disaster management. A 4-member team delegation of students were allowed to participate in the event. The event overall witnessed an encouraging participation from students across DU and helped them to sensitize about the various issues revolving around these aforementioned domains. Shaheed Bhagat Singh College bagged the first and second prize in the competition followed by Kalindi College.

CAPACITY BUILDING PROGRAM

Centre for Disaster Management Studies (CDMS), Shaheed Bhagat Singh College, Universityof Delhi had successfully organised the 7-Day Capacity Building Program on March 1-7, 2021 on the theme “Hydro Meteorological Disaster: Techniques for Measuring, Monitoring and Management of Floods. in collaboration with Teaching Learning Centre, Ramanujan College under the aegis of Pandit Madan Mohan Malviya National Mission on Teachers andTeaching, Ministry of Education, GOI.

CENTRE FOR DISASTER MANAGEMENT STUDIES
Shaheed Bhagat Singh College
(NAAC Accredited 'A' Grade)
University of Delhi

in Collaboration with

Teaching Learning Centre
Ramanujan College
(NAAC Accredited 'A' Grade)
University of Delhi
Organises
Capacity Building Program

Hydro-Meteorological Disaster: Techniques for Measuring, Monitoring and Management of Floods

INAUGURAL

Monday , 01.03.2021		
Time	Program	
2:30 pm	*Invocation, Lighting of Lamp and Welcome to Guests*	
2:35 pm	Welcome address by **Dr. Anil Sardana**, Principal, SBSC	
2:45 pm	Address by **Dr. S. P. Aggarwal** , Principal, Ramanujan College	
2:55 pm	Address by **Dr. Vibhash Kumar**, Assistant Director, TLC, Ramanujan College	
3:00 pm	Address by **Dr. V.A.V. Raman**, IQAC Coordinator	
3:00 pm	Introduction to the Program by **Dr. Poonam Sharma**,Director, CDMS and Program Coordinator	
3:15 - 4:30 pm	Inaugural Address - Disaster Risk Reduction and Sendai Framework : Indian Experiences	**Prof. R. B. Singh,** University of Delhi
4:45 - 6:00 pm	Keynote Address - Safe and Sustainable Living in the Hill Areas with reference to Chamoli Event of Feb 7, 2021	**Prof. Chandan Ghosh** NIDM
6:15 pm	Vote of Thanks by **Dr. Kavita Arora** , Coordinator	

The first day was the Inaugural Ceremony of the Program, that was instigated with lightningof Lamp and welcome note for august Guest by Dr. Anil Sardana, Principal, SBSC and thenDr. Vibhash Kumar, Principal, Ramanujan College. Afterwards, Prof. Poonam Sharma, Director, CDMS gave a fruitful introduction about the Program and throw light on therelevance of the Program.

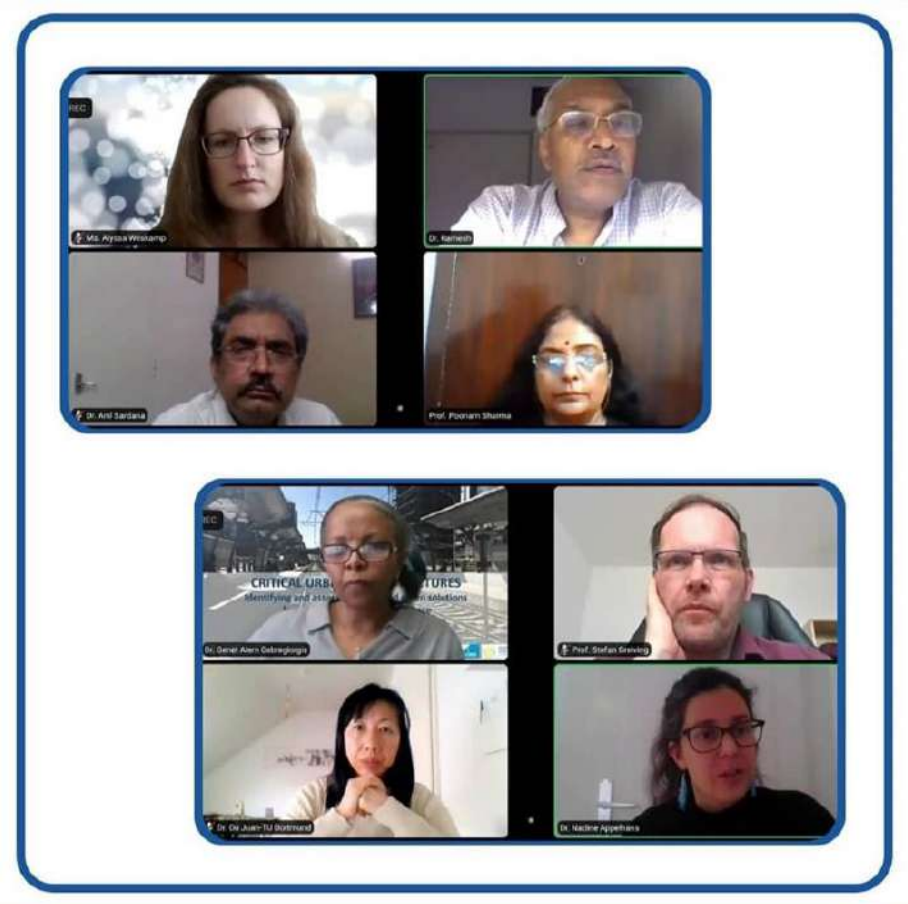
For Day 2, the Guest speaker was Prof. NK Goel, IIT Roorkee. For Day 3, the Guest speaker were Prof. NK Goel, IIT Roorkee and Prof. DS Arya, IIT Roorkee. For Day

4, the Guest speakers were Dr. Ajanta Goswami, IIT Roorkee, Dr. Sandeep Shukla, NIH Roorkee, Dr. Pratiman Patel, NUS Singapore. For Day 5, the guest speaker was Sh. C.M. Bhatt, Scientist-SF, IIRS- ISRO, Dehradun. For Day 6, the guest speakers were Dr. Ajanta Goswami, IIT Roorkee, Dr. Sandeep Shukla, NIH Roorkee, Dr. Pratiman Patel, NUS Singapore. For Day 7, which was the Valedictory Ceremony, the guest speakers were Dr. Ajoy Das, Gujarat University and Prof. D.S. Arya, IIT Roorkee.

These 7 days program was diligently organised and it illuminated the minds through providingprofound knowledge that were reflected by the Guest speakers and different Participants. It was undoubtedly fruitful and informative program.

WEBINAR ON CRITICAL URBAN INFRASTRUCTURE-IDENTIFYING AND ASSESSING SMART AND GREEN SOLUTION FOR EFFICIENT DISASTER RESILIENCE

Centre for Disaster Management Studies, Shaheed bhagat singh college, University of Delhiin collaboration with P4CA, Inhabitant, World Urban Campaign, IRPUD, Drees & Sommer, Sustainability and Adaptation Planning had diligently organised a webinar on May 6, 2021 on the theme - Critical Urban Infrastructure (CI)- Identifying and Assessing Smart and Green Solutions for Efficient Disaster Risk resilience.

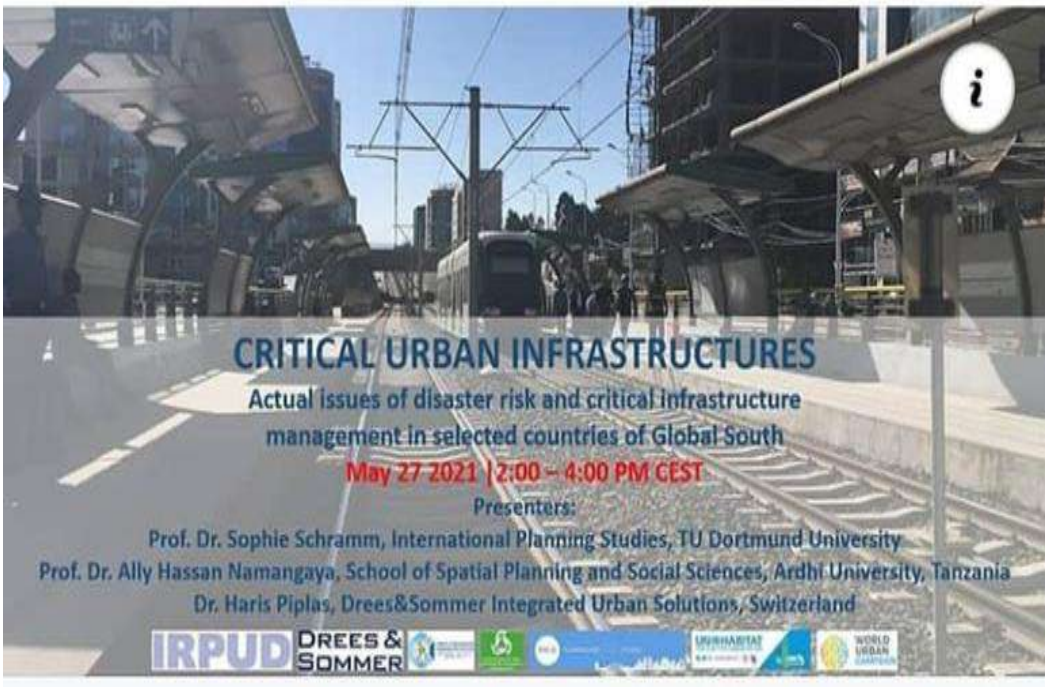


On this auspicious day, the keynote speaker were Dr K J Ramesh, National Commission for Monitoring Pollution India and Prof. Stefan Grieving, Institute for Spatial Planning, TU Dortmund University,

Germany and Panelists were Dr. DU Juan, Institute for Spatial Planning TU Dortmund; Dr. Nadine Appelhans Habitat Unit TU Berlin Germany and Ms. Alyssa, Weskamp Dress and Sommer Integrated Urban Solution, Berlin, Germany. Indeed, the webinar was quite informative and fruitful that immersed new insights about the critical aspects of Urban Infrastructure into the minds of attendees.

WEBINAR ON CRITICAL URBAN INFRASTURUCTUAL ISSUES OF DISASTER RISK AND INFRASTRUCTURE MANAGEMENT IN SELECTED COUNTRIES OF GLOBAL SOUTH

Centre for Disaster Management Studies, Shaheed bhagat Singh college, University of Delhi had observed International Day of Disaster Risk Reduction in collaboration with P4CA, Unhabitat, World Urban Campaign, IRPUD, Drees & Sommer, Sustainability and Adaptation Planning had organised another webinar (Session 2) on May 27, 2021 on the theme - Critical Urban Infrastructure (CI)- Actual issues of Disaster Risk and Infrastructure Management-in selected countries of Global South.



On this auspicious day, the presenters were Prof Sophie Schramm, International Planning Studies, TU Dortmund University;. Prof. Ally Hassan Namangaya, School of Spatial Planning and Social Sciences, Ardhi University, Tanzania; Dr. Haris Piplas, Drees& Soomer Integrated Urban Solution, Switzerland.The eminent Presenters reflected their profound knowledge on the Critical aspects of Urban Infrastructure and added new insights into the minds of attendees.

VIRTUAL POSTER MAKING COMPETITION 'ART-E -DISASTER'

Centre for Disaster Management Studies, Shaheed Bhagat Singh College, University of Delhi had observed International Day of Disaster Risk Reduction on October 10-13, 2021. On this occasion, CDMS had organised Virtual Poster Making Competition 'Art-E-Disaster' based on the theme Disaster Risk Reduction. Participants were given 3 days to work upon on their poster. Every poster was unique in itself, keeping the theme at its core.

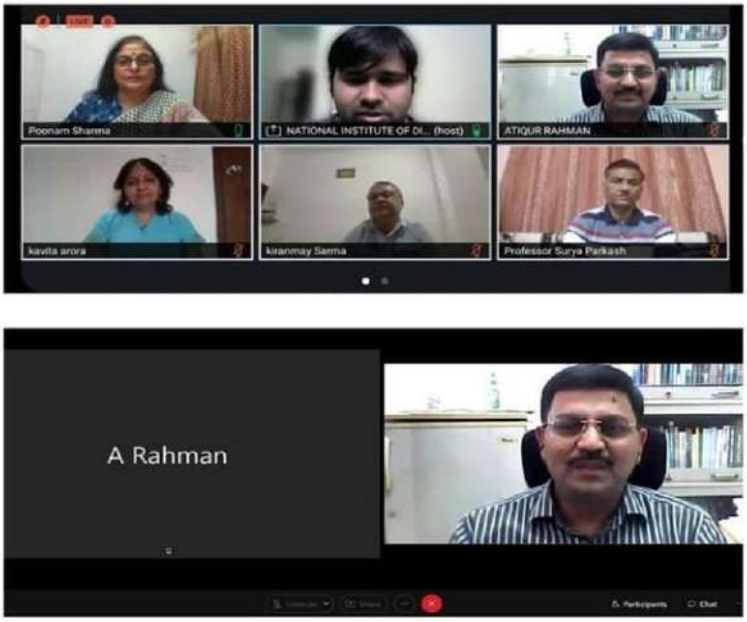
Participants are from different colleges all over India had showcased their prowess of art work. Winners were applauded with Cash prizes and Certificates.

3 DAYS ONLINE TRAINING PROGRAM

Preparedness is the only way we can combat natural disasters."

With this word, Centre for Disaster Management Studies, Shaheed Bhagat Singh College, University of Delhi in collaboration with the National Institute of Disaster Management, Ministry of Home Affairs, GOI successfully organised 3-day online training Program from 21-23rd October 2021, on Disaster Risk Reduction and Resilience. The first day was the Inaugural Ceremony, that instigated with the felicitation of the Patrons Major MK Bindal, Executive Director, NIDM, MHA, GOI and Prof Anil Sardana, Principal Shaheed Bhagat Singh College, DU; Programme Chair Prof Surya

Prakash and some eminent speakers by Prof Poonam Sharma Director, CDMS. She has talked about the essence and importance of this training program.

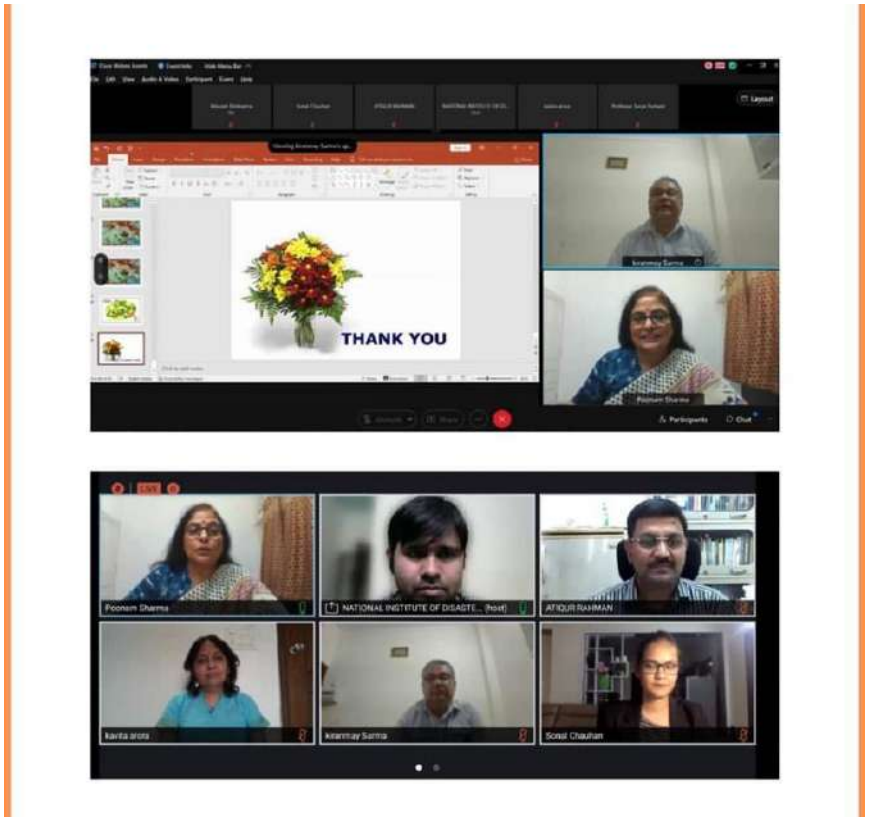


For Day 2, the eminent speakers were Dr. Raju Thapa, JC, NIDM; Sh Hari HK Devada, YP, NIDM and Sh. Ajit Batham, YP, NIDM. They all have talked about special attention for low-income families, to bring in practice of Early warning system, proper infrastructure, proper implementation of guidelines of Emergency Operation System and the use of Social networking services to obtain information.

For Day 3, the eminent speakers were Dr. Kiranmay Sharma, School of Environment Management, GGSIPU and Ms. Sonal Chauhan, Former DLSA, Advocate.

Dr. Kiranmay Sharma has emphasized on the use of remote sensing techniques, infrared spectrum and to have proper assessment survey of dams, reservoir, river, catchment area, etc.On the other hand, Ms

Sonal Chauhan has talked about the history and necessity of the Disaster Management Act, 2005. Indeed, this training imparted the intensive knowledge and skills about various aspects connected to disaster management.



The 3 days training Program thus culminated into a success by the notable efforts and meticulous planning of all the organizing committee.

QUIZZARD - QUIZ COMPETITION

A Quiz Competition was successfully organised by the Centre for Disaster Management Studies, Shaheed Bhagat Singh College, University of Delhi on 15th January 2022. It was graced with the presence of, Prof Poonam Sharma, Director of CDMS who conveyed her best wishes for the competition. The Quiz began under the observation of, Dr Satyam Mishra, Assistant Professor, Geography Department, Shaheed Bhagat Singh College and Rajani Kapoor, Assistant Professor, Economics Department, Shaheed Bhagat Singh College.

The quiz consisted of four rounds having 10 questions in each covering standard, moderate and difficult levels with elimination in each round. There were 97 participants which were very enthusiastic to qualify first round and the intense competition made it more exciting for the students and audience both.

Out of 97 participants, 56 of them made it to the first round after getting eliminated from a preliminary round, 20 made it to second round and finally 10 students to the last and final round. The quizzers surprised the audience with their knowledge and information. The questions put forth to the teams were captivating, exciting and made the audience applaud excitedly when the teams answered correctly.

The participant securing first place was rewarded with 3000/- cash prize and winning certificate, 2000/- cash prize and 1st runner up certificate for the participant in second place and the other two runner ups were rewarded with certificates and the students who got selected in 2nd round got participation certificates. It was a very informative and knowledge enriched competition for the participants along with the audience.

Final remarks were delivered by Prof. Poonam Sharma who commented that the event was very well coordinated by the team members who played a very active part in ensuring smooth conduct and promotion of the event.

GAME-O-MANIA

Centre for Disaster Management Studies, Shaheed Bhagat Singh College University of Delhi successfully organised an Online quiz competition, Game-O- Mania on February 4. The event had an enthusiastic audience from the society itself as they watched the participants try their best bid in the game. The game consisted of six rounds staring with Gibberish followed by tongue twister, crossword, riddle, word puzzle and situation-based questions along with some informative and lifesaving dos and don'ts at the time of a disaster occurrence. There were 181 registrations from all over the India. The participants surprised the audience with their knowledge.

Eventually, the vote of thanks was presented by Shashank Goacher, President of CDMS followed by the conclusion of the event and final remarks were delivered by Prof. Poonam Sharma who commented that the event was very well coordinated by the team members who played a very active part in ensuring smooth conduct and promotion of the event.

Winners were applauded with attractive Cash prizes along with certificate. Indeed, it was a very informative and knowledge enriched competition.

ONLINE TRAINING PROGRAMME ON DISASTER MANAGEMENT PLANS TO ENHANCE RESILIENCE OF INSTITUTIONAL BUILDINGS

Centre for Disaster Management Studies, in collaboration with the National Institute for Disaster Management, Ministry of Home Affairs, Government of India, organised a 3-day online training programme on "Disaster Management Plans to enhance resilience of Institutional buildings." The speakers shed light on the various intricacies pertaining to enhancing resilience of institutional buildings and the need for parties at all level to come with a blue print adhering to the current geographical and ecological conditions of the concerned sites to help strategise in the formulations of effective plans in this regard. They also stressed upon the regular review in a routine matter of the buildings in the disaster-prone areas and also development of ideal scientific discourse in this regard to plan ahead for impending circumstances as well as for the future generations.

The event was a splendid success, witnessing participation from students and professionals alike, adding to yet another successful collaboration with NIDM and CDMS strives to continue organizing such events to sensitize the society about the need to disaster prepared and resilient.

CENTRE FOR DISASTER MANAGEMENT STUDIES
SHAHEED BHAGAT SINGH COLLEGE
NAAC ACCREDITED "A" GRADE
UNIVERSITY OF DELHI, INDIA

IN ASSOCIATION WITH
NATIONAL INSTITUTE OF DISASTER MANAGEMENT
MINISTRY OF HOME AFFAIRS
GOVERNMENT OF INDIA

INTERNATIONAL GEOGRAPHICAL UNION COMMISSION
ON HAZARD AND RISK
&
UNITED NATIONS OFFICE FOR DISASTER RISK REDUCTION

CORDIALLY INVITES ALL TO THE

INAUGURAL CEREMONY

OF

VIRTUAL
INTERNATIONAL CONFERENCE

ON THE THEME

CHALLENGES TO DISASTER RISK REDUCTION AND RESILIENT HABITAT

APRIL 5, 2022 | 9:30 AM IST (GMT+5:30 HOURS)

KEYNOTE SPEAKER

Ms. Ana Cristina Thorlund
United Nations Office for Disaster Risk Reduction

CHIEF GUEST

Prof. Santishree Dhulipudi Pandit
Vice Chancellor
Jawaharlal Nehru University
New Delhi, India

GUEST OF HONOUR

Prof. S. C. Rai
Head
Department of Geography
University of Delhi, India

PATRONS

Prof. Anil Sardana
Principal, SBSC

Shri Taj Hassan, IPS
Execuitve Director, NIDM

CONVENERS

Prof. Poonam Sharma
Director, CDMS

Prof. Anil K. Gupta
Head, ECDRN Division, NIDM

Meeting ID: 837 2088 8176 | Passcode: 034028

KNOWLEDGE PARTNERS

SPEAKERS - INAUGURAL

MS. ANA CRISTINA THORLUND

Ms. Ana Cristina Thorlund is a Programme Officer at UN Office for Disaster Risk Reduction, Office for Northeast Asia and Global Education and Training Institute (UNDRR ONEA-GETI). Ms. Ana Cristina Thorlund joined United Nations Office for Disaster Risk Reduction (UNDRR) in 2005. She is now working in the Office for Northeast Asia and Global Education and Training Institute in South Korea. Prior to this assignment, she has led the Secretariat of the International Recovery Platform in Kobe, Japan and served in UNDRR for the parliamentarians and gender initiatives in Geneva. In this capacity, she has supported the engagement of members of parliament from Asia, Africa, Europe and Latin America in disaster risk reduction and supported legislative efforts for the development of the Disaster Risk Reduction and Management laws of 2013 for East African Community (EALA) and the Latin American Parliament for the Protocol on Disaster Risk Management.

Making disaster risk reduction gender-sensitive has been another area of her work. Ms. Thorlund holds a master of sciences from the University of Geneva and specialization for the assessment and management of geological and climate related risk.

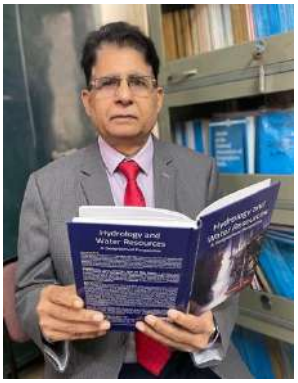
PROF. SANTISHREE DHULIPUDI PANDIT

Prof. Santishree Dhulipudi Pandit is Vice Chancellor of prestigious Jawaharlal Nehru University, New Delhi, India. She was born on 15 July 1962 at Leningrad [now St. Petersburg], Russia. Prof Pandit wads educated in Chennai at the Presidency College, both B.A. and M.A. Topper and Gold Medallist. She completed her M.Phil. and Ph.D. in International Politics from the School of International Studies, Jawaharlal Nehru University; Post-Doctorate in Peace and Conflict Studies from the Uppsala University, Sweden.

She has published several research papers and widely travelled across the globe. She has successfully completed several projects both major and minor. 27 students have completed their Ph.D. under her supervision.

Prof Pandit was General Secretary of the Pune University Teachers' Association from 1996 to 2009. She was elected to University of Pune Senate and Management Council from 2001 to 2006. Prof Pandit's areas of expertise are, International Relations, Asian Studies, Culture and Foreign Policy, Conflict, Violence and Gender. She has been Governing Council Member of Indian Council of Social Science Research [ICSSR]; Indian Institute of Advanced Studies [IIAS, Shimla]; ICCR and MAKIAS [Kolkata]. She has also been President's nominee on Selection Committees for many Central Universities. She has guided and consulted students for appearing in the Civil Services Exams and offered career counselling to students; she has held positions on several academic and professional bodies of national and international repute.

PROF S. C. RAI



Prof Suresh Chand Rai is a Professor of Geography at Department of Geography, University of Delhi. Prof Rai did his Masters in Geography (1979) and Doctor of Philosophy (1984) from Banaras Hindu University. His significant contributions are in the field of land and water resource management. His work has been outstanding on the Integrated Watershed Management in the Sikkim Himalaya have been recognized through the Soil and Water Conservation Society of USA, Award, 1999. The extensive studies made by Prof Rai on various aspects of mountain hydrology have not only helped in understanding the structure and function of the systems, but also in finding out means of how to make the system sustainable.

He has published more than 100 research papers in various impact factor/peer-reviewed journals and books (h-index-17). He has also authored 8 books to enrich the discipline. Since 2010, he is serving as Secretary General of National Association of Geographers, India (NAGI), the largest society of the Geographers in India. Prof Rai is elected as Vice-President of Asian Geographers Association, Beijing, P. R. China (2019-23).

VIRTUAL

INTERNATIONAL CONFERENCE

ON

CHALLENGES TO DISASTER RISK REDUCTION AND RESILIENT HABITAT

CENTRE FOR DISASTER MANAGEMENT STUDIES
SHAHEED BHAGAT SINGH COLLEGE
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INTERNATIONAL GEOGRAPHICAL UNION COMMISSION
ON HAZARD AND RISK

&

UNITED NATIONS OFFICE FOR DISASTER RISK REDUCTION

CORDIALLY INVITES ALL TO THE

PLENARY SESSION - I

ON THE THEME

CLIMATE EXTREMES AND BUILDING DISASTER RESILIENCE

APRIL 5, 2022 | 11:30 AM - 1:00 PM IST (GMT+5:30 HOURS)

SESSION CHAIR

Prof. V. P. Sati
Department of Geography
Mizoram University, India

Dr. Ronald Schumann
Department of Emergency
Management and Disaster Science
University of North Texas , USA

SPEAKERS

Dr. Mikio Ishiwatari
Graduate School of Frontier Sciences
The University of Tokyo

SESSION CO- CHAIR

Dr. Netranand Sahu
Department of Geography
University of Delhi, India

Mr. Amit Anand
Principal Consultant
Climate Resilience and Disaster Risk Reduction
Price Waterhouse Coopers

Meeting ID: 837 2088 8176 | Passcode: 034028

KNOWLEDGE PARTNERS

Prof. ANIL SARDANA
PRINCIPAL / PATRON

Prof. ANIL K. GUPTA
CONVENER

Prof. POONAM SHARMA
CONVENER

SPEAKERS: PLENARY SESSION I

DR MIKIO ISHIWATARI

Dr Mikio Ishiwatari is associated with Division of Environmental Studies, Department of International Studies, Disaster Management and Recovery, Tokyo. He graduated from Faculty of Science and Engineering (Waseda University), received MSc in Urban Engineering, from University of Tokyo.

In 2010, he received international studies doctorate from University of Tokyo. He served as Visiting Professor, University of Tokyo. His research activities and interest include policies and approaches of development assistance in disaster management, water resource management and climate change adaptation. He is associated with Japan Society of Civil Engineers, Member of Managing committee of scholar exchanging program, JSCE and Member of Technical Committee 21, Asian Civil Engineering Coordinating Council. His future plans include conducting research works on assistance approaches of disaster management. His research contributes immensely to resilient, inclusive and sustainable growth.

DR RONALD SCHUMAN

Dr Ronald Schumann is an assistant professor in the Department of Emergency Management and Disaster Science. He also worked as a research associate with the Hazards and Vulnerability Research Institute documenting housing reconstruction after Hurricane Katrina in Mississippi and Hurricane Sandy in New Jersey. He also has experience as a special programs coordinator and socio-cultural researcher with non-profit historical societies across the southeast and as a Geographic Information Systems (GIS) technician with the engineering firm AECOM. A human geographer by training, Dr Schumann's research interests include community recovery, social vulnerability, cultural memory, risk perception, and participatory GIS. His publications have appeared in a variety of scholarly journals, including *Risk Analysis*, *Weather, Climate and Society*, *Applied Geography*, and *Environmental Hazards*. His photo voice research exploring local knowledge on long-term recovery received a Doctoral Dissertation Research Improvement grant from the National Science Foundation. He has also received funding from the Natural Hazards Center for collaborative research on gathering places after Hurricane Harvey and an ongoing study examining conflicts between wildfire recovery and mitigation in northern California. Currently, Dr. Schumann is collaborating with an interdisciplinary team at the National Socio-Environmental Synthesis Center examining community recovery from destructive wildfires across the US.

MR AMIT ANAND

Mr. Amit Anand is presently working as Principal Consultant, Climate Resilience and Disaster Risk Reduction Price Waterhouse Coopers. He is member of professional associations like Indian Society of Remote Sensing, India and the Institution of Engineers, India. Mr Anand has vast experience of working in countries like the Netherlands, Kuwait, Lesotho, Papua New Guinea, India, Nigeria, Yemen and Lebanon. Research projects undertaken by him for Disaster Risk Reduction planning in Overijssel and Enschede, the Netherlands, Glacial Lake Outburst Flood Hazard Assessment in Uttarakhand, India. Multi-Hazard Risk and Vulnerability Assessment (HRVA) of the Cities of Shillong (Meghalaya) and Cuttack (Odisha), India. Preparation of Multi-hazard District Disaster Management Plan (DDMP) of four districts of Bihar state in India. Building A More Disaster and Climate Resilient Transport Sector, Component - A: Establishing a system of Hazard Risk Assessment in Papua New Guinea. Timor Leste natural hazards risk assessment in communities along Dilli, Ainaro and Linked Road Corridor and like many more projects have been completed under his supervision.

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PLENARY SESSION - II

Presented by Manchester University, UK

ON THE THEME

ROUND TABLE AND FILM SCREENING: URBANIZATION, DISASTER RISK REDUCTION & ADAPTIVE PATHWAYS

APRIL 5, 2022 | 4:30 PM - 6:00 PM IST (GMT+5:30 HOURS)

SPEAKERS

Dr. Christoph Woiwode
Indo-Germany Centre for Sustainability
IIT Madras & RWTH Aachen University

CHAIR

Dr. Joe Ravetz
Manchester Urban Institute
Leader Future-Wise Cities
Manchester University, UK

SPEAKERS

Dr. Loraine Kennedy
French Institute Pondicherry &
CNRS-EHESS, Paris

Prof. Sudhir Chella Rajan
Department of Humanities &
Social Sciences
IIT Madras, India

Dr. Ismu Rini Dwi Ari
Financial and Resource Affairs of
Engineering Faculty
Brawijaya University, Indonesia

Dr. Lakshmi Rajendran
The Bartlett School of Architecture
University College of London, IRIS, UK

Join At: https://zoom.us/my/synergistics | Meeting ID: 6381673776

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PRINCIPAL / PATRON

Prof. ANIL K. GUPTA
CONVENER

Prof. POONAM SHARMA
CONVENER

SPEAKERS: PLENARY SESSION II

DR CHRISTOPH WOIWODE

Christoph Woiwode, PhD (urban planner, anthropologist) is visiting faculty with the Indo-German Centre for Sustainability (IGCS) at IIT Madras and affiliated to RWTH Aachen University, Germany. Earlier academic roles include Senior Lecturer in Human Geography at Bath Spa University (UK) and lecturer at the International Spatial Planning Centre, TU Dortmund (Germany). He was also a planning advisor with the German International Development Agency (CIM/GIZ) in Sri Lanka. His research spans topics such as planning theories, urban governance, inequality/poverty and slum development, disaster risks and climate change.

MR JOE RAVETZ

Joe Ravetz is theme Leader for the Manchester Urban Institute on ‘Future-proof cities’ with foresight and innovation. He has worked on smart-wise cities, environment/climate policy and economic development, as Co-Director of the Collaboratory for Urban Resilience at the University of Manchester. From this he developed the Synergistics methods for working with ‘collective intelligence’ in technology, economic, urban and policy systems. His main publications include ‘City-Region 2020’, ‘Environment and City’, and ‘Deeper City: collective intelligence and the pathways from smart to wise’ (Routledge 2020). Joe has advised policy (UNIDO, UN-Habitat, DG Regio, EU Parliament & EU Commission, UK government & various agencies). He is also a Principal of London-based SAMI Consulting. Current projects include ‘global smart-wise cities’, urban / peri-urban climate resilience, local co-governance, and low carbon transitions. With experience as an architect and foresight/road-mapping practitioner, he also works as a visual thinker, systems designer and process facilitator in many countries.

DR LORAINE KENNEDY

Professor Loraine Kennedy is a CNRS Research Director at the Centre for South Asian Studies (CEIAS) at the École des Hautes Études en Sciences Sociales (EHESS) in Paris. Her research focuses on contemporary India and engages with three main areas: state spatial rescaling, the politics of urban development and metropolitan governance. Her work on urban India has increasingly been comparative (Brazil, China, Peru, South Africa), most notably in the EU FP7 project "Chance2Sustain". Recent publications include a monograph *The Politics of Economic Restructuring in India: economic governance and state spatial rescaling* (Routledge 2014), the coordination of a special issue of *Environment and Planning C: Politics and Space* (2017) on "State Restructuring and Emerging Patterns of Subnational Policy-Making and Governance in China and India", several book chapters, and two co-authored articles in *Territory, Politics, Governance* (2018, 2020) and one in *Cities* (2019). An edited volume is forthcoming: India's Greenfield Future. The Politics of Land, Planning and Infrastructure (Orient Blackswan, India).

Kennedy served as a member of the steering and hiring committee of the French Scientific Research Council (CNRS) for the section covering urban studies, architecture and human geography (2012-16). In 2015 she was invited to take part in the CNRS Task Force on Urban Research, a 19-member committee whose mission is to reflect on current trends and identify a strategic direction for future urban research.

She currently serves as Chief Editor of the online journal SAMAJ (South Asian Multi-disciplinary Academic Journal) and is a member of the editorial boards of the Journal of Urban Affairs and the Journal of Contemporary Asia.

PROF SUDHIR CHELLA RAJAN

Prof Sudhir Chella Rajan teaches at the Department of Humanities and Social Sciences at IIT Madras. He was formerly Head of the Department (2011-2014) and was Coordinator of the Indo-German Centre for Sustainability (2010 - 2016), where he is currently Area Coordinator for Land-Use. He obtained an inter-disciplinary doctorate in Environmental Science and Engineering from the University of California Los Angeles in 1994 and has worked in progressively senior positions in government, research consultancies, NGOs and academia. His interests are primarily at the interface of political theory and the environment; in particular, on the new challenges that enter politics within democratic societies in the face of composite social and environmental encounters. His Recent projects include, Water as Leverage, RVO, Netherlands, Climate Change Impacts on Coastal Infrastructure and the Adaptation Strategies, IGCS, Department of Science and Technology, Govt of India, 2018-2023, Indo-German Centre for Climate Change Adaptation and Resilience in peri-urban Chennai in the study area of Sriperumbudur: Sustainable Resources Management, Livelihoods and Governance, Global Technology Watch for a Sustainable Habitat and many more.

PROF. ISMU RINI DWI ARI

Prof. Ismu Rini Dwi Ari, is presently Vice Dean for General, Financial and Resource Affairs of Engineering Faculty, Brawijaya University. She is an Associate Professor in the Regional and Urban Planning Department, Engineering Faculty, Brawijaya University. She graduated from Brawijaya University (Undergraduate Degree), obtained Master's Degree from Institute of Technology Bandung, and received Doctoral Degree from Kyoto University. Her research interest is related to Urban and Infrastructure Planning, Community Development. She has been given many guest lectures in Indonesian universities as well as at Kyoto University (Urban Management Department) and Cornell University (SEAP Gatty Lecturer Series, 2017). She has been actively involved in international education collaboration with the Faculty of Engineering/Graduate School of Engineering, Kyoto University, and the Peri-cene Project, Manchester University.

DR LAKSHMI PRIYA RAJENDRAN

Dr Lakshmi Priya Rajendran is a social scientist with a background in architecture, urban design and planning. Her doctoral research (at Sheffield School of Architecture, University of Sheffield) focused on marginalized migrant communities in Sheffield, and examined the significance of socio-spatial dimension for inclusive urban planning and design. Dr Rajendran research won the International Best PhD Award 2015 from Society for Research on Identity Formation, US., her Post-PhD, research largely examines and explores socio-spatial relations and practices in the Global South for developing sustainable urban planning and design.

She has cross cutting expertise in Inclusive and Resilient city design, Health and Wellbeing and, Critical Social and Digital Media. Her past and current research advances theoretical and empirical work on how socio-spatial practices in city-making creates exclusionary landscapes of sustainable development in the Global South. This has allowed her to develop a wealth of research methods and interdisciplinary approaches for examining complex and pressing challenges affecting cities and city regions today.

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PLENARY SESSION - III

ON THE THEME

NATURE BASED SOLUTION, CRITICAL INFRASTRUCTURES AND DISASTER RESILIENCE

APRIL 6, 2022 | 10:00 AM - 11:30 AM IST (GMT+5:30 HOURS)

SESSION CHAIR

Prof. Anuradha Banerjee
Center for the Study of Regional Development
Jawaharlal Nehru University
New Delhi, India

SESSION CO- CHAIR

Dr. Suraj Kumar Singh
Suresh Gyan University
Jaipur, India

SPEAKERS

Dr. Genet Alem Gebregiorgis
International Planning Studies
Technical University Dortmund, Germany

Col. Sanjay Srivastava
Chairperson
Climate Resilient Observing Systems
Promotion Council

Prof. Chris S. Renschler
Director, Landscape-based
Environmental System Analysis &
Modeling (LESAM) Lab
University at Buffalo (SUNY), USA

Meeting ID: 837 2088 8176 | Passcode: 034028

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CONVENER

Prof. POONAM SHARMA
CONVENER

SPEAKERS: PLENARY SESSION III

DR. GENET ALEM GEBREGIORGIS

Dr Genet is an Academic Staff at Faculty of Spatial Planning at International Planning Studies, TU Dortmund. Dr Genet has vast working experience as architect planner, freelance researcher and consultant, and lecturer in both public and private sectors. She holds an MSc Degree in Urban and Regional Planning and Management, and Doctoral degree in spatial planning, both from the TU Dortmund, Dortmund. Dr Genet specializes in Urban resilient land governance, Risk and Critical Infrastructure management, Transformation and dynamics of built environment and urban spaces.

She has completed several research projects funded by DAAD (German Academic Exchange Service) and BMBF (The Federal Ministry of Education and Research). Dr Genet is a recipient of DAAD Prize for the Outstanding Achievement of a Foreign Student (2011), DAAD Scholarship Award for PhD Research in Ethiopia (2009), KAAD Scholarship Award for Masters Studies in Urban and Regional Planning and Management in Germany and Tanzania (2002), Addis Ababa Urban Development and Works Bureau, Award for outstanding professional input (2000), and ICAP (Instituto Cubano de Amistad con los Pueblos) Scholarship Award for Architecture study in Cuba (1989). Dr Genet has several research papers in reputed journals to her credit.

COL. SANJAY SRIVASTAVA

Col Sanjay Srivastava is a professional with 32 years of experience involved in extreme climate change and disaster risk management as a practitioner in Advisory, Research and Teaching role. He is also convener of 'Lightning Resilient India Campaign" and working with India Meteorological Department, Ministry of Earth Science and ISRO (NRSC), various State governments and agencies in technical intervention to adapt Climate Change issues in governance specially in agriculture, education and health sector with focus on comprehensive disaster, environment and climate risk management driving for the last one decade. Prior to this, he has a good exposure of corporate world in media and corporate sector. He is ex Colonel from Indian Army and have served in various strategic positions in Government/corporate at various levels with proven leadership skills. He is involved with the states in developmental initiatives with emphasis on Climate Change Adaptation to include policy advocacy, prevention, mitigation, response, rehabilitation and recovery network, Project management, planning and implementation of Work plan, budget/financial management, coordination with various stakeholders, process evaluation, monitoring, delivery, mobilizations of goods and services, capturing lessons and time bound accomplishments of desired goal by setting up priorities. He with his institution has made significant contributions including policy decisions in school safety, health care and social welfare schemes, various guidelines, SoPs, awareness and training programmes, IEC materials, and visible changes in the system towards disaster risk reduction among children , specially girl and rural children ,Water, sanitation, health education etc. He is innovative, IT savvy, dynamic with excellent communication skills, PR and media management.

PROF CHRIS S. RENSCHLER

Chris S. Renschler is Faculty at Department of Geography, University at Buffalo (SUNY). He is having PhD in Natural Sciences, from University of Bonn, Bonn, Germany. His educational competencies include achievement in GIS Award from Environmental Systems Research Institute (ESRI), OECD Co-operative Research Programme Fellow, U.S. Fulbright Scholar, "Geography Matters" Video Competition (Runner up) and many more.

His editorial positions include Editorial Board Member - Remote Sensing (Impact Factor 4.118) MDPI, Basel, Switzerland, Editor - Geomorphorum, AAG Geomorphology Specialty Group, On-line, Publication Committee Member - 3rd ACM SIGSPATIAL International Workshop on Analytics for Big Geospatial Data (BigSpatial - 2014), and many others also. His professional membership include AAG, SSSA, AGU,IAHS, ASCE, etc. He has organized various conferences and technical sessions also. He has supervised research and project work of students. He has a long list of publication in his account. He has presented his research in around 45 conferences, he also has been in public media coverage for his contribution in research work.

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PLENARY SESSION - IV

ON THE THEME

DISASTER EMERGENCY RESPONSE, TECHNOLOGICAL INNOVATIONS AND ADVANCEMENT IN DATA

APRIL 6, 2022 | 11:45 AM - 1:15 PM IST (GMT+5:30 HOURS)

SESSION CHAIR

Prof. A. R. Siddiqui
Department of Geography
Allahabad University, India

SESSION CO- CHAIR

Dr. Swati Thakur
Dyal Singh College
University of Delhi

SPEAKERS

Dr. Laura Siebeneck
Department of Emergency Management
and Disaster Science
University of North Texas , USA

Prof. Rajib Shaw
Graduate School of Media and Governance
Keio University, Japan

Dr. Ifte Ahmed
School of Architecture and Built Environment
University of New Castle, Australia

Meeting ID: 837 2088 8176 | Passcode: 034028

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CONVENER

Prof. POONAM SHARMA
CONVENER

SPEAKERS: PLENARY SESSION IV

DR LAURA SIEBENECK

Dr Siebeneck is an associate professor in the Department of Emergency Management and Disaster Science. A geographer by training, she has taught EADP courses such as Hazard Mitigation and Preparedness, Capstone in Emergency Management, Images of Disaster in Film and Media, International Disasters, and Introduction to Emergency Management. Her teaching and research interests include hazards, evacuation and return-entry processes, risk perception and risk communication, emergency management, Geographic Information Science (GIS) and spatial analysis.

Currently, she is working on projects examining geographic and temporal dimensions of risk perception, communication and household behavior during the evacuation and return-entry process. Additionally, as part of a multi-institutional research collaboration, she recently received funding from the National Science Foundation to examine issues pertaining to disaster return-entry, recovery, and resilience following Hurricane Sandy. She has research has been published in a variety of professional journals including Risk Analysis, Natural Hazards, Natural Hazards Review, International Journal of Mass Emergencies and Disasters, GeoJournal, and Journal of Emergency Management.

PROF RAJIB SHAW

Prof Rajib Shaw is a Japanese national of Indian origin, he is the professor in Graduate School of Media and Governance in Keio University's Shonan Fujisawa Campus (SFC). Earlier, he was the Executive Director of the Integrated Research on Disaster Risk (IRDR), a decade-long research program co-sponsored by the International Council for Science (ICSU), the International Social Science Council (ISSC), and the United Nations International Strategy for Disaster Reduction (UNISDR). He is also the Senior Fellow of Institute of Global Environmental Strategies (IGES) Japan, and the Chairperson of SEEDS Asia and CWS Japan, two Japanese NGOs. Previously, he served as a Professor in the Graduate School of Global Environmental Studies of Kyoto University. His expertise includes community-based disaster risk management, climate change adaptation, urban risk management, and disaster and environmental education.

Professor Shaw is the Chair of the United Nations Science Technology Advisory Group (STAG) for disaster risk reduction; and also the Co-chair of the Asia Science Technology Academic Advisory Group (ASTAAG). He is the editor of a book series on disaster risk reduction, published by Springer. Prof Shaw has published more than 45 books and over 300 academic papers and book chapters.

PROF IFTE AHMED

Prof Ifte ahmed is an Associate Professor at School of Architecture and Built Environment (Construction Management (Building) University of Newcastle. Prof Ahmed completed his Doctor of Philosophy, Oxford Brookes University, UK; Bachelor of Architecture (Honours), Indian Institute of Technology, Kharagpur and Master of Science (Architecture Studies), Massachusetts Institute of Technology, USA. Prof Ahmed's previous teaching assignments were at RMIT University School of Architecture and Design Australia and Bangladesh University of Engineering and Technology Department of Architecture Bangladesh. He has been working on the areas of Architecture for disaster relief, Building construction management and project planning, Community planning.

Prof Ahmed's work assignments include working for Asian Disaster Preparedness Center, Urban Disaster Risk Management, Thailand; United Nations Development Programme Disaster Management and Crisis Prevention Team Bangladesh; Gumbinger Associates, United States; and Peter Bartram, Germany.

Prof Ahmed has written 14 Books, 24 chapters, 37 reports and 52 journal articles, he has been part of numerous conferences, seminars and also supervised 3 thesis/dissertations.

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CHALLENGES TO DISASTER RISK REDUCTION AND RESILIENT HABITAT

APRIL 6, 2022 | 4:30 PM IST ONWARDS

CHIEF GUEST

Prof. Dilanthi Amaratunga
Head, Global Disaster Resilience Centre
School of Applied Sciences
University of Huddersfield, UK

KEYNOTE SPEAKER

Prof. Takashi Oguchi
Chair
Hazard and Risk Commission
International Geographical Union
The University of Tokyo, Japan

GUEST OF HONOUR

Mr. Sanjay Bhatia
Global Education and Training Institute
United Nations Office for Disaster Risk Reduction

Prof. Kaushal Sharma
Dean, Social Sciences
Jawaharlal Nehru University
New Delhi, India

Meeting ID: 837 2088 8176 | Passcode: 034028

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SPEAKERS: VALEDICTORY CEREMONY

PROF DILANTHI AMARATUNGA

Dilanthi Amaratunga is a Professor of Disaster Risk Reduction and Management, Department of Biological and Geographical Sciences, School of Applied Sciences, Global Disaster Resilience Centre, university of Huddersfield. She is a leading international expert in disaster resilience with an international reputation. She completed her PhD in 2001 and since joining University of Huddersfield in September 2014 as its Professor of Disaster Risk Reduction and Management, she leads the University's Global Disaster Resilience Centre, responsible for supporting research on disaster management portfolios.

She has produced over 500 publications, refereed papers and reports, and has made over 100 key note speeches in around 40 countries. She is an expert member, IOC-UNESCO (The Intergovernmental Oceanographic Commission of UNESCO), for ICG/IOTWMS (Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System) Working Group -1 on Tsunami Risk, Community Awareness & Preparedness. Prof Dilanthi is the winner of the prestigious Newton Prize (with colleagues) of 2019. In 2018, she received the "His Excellency the President of Sri Lanka Award" from President of Sri Lanka, for the contribution to Disaster Resilience in Sri Lanka. She is a Fellow of the Royal Institution of Chartered Surveyors (RICS); Fellow of the Royal Geographical Society, UK; Fellow of the Higher Education Academy, UK; Fellow/Chartered Manager of the Chartered Management Institute, UK.

PROF. TAKASHI OGUCHI

Dr Takashi Oguchi is the Director and a Professor at the Center for Spatial Information Science, the University of Tokyo, Japan. He received his Ph.D. in Geography from the University of Tokyo, and broadened his experience at the University of Arizona, Colorado State University, and the Centre for Ecology and Hydrology (UK). He was also an adjunct faculty of the University of Memphis. He has participated in research projects on fluvial/hill slope geomorphology, geo-morphometry, geo-archaeology, water quality, earthquake hazards, marine geology, land use and cover analysis, and spatial databases. He has conducted research in various foreign countries such as Bangladesh, China, Italy, Korea, the Philippines, Poland, Syria, Taiwan and the UK. He has authored and co-authored more than 100 peer reviewed articles and 30 book chapters. He has given several plenary/invited talks at international conferences on geography and geomorphology. He has been one of the editors-in-chief of the journal Geomorphology (Elsevier) since 2003, and on the editorial boards of several other international journals. He has also served as a reviewer for more than 30 ISI-listed international journals. He has been a steering committee member for several commissions/working groups of international academic societies such as the International Geographical Union and the International Association of Geo-morphologists.

MR. SANJAY BHATIA

Mr. Sanjaya Bhatia is Head, UNDRR Office for Northeast Asia and Global Education and Training Institute (GETI). Before taking this position, Mr. Bhatia worked as a head of the International Recovery Platform (IRP) – Secretariat at Kobe, Japan where he led the development of the Guidance Notes on Recovery and supervised a capacity building program for national and local governments, along with other knowledge management functions. He trained over 850 government officials in that period. Earlier as the Focal Point Disaster Resilient Schools and Hospitals with the Global Facility for Disaster Reduction and Recovery (GFDRR) of the World Bank he was instrumental in development of the "Guidance Notes on Safer School Construction" and the "Guidance Notes on Integrating DRR in Health Sector Projects" and financing of projects on safe schools and hospitals. He has worked with the Government of India, the World Bank, and the United Nations in the field of disaster risk reduction and climate change adaptation for over 26 years.

He has managed projects for mainstreaming of disaster risk reduction and CCA and ex-post recovery in India, Sri Lanka, Nepal, Haiti, Iran, Turkey, Lao PDR, Cambodia, China, Serbia, Indonesia, Vietnam, Pakistan, Honduras, Panama, El Salvador, Belarus, Ukraine, Algeria, Saudi Arabia, Ethiopia, Somalia, Georgia, Armenia, Mongolia and the Philippines. He was instrumental in the construction of 6,500 seismically safe primary school buildings. He holds a degree in law and a Master's Degree in Public Administration from New York University. He has authored a number of publications. He is a certified trainer for the Incident Command System (Emergency Management) and functioned as a trainer and resource person for the Government of India and the United Nations.

PROF. KAUSHAL KUMAR SHARMA

Dr Kaushal Kumar Sharma is a Professor at the Centre for the Study of Regional Development, Jawaharlal Nehru University, he is Dean of Social Sciences at Jawaharlal Nehru University and Director, Center of Excellence for Tribal Studies, JNU. Earlier he taught geography at Kirori Mal College from 1984 to 2016. He has also worked as Colombo Plan Teacher at Sherubtse College, Bhutan. He is a visiting Professor at Universities in Uttarakhand, Himachal Pradesh & Rajasthan, Community Development Advisor at the University of Himachal Pradesh and the University of Rajasthan. Prof Sharma is also affiliated with Global Research Centre, the University of Delhi as a fellow. He is also Secretary-General of All India Vice-Chancellors and Academician Association, Governing Body Member of School of Open Learning, University of Delhi. Member of Academic Council JRNR Vidyapeeth, Udaipur. He is also an Advisor to the Centre for Himalayan Studies, University of Delhi. Prof Sharma is a Member Evaluation Committee of Research Proposal at DST, UGC, ICSSR, and V.V. Giri National Labour Institute, Ministry of Labour. Prof Sharma has some extraordinary achievements to his credit as he very efficiently worked as Ex-Chief Proctor, JNU, Ex-Member Court - JNU, Ex-AC Member JNU and RGNIYD. He was also Honorary Director of Northern Regional Centre, ICSSR. Prof Sharma is deeply involved in Agricultural Transformation and Rural Development, women empowerment, Panchayati Raj Institution, Geo-hazards Earthquake & landslide, Floods Mapping (Micro-zonation) and database management for natural hazards. He is a national expert on training on CSR Policy and he successfully conducted more than 35 training programs on CSR at the Pan India level for DST (GIS & RS), NBCC, NTPC, Chartered Institute, Noida. He has written several books and has published many articles at the national and international levels. He also provides National and International Consultancy Services.

ABSTRACTS

Technical Session I

EXPOSURE AND SENSITIVITY TO CLIMATE CHANGE: A CASE STUDY OF BEAS RIVER BASIN, WESTERN HIMALAYA

Shekhar Kumar and K. Nageswara Rao

School of Sciences, Indira Gandhi National Open University

Email: kumarshekhar19@yahoo.co.in

Exposure is the presence of people, ecosystems, environmental services and resources, infrastructure, or economic, social, and cultural assets in places that could be adversely affected due to climate variability. Whereas, the degree to which a system or species is affected, either adversely or beneficially, due to climate variability or change is called climatic sensitivity. The exposure and sensitivity to climate change can be observed, measured, or assessed directly or indirectly in various forms. Recently, these concepts have attracted due attention from physical and social scientists. Studies have concluded that children, elders, disabled, women, ethnic minorities, and socially deprived communities are highly sensitive to climate change. The Himalayan Region is facing multiple challenges to endure and cope adverse effects of climate change from both a physical and societal perspective. Therefore, understanding and anticipating the impacts of climate change on Himalayan mountains and the services it provides to people is critical. In this study, we attempted to quantify the spatial heterogeneity in risk. we have taken biophysical, climatic, agricultural, economic, and demographic indicators. It was found that the upper Beas basin is relatively more exposed to climate change and associated hydro-meteorological hazards and therefore more sensitive to climate change than the lower basin.

Keywords: *Climate Change, Exposure, Sensitivity, Beas River Basin, Western Himalaya*

CLIMATE CHANGE INDUCED NATURAL DISASTER AND WOMEN SUSCEPTIBILITIES TO TRAFFICKING: A STUDY IN THE INDIAN SUNDARBANS REGION

Priyanka Biswas and Nilanjana Das Chatterjee

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In the 21st century, the world is facilitating enormous threats and challenges in all realms due to extremity in climate change situations. The relentless confrontation of extreme climatic events or natural disasters being resulting in large-scale resource depletions, biodiversity losses, pollution, socio-economic adversities which collectively diminishing the sustainable human development and exacerbate regional crisis.Such regional crises due to exposure to extreme climatic vagaries have highly been observed in the Indian Sundarbans for its strategic geographical location. The recurrent severe cyclones, monsoon, sea-level rise, and consequent natural hazardous situations like flood resulting in acute poverty, starvation, homelessness and escalated livelihood insecurities among the local inhabitants forced them to migrate as 'climate refugees'. The situations also resulting in breaking the social ties, make high-scale social disorganization and create 'space' for organized criminal activities in this region. The present study meticulously analyses that how far the severe cyclone '*Amphan'* in 2020 socio-economically and environmentally effects in the Indian Sundarbans and increase livelihood insecurities among the inhabitants and put the poor minor girls and young women at high risk of human trafficking. The adopted research methodology for this study incorporates in-depth direct interviews and Focus Group Discussions. The result reveals that the remote villages of Basanti, Gosaba, Kultali, Canning I & II, Namkhana, Kakdwip,Basirhat, Hingalgaunj, Habra blocks of Indian Sundarbans were significantly affected by the severe cyclone '*Amphan'*, result in extreme poverty, loss of livelihoods, economic disruptions are consequently emerge as the trafficking hot bed. This study also recommends further diversified approaches for disaster risk reduction and asking for taking resilience in order to strengthen the capacity building to break the trafficking rackets in the study area.

Keywords: *Climate Change; Trafficking; Vulnerabilities; Indian Sundarbans; Focus Group Discussions; Disaster Risk Management*

FRESH WEATHER FOR ALL

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The Sendai Framework for Disaster Risk Reduction encourages investment in innovation and technology development in disaster risk management. However, needs for science and technology inputs are unmet, and there is a lack of policy making that is based on science and evidence. This paper identified three key issues that could help overcome these barriers: networking, coproduction of knowledge, and a stronger role played by academia.

A number of innovative approaches and tools have been developed for disaster risk reduction (DRR); however, it has not yet been understood what the most effective DRR innovations are. A survey was conducted among representatives of academia, government, NGOs, and the private sector to identify the most effective DRR innovations. Community-based DRR and risk management received the most votes. Half of the top-10 list was taken up with innovative approaches, which shows that both products and approaches are widely recognized as innovations, and both contribute to the improvement of existing and traditional DRR as it tackles new challenges .To enhance the interfaces among science, technology, and policy making and the development and implementation of DRR innovations, the following is recommended: increasing coproduction with researchers and practitioners, continuing the sharing of innovation case studies, strengthening communication and dialogues among stakeholders using effective, national and local platforms, understanding that innovations are not limited to high-tech products but can be approaches as well, and pursuing research on the potential of Artificial intelligence (AI),

communication tools, and innovations related to climate disaster that can improve current strategies and capacities for DRR.

Keywords: *Sendai Framework Disaster Risk Reduction, Climate, Weather*

CLIMATE CHANGE AND VULNERABILITY

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Today, climate change is a severe threat for the world. Climate Change Vulnerability may be seen as the susceptibility of species, system or resource to the negative effects of climate change. The term Vulnerability is often used to describe the potential/adverse effect of climate change on ecosystems, infrastructure, economic sectors, social groups, communities and regions. This paper is primarily based on secondary sources. The main aim of the paper is to discuss the different types of vulnerability associated with climate change. It will also focus on the vulnerability aspects of different social groups in general and India in particular. This study will be beneficial for the officials of government organization, non-governmental organizations and policy makers to frame program and policy with respect to different geographical space and society.

Keywords: *Climate Change, Vulnerability, Exposure, Sensitivity and Adaptive Capacity*

MAINSTREAMING RESILIENCE THROUGH CLIMATE ACTION & DISASTER RISK REDUCTION INTO THE CONVENTIONAL DISASTER MANAGEMENT SYSTEMS

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India has witnessed many disasters in recent years, natural or climate change-induced, continuing to cause extensive devastation. As per the World Risk Index 2014, India is in the first half of all countries at risk from natural hazards and lacks the capacity to cope and adapt. Neglect of climate change impacts while formulating disaster management plans and policies seem to have severe repercussions. Further, delay and resistance to a paradigm shift from "response-based emergency management" towards "disaster risk reduction" adds to the failure to achieve disaster resilience. To holistically accomplish Climate and Disaster Resilience, a "proactive approach" of reducing disaster risks/impacts is imperative instead of a "relief-centric or reactive approach". This calls for an objective understanding of the contextual gaps, challenges and opportunities in the existing Disaster Management Systems (Plans/Policies/Programmes) at the state, district or local level in terms of inclusion or implementation of Disaster Risk Reduction and Climate Adaptation Mechanisms. Hence, this paper proposes derivation of a Qualitative Assessment Framework to analyze the existing type and extent of DRR and CCA provisions in the Disaster Management Systems of any state in the country; called as "Analysis Toolkit". The toolkit specifically explores the crucial dimensions of inducing or strengthening DRR and CCA following the existing structure of any Disaster Management Plan; thus, making itself handy and effective in application. The results of the assessment can be further used as standpoints to foster comprehensive Resilience in vivid geographies and multiple spatial scales through proposed interventions directly catering to the observed gaps.

Keywords: *DRR; Climate Action; Analysis Toolkit; Disaster Management; Resilience Building*

IMPACT OF TROPICAL VERY SEVERE CYCLONIC STORM "YAAS" OF 2021 IN MAYURABHANJ DISTRICT OF ODISHA

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Odisha , located on the eastern coast of India is one of the highly prone state to cyclonic storms .The cyclonic storms originating over the Bay of Bengal move in north northwest direction make land fall at Odisha coast. The frequency ,intensity, magnitude and duration of the cyclonic storms have increased manifolds due to the impact of climate change in the last two decades .Due to climate change induced rising in sea surface temperature ,the cyclones are becoming more frequent in pre-monsoon than post-monsoon season .In this paper an attempt has been made to study the impact of the most recent tropical very severe cyclonic storm Yaas in Mayurabhanj district of Odisha .The A low pressure area developed over the Bay of Bengal in the morning of 22nd May ,2021, intensified in to a very severe cyclonic storm in the evening of 25th May and moved in north north westwards. It made a land fall at Banaga Block of Balasore district with wind speed of 130-140kmph at 9.00 am of 26th May .The cyclonic storm passed over the district resulting heavy rainfall and high wind speed.The impacts are on the power transmission line ,telecommunication ,road communication ,kachha houses ,horticulture ,agriculture, pisciculture , forest , cottage and village industries and livestock. Due to adequate preventive measures taken by the state govt. and timely warning provided by the IMD ,the loss of life and hardship of the people could have been minimized .Huge loss of property affects adversely the socio-economy of the district. Due to its impact about 4.5 lakh people of the district were affected .Due to heavy rainfall all the flood water inundated large areas of the district resulting loss of crops.. Maximum damages in energy department followed by water resource department .The losses are due to lack of cyclone and flood resilient infracture.

Keywords: *Cyclonic Storm, Impact ,Preventive ,Cimate Change , Resilient*

ANNUAL, SEASONAL AND MONTHLY RAINFALL TREND ANALYSIS IN PUNJAB, INDIA

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Climate change is one of the major water stressors. Climate change can threaten the water availability through variation and alterations in the patterns of global precipitation and evaporation, changes in stream flow and longer drought durations, which can influence water supply and quality in various regions of the world. The present study attempts to analyse annual, seasonal and monthly mean rainfall trends in Punjab. To understand the patterns of annual, seasonal and monthly climatic data series, the trends were analysed by using Mann Kendall test and Sen's Slope Estimator test. Mann Kendall test is a non-parametric test used for detection of statistically significant trend, which is not necessarily linear, whereas, Sen's slope Estimator test is another non parametric test used to detect the slope of the trend. The study depicts a statistically significant decreasing trend in monsoon and annual rainfall, which can have serious implications on groundwater recharge and hydrological cycle of Punjab. Highly significant decreasing trends in the monthly mean rainfall was observed in the months of July, August and November. The southwestern part of Punjab shows decrease in rainfall in both monsoon and post-monsoon season, which can easily manifest into chronic water shortages. The trends raise serious concerns regarding the future of the agrarian economy of Punjab. Climate change can adversely impact soil fertility by decreasing soil moisture and increasing droughtness.

Keywords: *Mann Kendall test, Sen's Slope Estimator test, Variability, Precipitation, Trends*

CLIMATE CHANGE &TEMPERATURE TRENDS OF GUNTUR DISTRICT, ANDHRA PRADESH, INDIA

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Nature has witnessed a transformation in climatic conditions at an unprecedented rate in the past few decades as a result of the heightened anthropogenic activities like industrialization, urbanization, elevated density and size of the population, land cover/land-use change, use of fossil fuel combustion, emission of waste heat from automobiles and industries, buildings, excessive use of air conditioning, increasing levels of aerosols, construction activities like reservoirs, roads etc. the consequences of temporal and spatial analysis were portrayed in the form of tables. Data on three variables pertaining to temperature namely average annual minimum, average annual maximum, and average annual temperatures of 20 selected revenue mandals of the district were collected from the records of the Indian Meteorological Department (IMD) for the period between 1988 and 2017. Tables were developed to estimate the spatial alterations of temperature in the district. Using values of monthly temperature, various analyses were conducted on an annual and decadal basis. The current research intended at evaluating the spatial and temporal variations in the temperature of Guntur District, Andhra Pradesh, India, during the period 1988-2017. The study indicates rising trends in maximum and mean temperatures and declining trends in minimum temperatures, thus showing increasing trends in the diurnal temperature range.

Keywords: *Temporal Variations; Linear Average; Moving Average; Temperature Trends, Land Cover/Land-Use Change*

LAND USE AND LAND COVER CHANGE DETECTION, A CASE STUDY OF SUPER CYCLONE (1999) AND TITLI CYCLONE OF BHADRAK DISTRICT, ODISHA, INDIA USING GEOSPATIAL TECHNIQUES.

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Land cover alludes to the physical characteristics of earth's surface, captured in the distribution of vegetation, water, soil and other physical features. Land use refers to the way in which land has been used by humans and their habitats enrollment in development processes (such as agriculture, settlements, industry etc.). Land use and land cover change has become a central component in current strategies for managing natural resources and monitoring environmental changes. Landsat 7 ETM+ data of the month January (before cyclone) and October (after cyclone) for Super cyclone 1999 and Sentinel 2A optical real time satellite data of the month January (before cyclone) and October (after cyclone) has been use for the cyclone Titli 2018. Maximum Likelihood classifier is used in the supervised classification method in this particular study. Stratified Random Sampling Method has been use to create signature file. The study area has been divided into 6 LULC classes namely river and water body, vegetation and mangrove, cultivation, built-up, aquaculture and barren land. Kappa coefficient method has been used to make accuracy assessment and the change shows temporary variation of LULC before and after the cyclone hazard. The overall accuracy and Kappa coefficient of the January 1999 before cyclone LULC is 87.5% and 85% respectively. In the case of January 2018 before cyclone LULC, the overall accuracy and Kappa coefficient is 89% and 86% respectively. The above mentioned results indicate that there is significant difference in the pre-monsoon season and post-monsoon season.

Keywords: *Cyclone Hazard, LULC Change detection (Before and after cyclone), Supervised Classification, kappa Coefficient Statistical Analysis*

NEED FOR FOCUS ON INDIA'S ADAPTATION AGENDA

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India, with its multidimensional poverty, is one of the most vulnerable countries to climate change in the world. ND Gain Index 2020 ranks India 127th out of 182 countries in terms of vulnerability to climate change. As per the Global Climate Risk Index, India ranked 7th on the list of top 10 most affected countries due to climate change (2019) and lost nearly US$37 billion (2018) due to climate impacts. Climate risks are not only capable of reducing the development and progress made by India but can also reverse this progress if timely action is not taken. In a world struggling to keep the 1.5^{0}C target alive, climate extremes are set to intensify globally. India is likely to face increase in extreme events, increase in temperatures, higher variability in rainfall patterns and likely increase in rainfall intensity leading to increasing risks from floods, droughts and heat waves. Sea level rise and sea surface temperature warming in India are also higher than the global average and are set to intensify in future leading to increasing risks of coastal inundation, cyclones and saline ingress. Since more than 40% of Indian population is dependent on agriculture and even more are directly or indirectly dependent on natural resources for nature-based livelihoods or sustenance, these climate extremes can lead to multifold vulnerability for the Indian populace, thus highlighting the need to focus on adaptation to enhance India's resilience in future.

This paper would present a comparative overview of the State Climate Action Plans of various Indian states to identify emerging or existing trends and focus sectors for adaptation. The paper would also assess the focus of SAPCCs on gender issues, vulnerable communities, spatial planning, ecosystems and interlinkages between sectors. Cities are likely to be the key emitters and most impacted settlements due to climate change. Strategic focus on urban areas and community empowerment in decision making would also be assessed across SAPCCs. This assessment would also look at the states where the climate change strategy promotes a green pathway for recovery.

Keywords: *Climate adaptation, India, SAPCC (State Action Plan for Climate Change).*

Technical Session II

IMPACT OF SMART CITY INITIATIVES ON DISASTER RISK REDUCTION OF THE CITY THROUGH SPATIAL PLANNING PERSPECTIVE - A CASE OF PUNE CITY

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Cities are attracting populations at alarming rate. Cities provide for the need of populations in every way from livelihoods to livability. In doing so it is also exhausting its resources resulting in increasing threats of risk. An initiative like Smart City Mission is trying to enhance the capacities of the cities which ideally should result in increased livability and quality of life for its populations and decrease in threats of risk. This paper examines the impact of smart city initiatives through spatial planning perspective on disaster risk reduction, in smart city of Pune, in state of Maharashtra through series of structured interviews with key stakeholders. The findings suggest that smart city initiative is still in its primary stage and requires assimilation with the development strategy of the city to contribute to the risk reduction of the city in natural disasters. The study further proposes the need to integrate the smart city initiative with all the current and future investments.

Keywords*: Smart cities, Urban Resilience, Disaster Risk Reduction, Spatial Planning, Urban Risks*

FRAMEWORK TO MAINSTREAM DISASTER RESILIENCE INTO THE DEVELOPMENT PROCESS: CASE OF KOLLAM MUNICIPAL CORPORATION, KERALA

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In India, the Disaster Management Act, 2005 lays an institutional and coordination system for effective disaster management at the national, state, district and local levels. This top down approach is a response-based emergency management technique that ignores the fact that risk is ingrained in development processes. Without the active engagement of the local people who are affected by natural disasters, the government cannot and will not be able to manage and control all types of disasters with its machinery.

As a result, many academics and stakeholders believe that it is high time to execute a new strategy that will directly involve vulnerable people in the development and execution of mitigation, readiness, response, and recovery measures. This paper aims to address natural hazard risks in hazard-prone areas by providing a missing bottom-up approach in the medium-term strategic frameworks and institutional structures, development strategies and policies. The case of Kollam Municipal Corporation has been selected for the study as it has been affected by multiple disasters over last two decades and does not have any institutional framework and strategies in place at city level.

Keywords*: Vulnerability, Disaster Risk Reduction, Disaster Resilience, Community-Based Disaster Management*

MAINSTREAMING DISASTER RESILIENCE WITHIN THE NATIONAL MISSIONS FOR COASTAL CITIES: CASE OF SURAT

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India's coastal regions have become increasingly vulnerable to climate-related risks in recent years. The recent severe floods, combined with more intense and frequent cyclones such as Gulab, Tauktae, and Amphan, have caused damage on the country's coastal states. While effective disaster preparedness in many of these states has saved many lives, there are still significant challenges in rebuilding damaged infrastructure and resuming normalcy after disruptions. it became clear that government schemes are extremely relevant in the current development context, and they are developed for the upliftment of the people socially, economically, and physically. However, the risk of disaster is increasing at a very rapid pace, and there is still a lack of integration between development plans and important National missions, which are very isolated in terms of their scope of work. According to the research, insufficient capacity, particularly at the cutting-edge level, insufficient integrated planning and coordination, insufficient awareness among stakeholders, and a lack of technology in the regime must be addressed as soon as possible. Cities can only be smart if they are disaster resilient. Smart City guidelines include land use planning, building codes, and the urban heat effect in designated areas. It is now necessary for city disaster management plans (CDMP) to include a component of urban disaster risk reduction and climate change This paper examines the vulnerability of City's coastal infrastructure and Impact of climate change on it, the barriers to building Disaster-resilient infrastructure, and a variety of decision-making strategies to promote Disaster-resilient development. Level entry points are suggested

Keywords*: Cyclones, Flood, Climate Change, Disaster, Resilience, Development, Infrastructure*

SUSTAINABLE URBAN PLANNING – A RESILIENT APPROACH TOWARDS FUTURE

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Urban areas are tightly woven into the global risk landscape by unprecedented rates of growth housing more than half of the world's population. It is estimated that by 2050, seventy percent of the global population will reside in urban areas. It is this sheer number coupled with speedy unplanned development that makes urban areas bloated zones of vulnerability presenting crises of sustainability, resilience, security, stability and adaptation. All these has given rise to a potpourri of manmade disasters superimposed over the natural disasters such as floods, earthquakes, etc. already afflicted by climate change and environmental degradation.

It is noteworthy that the urban built environment is the most notable and conspicuous man-made creation over an urban landscape that is most impacted by this urban instability. This paper has thus highlighted the prime driving forces that are key to a sustainable built environment that will ensure designs certifying disaster preparedness. It would be pertinent to mention that since, majority of urban centres are geographically located near coastal zones, building design holds the key to disaster planning and resilience. Another issue that plagues our urban areas is the 'heat island effect', a menacing outcome of concretisation of our cities generating excessive heat capable of creating its own micro-climate ultimately resulting in global warming. In order to tackle this, there is a need to focus upon resilient measures such as green building design, energy efficient design, etc. in a hyper-urbanised context. In addition, the paper has also focussed upon smart techniques such as building renovation and material substitution through the 2M Model. Thus by suggesting such smart solutions in the context of the urban built environment, the paper would amply contribute to building a robust approach towards disaster preparedness and urban resilience.

Keywords: *Urban Planning, Sustainability, Resilience, Disaster Preparedness, Building Design*

DISASTER, URBANISATION AND RESILENT INFRASTRUCTURE

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Disaster mitigation is a policy issues concerned with minimizing and preventing the damaging impact of a natural or manmade hazard. It's becoming important to identify the vulnerabilities of communities and potential exposure to disasters. In this context, countries' have been planning and implementing resilience infrastructure to reduce negative impacts of disasters, including integrating DRM in their national planning frameworks. Mitigating risks call for developing both structural and nonstructural measures, urban risk assessments aim to identify critical infrastructure and develop early warning systems. This paper highlights how spatial planning and creation of formal land and housing markets leads to urban resilience by limiting unplanned development. Paper also focuses on how cities can revisit urban design and ensures enforcement of building codes and land-use plans to minimize or prevent further building in risk-prone areas and to reinforce structures so that they are resilient to various hazards. Paper also dwells on importance of building finances to respond post disaster as advance financing plan includes reserves, calamity funds, budget contingencies, a contingent debt facility and risk transfer mechanisms including insurance, reinsurance and parametric insurance is important, alternative risk transfer instruments include catastrophe bonds as on account of rising population density in urban areas, government's need to plan more resilient cities and policy makers need to plan holistically to deal with any situation.

Keywords: *Disaster, Resilience, Urbanization, Infrastructure*

GREEN INFRASTRUCTURE AND NATURE BASED SOLUTIONS APPROACH IN JAIPUR SMART CITY

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The European Commission Communication on Green Infrastructure describes it as a tool for providing ecological, economic and social benefits through nature-based solutions, for helping to understand the advantages nature offers human society, and for mobilising investments that sustain and enhance these benefits. In other words, it's a network of nature, semi-natural areas and green space that delivers ecosystem services, which underpin human well-being and quality of life. Green infrastructure can provide multiple functions and benefits on the same spatial area. These functions can be environmental (e.g. conserving biodiversity or adapting to climate change), social (e.g. providing water drainage or green space), and economic (e.g. supplying jobs and raising property prices). The contrast with grey infrastructure solutions, which typically fulfil single functions such as drainage or transport, makes green infrastructure appealing because it has the potential to tackle several problems simultaneously. Traditional grey infrastructure is still needed, but can often be reinforced with nature-based solutions. Research shows that green infrastructure solutions are less expensive than grey infrastructure, and provide a wide array of co-benefits for local economies, social fabric and the broader environment. Nature-based solutions are increasingly being implemented in urban areas to enhance resilience, support sustainable development, and safeguard biodiversity. The 2030 Agenda includes a dedicated goal on human settlements (SDG 11) that sets out to make cities inclusive, safe, resilient and sustainable. By endorsing a stand-alone goal on cities (Goal 11), known as the 'urban SDG', the international community recognized urbanization and city growth as a transformative force for development. Jaipur is capital city of Rajasthan is changing towards nature based solutions by adopting nature friendly initiatives and focusing on the people's awareness about sustainable environment.

Keywords: *Green Infrastructure, Nature Based Solutions, Urban Sustainable Development*

MONITORING URBAN GREEN INFRASTRUCTURE CHANGE IN A RAPIDLY DEVELOPING METROPOLITAN CITY OF NORTHERN INDIA, IN THE WAKE OF A DRASTIC SURGE IN THE NUMBER OF DISASTERS

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Understanding the spatio-temporal distribution, time-series change analysis, and development of green infrastructure in an urban environment is a critical element in disaster risk management. The process of urbanization needs a large number of buildings and industrial areas to meet the requirement of people. Vegetation cover areas are replaced with impervious constructions dramatically due to the rapid urbanization in conjunction with mega developmental projects and industrialization. The regularity of urban disasters is increasing due to a drop in vegetation cover and an increase in impervious land which negatively affect the quality of life of people who are living there. In this study, a timeseries change analysis of vegetation in Dehradun, India is performed using Landsat data to identify how urbanization and development activities affected this metropolitan city. Normalized Difference Vegetation Index (NDVI) is used to derive vegetation present in the study area from 2013 to 2022 in a time interval of 3 years. Vegetated and other land cover classes are classified from derived NDVI images and change detection is done for identifying the change in vegetation cover for each time interval. Using the result, the area undergone change is calculated by multiplying the number of pixels showing the change by the size of the pixels, and maps are generated for portraying changed areas. This study emphasizes the significant role of monitoring vegetation cover dynamics of the urban area and this can be used for the recovery activities that need to be done where the areas show significant changes.

Keywords: *Normalized Difference Vegetation Index, Change detection, Landsat, Urbanization, Urban Disaster, Time series analysis*

DISASTER RESILIENT TRANSPORT AND DISASTER RISK PREPAREDNESS OF DELHI METRO DURING FIRE HAZARD: A CASE STUDY OF CENTRAL SECRETARIAT METRO STATION, NEW DELHI

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Urban centers all over the world are known for their effective transport network that supports a huge population, stimulating the ease of movement of people and services. Such transport networks have successfully connected many parts of the city to one another. Delhi is one of the fastest growing urban centers in India, with a huge population base, and offering sustainable infrastructure i.e., transport in the form of transit system. The emergence of one of the world's most extensive Urban Rapid Transit Systems, in the form of the Delhi Metro is a classic example to this. With innumerable daily footfall in Delhi Metro, the chances of a potential disaster are more than an actual disaster itself. Human security is a major concern and the vulnerability of metro to a hazard cannot be ignored. A fire outbreak is one such disaster where its sudden outbreak might prove to be fatal and damage property permanently if not controlled in time. It can become more threatening at heavily crowded areas like the interchange metro station of Central Secretariat lying on the yellow line and connecting it with the Violet line. The study aims to bring out the state of fire management and control at metro stations along with an insight on the levels of awareness and communication highlighting how well are the masses able to decipher the guidelines issued by the DMRC, ensuring their security. The study is based on both primary and secondary data sources collected from various sources using stratified purposive sampling and aided by social media platforms like online survey. The result shows wide spatial disparities in the awareness level and lack of effective communication between the masses and the DMRC regarding the management and control of fire hazards. The paper proposes some innovative suggestions like installation of big screens, issuing disaster management alerts at frequent intervals, display of a 3-D evacuation plan models, a dedicated fire management team, regular mock drills and conduct of workshops, etc. The finding suggests that real-time decision making can minimize human losses by building a

mutual trust between DMRC and their riders, thus ensuring human sustainability and maintaining human security.

Keywords: *Disaster Risk, Fire Hazard, Resilient Transport, Metro Station, Preparedness*

RISK ASSESSMENT OF BUILT-UP AREA IN ITANAGAR, ARUNCAHL PRADESH

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The Itanagar township is growing at a faster rate compare to other towns of the state. But the growth has also brought in the problem of unplanned built-up area around the town. Growth of buildings in the town has been unplanned, uncontrolled and random. Many houses are being randomly built on steep slopes in a haphazard manner. Moreover, houses are being constructed by encroaching bank of river and small streams. Building houses by encroachment on river bank and rivulets obstructing the natural flow of water and built-up on steep slopes are potential hazards and an invitation to disaster in the event of natural calamities. The present paper is an attempt to illustrate the risk assessment for unplanned built up in Itanagar which is predominantly a hilly area. The method includes creating land use land cover (LULC) map and a slope map using USGS Landsat 8 image and SRTM DEM respectively. The superimposition of these two layers can be analysed to identify potential vulnerable built-up area which need to be again verified by field visit.

Keywords: *Risk, Built-up Area, Remote Sensing,Slope, LULC*

Technical Session III

CONCEPTUALIZING EMERGENCY PREPAREDNESS AND RESPONSE SYSTEM IN TIER-II CITY OF MAHARASHTRA

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The latest public health emergency caused by the recent pandemic of COVID-19, has taken multifaceted and unforeseeable toll on cities around the world. Urban Local Bodies (ULBs) are at the forefront while dealing with the pandemic and implementing innovative practices. This recent crisis has highlighted the importance of emergency preparedness and disaster management at local level. Urban Local bodies can deal more effectively with large- scale emergencies by planning and preparing for emergencies before they happen. Emergency preparedness and response system at city level is prerequisite in order to mitigate risks and vulnerability. To tackle any emergency and to reduce its impact it is necessary to have access to real time information and requires coordination between multiple agencies and departments. Despite the many challenges tackled by the ULBs during the pandemic, availability of existing infrastructure and digital technologies with tier I cities have made them better equipped to tackle the spread of the virus. On the other hand, COVID-19 has revealed the high-level vulnerability of smaller cities (tier II and III) to disasters. Present study aims at developing emergency response system for Khopoli City (Tier-II) in Raigad district of Maharashtra with community participation. The study focusses on mapping of municipal infrastructure available in the city so as to create spatial database of municipal services impacted by disasters. Understanding that when faced with disasters, availability of information and services at fingertips is crucial, this study has also developed and tested real time dashboard depicting various sectors of municipal infrastructure and services along participation of administration, NGOs, political representative, youth clubs and citizens.

Keywords: *Emergency Preparedness, Response System, Disaster Management, Tier-II Cities, Maharashtra*

SPATIO-TEMPORAL DYNAMICS OF URBAN GREEN SPACE: A CASE STUDY OF DELHI

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Green space in cities is crucial for beautifying the environment, boosting inhabitants' quality of life, and supporting long-term urban growth. The spatial organisation and arrangement of urban green space have changed dramatically as a result of rapid urbanisation. Through studies on the evolution of urban green space, it is critical to provide a sustainable development plan for green space. Using the Landsat thematic mapper (TM) and OLI/TIRS remote sensing image data from 1991 to 2021, and based on land use data from remote sensing interpretation, this study used a combination of mathematical statistics and GIS spatial analysis methods to analyse and assess the changing scale and spatial layout of the urban green spaces in Delhi NCT. This research will shed light on the nature of transition on both a geographical and temporal scale. This will also reveal the underlying reasons for such changes at different levels. At the planning and management level, as well as community engagement and sophisticated technology utilisation, an attempt will be made to explore different concerns and potential solutions. If anticipated and expected at the time of planning and policy making, the premises of this essay will contribute to the discussions on green space management in a better manner.

Keywords: *Urban Green Space, Spatio-Temporal, Evolution, GIS.*

URBAN CRIME MAPPING AND ANALYSIS

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In recent decades, combining a geographic approach with an interest in criminal justice has grown dramatically as crime cannot be separated from the society and can be studied geographically as part of human geography. Crime analysis is a helpful tool for estimating future crime patterns and identifying enforcement priorities. Premises of the research will revolve around two general issues, which will serve as the foundation for the research which are as follows: (1) Improving the data infrastructure available to researchers studying recent crime pattern; and (2) Clarifying and expanding the scope of empirical analysis aimed at describing and explaining recent crime trends with other physical and social factors. The present study focusses on different attempts which has been made to map the crimes and their type through different techniques such as analysing the Hotspot, Heatmap and Crime Corridor calculated through density estimation, which will help in understanding the changing pattern of crime through GIS and Machine learning techniques. The study interlinks environmental or background elements that influence criminal conduct which include location, time, laws, offender and victim are correlated to one another, other than that the influence of urban built environment has a substantial impact on urban criminal behaviour. The spatial distribution of crime has been explained by different geographical theories; however, the development of a strong parallel that has existed in science for decades has established a link between human geography and criminology, similar to how criminology was predominantly put in the focus of sociology due to a series of paradigm shifts.

Keywords: *Crime analysis, Hotspot, Heatmap, Crime Corridor, GIS and Machine learning techniques*

SPATIAL TEMPORAL ANALYSIS OF LAND SURFACE TEMPERATURE; A CASE STUDY OF AHMEDABAD CITY

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The heat island i.e. Surface heat island (SHI) refers to the relative heat of the surface of urban objects. The urban canopy layer (UCL) and urban boundary layer (UBL) forms a hotter air roof over the Urban landscape. Due to urbanization, natural surfaces are constantly replaced by buildings and other urban objects, which is the main cause of the formation of Urban Heat Island (UHI). Built surfaces consist of a large percentage of non-reflective and waterproof building materials. Therefore, they tend to absorb a large proportion of the incoming radiation, which is released in the form of heat. Geospatial technology offers the greatest potential in estimating regional and urban temperature. The main cause of UHI is urbanization that results in mean temperature levels. During summers UHI effect is high especially in temperate areas and in winters UHI effect is low and may yield positive effects such as reduced energy use, helpful biological activity, and reduced length of snow cover. The present research is based on the analysis of the Satellite images - Landsat 5 and Landsat 8 Thermal Satellite images. The land surface temperature (LST), Albedo, Emissivity, Normalized Difference Vegetation Index (NDVI) has been calculated to infer about the land surface Temperature. The PM10 and PM2.5 data from the Ahmedabad Municipal Corporation along with location of the weather station were used for the regression analysis. Based on the regression analysis, area with high LST were identified and mitigation measurements suggested.

Keywords: *Geo-spatial Technology, Land Surface Temperature, Thermal Islands, High Temperature Zones, Urban Morphology*

TRACING DISASTER PREPAREDNESS AT MICRO-LEVEL IN INDIA: AN EMPIRICAL STUDY OF BOATMEN AT MAGH MELA IN ALLAHABAD

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A serious disruption, occurring over a relatively petite time, of the functioning of a society or a community involving extensive human, material, economic or environmental loss and impacts, which surpasses the ability of the affected society or community to cope using its resources is known as a disaster. Mass gathering events with the huge influx of visitors always remain vulnerable to disasters and, disaster preparedness becomes a matter of great significance when it comes to organisation of such events. Allahabad, an important city in the Indian state of Uttar Pradesh, culturally known as Prayag, is eulogised in Puranic mythic as the "tirtharaj", situated at the confluence of the rivers Ganga, Yamuna and invisible Saraswati. Every year pilgrims and devotees to Hinduism and its various sects come by hundreds of thousands to the religious bath-fair at river banks of Ganges and Yamuna, called Magh Mela.With the congregation of millions of visitors and devotees, there arises the opportunity for various economic actors. Boatmen at the river banks of Yamuna near Kila Ghat are an integral part of this riverside economy. This paper attempts to showcase that unpreparedness of the boatmen and suggest possible solutions for preparedness, in case of any mishap or disaster, while sailing pilgrims and visitors to the Sangam from river banks of Ganga and Yamuna.This paper relies on primary data mainly, collected through non-participatory observation, focus group discussions and unstructured interviews with individuals. It also uses secondary data and literature available on this topic with the inductive methodology to achieve the objectives of the study.

Keywords: *Disaster Management, Pilgrimage Tourism, Sangam, Disaster Preparedness, Boatmen (Mallah), Mass gathering*

THE STUDY OF LAND USE CHANGE AND ITS IMPACT ON LAND SURFACE TEMPERATURE IN KANPUR CITY USING LANDSAT DATA

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The rapid increase in infrastructural development in populated areas has had numerous adverse impacts. The rise in land surface temperature (LST) and its associated damage to urban ecological systems result from urban development. Understanding the trends of LST phenomenon and its relationship to landscape composition and land use/cover (LUC) changes is critical to developing policies to mitigate the disastrous impacts of urban heat islands (UHIs) on urban ecosystems. Remotely sensed thermal infrared (TIR) data have been widely used to retrieve land surface temperature (LST). In the present study an attempt is made to study the impact of Land use/Land cover change in Kanpur City between 1996 and 2018 on its Land surface temperature using Landsat 5 TM data for the years 1996 and 2008 and Landsat 8 Data for 2018. In all six scenes dated 1st June, 1996; 24th Nov, 1996; 18th June,2008; 25th Nov, 2008; 4th June, 2018 and 26 Nov, 2018 Path 144 and row 42 have used. NDVI and NDBI have been derived to differentiate the built-up area from vegetation cover. In all six land use classes viz. built-up, barren land, fallow land, cropland, plantation and water bodies have been demarcated. Land surface emissivity were also evaluated which shows variation in different land cover surfaces like crop land, built-up, plantation and water bodies. The end results show that the LST derived from the satellite data showed a variation of ±3^{o}C from the actual data obtained.

Keywords: *Built-up Land, Landsat, Plantation, Temperature, Urban Heat Island*

ASSESSMENT OF LANDSLIDE SOCIAL VULNERABILITY IN THE DARJEELING DISTRICT USING MCDA BASED GIS TECHNIQUES

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The consequences or the result of impact to society or nature by any disaster or hazard is considered as vulnerability. In terms of landslide hazards, it causes a huge number of losses to society such as the death of people damages to property as well as damages to nature also. Social vulnerability is measured with different scales depending on the occurrences area. In this study, the social vulnerability was conducted to identify the socially vulnerable zones such as people and property. The study was conducted in the Darjeeling district, West Bengal ($26^0$27" N to $27^0$13" N latitudes and $87^0$59" E to $88^0$53" E longitudes). the main objective of this study is to find out the area under vulnerable zones. With the help of GIS platform and Data available from DDMA handbook and Census 2011, the social vulnerable map was created. In this study, Analytic Hierarchy Process (AHP) (Saaty 1980) was applied to determine the weighted values of each factor i.e., Population Distribution, Literacy Rate, Non-working population, etc. to create social vulnerability map all the parameters were put into Arc GIS based on each parameter's weighted values. The sum of the result was showing 26% area comes under high vulnerable zones and 4% were in Very High Vulnerable zones. The southern part of the district comes under high to very high vulnerable zones due to the high population density and also high Settlement density.

Keywords: *Social Vulnerable, Landslide, GIS, Remote sensing, Hazard, MCDA, AHP Model, Impact Assessment, Vulnerable Zones*

A GEO – SPATIAL STUDY OF URBAN HEAT ISLAND PHENOMENON IN LUCKNOW DISTRICT

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The history of man itself reveals the history of urbanization. As the human population increased, so did the number of urban areas, today about half of the global population have been urban dwellers. Urbanization has introduced so many changes in the urban landscape with reduction in natural vegetation, replacement of soil cover by concrete surfaces, introduction of anthropogenic heat sources. In the urban areas these artificial alterations govern a different localized climate which is warmer than surrounding rural areas is known as 'Urban Heat Island'. UHI is one of the most familiar influences caused by land use / land cover change due to urbanization. Lucknow being capital city one of the most populated states of India is facing high population pressure and experiencing rapid urbanization that has resulted in remarkable urban island effect. In this study Landsat TM, & ETM+ image from 2000 to 2020 in the Lucknow were selected to retrieve the land surface temperature (LST) and land use land cover types. Study showed that higher temperature in the UHI was located with certain pattern, which was related to certain land cover types. Normalized Difference Vegetation Index (NDVI), Normalized Difference Water Index (NDWI), Normalized Difference Bareness Index (NDBaI), Normalized Difference Built up Index (NDBI) indices are computed to analyzed the relationship between UHI and land cover changes. There was negative correlation found between NDVI, NDWI, NDBaI and temperature, to achieve the Sustainable Development Goal no. 11 which is Sustainable cities & communities we must focuses and adopt the mitigation strategy to combat UHI.

Keywords: Urbanization, Land Use Land Cover, Urban Heat Island, NDVI, Sustainable Development, Land Surface Temperature

VALUING THE BENEFIT OF URBAN WETLAND: A CASE STUDY OF BASAI WETLAND, GURUGRAM

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The main research of this research papers is based on the value of the Basai wetland as well as to know the hedonic pricing of the Basai Village in Gurgaon (Haryana). According to Ramsar Convention on Wetland define wetlands as: "areas of marsh, fen, peatland or water, whether natural and artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water with depth of which at low tide does not exceed six meters". The present study was carried out in the economic condition about the surrounding area of the wetland. The methodology used in this research paper is taken both primary data as well as secondary data. Field visit and collection of field data by questionnaire and interview in Basai Wetland in Gurgaon. The analysis showed that an increase of 1 meter further away from the Basai wetland decreased the total house price by Rs 645 which could be considered as a high impact. This wetland is famous for migratory birds.

Keywords: *Hedonic Pricing, Basai Wetland, Ramsar, Gurgaon*

Technical Session IV

HOW FLOODING AFFECTS COVID-19 SPREAD. CASE OF BALIKPAPAN CITY, INDONESIA

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Developing countries face many disasters management issues, including a biological disaster (COVID-19) caused by ineffective management and inadequate health services. In addition, several research show that this Covid-19 pandemic getting worst by combination of climate-hazards disaster like flooding currently. For this regard, case study in this research was conducted in Balikpapan City, Indonesia, as part of the supporting area of the New Capital City, where people have been suffering urban floods after normal rainfall. The study included mixed techniques, including in-depth interviews, field observation, and document analysis, to investigate the drivers of flooding and covid-19, as well as to describe how local communities adapt to it. This research identifies the network between flood and covid-19, then explains how flooding affects Covid-19 spread in local community. This paper also explores the drivers of this flooding and its impacts for local communities. The study found strong relationship between flood and COVID-19 spread in this city. Further, the study also reveals a mismatch between limited authority and transboundary problems of disaster management and calls for an integrated urban stormwater and urban health facilities management approach.

Keywords: *Covid-19, Drivers, Integrated Urban Stormwater, Urban Flooding, Urban Health Facilities Management Approach*

A SPATIO-TEMPORAL ANALYSIS OF DISTRICT COMPOSITE HEALTH PROFILE (DCHP) IN SELECTED EAG STATES OF INDIA.

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Health is a basic human right. Studies on human health have traditionally been focused on demographic aspects with certain socio-economic parameters. Given the focus of Sustainable Development Goal (SDG) 3 focus on health and well-being, it is imperative to understand the geographical dimension of certain health indicators, particularly related to maternal care and children health. Empowered Action Group (EAG) States are a group of states that have fared rather poor on certain socio-economic indicators. These states are having high burden of morbidity, maternal and infant mortality along with high share of lower quintiles in composite wealth index. This paper intends to undertake a district level spatio-temporal analysis of composite health profile by using composite index method on 13 important health indicators. The study attempts to explore the spatial variation of district composite health profile using the data from nationally representative National Family Health Survey 4 and 5. The final scores of DCHP were attached with district polygons in the study states based on three categories using Z score values. The district with values ≤ -2 SD is considered worst performers. Surprisingly through the study it has been found that number of worst performers states have increased from NFHS-4 to NFHS-5 and vis a vis in the number of best performer districts. Nevertheless, the average composite score has increase from NFHS-4 to NFHS-5. There need to bring in parity at district level health services particularly on maternal and children's health.

Keywords: *Health Indicators, District Composite Health Profile, EAG states, NFHS*

IMPACTS OF DUAL DISASTERS ON HUMAN LIVES: A CASE STUDY OF KULTALI BLOCK, SOUTH 24 PARGANAS, WEST BENGAL

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COVID-19, Cyclone Amphan, and monsoon flooding have shown us what a multifaceted and complex series of disasters look like today---and likely in the future. Our reporting finds that vulnerable communities living on the margins in covid-19, Cyclone Amphan, and monsoon flooding have all demonstrated what a diverse and complicated succession of disasters might look like today—-and will likely look like in the future. In Bangladesh and India, disadvantaged groups living on the edges are experiencing some of the worst effects, according to our research. Poor, rural communities reliant on agriculture, as well as migratory workers who frequently leave these villages in search of a better life, are shown to be the hardest hit. Today, sound, fact-based national policies may aid these populations in recovering more quickly. International humanitarian aid will ensure that those who have been displaced and are economically disadvantaged do not fall farther behind. Selected block Kultali, South 24 Parganas, West Bengal, are filled with natural resources including forest resources, water resources, soil resources, and population resources. Despite people in this area facing different types of difficulties related to socio-economic environment like poverty, crime, gender inequality, and unemployment, lack of health facility and oppression of women. This study area is located about 120 km. away from Kolkata metropolitan, so it is not very unfortunate. There is extreme inequality of resources among the people in this area. The aim of this study is to how well the Kultali Block's agricultural innovation affects food security. As a result, the government and the local people continue making the effort to innovate the Kultali block's agricultural system to reduce food grain imports and fulfill the yearly food requirement.

Keywords: *Sundarbans, Cyclone, Pandemic, Communities, Migrate*

IMPACT OF COVID-19 ON HIGHER EDUCATION: A CASE STUDY OF DELHI UNIVERSITY

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The impact of Covid-19 on overall lives of people have been huge and disastrous. Covid-19 pandemic has been an unprecedented event in the history of the world, shattering the education system of the country as functioning of educational institutions saw closedown. With this, Universities started running classes in the online mode which may prove to be challenging for the major chunk of students who could not retain the conceptual clarity that is required for the course. Along with this, the impact of high screen time, social, economic and mental challenges that have come up during covid-19 have made a huge difference in lives of students who lost their touch with the subjects due to lack of available digital infrastructure on the side of both student and the higher education institutions. Digital Divide and persisting socio-economic disparity in India have deepened inequality. At the same time, Hybrid mode of education has also proved to be a hope in disguise for the students of Higher education to pursue education hassle free. Though the discontinued pattern of education that persisted before the Covid-19 Pandemic has had an impact that could not be turned back, this paper aims to find out the suggestive measures which can be taken in the near future to revive the lost momentum of education in Higher education institutions. This research paper aims to find out the level of impact on the student's of Higher education institutions due to Covid-19 Pandemic. This research paper follows the research methodology which consists of both Qualitative as well as Quantitative methods using Primary as well as secondary data sources. For primary data collection, method of Stratified Random sampling is

used. This research work will provide a comprehensive analysis of multidimensional aspect and impact of Covid-19 on Higher education.

Keywords: *Covid-19, Disaster, Higher Education, Delhi University*

COVID – 19 PANDEMIC: MONITORING AND MANAGING THE RISK REDUCTION

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At presents Covid - 19 is a threatening biological disaster speeded all over the world and India. It is an infectious disease caused by the SAR-COV-2 virus. Covid – 19 affects different people in different ways, the economic and social disruption caused by the pandemic is devastating: tens of millions of people are at risk of falling into extreme poverty, so there is a need for planning and managing to reduce the risk of these viruses. However, Government took swift and massive action to mitigate the economic and financial effects of the pandemic, but should carefully monitor the longer-term budgetary costs of these measures. The government of India launched Aarogya Setu mobile App on April 02, 2021 to protect Indian Citizens from mass spread of Corona virus. The app uses a Bluetooth based contact tracing mechanism, and also identify potential hotspots around your location, But if we are adding and using geospatial technologies coupled with this app in the mapping of mobility patterns and tracking of infected cases, modelling the spread of disease, pattern detection, delineating and hotspots and determination of possible future occurrences integrated with socio-demographic data for assessment and making action plan during lockdown situation, so it can be become more potential planning to reduce the risk of pandemic. With the help geospatial technology we can able to find out the facilities (hospital, police station etc.) which is nearer to the containment zone area. GIS based mapping of Corona virus affected areas is helpful

the city to monitor viral infections in the city and steps to prevent its spread. Spatial database is becoming a strong pillar measuring the impact of Covid-19 combat pandemic.

Keywords: *Covid – 19, Pandemic, Risk, Social-demographic, Geospatial Technology*

KNOWLEDGE, ATTITUDE AND BEHAVIORAL CHANGES TOWARD THE COVID-19 PANDEMIC OUTBREAK: A POPULATION-BASED SURVEY IN DAKSHIN DINAJPUR

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The COVID-19 pandemic has revealed a lacklustre response to this potentially serious global calamity, including a lack of response to the psychological effects. This effect, which includes increasing familial violence, has been worsened by both economic hardship and continuous media coverage of fascinating information. On the other hand, the unanticipated 'extra time' allowed for fresh experiences and personal reflections on what is important in life, as well as a more mindful perception of nature and relationships. As a result, the goal was to examine how people's attitudes and behaviors' changed during the lockdown, and whether these perceptions contributed to personal well-being during the epidemic. The research paper will use both primary and secondary sources of data and Primary data were collected by random sampling methods from 295 peoples above the age of 18 at Dakshin Dinajpur in West Bengal, India. For data collection, an impartial cross-sectional survey was done using questionnaire surveys, such as with the WHO-Five Well-being Index (WHO-5), Multidimensional Life Satisfaction in a Brief. Selected important papers, personal published papers, PUBMED articles and media news related to the disaster management of the psychological effects of COVID-19 pandemic were collected over the last year that will be used in writing this research paper. The entering of data and its analysis was done through Ms Excel with cartograms and using SPSS 20 version software for descriptive statistics, linear

regression model & chi-square test etc. Among the total of 295 peoples, regarding the attitude and practice of COVID-19, 64% of the population having the knowledge of moderate to higher risk towards the disease. The result showed a significant correlation between higher education with knowledge, attitude, and practice. Our findings suggest that Dakshin Dinajpur population demonstrated decent knowledge, appropriate practice, and positive attitude towards COVID-19 at the time of its outbreak.

Keywords: *Knowledge, Attitude, Practice, COVID-19, Positive Impact*

IMPLEMENTATION OF COVID APPROPRIATE BEHAVIOUR: A STUDY OF ROHTAK DIVISION

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Under Disaster management, pursuance of COVID appropriate behavior is the key to prevent the corona virus disease from spreading in the society. This study tells us about the respondents' view on following the COVID appropriate behavior by the people around them. It includes the residents of 5 districts of Rohtak Division of the state of Haryana (India) namely Bhiwani, Charkhi Dadri, Jhajjar, Rohtak and Sonipat. These respondents are from the rural as well as the urban areas. Thus, this study helps in knowing how well the preventive measures are followed by the general public.

Keywords: *Disaster Management, COVID Appropriate Behavior, Rural Area, Urban Area*

RISK MANAGEMENT THROUGH LIFE INSURANCE: ASSESSING THE COVID IMPACT

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Uncertainties and risk associated with Covid 19 is difficult to assess in many ways. Worldwide people learned lessons of health and wealth. Financial immunity became utmost important. Life insurance cover became as important as getting vaccinated. The paper tries to assess the behavioural changes in people before and after pandemic related to life insurance. It also evaluates the insurance claims and new policies issued by some selected insurance companies. The study shows that people who were carefree prior to the outbreak of Covid 19 are now thinking of building financial immunity by buying life insurance and health insurance policy. Families that didn't have insurance cover at time of Covid faced major financial turmoil and not only lost their loved ones but also lost the livelihood in many cases. They couldn't pay hospital bills and in some cases came under debt in order to manage and sustain their everyday life.

Keywords: *Risk Management, Life Insurance, COVID, Financial*

Technical Session V

GIS-BASED MULTI-CRITERIA EVALUATION OF LANDSLIDE SUSCEPTIBILITY USING AHP TECHNIQUE IN THE HIMALAYAS

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The Indian Himalayas are one of the world's most unstable and vulnerable mountain ranges. According to NASA's global landslide database (2007 to 2018), they are hotspots for landslides. Further, human disturbances of the natural environment can exacerbate slope instability and lead to landslide hazards. The present paper uses Geospatial technologies to prepare a Landslide Susceptibility Map (LSM) of the study area using multi-criteria decision analysis. Seven causative factors, namely elevation, slope, slope aspect, slope curvature, terrain ruggedness index (TRI), distance to rivers, and land use/land cover (LULC), were used to assess the slope instability. The weights of various causative factors were derived using the analytical hierarchy process (AHP). Consistency ratio (CR) was used to assess the priorities assigned to various causative factors with an obtained CR < 0.1. Finally, the LSM was generated using the weighted overlay method. The final LSM was reclassified using natural breaks classification into five classes, i.e., very low, low, moderate, high, and very high. The LSM was assessed using the area under the receiver operating characteristic (ROC) curve technique. The produced LSM can be utilised for landslide mitigation by disaster management authorities and other stakeholder bodies in the study area.

Keywords*: Landslide Susceptibility Mapping (LSM), Multi-criteria decision analysis, AHP, Geographical Information System (GIS), Remote Sensing*

ANALYSIS OF CLIMATE CHANGE INDUCED DISASTER EVENTS IN THE NORTH WESTERN PART OF KASHMIR HIMALAYAS: A CASE STUDY OF KASHMIR VALLEY

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Climate change has emerged as a serious global issue resulting in climate induced disaster threats in most parts of the world. Climate change induced disasters are associated with high level damage impacts on various sectors of economy particularly agriculture and horticulture. The effects are more pronounced in fragile mountainous ecosystems like Kashmir Himalayas. The present study focuses on occurrence of the climate induced disaster events over the period of time and highlights the impact of the various types of disaster events on the two basic sectors of economy. The data was collected by the application of semi-structured questionnaire during proper filed surveys through simple random sampling method. In order to validate the results of primary survey, the secondary sources of data were obtained from the Indian Metrological Department-Srinagar. There is a significant impact of climate change induced disasters and the occurrence of these events have increased over the period of time, and have caused high damage in these economic sectors. The impact gets exacerbated and pose a significant challenge in managing these risks when multiple types of disasters coincide with the poorest and most vulnerable populations who are practising the above two sectors of economy. There is a need for effective leadership that entails preparing for and responding to increasing intensities and frequencies of extreme natural hazard events.

Keywords: *Climate Change, Induced Disasters, Agriculture, Fragile, IMD-Srinagar*

ANALYSING CLIMATE VARIABILITY IN SRINAGAR CITY, A PART OF INDIAN HIMALAYAN REGION

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The spatio-temporal quantitative estimation of precipitation and temperature is required for various purposes such as water resource management, climate change studies etc. This study is also an attempt concerned with analyzing climate variability for Srinagar city located in Indian Himalayan Region. The Seasonal Mann-Kendall (MK) test has been used for the determination of trend while Sen's slope estimator was used for determining slope magnitude. The observed data at Srinagar station, available for the time period 1980 to 2019 for minimum and maximum temperature and from 1893 to 2019 for mean temperature and precipitation was used for the analysis. Results showed positive trend for annual series, all seasons and some months for mean, maximum and minimum temperature and precipitation. Further, abrupt anomalies in these climatic variables also coincided with the extreme events recorded in recent past. This study showed that changes in air temperature and precipitation have occurred. Positive trend was found for temperature in most of the cases though not statistically significant. The precipitation pattern also seems to be changing, which may influence tourism, flood insurance, land use and land cover, glaciers etc. in this region.

Keywords: *Srinagar, Mann-Kendall, Temperature, Extreme Events, Climate Change, Sen slope*

ASSESSMENT OF VULNERABILITY OF MOUNTAIN SLOPE INSTABILITY USING REMOTE SENSING TECHNIQUES – A CASE STUDY OF RISHIGANGA RIVER BASIN, UTTARAKHAND

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Slope failure and landslide are among the most prevalent devastating hazards throughout the Himalayan region. On 7th Feb, 2021 a disastrous glacial avalanche coupled with rapid debris flow and flash flood occurred in the Rishiganga river basin, which invites a wide scope to carry out further studies for such similar event in this region. The present work aims to identify the spatial distribution of areas which are potential to slope failure events in Rishiganga river basin in Uttarakhand, a highly dissected mountainous tract, using remote sensing technique and GIS tools. Taking into account various causative and triggering parameters like slope aspect, slope angle, curvature, relief, drainage density, distance to drainage, geomorphology, lineaments, NDVI, land cover, rainfall, TWI and SPI the present study was carried out adapting Frequency Ratio Model. Class frequency or individual class weight is derived using this model. All the thematic layers for analysis were prepared according to multi temporal high resolution Sentinel 2 images, Alos Palsar DEM, and images available in google earth platform of various time scale and with the help of Erdas Imagine and ARC GIS software (10.6.1). Then Rishiganga river basin was classified into 5 potential slope failure hazard susceptible zones. Finally, results obtained from this study were validated with the recent event report, inventory mapping and various ancillary data. This kind of local level study of slope failure susceptibility mapping can play a crucial role in identifying consequent effects in the lower catchment area where more precise assessments of potential hazard should be taken, which could help in reducing the risk and to adopt appropriate mitigation.

Keywords*:* *Slope Failure, River Basin, Frequency Ratio Model, Multi Temporal High Resolution*

A GEOSPATIAL MAPPING & LOCATIONAL ANALYSIS OF CLOUD BURST IN WESTERN HIMALAYA

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Cloud Burst in western Himalaya is a common phenomenon. Cloud Burst is a massive downpour associating with flashflood, landslide, and earth flow that causes enough devastation in mountain areas. In recent years the frequency of this event has been increased enormously. One of the important causes of frequent cloud burst is Cloudburst occurs when moisture-rich air travels up a mountainous region, forming a vertical column of clouds known as Cumulonimbus clouds. The upward movement of clouds provides the required energy for a cloudburst. It usually happens at 1,000-2,500 metres above the sea level. The moisture is usually provided by low-level eastern winds associated with a low-pressure system over the Gangetic plains. For better understanding the pattern of Cloud Burst events in Western Himalaya we are doing the Geospatial mapping and locational analysis for two decades using TRMM data which provide important precipitation information using several space-borne instruments to increase our understanding of the interactions between water vapor, clouds, and precipitation.

Keywords: *Cloud Burst, Western Himalaya, TRMM, Geospatial Analysis, Locational Analysis*

IMPACT AND MITIGATION OF CLIMATE-INDUCED HAZARDS IN THE UTTARAKHAND HIMALAYAS: A CASE STUDY

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Mountainous natural hazards are a global phenomenon that pose a threat to communities, especially those with infrastructure located inside valleys. This paper examines the environmental and economic impact of cloudburst-triggered debris flows and flash floods in Uttarakhand Himalaya and suggests some mitigation measures. In the Himalayan region, cloudburst-triggered debris flows and flash floods are increasing, causing huge loss of life and property and degradation of landscape because the Himalaya favours location for its generation (Allen et al., 2013). They are very disruptive events that generally take place during the summer and monsoon seasons (Devi, 2015; Sati, 2020). The nature of lands such as precipitous slopes and fragile and undulating terrain further accentuate the severity and frequency of debris flows, flash floods, landslides, and mass movements in the Himalayas (Wang et al., 2014; Mayowa et al., 2015).

The study is based on primary data collected from four villages affected by cloudburst calamity located in the Himalayas of Uttarakhand. Data were gathered from a household-level survey of affected villages. A total of 143 households were surveyed. First, the damage to houses, cowsheds, bridges, trees (forests and fruits) dislocation, degradation of total land along the streams, and arable land in and around the villages were measured with the help of the head of households (environmental impact) and economic valuation of all losses was noted (economic impact). This study finds out that a large area of all villages was severely affected by cloudburst-triggered debris flow and the flash flood because they are located in a highly vulnerable landscape. This study reveals that Nirakot village needs to be rehabilitated entirely and in other villages all households, which are harshly affected need to be rehabilitated as soon as possible to escape from the future cloudburst catastrophe.

Keywords: *Cloudburst, Debris flow, flash flood, Hazard, Vulnerability*

AN IMPACT OF DISASTERS ON HUMAN LIVES OF KULLU DISTRICT (HIMACHAL PRADESH): A GEOGRAPHICAL ANALYSIS

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Natural and man-made disasters have caused a great deal of trouble for mankind throughout history, and their effect on national economies has also been noted. Landslides, earthquakes cloudbursts, flash floods, snow avalanche, GLOF, hailstorm and forest fires are all common natural and man-made disasters in the Himalayan region. Mountainous regions for their physiographic complexities are inherently susceptible to geophysical disasters. Kullu is a district of Himachal Pradesh located in the western Himalayas is prone to such disasters and has a long history of disastrous earthquake, landslide and snow avalanche, cloudbursts, flash floods, hailstorm and forest fires events. The main objective of this study is to analyze the major natural and man-made disasters occurring in Kullu district and to study their impact on human life. This study is fully based on secondary data. Secondary data is obtained from various government departments, websites and reports. Following data collection, MS Excel was used to analyze the data and Arc-GIS and QGIS was used to create the study maps. It is concluded from the study that Kullu district is very vulnerable to various natural and man-made disasters. This district is located in the high earthquake risk zone, high flash flood prone area, high landslide, hailstorm and snow avalanche affected area, due to which there is heavy loss of life and property due to these disasters.

Keywords: *Disasters, Himalayan Mountain, Human Life, Impact, Kullu District*

Technical Session VI

SYSTEMIC RISK FROM A DISASTER MANAGEMENT PERSPECTIVE: A REVIEW OF CURRENT RESEARCH

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Disasters are becoming increasingly common, unexpected, and difficult because of the rapid environmental and socioeconomic changes occurring at several levels. They are often the result of systemic risks marked by complexity, uncertainty, ambiguity, and cross-border consequences, very much like the continuing worldwide Covid 19 epidemic. These systemic risks outperform traditional risk management practices, posing new, unsolved policy and governance issues. This study aims to assess the origins of systemic risk thinking - particularly in relation to disaster risks, identify key inflection points in its evolution, and identify areas of opportunity in the governance of such risks by building on existing research and conducting a qualitative review of state-of-the-art literature published by academia, industry, and government. The study's findings indicate a good shift in the recognition of systemic disaster risks, but they also underscore the need for further maturity in its management and governance. Systemic risks, due to their complexity and dynamic nature, need a paradigm change in how we encourage deeper integration of disaster risk management across several sectors and levels while accounting for interdependence, co-benefits, and trade-offs. To increase holistic management of disaster-related systemic risks and coordinate an effective policy response, this research proposes the essential design principles and conceptual framework for integrated disaster resilience (IDR).

Keywords: *Global Systemic Risk, Integrated Disaster Resilience, Resilience, Disasters, Adaptive Governance*

PEOPLE'S PERCEPTION OF RISK: AN INSIGHT OF THE DEGRADED LANDS OF SIRSA DISTRICT, HARYANA

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Sirsa, the westernmost district of Haryana, is currently facing several issues related to land degradation. Anthropogenic activities, climate variability, vegetal degradation and soil erosion have been identified as the significant drivers of degradation leading to desertification. The general productivity of land is found to have a diminishing trend that may subsequently lead to the loss of livelihood, thus creeping in poverty, marginalization and forced out-migration or shifting to alternative subsistence. This sequential study underlines the investigation of how the local population identifies risk towards degradation and what adaptive measures they apply to combat such event. This paper is based on an in-depth qualitative analysis of the various stakeholders' perceptions of rainfall, temperature, and groundwater conditions for five villages of the Sirsa district. The accuracies of these perceived notions were verified and compared using secondary climatic and groundwater datasets. Furthermore, the paper tries to identify the critical determinants of adaptive capacity of the local population by exploring their socio-economic conditions.

Keywords: *Land Degradation, Risk Perception, Climatic Variability, Groundwater Conditions, Socio-Economic Status*

DRINKING WATER SUPPLY SERVICE AND DISASTER RISK REDUCTION: A SURVEY OF WATER QUALITY AFFECTED AREAS OF ODISHA

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There is no dispute that saving lives to be an immediate concern of any strategy for disaster risk reduction. When prediction made about the occurrence of any disaster, government's entire attention concentrated on how to save lives of people may be through evacuation or isolation. Moreover, Hyogo Declaration, 2005 and Sendai Framework for Disaster Risk Reduction 2015-30 has provided the insight that there is a need to go beyond rescue and rehabilitation as reducing risk of disaster is a cost-effective strategy towards sustainable development. In this context, this paper argues that any activity of disaster risk reduction would be incomplete if it would not take into account the risk associated with essential public utilities and sustenance of safe water drinking facility is one among them. However, in India, for a long time the provision of rural drinking water supply services continues to be a neglected subject. It is with the commencement of various global policy interventions and Disaster Management Plan both at the national and state level sustenance of safe water supply provision has got into an attention. Considering the above trend, this paper aims to analyse the governance of water supply services in quality affected areas of Odisha as more than 90 per cent of rural population depends on groundwater which is mainly contaminated with iron, fluoride, chloride and salinity.

Keywords: *Planning, Drinking Water, Rural, Governance*

SUSTAINABLE DEVELOPMENT: FUTURE OF GROUNDWATER MANAGEMENT

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Groundwater is the most important asset of Planet Earth for sustaining life and the environment. The rampant use in all spheres led to its fast depletion, so sustainable resource management is the need of the hour. Management of groundwater resources becomes important not only in India but also all over the planet earth. The sustainability of water resources is a significant challenge for most countries, especially for those that are located in arid regions. Here, we define a sustainable water resource as a flux of water that is managed to maintain the availability and quality of water for as long as the current climate prevails. Drinking water is too fundamental and serious an issue to be left to one institution alone. It needs the combined initiative and action of all if we are serious about socio-economic development. Safe drinking water can be assured, provided we set our mind to address it. Water management is a composite area with linkage to various sectors of the Indian economy including the agricultural, industrial, domestic and household, power, environment, fisheries, and transportation sector. The water resources management practices should be based on increasing the water supply and managing the water demand under the stressed water availability conditions. The present article deals with the review of various options for sustainable water resource management in India. There is the interplay of various factors that govern access and utilization of water resources and in light of the increasing water demand, it becomes important to look for holistic and people-centered approaches for water management.

Keywords*:* *Sustainable Development, Groundwater, Water Resources*

INTERGENERATIONAL EDUCATION CHALLENGERS IN RISK MANAGEMENT, THE CASE OF STUDY: COMMUNITIES OF LAIGUA DE VARGAS AND LAIGUA DE BELLAVISTA OF THE PROVINCE OF COTOPAXI ECUADOR

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The study wants to understand the process of education, for reduction of disaster risk, to aim to reduce the vulnerability for Andean community, in particular applied at the Ecuadorian one. Countries in which, year by year, the indigenous groups lose the memories about the relationship with their territory, and the real and correct management of risk. In this context the analysis is oriented to understand which are the problems in the education, (formal and not) process about disaster risk management, with a specific focus of prospective generation? The analysis was thought to be implemented in Latacunga province, nearly Cotopaxi volcano, one of the most dangerous and active volcanic systems in the word. The geographical area is determined by the presence of a complex ethinc gropu and rural and for a diferents group: age, cultural level, ethnic, economics, accompanied to an historical and qualitative analysis. The results put in evidence that the difference between the younger generation and the oldest one is so evident, and more emphasized, by the absence in formal education, for the younger generation about specific programs of risk management. Furthermore, the oldest one has lost the real perception of his space, and about informal education, the message is not unique, and not programmed really well, by local authorities, and national one, putting in evidence different information systems. The educational discourse is not unique for all the generations, and may create real confusion in the application of correct response day by day.

Keywords: *Indigenous, Risk Management, Formal Education, Disaster*

Young Scholar Award

THE RIVER OF LIFE, DEATH, LIVELIHOOD AND PILGRIMAGE: AN ASSESSMENT OF GANGES IN VARANASI, UTTAR PRADESH

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According to Hindu mythology, Ganga is the only river brought from heaven to earth for livelihood security, resettlement, and well-being of the entire human civilization. Varanasi erstwhile renowned as Banaras and even before famous as Kaashi is known as the land of Lord Shiva, the son of Ganga, land of mystics, guru and maha guru, ghats, and Gharana. The dynamics of change and time have rarely shaken the rich heritage, resilient capability, and capacity of Mother River since immemorial times. The use of sweet language and indigenization of ghats' informal economy is attracting and luring people from the world over to come and experience one of the oldest living cities. Life on land and under water in Varanasi is threatened because of several anthropogenic activities like sewage discharge, mining, and others. These activities are negatively impacting the bacteriophage cleaning capacity of mother Ganges. The basic objective of the study is to identify and analyse livelihood security, psychological wellbeing, and indigenous knowledge in making Ghats resilient from social, political, and economic dimensions. The research is based on both primary and secondary data, while descriptive and empirical methods were used for the desired outcome. A household survey was conducted in Ghats of Varanasi district, Uttar Pradesh in 2021. It was concluded that the livelihood security of people is under threat owing to changes like the declining water level and pollution. It has impacted aquatic habitat and there is a need to be more concerned about their habitat than ever before as these hazards will become disasters in time to come. Though the recent coronavirus pandemic has given temporary relief to the river thereby, significant improvement has been observed in her water quality, flow, and aquatic flora and fauna.

Keywords*:* *Livelihood, Habitat, Resilient, Hazards, Indigenous*

INDIGENOUS SOLUTION FOR CLIMATE AND DISASTER-RESILIENT AGRICULTURE IN WESTERN RAJASTHAN

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The introduction of the Indira Gandhi canal had provided some relief to the vegetation and risky agricultural practice due to widespread, frequent droughts and lower productivity. Climate change is becoming intense with the IPCC report stating that the present rise in Temperature is around 1.1°C higher in the current situation. Rajasthan is already being vulnerable to extreme events. Monsoon is shifting and becoming more erratic with extended dry spells and surplus for a few weeks and finally consistent deficit rainfall. Melting of glaciers at a rapid pace is pushing up water supply but unsustainably. To maintain climate and disaster-resilient agriculture, traditional crops (Coarse grains) should be coupled with climate for smart agriculture for providing economic resiliency and mixed farming. Ecological resilience by variety in crops, no water-intensive crops should be promoted in such area to avoid land degradation and increasing water deficiency along with social & economic security. Apart from this watershed management and the use of ICT can be helpful to reduce the burden on groundwater tables. The study area especially Jaisalmer, Jodhpur division of Rajasthan after the Indira Gandhi canal, these regions are facing new challenges like water salinity, water deficiency, land degradation, socio-economic problems, etc. There is an immediate need for a permanent or sustainable solution and the introduction of the indigenous ways in spatial aspects for sustainable and innovative environmental practices.

Keywords: *Vulnerability, Ecological, Resilience, Degradation, Indigenous.*

GEOSPATIAL TECHNOLOGY AND DISASTER RISK REDUCTION-A PROGRESSIVE CONSORTIUM

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The incorporation of Geographic Information System with the art of remotely accessing the physical phenomena has been a boost to anticipate, manage and quantify the disastrous events and it has helped in disbursement of assistances in timely manner which otherwise was tedious to do. The Consortium where Geospatial Technology lies on one end and Disaster Risk Reduction on the other is being seen as positive progression of the era in order to mitigate the adverse impacts on human civilization.This paper aims to describe the multiple applications of geospatial technologies employed in analyzing events in relation to multi-hazard scenarios of Kashmir Valley. The paper elucidates multiple hazard profile of the region and uses geospatial techniques to justify the argument. The availability of data on varied geophysical phenomena assessed from secondary sources, analysis of the data using geospatial software like ArcGIS, Google Earth, Erdas for the processing of data into useful information and representation of results in the form of thematic maps, graphs and tables, these all have been employed to generate the crux of the hypothesis and come up with interpretable results. The locational information of the critical infrastructure was collected using opensource geospatial platform, the Google Earth. The results demonstrated the multi-hazard scenarios of the region under study and did highlight the utmost need to develop a robust and efficient geographic information system that can serve the purpose of assessing hazards and their potential risks timely in pre-disaster context. The incorporation of Geospatial technologies with the ancillary datasets did help in comprehending the multiple hazards of the region spatially and the results drawn can be utilized for future studies of planning and developmental strategies in sync with the targets laid for Disaster Risk Reduction.

Keywords: *Geospatial Technology, Disaster Risk Reduction, Kashmir Valley, Multi-Hazards, Disaster Management*

GOVERNANCE, LAW AND INCLUSIVE DISASTER MANAGEMENT

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The havoc of disasters in the contemporary era has evolved and the discourse surrounding is understatood at all levels but it has severe consequences on the economic, social and political front. This paper will delve into the undervalued notion of governance in the disaster preparedness parley. The field of disasters efficiently focuses on government planning, response, legislation, policies as opposed to introducing governance which is in itself an holistic and inclusive term to incorporate disaster management and risk reduction activities that take place in the context of and are enabled by both societal and disaster specific governance activities. The paper will also bring out a comparative study and analyze the disaster management legislations and amendments introduced. There's also a breakdown of the national authority (NDMA), institute (NIDM), emergency response, and subnational and district disaster governance frameworks. This paper will also underlie that many disaster risk reduction programmes rely on cross-border cooperation and convoluted governance structures so a comparative study on cross border governance to increase inclusive disaster management is another point of contention in this study. Disaster governance is also inclusive of environmental governance and provides a holistic perspective about making an inclusive and integrated legislation for effective disaster preparedness. The paper will also bring into perspective the integration of disability-inclusive disaster risk reduction in the Indian legislation. The paper will also bring out a holistic comparative analysis of global governance of disaster management on the legal implication in rural society and minority cultures.

Keywords: *Governance, Law, Disaster Management, Legislation, Inclusivity*

FEASIBILITY STUDY ON LHEF (BIS CODE) AND AHP METHOD FOR LANDSLIDE SUSCEPTIBILITY ZONATION: A CASE STUDY OF MAO-MARAM MANIPUR

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A feasibility study has been carried out to ascertain the scope of landslide hazard evaluation factor (LHEF – also a BIS code) and Analytical Hierarchy Process (AHP) method for landslide susceptibility zonation (LSZ). LHEF guidelines recorded in the BIS code has been slightly modified considering the scale of the study. Multi-source geospatial data has been used to extract landslide causative factors in addition to the slope facet. Total 153 slope facets have been identified for the study area Moa-Maran region of Manipur. For each slope facet, an estimate of landslide propensity has been made using ratings derived from the LHEF scheme and the AHP method. Prediction rate curve and ROC have been evolved for LHEF and AHP methods and further used for establishing feasibility. The prediction rate curve estimated 78% and 75% accuracy for LHEF/BIS method and the AHP method respectively whereas ROC estimates were found to be 80% of LHEF/BIS and 77% for the AHP method. This study has found both the methods reasonably feasible which can be used in similar terrain conditions found in other regions.

Keywords: *LSZ; BIS code; AHP; Slope facet; GIS and Remote sensing*

A GEOSPATIAL ANALYSIS OF MULTI-HAZARD BUILT-UP RISK IN COASTAL PLAINS OF TAMIL NADU

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Being a densely populated area, the coastal plains of Tamil Nadu (TN) is highly vulnerable to many coastal disasters. Most of the previous studies on disaster risk carried out in TN concentrated on casualties and economic losses from such disasters, with very few studies focusing on damage to infrastructure. But, these studies were based solely on aftermath surveys and statistical analyses of insurance claims data. In this study, the risk for built-up areas has been estimated at the micro administrative level for the entire coastal plains of Tamil Nadu for the first time. To achieve this, built-up areas in the study area were delineated by using high-resolution satellite imagery services of ArcGIS and Google Earth. Later, the extracted built-up areas were categorized and overlapped with multi-hazard layers to identify the risk zones. The result shows that the built-up areas in Chennai and its surroundings, Pondicherry, Karaikal, and shoreline built-ups of Cuddalore and Nagapattinam districts fall under very high to high risk category. Due to the higher elevation and less dense built-up areas, the southern coastal plains are at low to very-low risk except for a few villages in Thoothukudi and Kanyakumari districts. This risk estimation for build-ups derived through this study would be much helpful for policymakers, engineers, and related stakeholders to identify high risk zones for coastal disasters. As this study has been attempted at the micro-level, the results can be scaled-up to higher levels for deriving an efficient disaster management plan to mitigate infrastructure loss at coastal regions.

Keywords: *Coastal Plains, Built-up Risk, Multi-Hazard, Tamil Nadu, Geoinformatics*

VULNERABLE GEOGRAPHY OF SALMORA, MAJULI: THE HOME OF KUMARS(POTTERS) IN ASSAM

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Flood and river bank erosion are the two prominent discourses in the politics of Assam. Both the discourses are directly related to the issue of 'land'. The land is not only a physical resource; it also turns into a political factor regarding livelihood security and subsistence economies. Salmora area in Majuli district of Assam struggles for its existence against the river-borne erosion and flooding. Making clay pots is the only source of livelihood for these people whose survival virtually depends on the mercy of the river Brahmaputra for the raw material required for this craft. Though some of the families resettled in the nearby districts, many of them are not willing to leave the old place because of their dependency on the river as a source of their livelihood. This paper tries to analyse their traditional livelihood insecurity and how it faces challenges through the environmental governance process in Majuli. The paper is based on observation and in-depth interviews to interpret the vulnerable ecology which, in the later phases, becomes a question of livelihoods security of the pottery makers.

Keywords: *Livelihoods, Vulnerability, Pottery Making, Politics*

MIGRANT COLLEGE STUDENTS DURING COVID PANDEMIC: EVIDENCES FROM THE FIELD

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Recent years saw the catastrophic event of disastrous consequences from the unexpected outbreak of novel coronavirus. The aftermath plunged our lives and struck us, all the way from the intimidating financial and health crisis to overwhelming social exclusion. Alongside the physical worries, it amalgamated a ton of traumatic experiences for the students to deal with.

According to a paper on Impact of COVID-19 pandemic on mental health in the general population: A systematic review, published in journal of affective disorders in December 2020, worldwide grasp of psychological symptoms include that of anxiety (6.33% to 50.9%), depression (14.6% to 48.3%), post-traumatic stress disorder (7% to 53.8%), psychological distress (34.43% to 38%), and stress (8.1% to 81.9%). The aim of this paper is to establish the effect of coronavirus on Migrant college students' social and psychological wellbeing and the ways in which they dealt with them. Apart from the secondary databases of literature available, primary data has been efficiently collected with the means of a questionnaire. The data accumulated includes hardships faced during the suffering of ailment, psychological effect on college students who migrated for studies, effects of social exclusion, and the mental state after coping up from the virus. The data for research has been contributed by various college students who migrated from their place of residence to their University's location.

Keywords: *Social Exclusion, Anxiety, Distress, Traumatic Experiences, Covid-19*

ASSESSMENT OF FLOOD IMPACT ON AGRICULTURAL LAND USING CLOUD-BASED GEO-COMPUTING PLATFORM IN NORTH BIHAR, INDIA.

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Floods are the leading cause of death related to natural disasters in the world. The Indian state of Bihar is flooded every year during the monsoon season due to the overflow of major rivers. Which severely affects people's life, infrastructures, properties and agricultural land. approximately 76 percent of the population is dependent on agriculture, which is severely impacted by recurring floods. Remote sensing datasets are widely used for robust monitoring of flood events, progression, and deterioration monitoring. Here, we investigated the flood extents and their impact on agricultural land for North Bihar using all accessible Sentinel-1A/B SAR and Sentinel-2A/B MSI images with additional supporting datasets available on the cloud-based computing platforms like Google Earth Engine (GEE). This Google server-based GEE platform provides a unique platform to process different types of datasets through improved algorithms and JavaScript codes without requiring local storage or downloading raw imagery. The study showed that a large portion of Bihar was submerged during the monsoon season of 2020 and 2021. To visualize the results of this study, inundation maps are available with the area of statistics. This study can be helpful for decision-makers at the time of disaster to prioritize relief, rescue operations and precautionary measures

Keywords: *Agricultural Land, Flood, Google Earth Engine, Geo-Computing Platforms, Sentinel-1&2*

Poster Presentations

A GEOSPATIAL MAPPING OF GLACIAL LAKE DYNAMICS IN THE HIMACHAL HIMALAYA

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The Himalayan glaciers are continuously retreating since the Little Ice Age (LIA) onwards with a varied rate over geographical space and time. However, the retreating alpine glaciers resulted in formation of glacial lakes ordinarily dammed by the ice margins, recessional and end moraine complexes and sedimentation from the lateral moraines by the glacio-fluvial activities near glacier terminus. The formation of the lakes in the margins of the glacier resulted in acceleration of the rate glacier melting and growing in size over the time. The formation of large size lakes in the high energy environment like Himalaya and its association with the heavy precipitation or cloudburst resulted in massive Glacial Lake Outbursts Floods (GLOFs) i.e. Kadarnath (2013) and huge devastation in downstream. Mapping of the glacial lakes dynamics with high resolution remotely sensed data is useful in understanding their formation, dynamic over time and vulnerability. The mapping of the glacier lakes in the Himachal Himalaya has been performed with the Indices i.e., Normalized Difference Water Index (NDWI) etc. with Landsat and Sentinel Data and cross validation and manual rectification with Google Earth database. The study is showing a significant increase in the lake area vis-à-vis numbers of lakes in the Himachal Himalayan over last two decades. Mapping of the glacial lakes with remotely sensed data with incorporating field input of structural characteristics can help in analysing their potential for sudden breaching, through the loss of life and livelihood can be mitigated.

Keywords: *Glacial Dynamics, Glacial lakes, High Energy Environment, Glacial Retreat*

COMBATING COVID-19 THROUGH NETWORK GOVERNANCE: NETWORKING MODELS USED IN INDIA FOR CRISIS MANAGEMENT

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Considering academic cicadas of Public Administration, which shape and giving direction to the course of Public Administration with its impact is The Minnowbrook conferences. Held in 2008, the scholars of Public Administration discussed the relevance with a wide range of topics. The primary concerns that attracted the central place are network in public policy, collaborative governance, social justice, impact of Information and communication technologies, public budgeting, finance, and accountability. The debates relating to these contemporary issues were developing. Meanwhile, the COVID-19 pandemic emerged as one of the most formidable challenges to humankind in 21st century.

The importance of Network Governance and Collaborative Governance occupies the utmost important place in the administration driven by technology. International collaboration or the network among the nations and coordination with the international agencies or federal coordination of the central government to the state government. Various administrative units, agencies (line and staff) worked with all the stakeholders i.e. public, private entities, civic bodies in social, economic and administrative functions. Initial Lockdowns, tracing, new work culture, medical and health assistance, vaccination coverage of the entire population, financial aid, social security or realization of social responsibilities of public. Collaborative and Network Governance played a significant role in managing COVID-19 pandemic. The proposed paper highlights the Networking and Communication model of governance using UCINET with all stakeholders. Particularly the COVID-19 crisis management in Indian governance structure by various agencies.

Keywords: *Network Governance, Collaborative Governance, COVID-19, Management, Agencies, UCINET*

GREEN INFRASTRUCTURE AND NATURE-BASED SOLUTIONS APPROACH

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Many cities are experiencing the need for efficient and sustainable land use as a result of urbanis ation and climate change.Over the last few decades, urbanisation approaches and concepts have evolved and absorbed a variety of metaphors, including Ecosystem services (ES), Green infrastru cture (GI), and Naturebased solutions (NBS). NBS are urban design and planning tools for ecolo gically sensitive urban development, and they incorporate the main ideas of green and blue infras tructure, ecosystem services, and biomimicry concepts. NatureBased Solutions are interventions that simultaneously address social, economic, and environmental sustainability challenges, result ing in a multifunctional, solution-oriented approach to urban sustainability. Nature-based solution was created in order to integrate an ecosystem services approach into spatial planning policies and practices, fully integrate the ecological factor, and address current socioeconomic concerns in cities. NBSs are now becoming more widely accepted as part of national and international strategies. As a result, a more performance-based planning approach to NBS implementation could be beneficial; a flexible approach to urban planning that supports the integration of different land uses and takes into account urban complexity. We conclude that the NBS concept has the ability to 'guard and maintain' by considering upgrading, restoring, co-creating, and co-designing multifunctional and connected urban green networks with nature.

Keywords: *Environmental Metaphors, Urban Forestry, Urban Ecosystems, Green Infrastructure, Ex-Situ Conservation*

UNFOLDING THE REALITIES OF TRIBAL COMMUNITY: AN ASSESSMENT OF TOTO TRIBE

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Tribal communities follow the traditional subsistence activity for their livelihood along with co-existing with the varied climatic conditions. They reside within their own territorial regions with feelings of unity through common practices like herding, dialects, language, rituals, and customs. These practices bind them in a single thread of fraternity; assuring each one's dignity and integrity toward their indigenous norms. Over time the climate across the globe is changing at a pace much faster than expected. Such changing climate and variability affect their livelihood pattern, health system, and sustainability. Similar changes are observed among the Toto tribes. Recent changes and developmental activities are making Totopara more fragile and sensitive. These changes are happening and would impact them in long run. The basic objective of the study is to identify and analyse the adverse impact of climate change vis-a-vis the declining population of the Toto tribe, Totopara. The study is based on both secondary and primary data while an empirical method was used for further analysis. A primary survey was conducted at Totopara in Madarihat block of Alipurduar district, 2019. After the discussion, it was concluded that wide-ranging cooperation from all sections of society including geographers and environmentalists are needed for the adaptation of these tribal communities as they are an asset to the nation and all possible steps must be taken for their welfare.

Keywords: *Fragile, Livelihood Security, Disease, Climate Change, Subsistence*

"ECO-TOURISM OR ECONOMY" STRENGTH OF RAJASTHAN

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Eco-tourism in Rajasthan has established itself as a significant tourism destination on the domestic, national, and international tourist map. Because this state is known for its diversity for its natural resources, cultural heritage, historical as well as archaeological wonders, and rare wildlife. In Jaisalmer and Jodhpur large number of tourist visits places of attraction for example Mehrangarh Fort, Kaylana Lake, Umaid Bhawan, Jaswant Thada, Balsamand Lake, Tanot Mata, Kuldhara, Bada Bagh, Jaisalmer Fort, Jaisalmer war museum, etc. Tourism is another most important revenue contributor to the state because it accounts for about 15% of the economy of Rajasthan. Rajasthan contributes 11.2% and 3.3% share of India's foreign anddomestic arrivals. Tourism is the triadic composition of a social, natural, and cultural phenomenon in Rajasthan which is offering many unique products such as forts and places, heritage hotels, colorful fairs and festivals, local art, and handicrafts. The total number of foreigners has been increased in the state over the past decades. Tourism has a significant multiplier on the state economy because it is increasing employment opportunities generates revenue, develops infrastructure, increases investment opportunities, and heritage conservationand management. Economic sustainability can also be gained through promoting the cultural and traditional activities where they originate and providing a livelihood to the local public, therefore, investment through the government in the tourism sector is an important task for generating employment and increasing the GDP of Rajasthan.

Keywords: *Eco-tourism, Economy, Domestic, Conservation, Sustainability, Traditional.*

Technical Session VII

ALTERNATIVE USE OF ABANDONED MINES FOR MINING TOURISM: A CASE STUDY OF COAL MINES IN SALANPUR BLOCK, DISTRICT PASCHIM BARDHAMAN, WEST BENGAL

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This study highlights the scope of mining tourism to promote a mine site into a tourist site. For the present study, five abandoned mines of Raniganj Coalbelt in Paschim Bardhaman District of West Bengal namely Dalmiya, Sangramgarh, Alkusha, Binodikata, Bonbiddi colliery have been taken into consideration. The mining-based tourism is a trend in many countries of the world but this is rare in India. The study is conducted to appraise all the aforesaid mine locations in terms of geotourism planning from site suitability context and prepare a suitable plan for sustainable mine-based tourism in such abandoned coal mines. The outcomes of the study highlight that although risk factor is present in some cases, each mining sites represents diverse mining tourism attractions.

Keywords: *Abandoned Mines, Tourism, coal mines, Geo-tourism*

GEOSPATIAL ASSESSMENT OF FLOOD MONITORING, VULNERABILITY ASSESSMENT, REDUCTION AND CHANGE DETECTION OF MANGROVES AND INLAND WETLANDS: A GIS AND REMOTE SENSING APPROACH USING QGIS AND GOOGLE EARTH ENGINE

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Floods are among the most devastating, expensive, natural, anthropogenic (caused) disasters in India. Flood effects are on the rise as flood prevention and mitigation strategies are lost, in lesser developed regions, it has led to mass exodus of human habitat and damage to infrastructure. The wildlife has been potentially at risk, and with irregular alterations in rainfall patterns it has resulted in frequent floods hampering the local vegetation. Intense and frequent flooding has hampered the mangrove, inland wetlands for the Indian subcontinent especially the Ganga-Brahmaputra doab and the Cauvery-Krishna basin. In a larger context, it is the water-related ecological transition zones such as mangroves, wetlands that provide breeding grounds to fauna, migrating birds and water services to society. Sustainable Development Goal (SDG) Target 6.6 seeks to halt the anthropogenic impacts, degradation and destruction of these ecosystems, and to assist the recovery of those already devoured ecosystem. The water-borne systems such as vegetated wetlands, rivers, lakes, reservoirs and groundwater, as well as those occurring in mountains, vegetation and forests, which play a special role in storing freshwater and maintaining water quality. In this study we provide a novel approach using Quantum GIS (QGIS) and Google Earth Engine (GEE) for real time flood monitoring using Landsat series and Sentinel-2 followed with identification of hot spot sites around these sensitive ecosystems. Throughout the sub-continent, world is recognizing the flood mitigating strategies, employing green infrastructure belts, including restoration of some of these ecosystems, to increase resilience and fulfill United Nations (UN) SDG goal-6.6.

Keywords*: Flood Management; Mangroves; Wetlands; QGIS; GEE; Sustainable Development Goals (SDG); Landsat; Sentinel-2*

DETERMINING THE IMPACT OF CLIMATE CHANGE ON DOOM TOURISM LANDSCAPE USING GEOSPATIAL TECHNOLOGY: A REVIEW

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This study explores the application of geospatial techniques for the detection of changing tourism landscapes that are environmentally threatened. People rush to visit places which is critically endangered and going to lose their attraction in near future. This kind of tourism is called doom tourism or last chance tourism which is vulnerable to climate change as well as change in the natural landscape of the region. This paper is a narrative review of some selected journals written to specify the importance of using spatial technology. Different methods adopted by the scholars like, survey, model building, secondary data collection, and analysis, empirical studies, etc. have been compared to critically analyze the results. The use of Remote Sensing and GIS technology, climatic data collection and analysis, pollution mapping, and land cover mapping is very important to understand the exact situation of the sites. The result suggests that climate change, specifically temperature and rainfall play a crucial role over the landscape and successful monitoring of hazard and risk factors inevitably for tourism management. This disappearing landscape gives rise to the last chance tourism or doom tourism and it will definitely affect the environment and economy.

Keywords: *Last chance tourism, vanishing destinations, nature-based tourism, climate change*

FACTORS INFLUENCING WEB-GIS APPLICATIONS IN EDUCATING DISASTER RISK REDUCTION

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In societies, children are the most vulnerable groups directly affected by disasters. It is predicted that children affected by disasters will be increasing in the coming years because both the frequency and intensity of natural hazards will rise. The concept of disaster safety must be included in education from childhood to reach the goal of sustainable disaster reduction. Therefore, implementing DRR knowledge in education has become essential. However, there are still no well-established guidelines for teaching DRR in schools, and it is still unknown whether students can

understand DRR and improve their ability of DRR thinking by using GIS. Therefore, this study utilizes Web-GIS technology to support the geospatial thinking of students and investigate the factors influencing DRR learning. For this purpose, we developed materials for systematic DRR education, and designed curricula to utilize the materials effectively. This approach was implemented multiple times for students in Chinese secondary schools as both online and onsite courses in 2020 and 2021. Questionnaire surveys, pretests, and posttests were also conducted to collect information for evaluating the educational effects of our materials and curricula. The results show that the posttest scores were improved compared with the pretest scores, indicating the effectiveness of the conducted DRR education. The improvement at the onsite implementations is more evident than that at the online implementations, and the difference is statistically significant. It was also found that familiarity with DRR information is positively correlated with their performance in DRR learning.

Keywords: *Disaster Risk Reduction, Education, Web GIS*

BLOCKCHAIN: INNOVATION IN DISASTER RESILIENCE

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Each year, hundreds of natural disasters occur, claiming over 60,000 lives annually and millions of people affected. COVID-19 pandemic has now surpassed that number, with worldwide mortality crossing over 5.8 million as of February 16, 2022. Since 2000, India has suffered over 110 billion dollars in economic losses affecting 1.1 billion people. It is expected that developing economies to bear the most significant toll from extreme weather events. The cooperation of several agencies and the general public is critical for disaster relief preparation, victim assistance, and disaster management. There are many instances when aid and assistance come from various

sources. However, numerous people are deprived of aid owing to inefficient management like insufficient information, coordination, late aid, chaos, and poor handling of resources, water, medical support, clothing, and transportation. The present paper addresses the innovative solutions for addressing disaster response and relief measures through Blockchain technology. Blockchain technology enables a platform for recording transactions, immutable records, identity validation, permission data access, and trustful access to important data across information systems. Blockchain technology can be used pre/post and during a disaster to illustrate and enable unprecedented opportunities for disaster risk reduction as well as rapid response to natural disasters, whether they be caused by floods, cyclones, or pandemic/epidemics. Blockchain in disaster resilience will enable a) Better planning and resource mobilisation, b) Transparency and accountability of aid / relief measures, and c) Security transaction and improved livelihood

***Keywords**: Blockchain, Disaster Resilience, Innovation, Relief Measures, Climate Change*

DEVELOPMENT OF DYNAMIC WEATHER INFORMATION DASHBOARD (DWID) USING FOSS TECHNOLOGIES

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India is one of the worst disasters affected counties in the world. Monitoring and understanding all natural and man-made disasters at PAN India level from various sources is a challenging task. The information on the latest disaster related news, current weather information and forecast, current water levels at different rivers and reservoirs, rainfall forecast, flood forecast, and earthquake information, heat wave and cold wave alerts, weather bulletins issued by various forecasting agencies, gives the users, organizations, disaster mitigation agencies and first response forces the lead time for preparedness to carryout relief and rescue operations and to reduce the impact of the disasters Globally as well as Nationally. There are different organizations which provide weather

information in near-real/real time (nowcast) and forecasts well in advance and this information is being communicated through their own platforms and communications systems. But getting all this information through a single platform in an integrated way gives a holistic understanding about the weather situation of a specific locale. In view of this, we propose a desktop-based tool, called Dynamic Weather Information Dashboard, DWID, entirely based on Python scripting language, which collects the information continuously from various platforms and hosts in a web GIS environment for further analysis.

Keywords: *Weather parameters, Mitigation, Web GIS, Python, DWID*

AN ASSESSMENT OF GREEN INFRASTRUCTURE USING GIS AND REMOTE SENSING ON GORAKHPUR CITY

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In the way of hazards urbanization and its demand, challenging the sustainability and deteriorating the aesthetic beauty of urban areas with many environmental problems. The expansion of urban areas displacing the natural ecosystem. It minimizes natural space filling with cement, concrete. That causes major urban issues like pollution, UHI, Urban Sprawl, extreme weather events, water logging etc. and making urban life uncomfortable.

Developing urban areas with the right strategy and proper interlinking of green infrastructure components can improve and enhance sustainable urban development. GI's multifunctionality not only develops an area in a sustainable way but also it has potential to tackle all urban issues with green infrastructure tools and components. The aim of this paper is to find out decadal changes in green infrastructure components and find out which major green infrastructure components are suitable for the enhancing sustainable urban

development of the city. Green Infrastructure projects and provides space for nature and natural things with social and economic benefits like it balances water flows, it provides thermal comfort etc.. If an urban developer effectively applies GI and implements it on ground level that will simultaneously provide natural regions, eradicate urban climatic issues, water management and provide important green networks that will help in sustainable urban development.

Keywords: *Aesthetic Beauty, GIS, GI, UHI , Extreme Weather Events*

Technical Session VIII

MULTI-HAZARD ASSESSMENT AND SUSCEPTIBILITY MAPPING: A REVIEW

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Climate change and population growth are causing an ever-increasing risk of natural disasters. Recent natural disasters have compelled researchers to better understand the hazard and build a comprehensive plan to mitigate it in the future. This article focuses on concepts, methodologies, and tools developed by scholars, academics, and other organisations over the last decade or two to better comprehend the multi-hazard notion, as well as its evaluation and susceptibility mapping. This paper seeks to explore a variety of existing principles that will aid researchers in developing techniques for multi-hazard research. Various methodologies, models, tools, and methodologies have evolved through time and have proven to be the best for assessing multi-hazards such as landslides, earthquakes, floods, and forest fires. These threats are all affecting the same place at the same time. Various procedures and methods have already been used to try to pinpoint the likely sites of these dangers. In the past, qualitative and semi-qualitative techniques have been used. This work seeks to present previous studies using geospatial and machine learning techniques for individual and multi-hazard scenarios. By utilizing topographic data, geospatial approaches are particularly effective in delineating risky areas, but machine learning techniques have emerged as the most significant and dependable platform for doing detailed assessments of vulnerable areas by using inventory data, topographic data and hidden layers. An attempt has been made to understand and examine the methods and their application while extracting probable vulnerable sites for individual hazards or all hazards as a whole.

Keywords: *Multi-Hazard, Susceptibility, Geo-Spatial, Machine Learning*

MAPPING OF WATER LOGGED AREAS USING REMOTE SENSING AND GIS ALONG THE CANAL IN THE DISTRICTS OF FARIDKOT AND SRI MUKTSAR SAHIB IN PUNJAB

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Water logging is a major problem for sustainable development of the natural resources. It needs a reliable and accurate mapping of location and spatial extent of areas affected by it. For this, a Sentinel-2A Image of 2021 and Google Earth was visually interpreted based on the image elements such as tone, texture, pattern to delineate, and map the waterlogged areas along the canals of Sirhind Feeder and Rajasthan Feeder flowing through the districts of Faridkot and Sri Muktsar Sahib in Punjab. On-screen digitization in GIS was performed to create a polygon map of the interpreted units and buffer along the canal was created to demarcate study area as area of interest and it was further verified during field check and the area of each polygon was calculated. The classified land use and land cover map into built up, water bodies, water logged and agriculture land was also prepared. The total water logged area is found to be approximately 80.8 hectares in the study area. It was found that most water logged affected areas are lying in a close proximity of the canals experiencing groundwater overdraft and water logged area decreases as we move away from canals. The major causes behind this problem are the natural depression or bowl shaped dip in land, improper drainage system, shifting in cropping patterns and canal seepage. This generated data can be useful in making suitable water management strategies for regional planner, and agriculturalist and this can prove to be crucial for the sustainable development of each parcel of land existing in this region.

Keywords: *Sentinel Image, Land use/Land Cover, Water-logging, Visual Interpretation*

GIS BASED SPATIO-TEMPORAL AND HOTSPOT ANALYSIS TO FOREST FIRES IN ALMORA DISTRICT OF UTTARAKHAND, INDIA

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In a recent past, there were several events of forest fires in the worldwide like Amazon fires (2021), Congo basin forest fire (2020), Australian bush fire (2019), and every year can be easily seen in California (USA), which has resulted in huge loss of forests and biodiversity. These events attract attention of researchers and scientist as forest fires occurrence plays a vital role in analyzing the effect on biodiversity. In this study, we have analyzed the occurrence of forest fires during the period 2001 - 2018 in Almora District of Uttarakhand state of India. The objectives of present study are to analyze the dynamics of forest fire using GIS and remote sensing and identify the forest fire hotspot region in the study area. The methodology involves the use of Landsat 8 OLI images and fire point data to achieve the above-mentioned objectives. In addition to this, 'total forest fires' and 'extreme event' have been used to analyze the trends of forest fire based on fire point data obtained from forest survey of India (FSI). Kernel density have been used to analyze shifting patterns of forest fires and identification of hot spot of forest fires was done using Getis-Ord Gi's Hotspot Method. The findings reveal that total of 7380 fire incidents over stretch of 3150 square kilometers have been recorded during 2001 - 2018 while 2012 and 2016 emerged as years with maximum number of forest fire events. Lastly, approximately 68 percent forest fires occurred in March and April with approximately 88 percent forest fire incidents occurred in last ten days (21-31) of May month. Further, required recommendations and suggestions have been made to assessment of forest fires in Almora district.

Keywords: *Forest Fires, Kernel Density, Getis-Ord Gi* Hotspot, Environmental Monitoring, Forest Resources*

WATERSHED DELINEATION OF TUNI RIVER OF MAJULI USING ARC HYDRO MODEL

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In hydrology watershed delineation is an important task to find the catchment area of a river. In GIS, Digital Elevation Models (DEMs) are the spatial grids used to demarcate watershed boundary. Arc Hydro Model was applied to the cartosat imagery of Majuli to find the outlets, catchments and finally watershed region of Tuni river. While the model was run several intermediate results such as fill sink, flow direction, flow accumulation, stream definition, stream segmentation, catchment grid delineation, drainage line processing, adjoin catchment processing, outlet generation were produced which were the basic parameters of Tuni river and at the end of the model catchment areas and watershed of Tuni river as well as the sub watershed regions of the tributaries and sub – tributaries were defined by the model. The result of the this model can be used in Rainfall- Runoff analysis, RUSLE analysis, USLE analysis and other advanced research of the catchment area of Tuni river. Ultimately the results will support the decision making process on ground water and surface water resource and help in future management and distribution of water resource in Majuli.

Keywords: *Catchment, Demarcate, Hydrology, Parameters, Watershed*

KAPPA COEFFICIENT ANALYSIS AND CHANGE DETECTION OF LAND USE AND LAND COVER OF BHADRAK DISTRICT, ODISHA, INDIA USING GEOSPATIAL TECHNIQUES

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Land cover alludes to the physical characteristics of earth's surface, captured in the distribution of vegetation, water, soil and other physical features. Land use refers to the way in which land has been used by humans and their habitats enrollment in development processes (such as agriculture, settlements, industry etc.). Land use and land cover change has become a central component in current strategies for managing natural resources and monitoring environmental changes. Landsat 7 ETM+ data of the month January (before cyclone) and October (after cyclone) for Super cyclone 1999 and Sentinel 2A optical real time satellite data of the month January (before cyclone) and October (after cyclone) has been use for the cyclone Titli 2018. Maximum Likelihood classifier is used in the supervised classification method in this particular study. Stratified Random Sampling Method has been use to create signature file. The study area has been divided into 6 LULC classes namely river and water body, vegetation and mangrove, cultivation, built-up, aquaculture and barren land. Kappa coefficient method has been used to make accuracy assessment and the change shows temporary variation of LULC before and after the cyclone hazard. The overall accuracy and Kappa coefficient of the January 1999 before cyclone LULC is 87.5% and 85% respectively. In the case of January 2018 before cyclone LULC, the overall accuracy and Kappa coefficient is 89% and 86% respectively. The above mentioned results indicate that there is significant difference in the pre-monsoon season and post-monsoon season.

Keywords: *Cyclone Hazard, LULC Change Detection (Before and after cyclone), Supervised Classification, Kappa Coefficient Statistical Analysis*

GEO-INFORMATICS BASIS ASSESSMENT OF HYDROGEOLOGICAL CHANGES IN SAMBHAR LAKE CATCHMENT AREA, INDIA

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We all know that human beings are the main part of environmental change. To achieve a longterm healthy order, maintaining a healthy environment is the first requirement, but there is always a contradiction between the voluntary work of the people and the rules designed to protect the environment. Now around the world, regulation of wetlands has become a more prominent issue than any other environmental issue. Sambhar Lake is also an important wetland in India, being the largest inland saltwater lake in the country. The catchment area of Sambhar Lake and the ecosystem of the lake are being affected due to anthropogenic activities for the last few decades. According to current studies, increasing erosion in the catchment area of the lake and encroachment and sedimentation are reducing the water holding capacity of the lake day by day.

Keywords: *Environmental Change, Anthropogenic Activities, Ecosystem, Encroachment, Sedimentation*

ROLE OF GEO-SPATIAL TECHNIQUES FOR SNOW AVALANCHE MANAGEMENT IN KARGIL – LADAKH REGION OF TRANS- HIMALAYAS

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Snow avalanches are considered one of the most dangerous but less documented natural hazards in the remote mountainous regions across the world. The lack of well-documented data is still the biggest hurdle in avalanche mapping and assessment in remote inaccessible terrains. The present study focuses on generation of snow avalanche susceptibility map for Kargil district in Trans-Himalayan Region using geo-spatial techniques. The avalanche susceptibility map generated for the region results reveal that (14%) area falls under high and very high susceptibility classes, (67%) of area fall under low and very low avalanche susceptibility classes and around (17%) area lies in the moderate susceptibility zones. The very high and high susceptible zones are confined in the northern part of study-area which is having a high population concentration, lineaments, and higher road density. The moderate zone falls close to local highways and link roads connecting different Tehsils of the District. The remaining area falling in low and very low susceptibility classes is either located at very high elevations or in areas covered with snow or ice throughout the year. The avalanche susceptibility maps will be helpful in formulating effective mitigation strategies in this strategic border region, which demands significant movement of security personal and heavy machinery round the year owing to its proximity to the volatile border with Pakistan and China.

Keywords: *Snow Avalanche; Remote Sensing; Mountainous Region; Kargil-Ladakh*

CHANGE DETECTION OF WETLAND USING GEO-SPATIAL TECHNIQUES: A STUDY ON TAMRANGA BEEL OF BONGAIGAON DISTRICT, ASSAM, INDIA

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Wetland has its significant role in restoring, functioning, balancing, and also for ecological productivity of various ecosystems. It's the home of varied types of valuable flora-fauna for which these are considered as geo-ecologically important for humankind. However, the high range of

exploitation of wetlands has lead to negative outcomes. The degradation and shrinking of wetlands has become a threat to ecological status at regional as well as global level. The present paper reveals the rapid spatio-temporal change of Tamranga beel (wetland) of Bangaigaon district of Assam due to various anthropogenic activities. The main objective of this paper is to highlight the effective measurement of wetland change using LANDSAT7/8 OLI satellite images and GIS (Geographic Information System) based tools and techniques. For the identification of this spatio-temporal change of this wetland change detection maps having the duration of 18 years (2002-2020) gap has been prepared and also various spectral indices like NDWI, NDVI, MNDWI, NDTI and NDPI are applied for extraction of water quality and water extension of this wetland. The Land use-land cover (LULC) change detection has also been done using supervised classification using Arc GIS (10.3) and for verifying the result accuracy, assessment has also been done. The result shows that there is a dramatic change in water extension, vegetation cover, and LULC of the study area.

Keywords: *Wetland, GIS and Remote Sensing, Spectral Indices, Change Detection, Accuracy Assessment*

Technical Session IX

DISASTER DIPLOMACY & NEW DEVELOPMENTS IN STATE RELATIONS: CASE STUDY OF US & CHINA APPROACH TO THE FIRST WAVE OF COVID PANDEMIC

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International relations in post cold war era are defined by rise of multipolarity and new dimensions to security issues. Earlier the idea of security was limited to military aspects and this idea has seen new concerns namely rise of technology, sustainability, pandemics, amongst others as important factors in global realms. To add to that, outside or foreign aid has always been an important factor for any nation from cold war to post cold war times, with respect to military, economic, other related concerns of development and national interest. In the same vein, Disaster Diplomacy has often seen important nation's of the world come forward in support of biggers concerns of growth, humanitarian intervention, amongst others. Though there is no established theorem that events of Disaster Diplomacy lead to sustained peace but at the same time, one cannot ignore how these unplanned scenarios often lead to avenues for gaining domination in global arena. The paper presents reflections from US & China approach to first wave of Covid Pandemic with their support for kits, medicines, etc to various parts of world and demonstrate how Disaster Diplomacy needs to be understood as an important pillar of state relations in contemporary International Relations.

Keywords: *Disaster Diplomacy, State Relations, US, China, Pandemic*

DISASTER DIPLOMACY AND INDIA NEPAL COOPERATION FOR DISASTER RISK REDUCTION

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Disaster is an indefeasible phenomenon for all human beings. Disaster never restrains within the political boundaries of nations. Disaster diplomacy is a modality gesture of a country, often used to enhance the quality of relations with other countries. Disaster is one such thing which require cooperation between different territories and therefore open new opportunities in context of diplomatic actions. When disasters occurred in cross border settings, it will become more prominent to have disaster diplomacy to reduce disaster risk because geographical adjacency plays a big role to deal with the problem. It is often being seen that 'security dilemma' always prevent cooperation between India and Nepal. The fact that creates need of cooperation-oriented disaster diplomacy is that disaster might originate in one country but it has certain ripples that can felt across borders. However, in the case of most recent Nepal's earthquake in 2015, India utilized this event as a catalyst to improve the quality of disaster diplomacy towards Nepal. Likewise, flooding is also a natural disaster and every flood in Nepal generally causes deluge in India. Therefore, management of disasters specially earthquake, flood and landslide needs coordinated efforts from both countries. In this context this study is intended to review the policies, post disaster incidences, and coordinated response mechanism between India and Nepal. The study will also examine the shortcomings, opportunities and challenges of joint disaster response operations

Keywords: *Disaster Diplomacy, Cooperation, India, Nepal, Risk Reduction*

PROBLEMS OF NATURAL HAZARDS AND NATURAL DISASTER REDUCTION IN THE SOUTH ASIA REGION: A CASE STUDY

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The south Asia region faces different kinds of natural hazards and disasters within the region are exposed to a high proportion of all disasters and natural hazards. This region is more populated and have low income economies which have considerable impact, especially on the poor, and it exacerbate poverty conditions in different parts of the region. The long coastal region is prone to cyclones and arid and semi-arid regions are prone to persistent drought, the Himalayas mountain terrain and parts of the continental crust are prone to earthquakes and landslides. The regions near perennial rivers are subject to periodic floods. Rapid increase in population pressure and environmental degradation have often have to face challenges of natural disasters and hazards. The role of IDNDR, NGOs, and others are very important and impressive in relief works in such affected regions. In this paper an attempt has been made to examine and analyse the causes and consequences of natural disasters and hazards problems of the south Asia Region.

Keywords: *Natural Hazards, Disasters, South Asia, Disaster Risk Reduction (DRR)*

POLICE IN DISASTER MANAGEMENT

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Police as an organization is supposed as a major player in disaster management. Police play a significant role in all phases of the Disaster Management Cycle. Every year, thousands of people are affected by man-made and natural disasters. In every situation, police stood as rock-solid support for and with the people in the time of crisis by being present. Model Police Act, (2006) Chapter VI, Section 57 mentions "to provide, as first responders, all possible help to people in situations arising out of natural or man-made disasters, and to provide active assistance to other agencies in relief and rehabilitation measures." Chapter IV section 25 (1) of Disaster Management Act 2005, establish a District Disaster Management Authority, it has been stated that the Superintendent of Police is the ex-officio member of the District Disaster Management Authority (DDMA) and in this capacity, he could play an important role in all the three phases of Disaster. The main argument of this paper is, despite the participation of police in all phases of disaster, still non-recognition of a specific role in the Disaster Management Act, 2005, instead of specifying the role of the specialized forces like Paramilitary forces, Army, and NDRF. It has also been noticed that the conceptual role of police in pre-disaster planning during the disaster and post-disaster responses has primarily been ignored in Act. Why do we need police in a disaster situation as a first respondent despite not-recognition in the disaster management act? To answer these questions, this paper's objective is to study police in all phases of Disaster Management.

Keywords*: Police, Disaster, Management, Act 2005*

IMPACT'S OF GREEN CLIMATE FUND

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The Green Climate Fund (GCF) is the world's biggest environmental fund, with the goal of assisting poor countries in reducing their greenhouse gas emissions while also requiring them to adapt to climate change. This is accomplished through the use of a cutting-edge financing window to support projects, programmes, policies, and other activities. It was formally formed as a finance mechanism by the United Nations Framework Convention on Climate Change (UNFCCC) in 2010 and is located in South Korea's Songdo area. Climate change is one of the most urgent issues of the twenty-first century. Its impacts have had a tremendous impact on, and even transformed, the globe. Long-term climate changes on Earth are extremely important. If the alterations are not reversed or minimised as soon as possible, they can have economic, human, and geographic repercussions. There are climate change mitigation methods, but they are not financially viable for many poor countries. As a result, the GCF will assist in bridging this gap through economic methods. The formation of the GCF is significant in India's opinion. The reason for this is that India led the charge with other developing countries in pressing on the establishment of a global system under the auspices of the UNFCCC using funds donated by poor countries. The Ministry of Environment, Forests, and Climate Change (MoEFCC) has been designated as India's GCF Nationally Designated Authority (NDA). The MOEFCC will present financing requests for national climate policies to the GCF's managing board. GCF has authorised NABARD as the first entity to obtain financial resources from the GCF for India.

Keywords: *Green Climate Fund, Greenhouse Gases, UNFCCC, Moefcc, NABARD*

ROLE OF SOCIAL MEDIA IN NATURAL DISASTER MANAGEMENT

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Disaster" means a catastrophe, a mishap, a calamity or grave danger event occurred in an area and affected life and properties. It may be arising from natural or man- made causes, or by accident or due to negligence. Natural disasters may be broadly grouped into major and minor types depending upon their potential to cause damage to human life and property. A very huge infrastructure gets damaged within a few seconds or minutes. In recent decades, the world has faced a series of big natural disasters, like cyclones, earthquakes, volcanic eruption, tsunami, floods, drought, hailstorms, avalanches, landslide, epidemic etc. With the increase of natural disasters that have occurred in the past years it is expected their frequency will continue to increase in the next coming years. Social media has played a dominant role in disaster management. The term “social media” refers to Internet-based applications that enable people to communicate and share resources and information. Social media has re-defined communication in today’s modern life. Text messages, internet and social networking sites (Facebook, twitter, whatsapp etc.) have made it possible to communicate with a large number of people anywhere on earth. It is very efficient and easy way to keep in touch and impart information, particularly in a time of crisis. During natural disasters, social media can play an essential role in the emergency response and provide a complete picture of situational awareness during and after the disaster. Due to natural disasters there is an increased communication since people seek to contact family and friends in the disasters zone and seek information regarding food, shelter and transportation. Social media has played a significant role in disseminating information about these disasters by allowing people to share information and ask for help. Social media are also becoming vital to recovery efforts after crises, when infrastructure must be rebuilt and stress management is critical. The extensive reach of social networks allows people who are recovering from disasters to rapidly connect with needed resources. The major objective of the paper is to assess the role social media in natural disaster management.

Keywords: *Natural Disasters, Social Media, Internet, Natural Disasters*

UNCERTAINTY AND BLAME: AN ANALYSIS OF NEWSPAPER REPORTING IN INDIA DURING THE SARS COV-2 PANDEMIC

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News media, especially after the occurrence of a disaster, often practice blaming in their reportage. This suggests that in the pre- and post-emergency situation societal expectations remain unmet. The present pandemic of SARS CoV-2 virus has however added a complication to the decision-making, that is, there was considerable uncertainty with regards to properties of the virus and potential health outcomes. Many federal and state governments found themselves preparing for an "unknown situation." Consequently, significant departures from conventional roles and responsibilities of decision-making were undertaken. Uncertainty with respect to the unfolding pandemic presents an opportunity to examine nature of public policy and societal responses. Particularly, an analysis of assignment of blame in news reports under uncertainty is undertaken to understand the locus of blame. To this end, editorials and op-editorials of three national dailies-two news dailies and one business daily have been analyzed. The period selected for analyses is three months, soon after the first lockdown was eased and newspaper printing and distribution was restored and considerable uncertainty about the virus continued. Further, the analysis will report on 'ripples' that may have been produced as a consequence of blame practices. As already reported in the literature, a flow of blame signals is crucial to understand societal response to disasters. The evidence and analyses discussed in this paper advances this thread of theorization, namely, 'social amplification of risk.'

Keywords: *Blame, Pandemic, SARS CoV-2, Newspapers, Social Amplification of Risk*

Technical Session X

THE APPLICATION OF SAR (SENTINEL-1A) DATA FOR FLOOD INUNDATION MAPPING OF MALDAH DISTRICT, WEST BENGAL, INDIA AND ITS IMPACT ON HOUSEHOLDS

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The real-time flood situation monitoring data helps the decision-makers take immediate action to rescue or send essential commodities for the flood-affected area's community. The present study is focused on the mapping of real-time flood inundation area of Maldah district. The flood inundation area was developed using the SAR (Synthetic Aperture Radar) data i.e. the sentinels-1A data has two types of polarization: Vertical transmit and Vertical receive (VV) & Horizontal transmit and Vertical receive (HV). In this study, VV polarized Radar data has been used to map the flood because this VV polarized data holds a high potential to visualise the water submerged areas. The SNAP was used to generate the flood inundation layer of Maldah, where Sigma_0 image and dB (non-linear) virtual band was created for better visualization of water signatures. After that, ISO cluster unsupervised method was applied to the Virtual band on ArcGIS. Lastly, the flood inundated area was calculated (380.19 km² on 4th Sept. & 338.87 km² on 10th Sept.) for Maldah district. The flood inundation layer was further integrated with the block level data with the help of GIS, and observed that among all blocks Harischandtapur-II (75.67%), Manikchak (68.60%), and Kaliachak-III (68.00%) are the highest flood affected blocks. It has also delineated that the based on effect of flood on population and household of this district the most safest blocks are Chanchal-I, Gazole, Harischandrapur-I, and Kaliachak-I. And another side, highly vulnerable blocks of this district are Harischandrapur-II, Kaliachak-III, and Manikchak.

Keywords: *Flood, Inundation, Sentinel-1A, Sigma-0, SNAP*

ASSESSMENT OF FLOOD PRONE AREA FOR THE PREPAREDNESS AND MITIGATION PLAN: A CASE STUDY

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Floods are one of the most devastating natural phenomena of the world. The early information about these events is prerequisite for their management. Preparedness before events is depends on the unbiased near-real-time information about the flood as well as can also helpful in their mitigation activities. Present study deals with the role of Geospatial technology in flood assessment and modelling for future to not only minimize the impact but also save lots of life and infrastructure as well as economy of the nation. The temporal and spatial resolution of the various remote sensing sensors has a capability to provide information from micro to macro scale 24 X 7. This information is very much important for flood modeling not only by using the visible wavelength but beyond the human vision especially microwave sensor that capacity to see below the clouds. This technology is very much useful in monitoring flood events, mapping the extent, assessing impact and modeling for future by using multi-sensor conjunction with multi-criteria analysis in GIS environment.

Keyword: *Flood, Geospatial Technology, Flood Modelling, DEM/DTM, Flood Preparedness.*

MAPPING AND ZONING OF THE FLOOD HAZARD AREA USING FLOOD HAZARD INDEX [FHI]: A CASE STUDY OF DELHI FLOOD 2010

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This paper tried to categorize the Delhi into five flood hazard zones based on the role of physiographic, hydrological and geological parameters in influencing flooding. The purpose of

this study was also to know the most affected land use class in the different flood hazard zones due to flooding. The eight parameters were identified for flood hazard zoning namely flow accumulation, draining capability, elevation, runoff coefficient, slope, ground water depth, land use and geology. Analytical hierarchy process (AHP) of multi-criteria decision making (MCDA) was used to find out the weights of these parameters. Flood hazard index was used to prepare flood hazard zone map after combining the weights derived from AHP and rating of the parameters using the raster calculator tool of ArcGIS software. Landsat-5 data was used to map the flood extent during the peak flooding time on 26 September 2010. A modified normalized difference water index (MNDWI) was used to delineate study area into water and non-water classes. This historical flood extent map was also used for the validation and authentication of the flood hazard zone map. The flood hazard zone map concluded that 8.75% area of Delhi is lies in very high flood hazard zone. Built-up with 39.66% and agriculture with 32.91% covered approx 72% area of the very high flood hazard zone. Built-up was the most affected due to flooding in Delhi. Flood hazard zone map of Delhi may be helpful for the disaster manager, city planner and decision maker in the case of pre-planning, development activities, flood monitoring, evacuation and for quick response during flood.

Keywords: *Flood Extent Mapping, Flood Hazard Index, Analytic Hierarchy Process, Geographical Information System, Modified Normalized Difference Water Index.*

FLOOD HAZARD AND GENDER VULNERABILITY: A CASE STUDY OF MALDA DISTRICT, WEST BENGAL

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Floods are very common in lower Gangetic flood plain areas, especially in the Malda district, West Bengal. The Malda district has become synonymous with flood hazards. The impacts of the flood are not only limited to spatial, economic, agricultural disaster but also affect men and women differently, making it not gender neutral. The poor community, children, aged and physically challenged are highly vulnerable to the floods, but among them the women are the most vulnerable group. This study attempts to assess the condition of women and their special vulnerabilities during flood disasters, and to discuss how floods affect women differently from men in the Malda district. To carry out this study, primary and secondary data have been used. During flood scenario in the Malda district, it has been found that women, having involved more in the household work, cooking, collecting fuel and water, are more likely to have been suffered by infectious diseases such as Cholera, Diarrhea and skin disease, making them more vulnerable than men, who go out for just collecting food, fishing and selling them to earn little extra. Hence it's important to study the way floods impact on the female lives differently that's quite evident when compared to the male in the flood hazard area.

Keyword: *Disaster, Hazard, Flood, Gender Vulnerability, Infectious Diseases*

IDENTIFYING FLOOD SUSCEPTIBLE ZONES OF A FLOOD PRONE REGION OF UTTAR PRADESH, INDIA

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Flooding is one of the most frequently occurring natural disasters on the world. It results in the death of people as well as the damage of property, livelihood, and resources. From 1995 to 2015,

floods accounted for around 47 percent of all weather-related disasters, with Asia accounting for 95 percent of all floods. After Bangladesh, India is the world's second most flood-prone country. Uttar Pradesh is India's third most flood-prone state. Floods damaged Balrampur district in 2017, affecting roughly 300 villages. Approximately 94 percent of the population in Balrampur district lives in rural areas and is reliant on agriculture and related activities. Because of the dynamic and complicated nature of floods, forecasting flash floods is difficult. However, different models can be used to map flood-prone areas. Every year, a flood damages the agriculture. The purpose of this study is to determine which areas of the district are prone to flooding. Using a fuzzy logic method, flood susceptibility model was developed by merging 13 influencing parameters. The results show that areas along the Rapti river channel in the Balarampur, Shri Dat Gani, Utraula, Gesari, and Gaindas blocks are highly susceptible to flooding. This research will be useful to governments and policymakers around in order to promote sustainable development in flood-prone areas.

Keywords: *Flood Prone Area, Flood Inventory, Fuzzy Logic, Sustainable Development*

IS FLOOD BOON OR BANE? -- A CASE STUDY ON HUGLI DISTRICT, WEST BENGAL

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The basic concern of geography is to search for meaningful interpretations of the interface between man and nature. Thus, a geographer always tries to find the correlation between the environmental and the social systems with the attendant technology and infrastructure in use. Different systems of the environment provide a number of opportunities for societies to absorb the various elements

of the natural systems as resource. The occurrence of regular but low-magnitude floods in floodplain regions has proven beneficial to local ecosystem peoples as well as hydraulic societies, as such floods carry nutrients along with sediments that are deposited in cultivable lands, and thus the immediate ecosystems are replenished on a regular basis to support the biodiversity adapted to them. The perception of flood, therefore, can vary between people depending on their occupations or trades in practice and on those components of our concept-frames which are relevant to comprehending the specific situation of the study area in terms of flood. A remarkable portion of the district of Hugli in West Bengal experiences almost regular floods and the area is predominated by a dense population with variety of primary and other economic activities which are directly or indirectly terminated by the periodic floods. This paper is an attempt to examine the relationship between flood and the human societies and to put together their possible management considering both their economic and ecological importance.

Keywords: *Periodic Flood, Floodplain, Ecosystem, Occupation, Natural Systems, Nutrients.*

IDENTIFYING AND ANALYSING THE DOMINANT SOCIAL FACTORS THAT ENCOURAGES PEOPLE TO INHABIT FLOOD-PRONE AREAS OF SRINAGAR CITY, INDIA

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Flooding is a major problem in many parts of the world. Vulnerable populations living in poor and developing countries are at greatest risk. Flood risks are amplified by human-induced climate change, which is a crisis within multiple crises and felt by everyone. This study pertains to Srinagar City of Kashmir Valley along the Jhelum River, a region prone to multiple hazards including

floods. The purpose was to go beyond physical aspects and assess the underlying social factors that encourages people to continue dwell, or move to the areas at-risk of flooding. The data was collected at the household level through in-depth semi-structured interviews with residents having direct flood experience while adhering to the Covid19 protocol. The study included both male and female participants to seek diversity of opinion. After analysing the data using thematic analysis approach, several factors were identified that include, but are not limited to, a sense of place; easy access to quality healthcare and education; good living situation as a result of available urban amenities to accomplish humanitarian needs of people; and equally important being well-adjusted to the flood-hazard situation. In addition, the disconnect between government and people, with residents showing lack of trust in government run flood risk management programmes and a cold attitude towards people-centered disaster risk management was a major highlight of this study. Interventions such as capacity building through community involvement, the use of traditional knowledge and indigenous technology, and the letter and spirit implementation of flood control and prevention measures were considered as a way forward to improve flood resilience in the region.

Keywords: *Floods, Motivations, Flood Risk Reduction, Urban People, Hazard*

URBAN FLOOD RISK HOTSPOT ZONATION USING GIS BASED TECHNIQUES

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Urban floods are a new category of floods plaguing the modern fast growing cities all over the world. Unplanned city growth leaving behind poor drainage and less permeable area fuelled by the increasing intensity and frequency of precipitation events due to climate change are the reasons behind the growing menace of urban floods. Some parts of the city are worst affected by urban floods than others. This is primarily because different factors accumulate and affect that part of city in the most negative way. The present study aims at identifying such hotspots in a city based on a number of factors such as their elevation, stream density, remote sensing indices viz. Normalized Difference Built-Up Index (NDBI) and Normalized Difference Vegetation Index (NDVI) and Normalised Difference Water Index (NDWI) and Runoff potential obtained using the NRCS-CN model. These different factors have been combined using geographic information system (GIS) platform to identify potential hotspots of urban floods. Hotspot identification helps in identifying most flood prone areas which in turn can be used for suggesting risk resilience measures.

Keywords: *Urban Floods, Remote Sensing Indices, NRCS-CN, Flood Hotspots*

Technical Session XI

COMMUNITY BASED DISASTER RISK MANAGEMENT: STUDY OF AWARENESS AND PREPAREDNESS TO DISASTERS IN RURAL AREAS OF RAJASTHAN

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In the last 20 year period from 2000 to 2019, 7348 disaster events were reported worldwide which claimed 12mn lives and affected more than 4.03 billion people. Asia suffered the highest number of disaster events due to size of the continents, its physiography and high density of population. In terms of affected countries globally India with 321 events was third highest in terms of economic losses and loss of lives (UNDRR, 2021). It has been proved that countries where the communities are aware and participate in DRR activities the losses due to disaster events are low. Developing countries like India where the resources are limited communities can play very important role in DRR. If communities are involved in DRR it will not only help in reducing the burden on Government and local administration but also help communities to be self-reliant in emergency situation. As communities are the first responders in every disaster event it is very important to build and improve their capacities so that they can respond efficiently in event of occurrence of disaster. The scale and spread of recent COVID-19 pandemic demonstrated and proved that catastrophes which occur at this large scale cannot be handled efficiently only by Government agencies and local administration. Participation of communities whether it is RWA's, religious, political, philanthropist, charitable and social organisations or group of individuals are important pillars and support to handle the catastrophes by providing help and relief to the victims. Therefore, it is important to build capacities of people by creating awareness and imparting them skill and training for relief and rescue operations to manage the disasters. These skill improvement and trainings will improve the preparedness level of population to face disasters. Involvement of communities also lead to understanding of disasters and traditional coping mechanisms. Their understanding of local disasters and traditional knowledge of dealing with disaster can be very effective in emergency situation. Communities understand their areas better, they know their strengths and weaknesses. In our research project we have analysed and studied the level of awareness and preparedness to face the disaster among the rural population of two villages of Rajasthan both at household level and at community level. The study is based on collection of both

primary and secondary data. Level of awareness and preparedness of individual household was analysed with help of primary data collected through structured questionnaire and interviews. Role of local Panchayats and BDO in creating awareness and helping the communities to improve their capacities was studied with help of interviews of local administrative officials. The study is based on Post Covid-19 scenario.

Keywords: *CBDRM, Capacity Building, Awareness, Preparedness, DRR*

BROOM CULTIVATION AS A SOURCE OF LIVELIHOOD: A CASE STUDY AT CHIRILANGSO VILLAGE IN WEST KARBI ANGLONG DISTRICT OF ASSAM

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Shifting cultivation which is unproductive and negative consequences to environment has paved the farmer for an alternative method of raising crops for family sustenance as well as for commercial purpose. In last few decades, varieties of commercial crops like rubber, tea etc.,have been practised in hilly region in Karbi Anglong district of Assam. Broom (*Thysanolaena*) flower cultivation is widely practised which require least investment but having well in return. The district council has been collecting revenue as broom crop is categorized as non-timber forest product. Mostly practised by the tribal peoples and constitutes an important source of income in the family. This paper is an attempt to study how broom cultivation makes a source of livelihood for the families in Chirilangso village under Chinthong block in West Karbi Anglong district of Assam. Data is collected through structured questionnaire. The study adopted descriptive research design for interpreting the findings. The data have been processed using simple statistical analysis and conclusions are drawn accordingly. It is found that 30 per cent of an annual income of a family

comes from broom cultivation. Villagers continued their farming despite having negative impact on environment. Systematic method of cultivation like planting of shade tree in the broom field can prevent from soil erosion and loss of humidity.

Keywords: *Broom Cultivation , Product, Income, Tribal Life*

AGRIVOLTAIC SYSTEMS: PROMISING MODELS OF CLIMATE RESILIENT AGRICULTURE AND ENERGY INTEGRATION

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Agrivoltaic Systems (AVSs) are a relatively new technology that aims to balance conflicting land uses. Solar panels are placed above crops in agrivoltaic systems to absorb diffuse sunlight and convert it to power, maximising the value of a single plot of land. It combines renewable energy generation, staple crop farming, and typically livestock in such a way that one or more of these components benefits from synergistic design. It was created to address two issues: regulating rivalry between solar and other land uses, notably agriculture, and improving the efficiency with which PV systems may be incorporated into society. They aren't widely used yet because to a lack of understanding of their benefits among farmers and other landowners, as well as a lack of precise information on their economic feasibility. Plants can only use a certain amount of sunlight. Any light over that point has no effect on photosynthesis or the plant's ability to grow. It does nothing but raise the plant's water use. Solar panels may be positioned to offer precisely the proper quantity of sunshine, with the extra light gathered for energy generation. The study is based on qualitative and quantitative data analysis, and attempts to address climate resilient agriculture. This research aims to follow the development of agrivoltaics in India, identify the problems it encounters, and make recommendations for a win-win-win solution that combines food, water, and electricity.

Keywords: *Agrivoltaics, Climate Resilient Agriculture, PVs*

CLIMATE CHANGE AND ITS EFFECT ON CROP PRODUCTION- A CASE STUDY OF ASSAM

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Intense climate-related disasters like floods and droughts have been rising everywhere and affecting livelihoods of people all over the world. Out of different elements of climate, rainfall and temperature used to have maximum effect as these two are the most important element of climate. In this study for the sake of simplification only one aspect of climate i.e. rainfall has been considered and its impact on crop production has been studied. This study has been carried out with the aim of understanding the impact of excess or scarce rainfall on crop production of Assam. Monthly rainfall data for a period of 36 years (1975-2010) recorded in different rainfall gauging stations of Assam has been analysed. Coefficient of variation (C.V.) and Precipitation concentration index (PCI) has been computed to assess rainfall variability. Agricultural data of all the districts of Assam has been collected for the period 1975-2010 and processed. Carl Pearson correlation method is employed to study the effect of rainfall on crop production. The statistical significance of correlation coefficients has been tested at 5% and 1% level of significance. Findings showed that temporal rainfall variability has a significant effect on crop production.

Keywords: *Rainfall Variability, Crop Production, Trend Analysis, Coefficient Of Variation, Precipitation Concentration Index*

GLOBAL PROSPECTS OF SHALE GAS DISTRIBUTION AND THE ADVANCEMENT IN THE PRODUCTION OFGASES

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Natural gas collected from organic-rich shale rock formations has become the fastest-growing source of gas in the United States, and it has the potential to become a significant new global energy option. Although the energy industry has long known about vast gas reserves trapped in organic-rich shale, it has only been in the last decade that companies have successfully combined two well-established technologies to unlock the tight and shale oil/gas resource: hydraulic fracturing and horizontal drilling. The EIA (Energy Information Administration) recently evaluated 95 shale gas basins in 41 countries. India, along with Mexico, Australia, China, Canada, and other countries, is one of the countries studied in this study. Based on current data, the theoretically recoverable shale gas reserve in these nations is estimated to be 7299 TCF. In India, shale gas is not currently exploited much. Encouraged by the results in the United States and a preliminary USGS evaluation, the Indian government is seriously considering doing extensive exploration followed by phased extraction. Based on current data, the theoretically recoverable shale gas reserve in these nations is estimated to be 7299 TCF. In India, shale gas is not currently exploited. Encouraged by the results in the United States and a preliminary USGS evaluation, theIndian government is seriously considering doing extensive exploration followed by phased extraction. According to preliminary estimates from various agencies, the Cambay Basin in western India, the Krishna-Godavari Basin along India's east coast, the Cauvery Basin in southernIndia, and the Damodar Valley Basin in northeast India have risked gas-in-place of 290 TCF witha technically recoverable resource of 93 TCF. The development of domestic shale gas deposits could assist India in meeting its expanding energy demand while also lowering its reliance on costly energy imports. Furthermore, the growth of the local shale gas industry has the potential toenhance the Indian economy.

Keywords: *shale gas, well logging, hydraulic fracturing, co_2 injection, Krishna Godavari basin EIA (Energy information administration).*

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