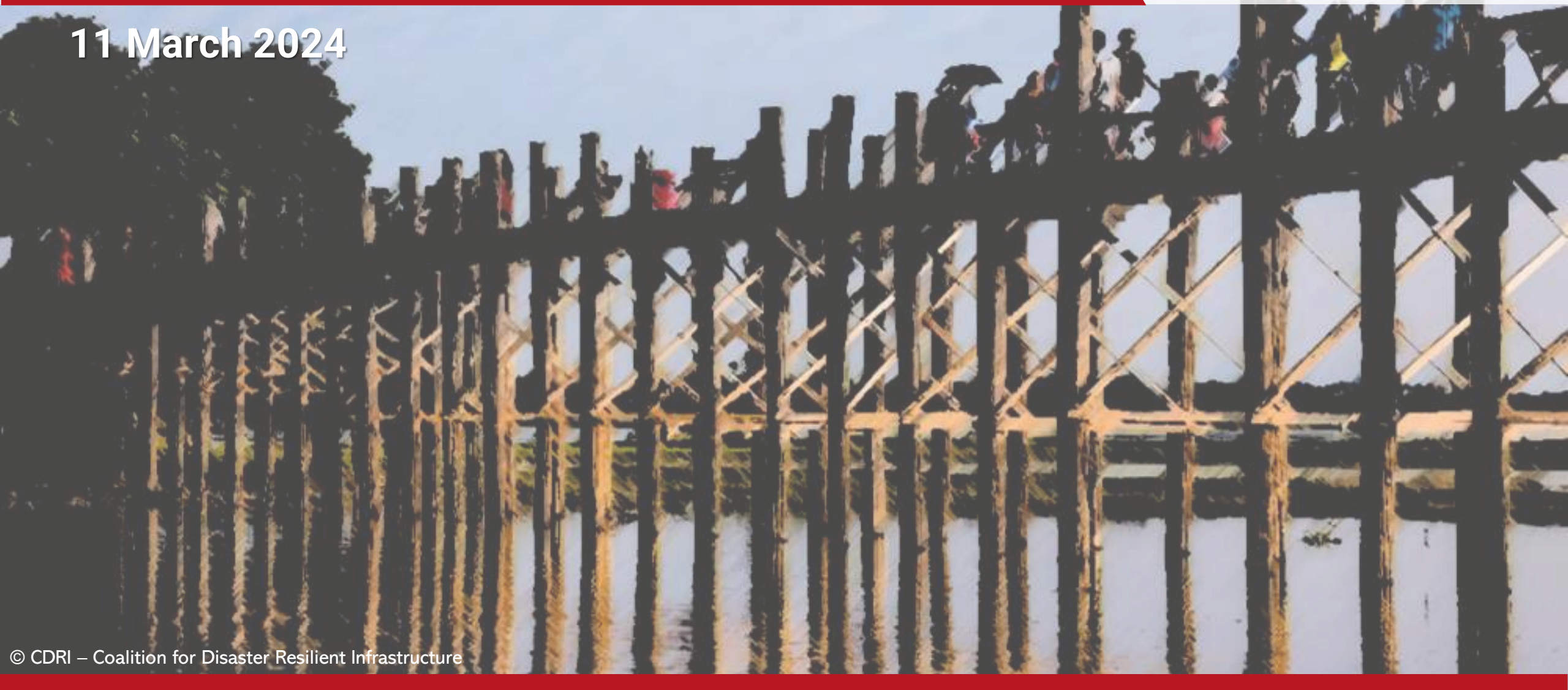
Coalition for Disaster Resilient Infrastructure

CDRI
Coalition for Disaster Resilient Infrastructure

11 March 2024



CDRI
Coalition for Disaster Resilient Infrastructure

Launched at

UN Climate Action Summit in 2019

What we need is a global people's movement to bring about behavioral change…….therefore India is here today to present a practical approach and roadmap.

In order to make our infrastructure resilient in the face of disasters, India is launching a Coalition for Disaster Resilient Infrastructure. I invite all member states to join this Coalition.

UN Climate Action Summit in September 2019

1. **Global Coalition & Governance**
2. **Advocacy for Disaster Resilient Infrastructure (DRI)**
3. **Knowledge & Capacity Development**
4. **Programmes & Technical Support**

Shri Narendra Modi
Hon. Prime Minister of India

Global Coalition & Governance

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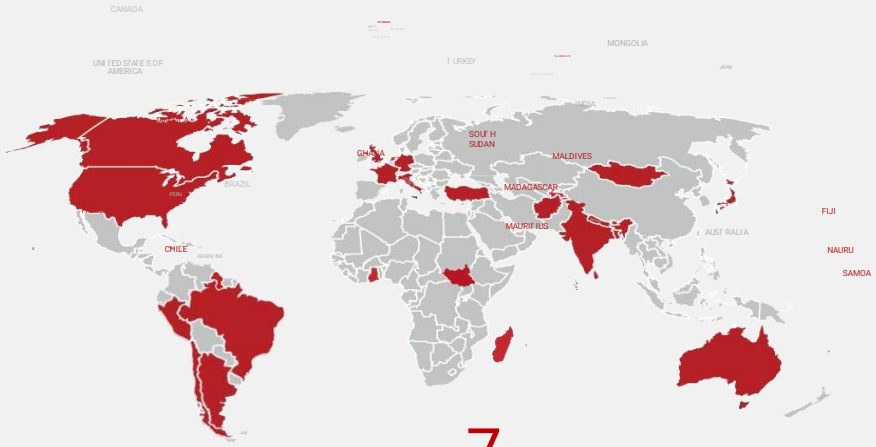
Coalition for Disaster Resilient Infrastructure



38
COUNTRIES

7
INTERNATIONAL ORGANIZATIONS

ADB
WORLD BANK GROUP
European Investment Bank
UNDP
arise
UNDRR
UN Office for Disaster Risk Reduction

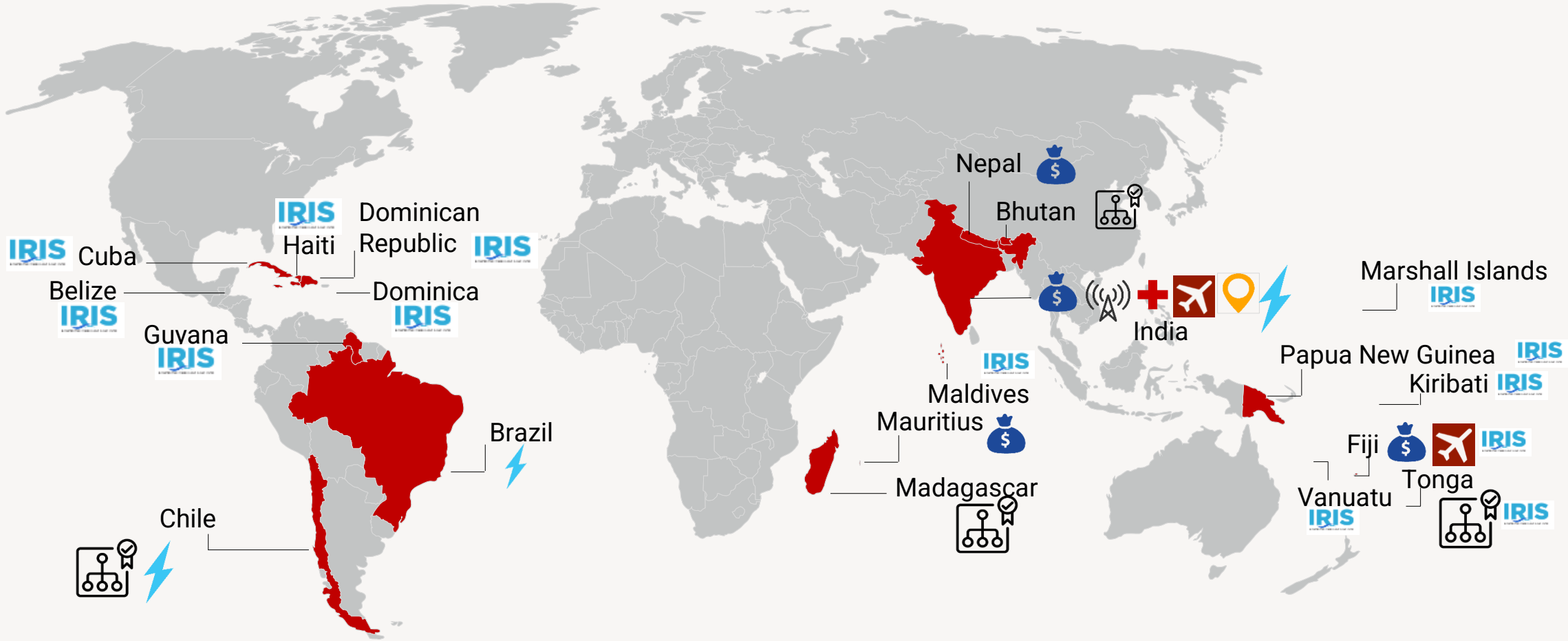
Target

- **75 countries by 2026**
- **Focus on Africa, SIDS, Southeast Asia**

- AFGHANISTAN
- ANTIGUA AND BARBUDA
- ARGENTINA
- AUSTRALIA
- BANGLADESH
- BHUTAN
- BRAZIL
- CANADA
- CHILE
- DOMINICAN REPUBLIC
- FIJI
- FRANCE
- GERMANY
- GHANA
- GUATEMALA
- GUYANA
- HAITI
- HONDURAS
- INDIA
- ITALY
- JAMAICA
- JAPAN
- MALDIVES
- MADAGASCAR
- MAURITIUS
- MONGOLIA
- NAURU
- NEPAL
- NETHERLANDS
- PERU
- SAMOA
- SOUTH SUDAN
- SRI LANKA
- TAJIKISTAN
- TONGA
- TÜRKIYE
- UNITED KINGDOM
- UNITED STATES OF AMERICA

7 new member countries in 2023

Global Programmes & Initiatives



Power Sector Resilience

Transport Sector Resilience

Telecom Sector Resilience

Health Sector Resilience

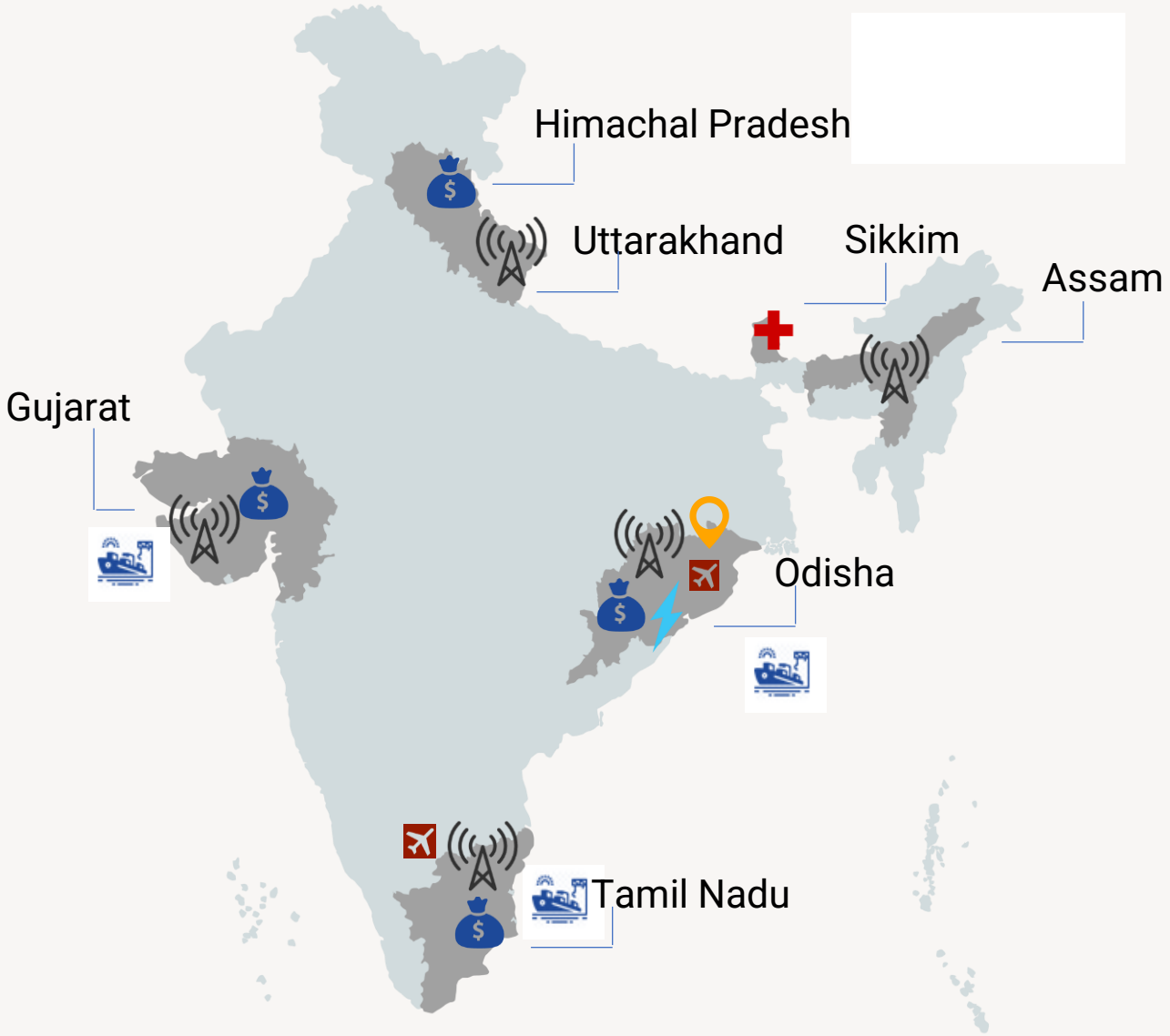
Disaster Risk Financing

Governance Study

Urban Resilience Programme

IRIS

Programmes and Initiatives across India



- **Power Sector Resilience**
- **Transport Sector Resilience**
- **Seaport Resilience**
- **Telecom Sector Resilience**
- **Resilient Health Infrastructure**
- **Finance for Resilient Infrastructure**
- **Urban Resilience**

Overview- Disaster & impact on community, critical power infra & economy

Resources (fuels, HR, equipment	Transport & Logistics	Generation	Transmission	Distribution	End-User
Disruption to supply chain	Disruption of logistics network & transport	Disruption to supplies and reduced efficiency due to extreme temperatures, very high winds, drought & floods			Changes in demand; ability to recover from extreme events

Cyclone Fani, India (2019)

Economic Impact- $ 9 billion

Cyclone Winston, Fiji (2017)

Economic Impact- $ 1.3 bn (31% GDP)

Hurricane Maria, Puerto Rico (2017)

Economic Impact- $ 91 billion

Superstorm Sandy, USA

Economic Impact- $ 65 billion

Annual economic losses in Pacific SIDS- **$ 1 Bn--5%** of combined GDP- World Risk Index 2021

40 % ↑ no. of disasters during 2015-2030- GARR 2022

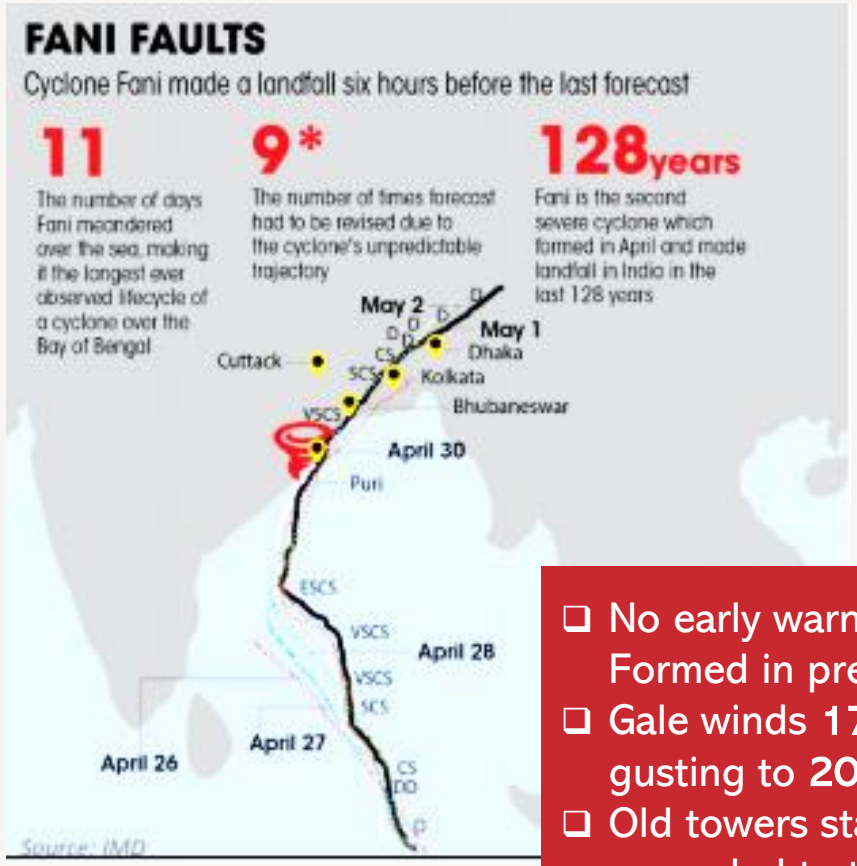
Economic Impact on developing countries-

Pvt Sector Sale Losses of **$ 82 Bn per year**

Household losses- **$ 2.3 bn -190 Bn per year**

Stronger Power, World Bank 2019

Case Study-Cyclone Fani: Impact on Odisha power infrastructure



Damage to power infrastructure: INR 8,139 Crs (USD 1.2 Bn)

Transmission (440, 220 and 132kV)

- **116** towers
- **2** Grids and **250 km** lines

Distribution (33kV, 11kV and LT)

- **2.2 lakh** poles
- **1.1 lakh km** lines
- **12,064** Transformers

Estimated revenue loss: INR 254 Crs (USD 36 Mn)

Electricity consumers impacted: 4.63 Mn

- No early warning indicator- Formed in pre-monsoon (April)
- Gale winds **175-185 kmph;** gusting to **205 kmph**
- Old towers standards not upgraded to the above wind speed
- High winds and torrential rains in Puri & Bhubaneswar

- Major damage to distribution infrastructure, transmission impact was limited
- Power disruption to critical consumers like hospitals, water pumps, state dept. offices
- Clogged roads and highways due to fallen trees, electricity poles, and lines

Disaster Resilient Power Systems

Odisha Power Infrastructure Resilience

Component I: Disaster preparedness and management

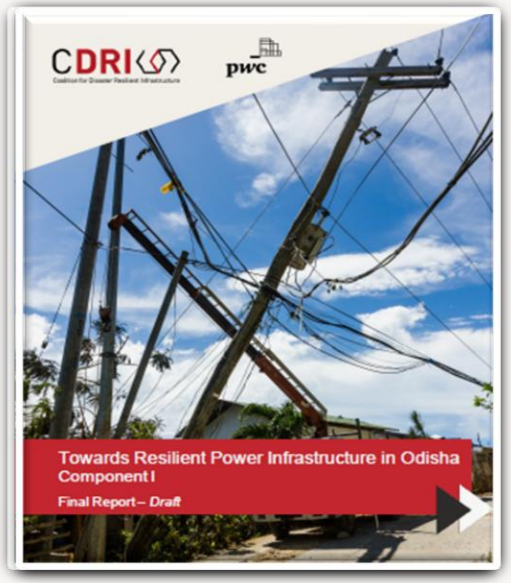
- Preparedness and survival
- Recovery and reconstruction
- Social and community resilience

Component II: Risk mapping and improvement of infrastructure

- Risk identification and estimation
- Codes, standards, design and regulation
- Technology and innovation

Component III: Institutional capacity and financing for resilience

- Risk based governance and policy development
- Financing resilience and adaptation
- Capacity mapping and development, and knowledge management



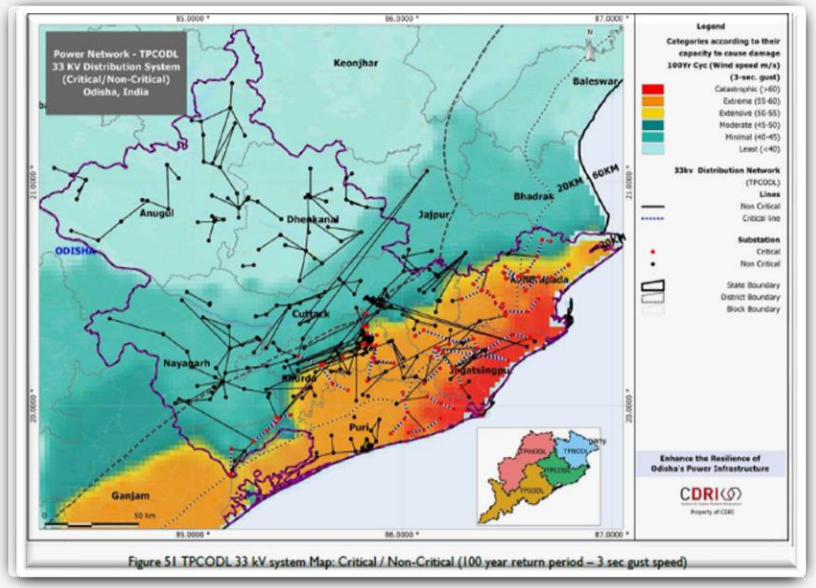
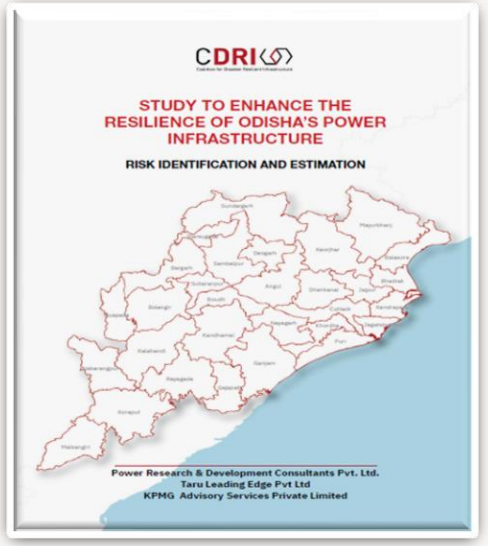
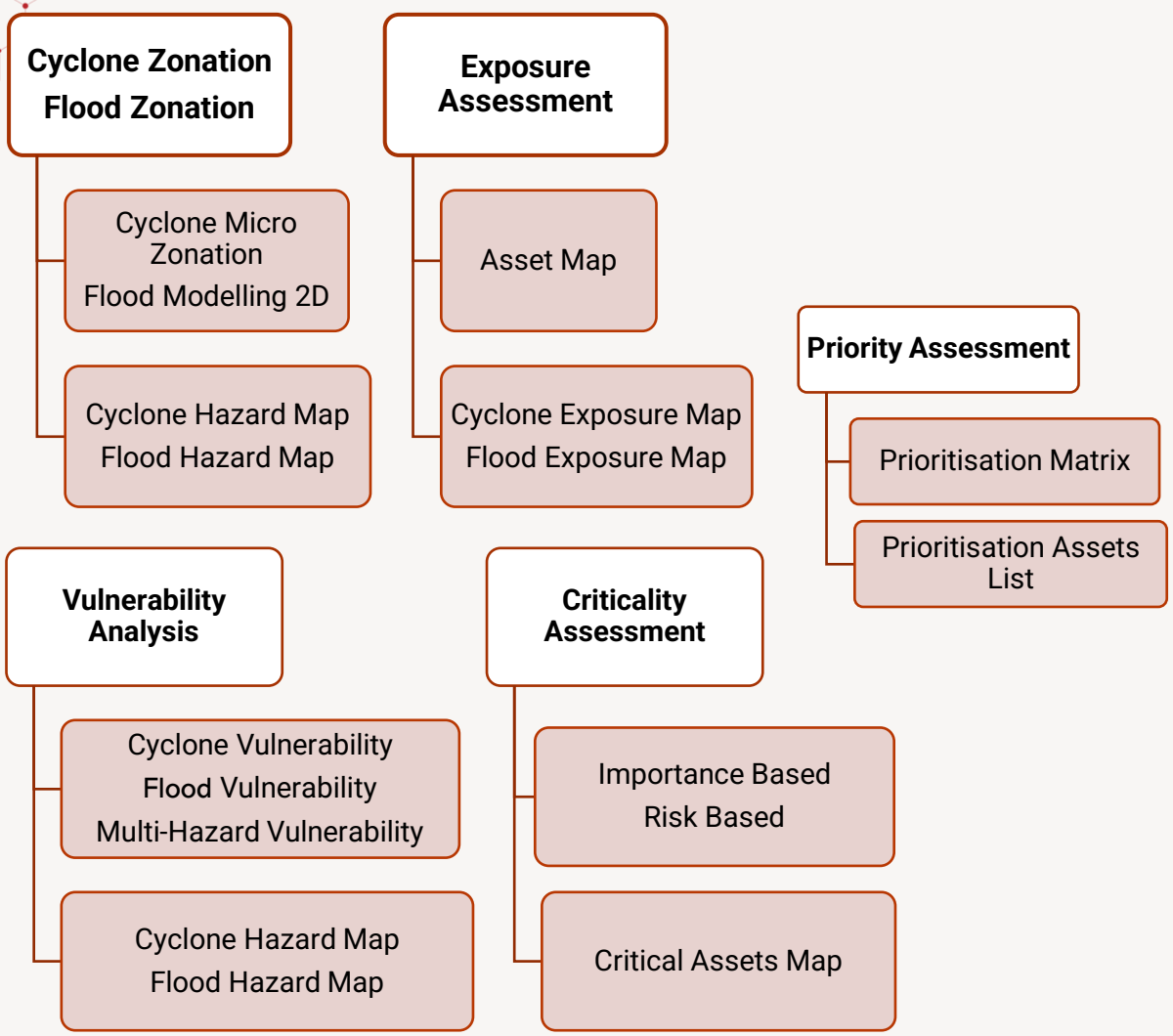


Figure 51 TPCODL 33 kV system Map: Critical / Non-Critical (100 year return period – 3 sec gust speed)



Component II: Risk Identification and Estimation Methodology



Prioritisation Matrix

Criticality	Vulnerability	Distance from seacoast	Priority
Yes	High	High	1
		Medium	2
		Low	3
	Medium	High	2
		Medium	3
		Low	4
	Low	High	3
		Medium	4
		Low	4
No	High	High	2
		Medium	3
		Low	4
	Medium	High	3
		Medium	4
		Low	4
	Low	High	3
		Medium	4
		Low	4

Component II: Risk Identification and Estimation Methodology

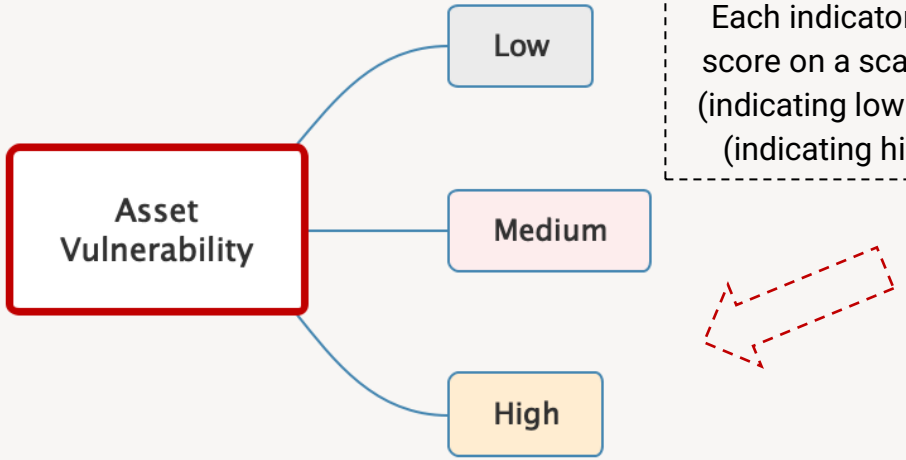
Vulnerability Assessment and Flood Exposure

16 Indicators based on their correlation with infrastructure vulnerability

1 Low Vulnerability

4 High Vulnerability

Each indicator was assigned a score on a scale ranging from 1 (indicating low vulnerability) to 4 (indicating high vulnerability)



DISCOMs/Districts	Flood exposure for power systems		
	1 in 5 (Current Scenario) year return period	1 in 100 (Current Scenario) year return period	1 in 100 (Far Future) year return period
TPCODL	5.6%	6.2%	6.5%
Angul	0.0%	0.0%	0.0%
Cuttack	4.8%	4.8%	4.8%
Dhenkanal	0.0%	0.0%	0.0%
Jagatsinghpur	15.0%	20.0%	20.0%
Kendrapada	25.0%	28.1%	31.3%
Khordha	0.0%	0.0%	0.0%
Nayagarh	0.0%	0.0%	0.0%
Puri	12.5%	12.5%	12.5%
TPNODL	11.1%	11.9%	13.3%
Balasore	19.7%	21.3%	24.6%
Bhadrak	24.2%	27.3%	30.3%
Jajpur	5.3%	5.3%	5.3%
Keonjhar	0.0%	0.0%	0.0%
Mayurbhanj	5.8%	5.8%	5.8%
TPSODL	0.0%	0.0%	0.0%
Gajapati	0.0%	0.0%	0.0%
Ganjam	0.0%	0.0%	0.0%
Grand Total	**6.6%**	**7.2%**	**7.8%**

Component II: Risk Identification and Estimation Indicators

Transmission Sector

Components	Indicators	Parameters	Score
GSS	Type of GSS	GIS	1
		AIS Outdoor	4
	Year of Commissioning	< 30 years	1
		> 30 years	4
	Failure History in past cyclones	No	1
		Yes	4
	Type of GSS power supply source	Ring type	1
		Radial type	4
Transmission Lines	Year of Commissioning	< 30 years	1
		> 30 years	4
	Type of Circuit	Double (Multiple Source)	1
		Single (Single source)	4
	Span length (m)	400 kV line (>400 m) & 220 and 132 kV line >250 m	4
		400 kV line (<400 m) & 220 and 132 kV line <250 m	1
	Failure History in past cyclones	Yes	4
		No	1

Distribution Sector

Components	Indicators	Parameters	Score
PSS	Year of Commissioning	< 30 years	1
		> 30 years	4
	Type of PSS	GIS	1
		AIS Indoor	2
		AIS (Indoor -11kV & Outdoor-33kV)	3
		AIS Outdoor	4
	Building Standards/ Codes/ Design Spec	Single Storey	1
		Double Storey	4
	Type of PSS power supply Source	Ring type (Double source)	1
		Radial type (Single Source)	4
Distribution Lines	Year of Commissioning	< 30 years	1
		> 30 years	4
	Type of supporting structures/poles	UG (Under Ground) / Narrow Base Lattice Structure / H-Pole/ H, Rail/ Tower (Lattice)	1
		NBLS, JOIST, UG / Joist, Rail / Joist, Tower / Joist, H	2
		Joist / MIX	3
		PSC / Joist, PSC, Rail / Joist, Lattice / Joist, Tower	4
	Span length (m)	Upto 40 m	1
		40 to 50 m	2
		50 to 60 m	3
		> 60 m	4
	Failure History	No	1
		Yes	4

Component II: Risk Mapping and Improvement of Infrastructure

Methodology For CBA of Odisha Power Infrastructure Investment

Exposure Assessment is carried out to estimate the nature and extent of debacle risk and evaluating prevailing conditions of exposure and vulnerability to infrastructure, services, mankind and environment

Cyclone Micro Zonation

Zonation is carried out classifying larger region into micro zones with varying wind speeds

Using the wind speed values at each grid points for different return periods (5, 10,25.50,100 years) , the micro-zonation maps were obtained using Geographical Information System (GIS) tool Inverse Distancing Weightage10 (IDW) Giving potential power assets exposed to cyclone

To assess the losses incurred and the financial resources required, vulnerability assessment basis on the order of risk associated.

Vulnerability Assessment Indicators

Distribution Primary Substation

- Year of Commissioning
- Type of PSS
- Building Standards/codes/Design spec
- Type of PSS power supply source

Distribution - Lines

- Year of Commissioning
- Type of supporting structures/poles
- Span Length
- Failure history

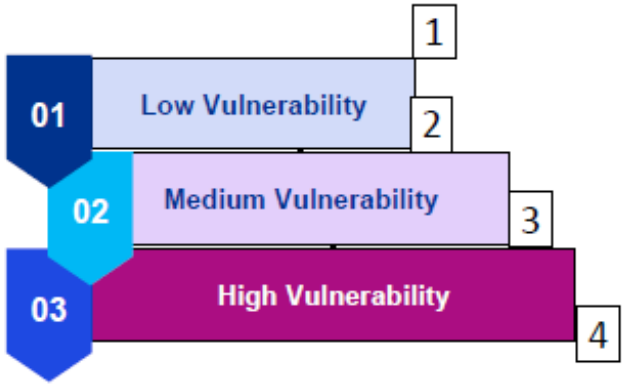
Transmission Grid-SS

- Year of Commissioning
- Type of GSS
- Failure history in past cyclones
- Type of GSS power supply source

Transmission - Lines

- Year of Commissioning
- Type of circuit
- Span Length
- Failure history in past cyclones

Ranking Scale



Identification and prioritization of critical components

Based on the vulnerability and criticality analysis, lines and substations are exposed to high risk and are prioritized for retrofitting/ modification of its components in order to resist the multi hazard risks.

6

Recommendations and Next Steps

Data collection and management

Utilities to work with SDMA to regularly integrate climate risks by improving data availability on current levels of extreme events, recent trends, and projections of future changes into a hazard map.

- **Systematic Recording** from Loss and damage of power sector assets to Learn, Build Back Better which will result in developing power sector-focused **Post Disaster Need Assessment** guidelines
- Use of digital tools such as Digital asset inventories, Open-source modelling, and Web-GIS Applications for effective asset management

Codes, standards, and regulations

Odisha coast must be considered in Wind Zone VI instead of Wind Zone V in IS 802 Part 1 Section 1.

Wind maps in the Indian Standards (IS) 802 to be updated with recent trends (wind speed of more than 220 km/hr) and projections of future changes

- **Climate, disaster maps, and data** should be generated, integrated & upgrade **codes and standards.**

Infrastructure - resilience governance

Governance structures to be set up to guide stakeholder coordination (BIS, IMD, MoP, NDMA) for effective preparedness, recovery, and mitigation in the power sector.

- **State-specific design specifications** are to be formulated to enhance the system's capacity to withstand the localised intensity of disasters.
- The **policy and regulatory framework** must be more dynamic in **including new technologies** and measures to make the sector resilient.

Regulatory approvals and policy development

Creation of framework (cross-sectoral) with Forum of Regulators, MoP and NDMA

- **Include resilience assessment as mandatory for regulatory approval.**
- **Regulatory inclusions to ensure the adoption of disaster resilience practices.**
- **Incorporate resilience into infrastructure investment and assist regulators by developing tools to recognise resilience's economic benefits outweighing its costs.**

Adequate financing mechanisms

Make public funds conditional on resilience end-to-end integration for new/greenfield infrastructure build-out. For e.g. MoP's Revamped Distribution Sector Scheme

- Work with regulators to mandate the creation of a power utility-focused disaster fund where **at least 1.5% of annual revenue** is to be allotted (Ministry of Power/CEA recommended).
- The government should introduce **innovative financing instruments, including Budget/ Viability Gap Funding** for risk financing instruments

Adequate financing mechanisms

Develop a framework giving an overview of available financial windows with the various national/international agencies (National Disaster Mitigation Fund, MoP's funding) along with policies and institutional mechanisms for financial protection.

- Providing adequate funding to include risk assessments in master plans and early project design

Other Engagements in Power Sector

South America

Chile

- Supporting Chile on National Study on:
  - Map exposure of power infrastructure to natural hazards and climate change
  - Measure vulnerabilities and quantify risk
  - Roadmap and recommendations for power infrastructure resilience

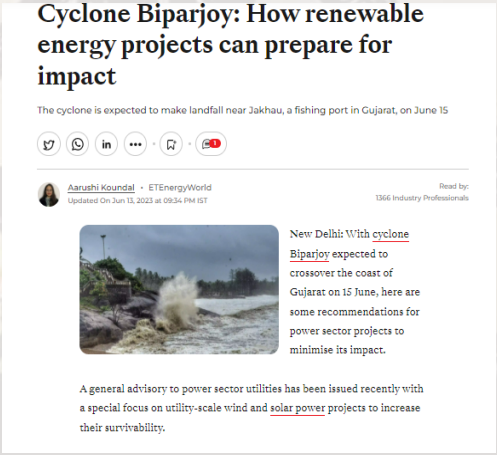
Brazil

- Study on risk governance for management of drought-induced stress in the power sector
- Supporting Brazil in developing a hydro reservoir recovery plan ("Reservoir Recovery Plan" – RRP), with a 10-year perspective, to progressively improve the management of hydropower reservoirs in the sense of bringing more predictability to all water-using sectors, including the power sector

Small Island Developing States (SIDS)

- Building capacity of power sector professionals in the Pacific SIDS conducted a virtual workshop with more than 30 participants from 10 countries in the Indo-Pacific region.
- National Workshop in Mauritius- Capacity Building Workshop is being planned for the Power sector.

Technical Support on Disaster Preparedness



Cyclone Biparjoy: How renewable energy projects can prepare for impact

The cyclone is expected to make landfall near Jakhau, a fishing port in Gujarat, on June 15

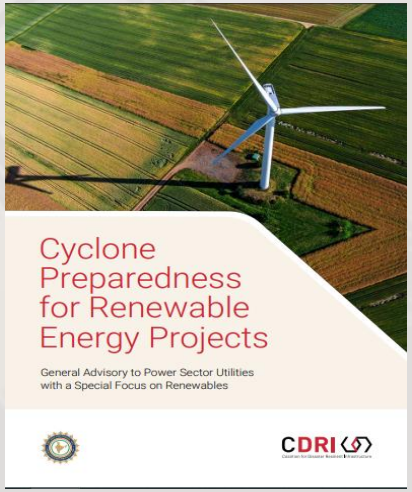
Aarushi Koundal · ETEnergyWorld
Updated On Jun 13, 2023 at 09:34 PM IST

Read by: 1366 Industry Professionals

New Delhi: With cyclone Biparjoy expected to crossover the coast of Gujarat on 15 June, here are some recommendations for power sector projects to minimise its impact.

A general advisory to power sector utilities has been issued recently with a special focus on utility-scale wind and solar power projects to increase their survivability.

Developed Advisory on Cyclone Preparedness for Power Utilities and Renewable Energy Projects – Adopted by MNRE and Ministry of Power, India



Thank you

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