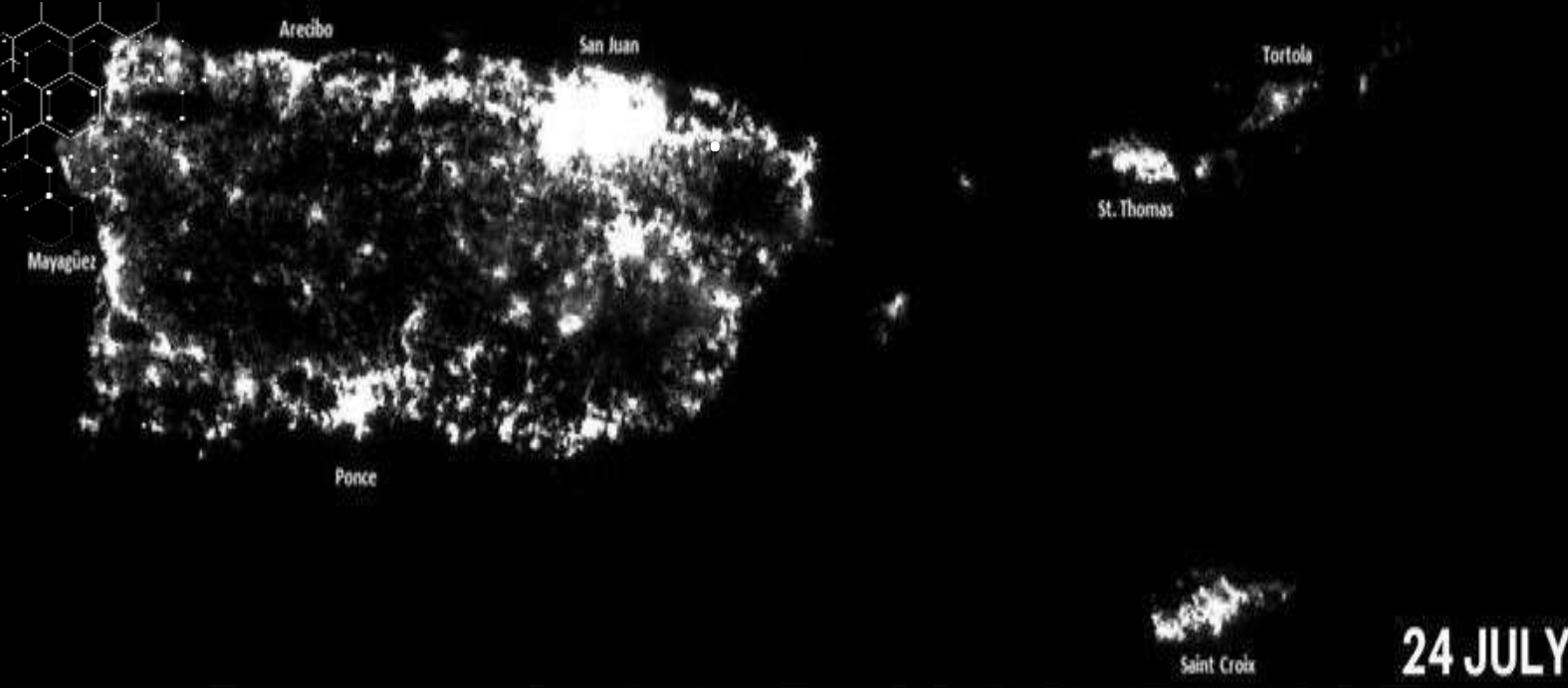




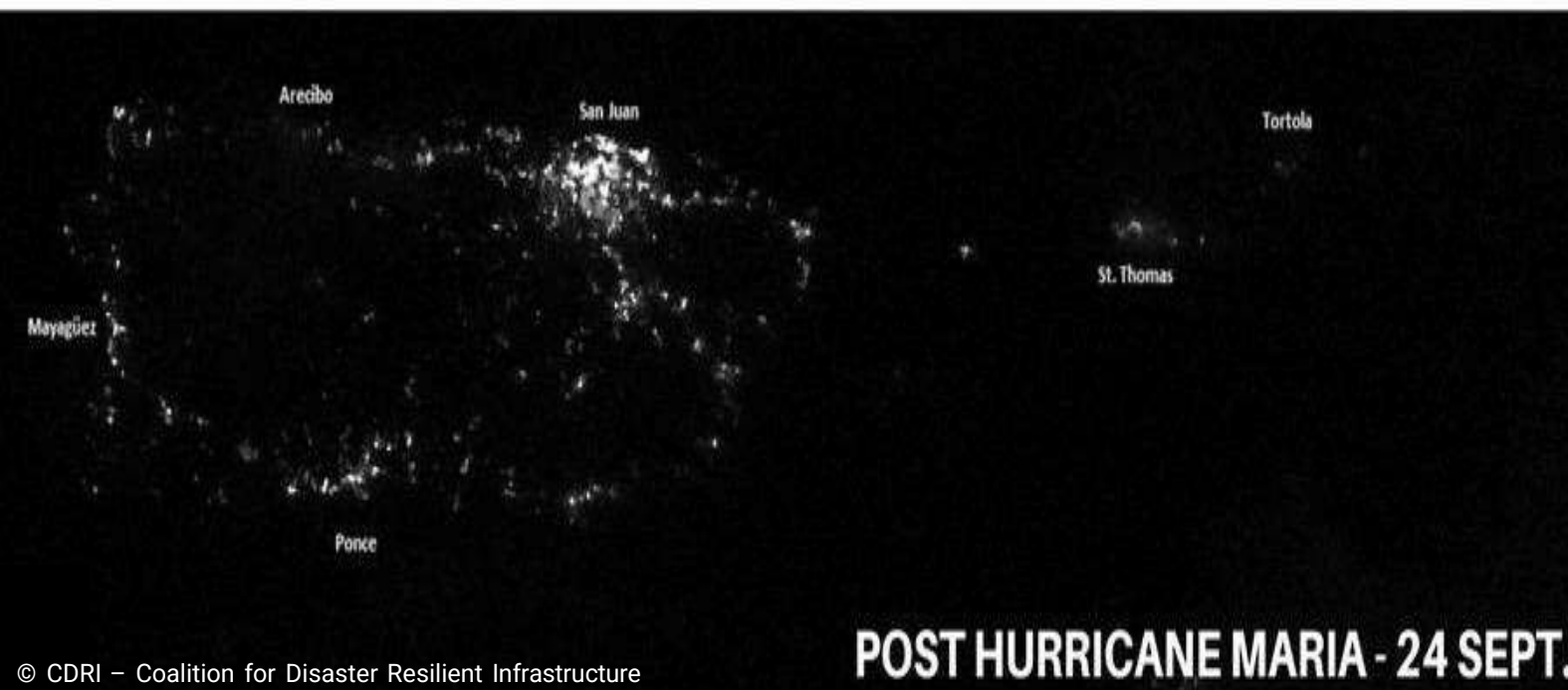
Resilient Infrastructure through Digitalization

*By: Amit Prothi, DG, CDRI
21 August 2025*



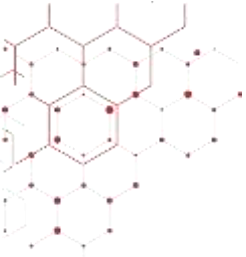
Hurricanes Irma and Maria, Puerto Rico, 2017

- Hurricane Irma, a Category 5 storm, struck Puerto Rico on September 7 and damaged much of the electrical grid infrastructure.
- Hurricane Maria struck on September 20, destroying most of what was still functioning; left the island of 3.4 million inhabitants completely without power.
- In some areas, it took up to a year for power to be restored.



Floods in Bangkok, 2011

- 2011 floods in Bangkok triggered cascading regional impacts on manufacturing supply chains in SE & East Asia
- Western Digital produces a quarter of the world's computer hard drives. When their offices and facilities in Thailand were flooded, it took a year to resume production to pre-flood levels & disrupted computer manufacturers' supply chains.
- Most of the suppliers who were affected by the Thailand floods were SMEs that lacked flood resilience measures



Roads and Railways



Melted asphalt of road in New Delhi during the heatwave in May 2015

- *In EU, the annual cost of heat and drought damage to the road sector from 1998 to 2010 was estimated to be 50 million Euros.*

Source: SBS News website, 2016



Buckled railway tracks in UK during heatwaves in July 2022

- *In the US, sun kinks (buckling of rail) caused over 2,100 train derailments in the last 40 years, equivalent to around 50 derailments per year.**

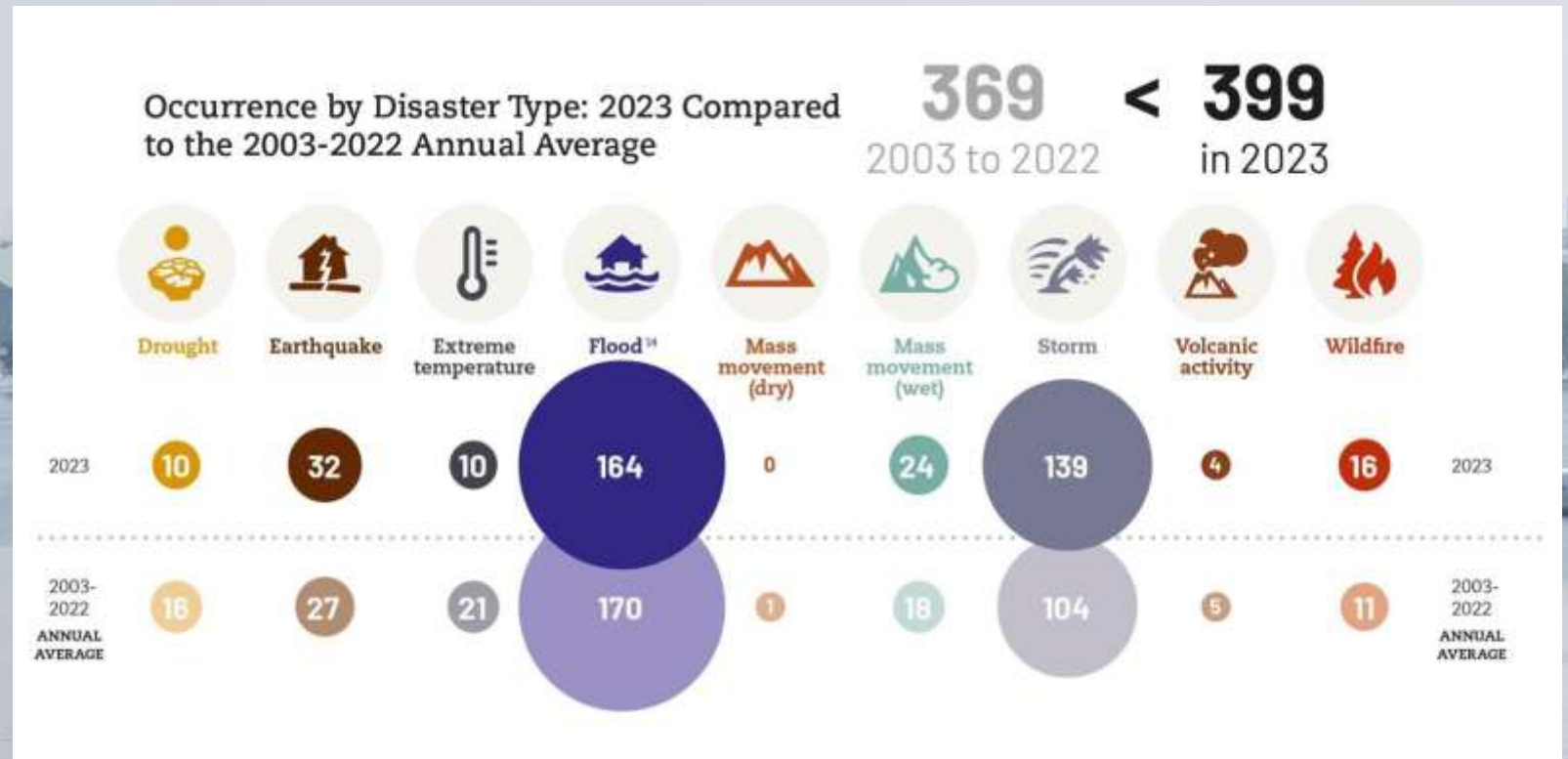
Insurance Losses 2021

- Global insured catastrophe losses in 2021: **US\$ 112 billion**
- Total economic losses in 2021: **US\$ 259 billion**
- Disruption to infrastructure costs households and firms in LMICs at least **US\$ 390 billion a year**, and the **indirect effects** place a further toll on households, businesses, and communities (World Bank: Lifelines, 2019).



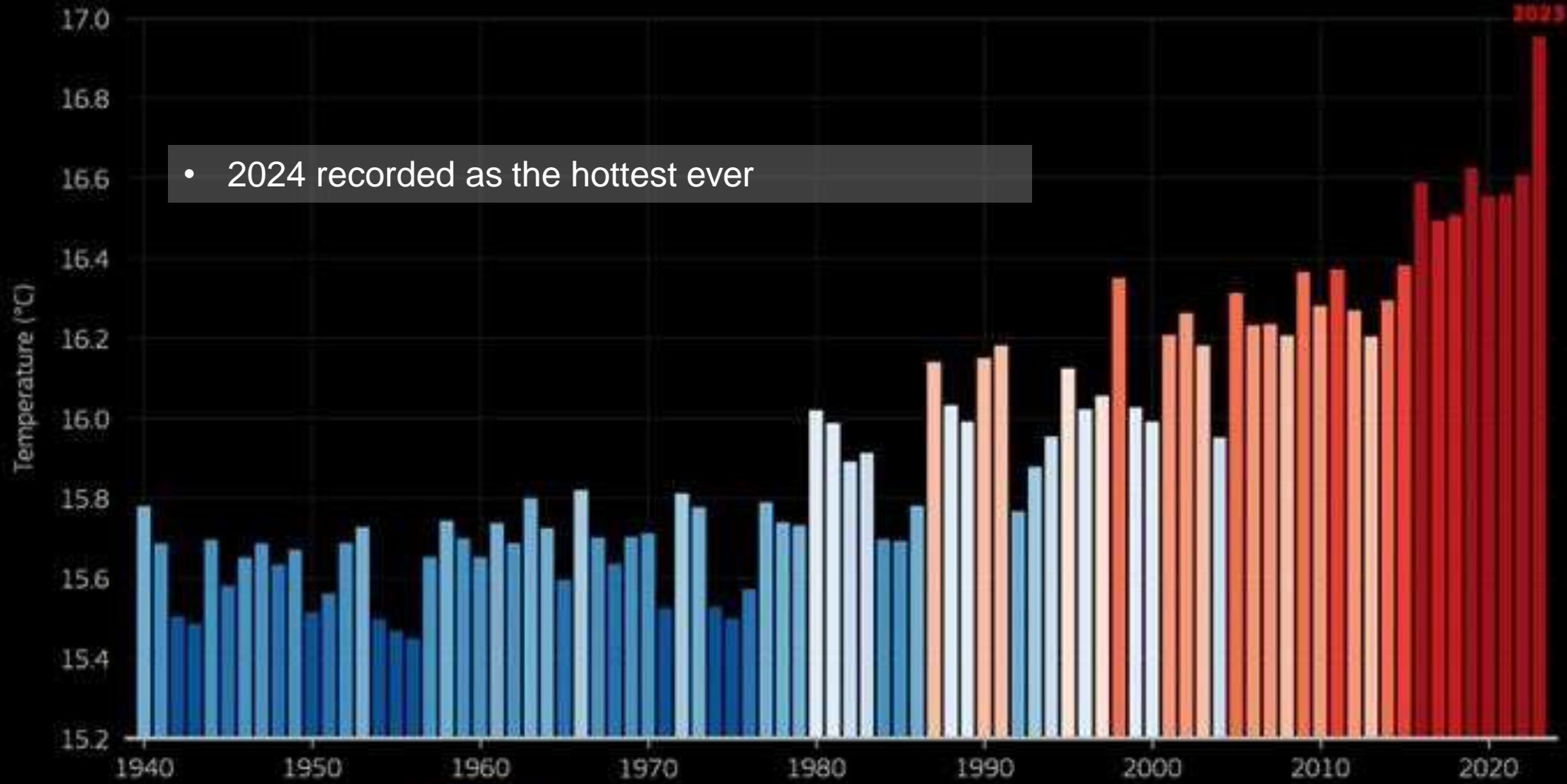
(Source: Swiss Re Institute)

Disaster & Climate Event Trends



GLOBAL SURFACE AIR TEMPERATURE

Data: ERA5 1940-2023 • Credit: C3S/ECMWF



- 2024 recorded as the hottest ever



PROGRAMME OF THE EUROPEAN UNION



Source: WMO Website, 2023

Membership

50 countries, 8 organization



Shri Narendra Modi
Hon. Prime Minister of India

"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."

Africa

- GHANA
- MADAGASCAR
- MAURITIUS
- CHAD
- SOUTH SUDAN
- GUINEA
- KENYA
- NAMIBIA
- MAURITANIA

Asia

- AFGHANISTAN
- BANGLADESH
- BHUTAN
- INDIA
- JAPAN
- MALDIVES
- MONGOLIA
- NEPAL
- SRI LANKA
- TAJIKISTAN
- VIETNAM

Europe

- FRANCE
- GERMANY
- ITALY
- NETHERLANDS
- TURKEY
- UK

South America

- ARGENTINA
- BRAZIL
- CHILE
- COLOMBIA
- ECUADOR
- PERU
- GUYANA

North & Central America

- GUATEMALA
- HONDURAS
- CANADA
- USA

The Caribbean

- ANTIGUA & BARBUDA
- CUBA
- HAITI
- JAMAICA
- DOMINICAN REPUBLIC
- TRINIDAD AND TOBAGO
- GRENADA

Oceania & Pacific

- AUSTRALIA
- FIJI
- NAURU
- NEW ZEALAND
- SAMOA
- TONGA



CDRI Support: Disaster Preparedness/Post Disaster Reconstruction (40 countries)



Infrastructure for Resilient Island States (IRIS)

- Resilient Housing, Hospitals, Schools (Dominica, Haiti, Maldives, Comoros)
- Multi-Hazard Early Warning Systems (Fiji, Dominican Republic, Vanuatu, Kiribati, Tonga)
- Resilient Road infrastructure (PNG)
- Water Supply, Drainage, Irrigation (Guyana, Mauritius)
- Power (Vanuatu, Grenada, St. Lucia, St. Kitts & Nevis, St. Vincent & the Grenadines)

UN SIDS Partnerships Awards 2024
Environment Category 4th International Conference on SIDS



- **Urban Programme** supports 15 cities (Brazil, Bhutan, India, Honduras, Madagascar)
- **Telecom** work in 5 Indian states with DOT & NDMA (replication in Bhutan; in discussions with Ghana)
- **Power sector assessment** in Odisha; **MoU with Chile on Power Sector Resilience**
- **Disaster Risk Financing assessment** in Fiji, Nepal, Mauritius, India



Data Value Chain

Data Collection

Data Processing

Decision Support

Remote sensing, sensor networks, drones, 360 imagery, IoT, social media, smart devices, cloud computing, digital twins, AI+, VR+, BIM, big data, AMS, etc.

Communication

Collaboration

Early Warning

During Crises

Virtual reality, AI, social media, platforms, satellites, 5G, digital twins, etc.

Supporting Actions

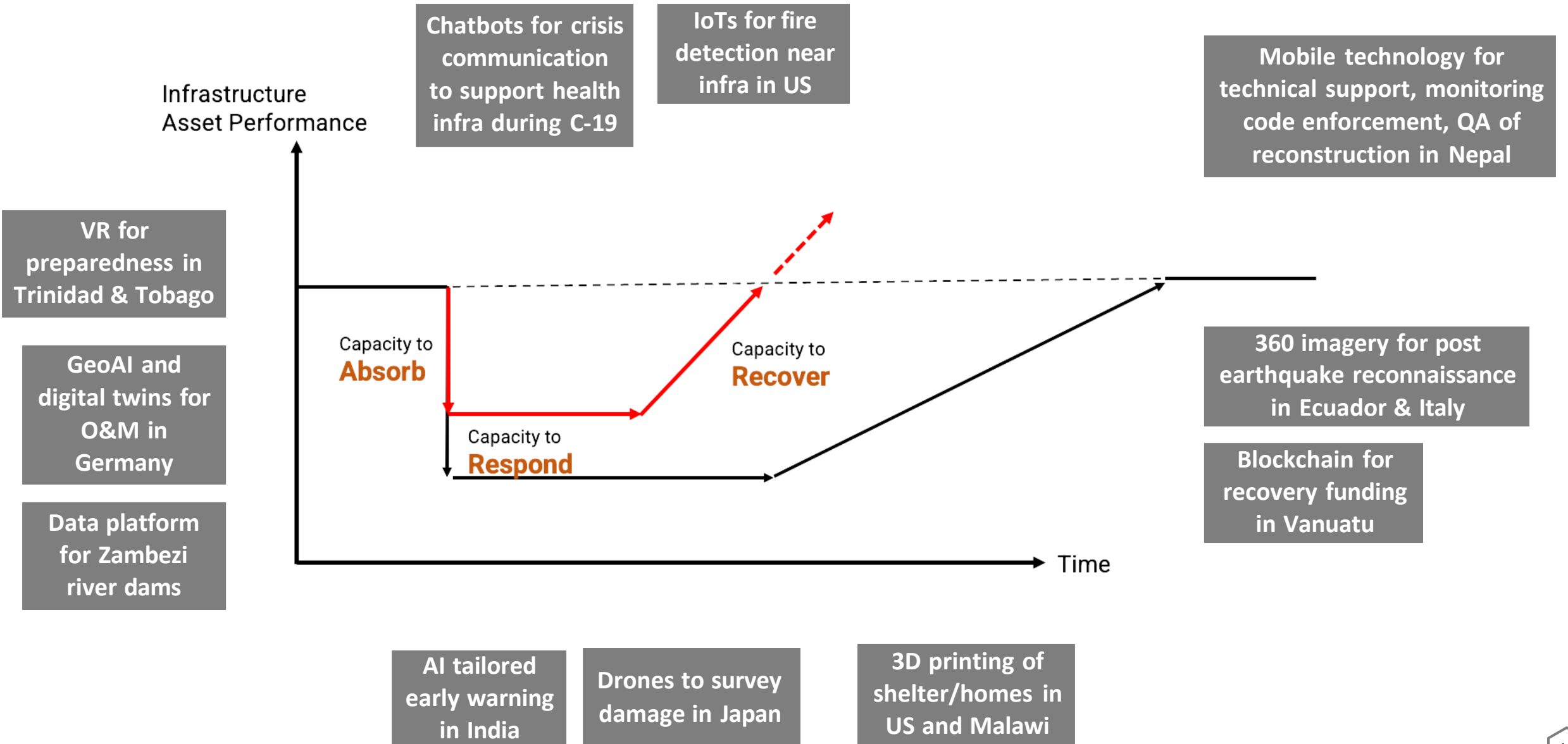
Strengthen Infra

Improve Safety

Increase efficiency

Blockchain, batteries, construction materials, 3D printing, robotics, drones, etc.

Examples (Upcoming CDRI Report)



Global Infrastructure Risk Model and Resilience Index (GIRI)

Measuring Risk & Resilience in Infrastructure Sectors

Risk has been estimated for the existing climate and two different climate change scenarios. Risk metrics such as the Average Annual Loss (AAL) enable governments to identify and understand the contingent liabilities internalised in their infrastructure systems and to choose the most appropriate strategies to strengthen resilience.

Please note that you are accessing the Beta Version of the GIRI Platform. The findings, analyses, interpretations, and conclusions expressed in this Work by Partners/Contributors do not necessarily reflect the views of CDRI, its Executive Committee, or the members of the Coalition.



High Income

Average Annual Loss (USD Billion)

535

Upper-middle Income

Average Annual Loss (USD Billion)

373

Lower-middle Income

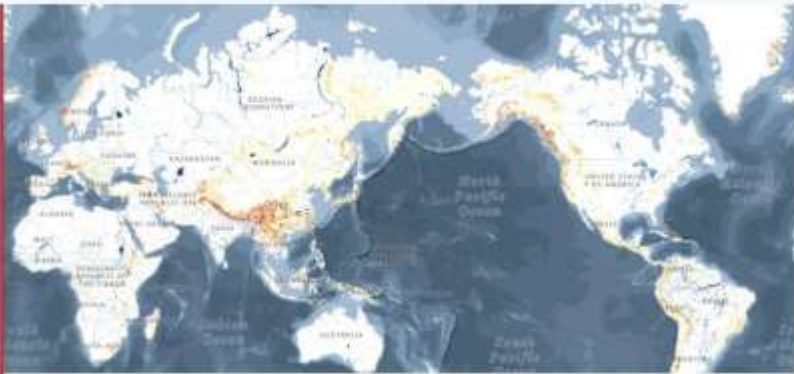
Average Annual Loss (USD Billion)

127

Low Income

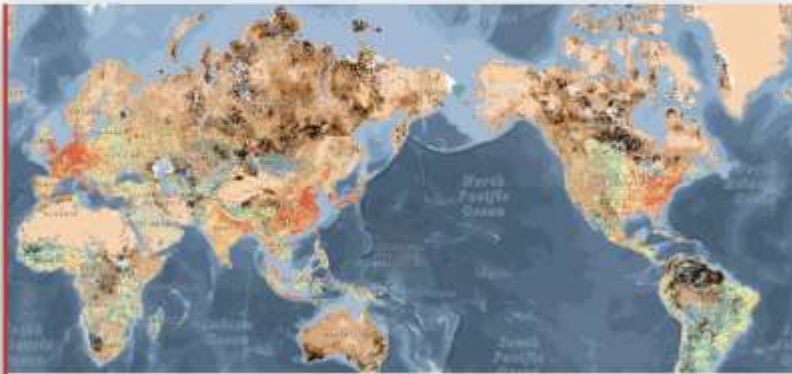
Average Annual Loss (USD Billion)

10



Featured hazard and risk layers

A section which contains a selection of the most relevant exposure, hazard and risk datasets. Dedicated to general users who approach



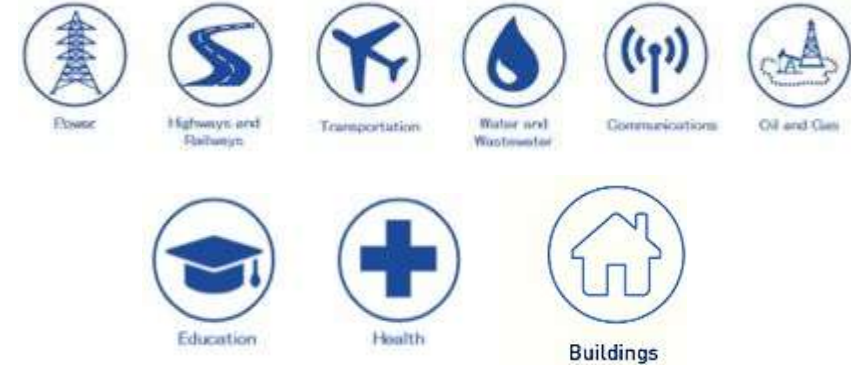
Full set of hazard & risk layers

In this section, you can browse through the more than 100 layers generated for the GIRI project. You can also create your own

The data platform

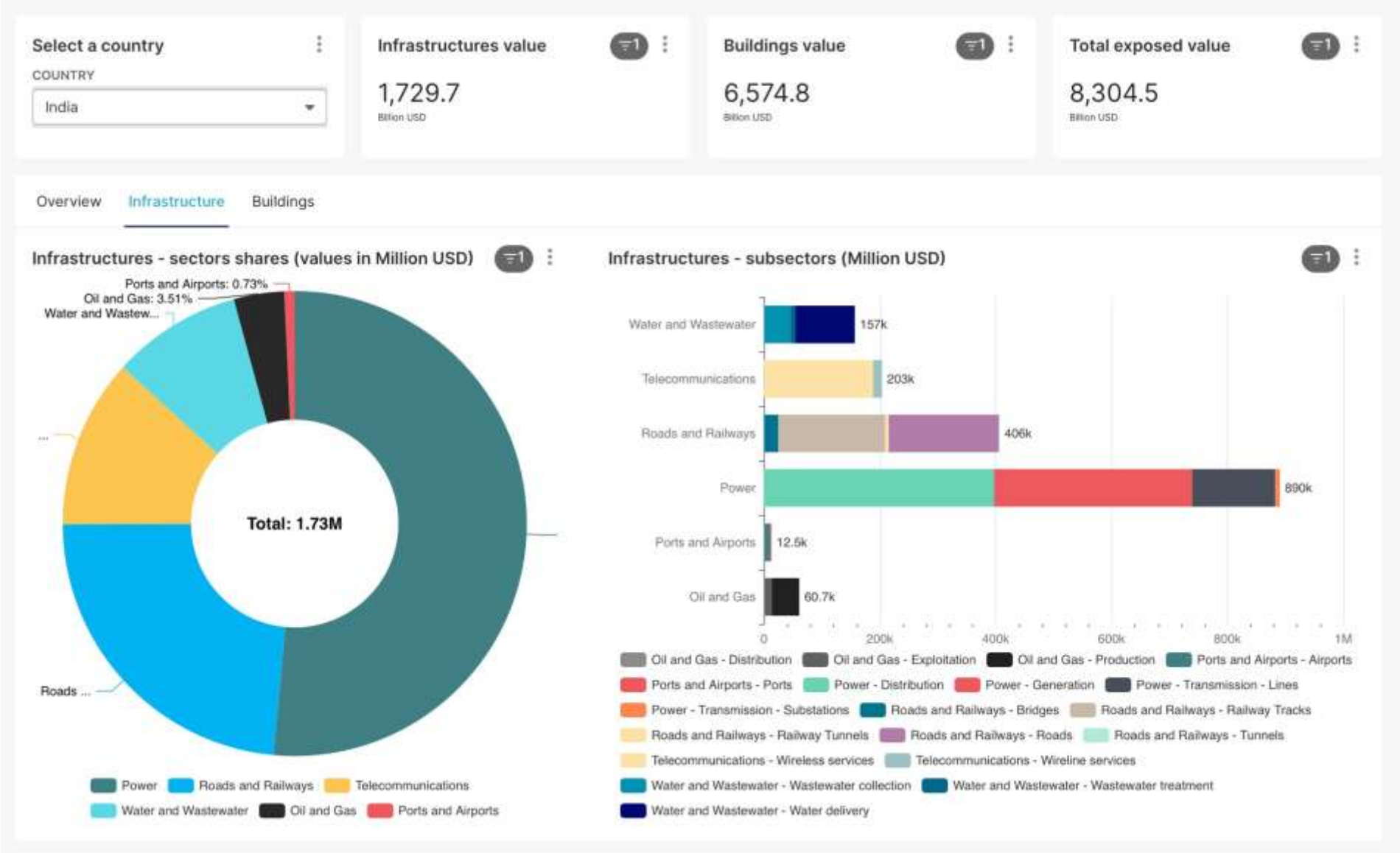
<https://giri.unepgrid.ch>

- GIRI identifies and assesses risks associated with **3 geophysical**, and **4 hydro-meteorological hazards** across **9 infrastructure sectors**



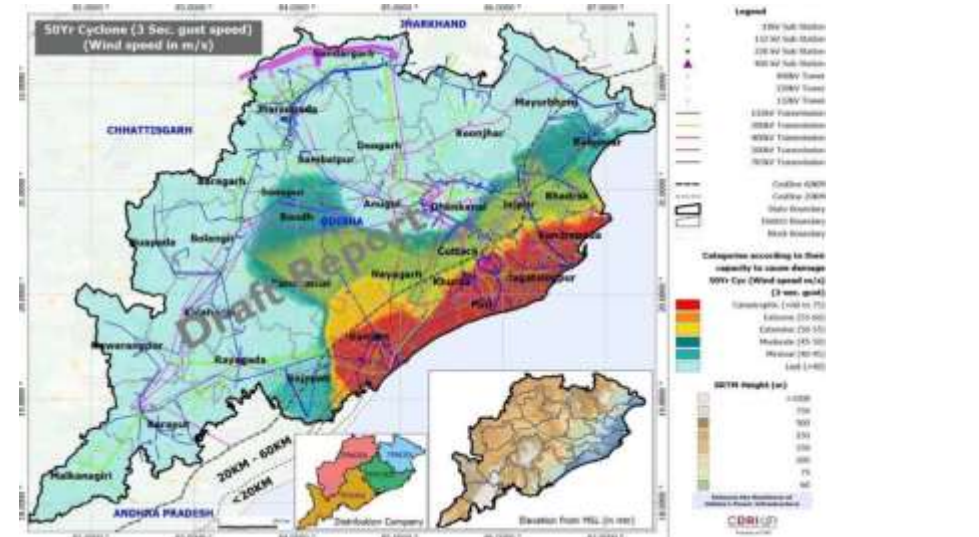
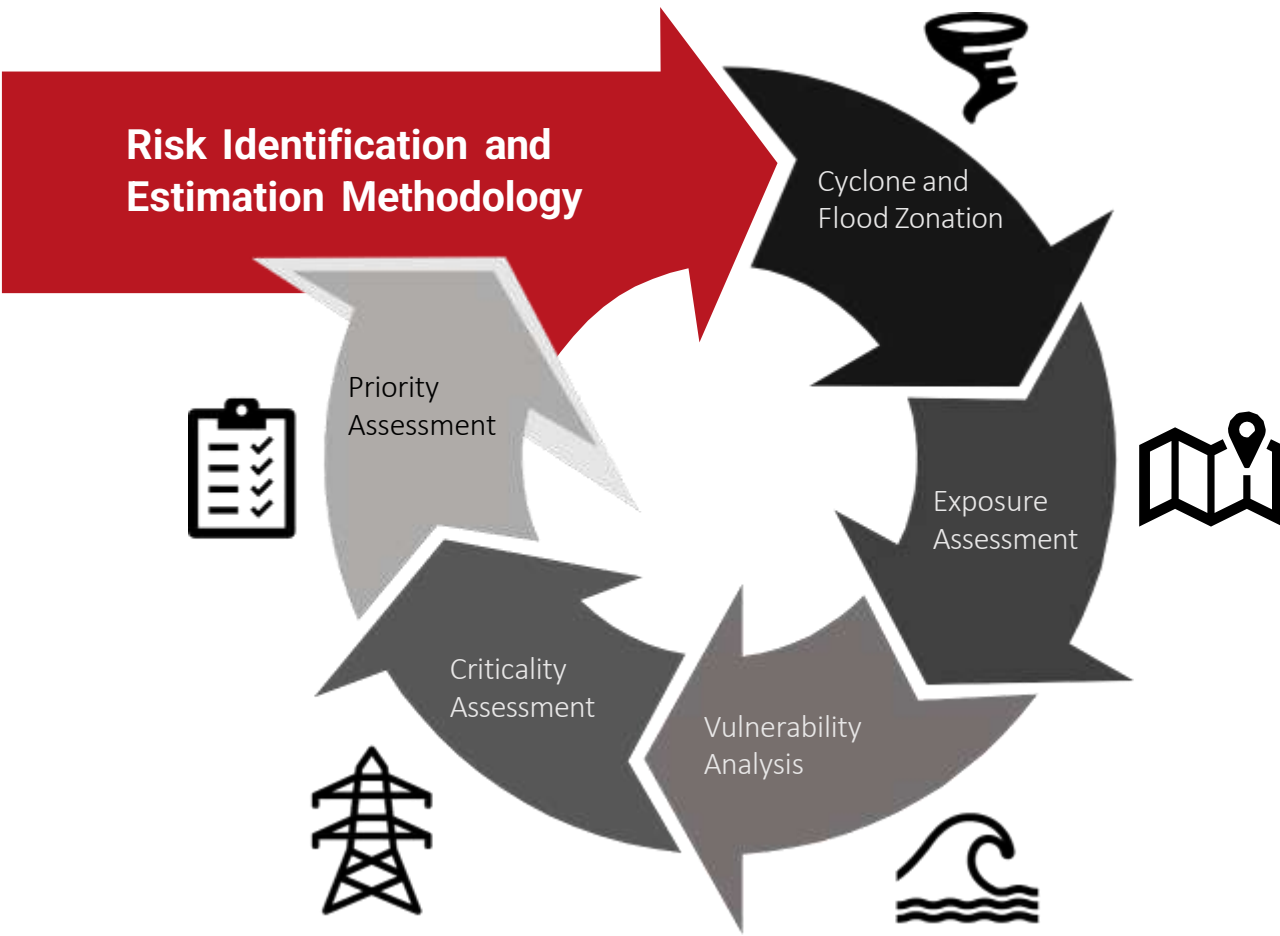
- Global AAL = **USD 732-835 billion**

Understanding Infrastructure Risk and Opportunities

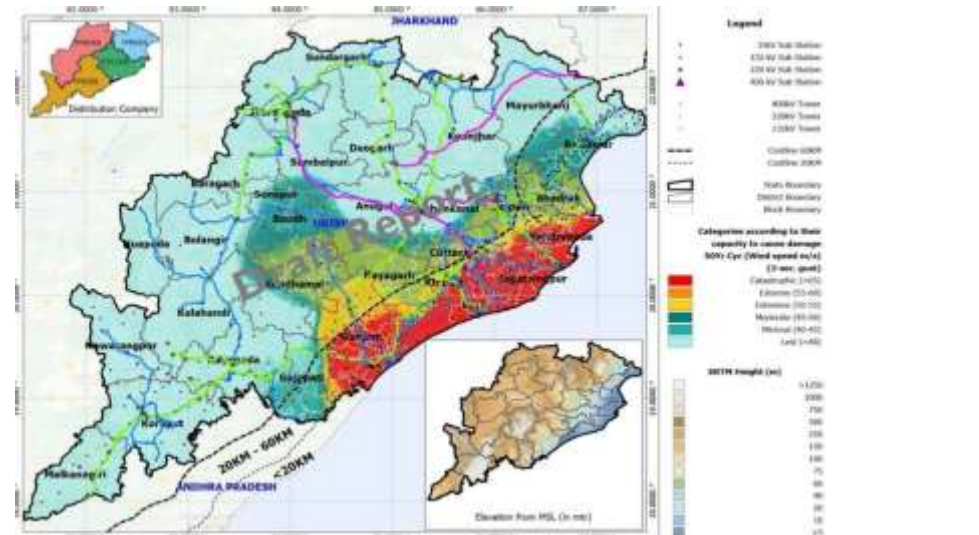


Risk Assessments: Odisha Power Study, CDRI

Methodology: Risk Identification and Estimation of Exposure, Vulnerability, and Prioritization of Assets



Transmission network exposure to cyclone with 50-year return period



Transmission and distribution sub-stations exposure to cyclone with 50-year return period

Spurring Research through Fellowships

212 Fellows **26** countries

91 Projects **30%** Women



Australia - Integrating machine learning through employing rule-based verification on aerial imagery for damages assessment and evacuation



Brazil - ResilientRio: Approaches to landslide safety

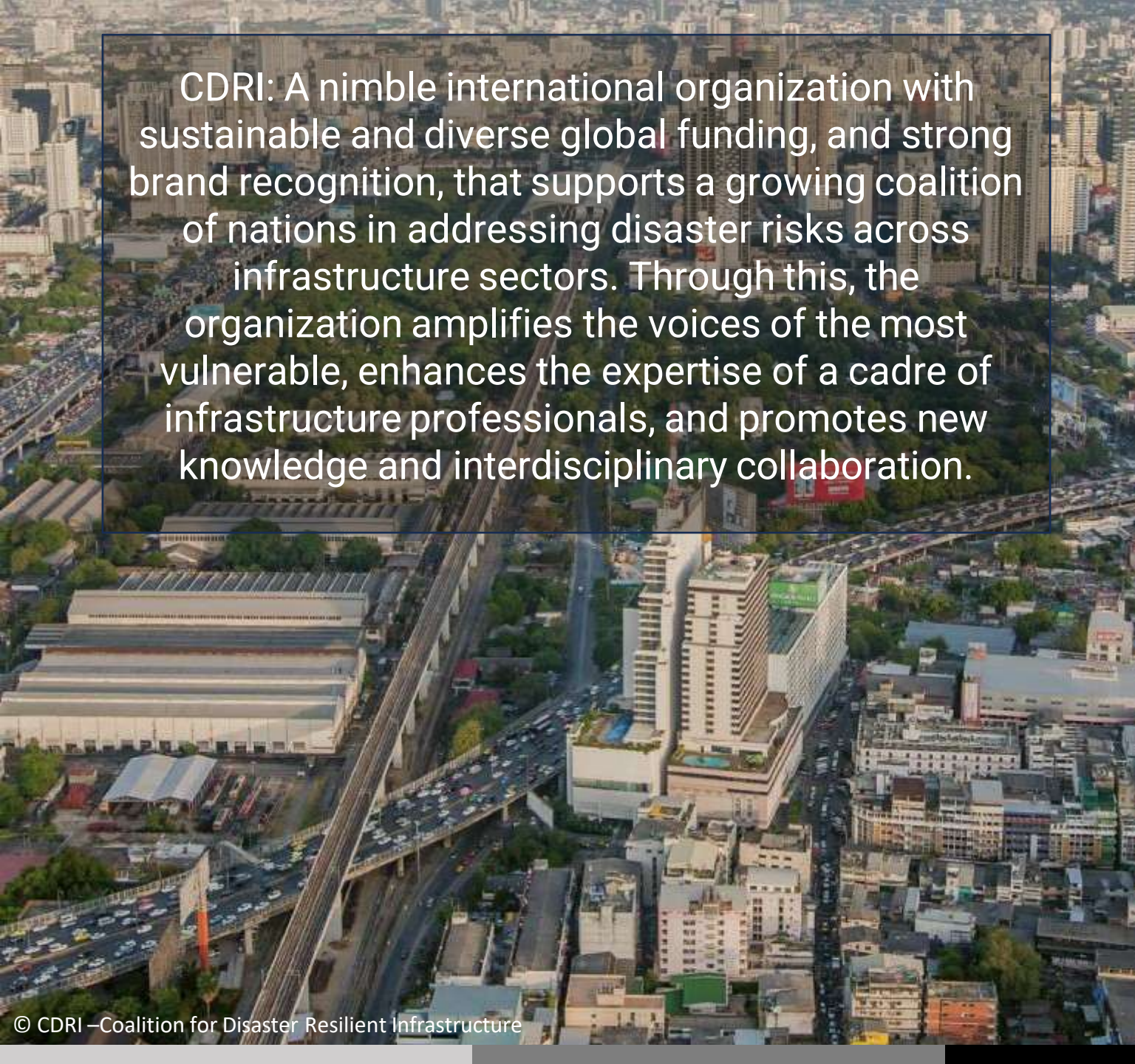


Ghana - Incorporating urban greenery /detention ponds in urban flooding management in the Mamahuma Basin



Mongolia - Development of application of strong motion shake map in Ulaanbaatar city





CDRI: A nimble international organization with sustainable and diverse global funding, and strong brand recognition, that supports a growing coalition of nations in addressing disaster risks across infrastructure sectors. Through this, the organization amplifies the voices of the most vulnerable, enhances the expertise of a cadre of infrastructure professionals, and promotes new knowledge and interdisciplinary collaboration.

Thank You