CDRI

Coalition for Disaster Resilient Infrastructure

Data and Technology Strategy

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Data and Technology Strategy

Executive Summary

The Strategy document presents a comprehensive plan to strengthen the Coalition for Disaster Resilient Infrastructure (CDRI) Member Countries' ability and capacity to collect, access, and use high-quality infrastructure risk and resilience data, tools, and technology resources. Leveraging such data and technology as strategic assets will enable Member Countries to make risk-informed and strategic policy, regulatory, and investment decisions to strengthen the resilience of their existing and future infrastructure systems.

The data and technology challenges for disaster resilient infrastructure (DRI) are felt most acutely by the Least Developed Countries (LDCs) and Small Island Developing States (SIDS). CDRI will make a focused effort to accelerate the exchange of knowledge, experience, and advanced technologies from middle-income and developed countries to LDCs and SIDS.

CDRI's LDC and SIDS Members face many data and technology challenges in implementing disaster risk reduction (DRR). The most common issues include a lack of high-quality geospatial and risk data, an inability to generate, access, store, manage, and govern risk data, insufficient human and institutional capacity for infrastructure risk and resilience assessment, and costs and access barriers to innovative technologies.

The implementation of a cross-cutting CDRI Data and Technology Strategy (hereafter referred to as the 'Strategy') that integrates data and technology capabilities and activities into CDRI's programs and initiatives will address these challenges and strengthen CDRI's mission and Strategic Outcomes.

The expected outcomes of this Strategy are:

1. Member Countries enhance and strengthen their capacity to generate, collect, analyze, utilize, and manage high-quality geospatial and infrastructure risk data, tools, and technologies.
2. Member Countries develop risk knowledge and analytical capacity to utilize models, tools, and technologies for assessing infrastructure risk and resilience.
3. Member Countries develop and adopt risk-informed policies and regulations.
4. CDRI develops the ability and capacity to use risk data and technologies as strategic assets.

These outcomes will be achieved through the following objectives:

1. Facilitate timely access to high-quality geospatial and infrastructure risk data, tools, technologies, and knowledge resources for Member Countries.
2. Provide technical assistance, capacity building, and training to Member Countries to enhance their risk awareness and improve their capacity to assess infrastructure risk and strengthen resilience.
3. Develop CDRI's human and technical resources that leverage data and technology to support Member Countries in achieving their DRI objectives.

The scope covered under the Strategy includes: (a) data elements such as earth observation, geospatial, and risk data related to infrastructure and (b) digital technologies with a focus on Artificial Intelligence and Machine Learning (AI/ML), Internet of Things (IoT), Geospatial, Remote Sensing (RS),

and Earth Observation (EO) technologies, data science, and disaster risk assessment modelling and simulation.

Three output categories (technical assistance, capacity building and training, and advocacy and communications), and four themes (infrastructure asset data, GIRI democratization, infrastructure risk and resilience assessments, and infrastructure risk data, tools, and innovative technologies) were identified to organize strategic activities. The activities were subsequently prioritized based on impact and effort.

A rigorous process was followed to identify, select, and prioritize strategic output activities. This involved extensive internal discussions and external consultations with a working group of experts who guided both the strategy and the process. Consultations were also held with Member Countries and Organizations, as well as with other stakeholders involved in disaster risk management and reduction, including academia, non-profits, think tanks, and the private sector.

Tables of Contents

i. List of Figures and Tables

ii. Abbreviations and Acronyms

ABAS	Antigua and Barbuda Agenda for SIDS
AI	Artificial Intelligence
AR	Augmented Reality
CDRI	Coalition for Disaster Resilient Infrastructure
CoP	Community of Practice
COP	Conference Of Parties
DRI	Disaster Resilient Infrastructure
EO	Earth Observation
EWS	Early Warning Systems
FAIR	Findability Accessibility Interoperability Reusability
GEDSI	Gender Equality, Disability, and Social Inclusion
GeoAI	Geospatial Artificial Intelligence
GFDRR	Global Facility for Disaster Reduction and Recovery
GIRI	Global Infrastructure Risk Model and Resilience Index
GIS	Geographic Information Systems
HR	Human Resources
ICDRI	International Conference on Disaster Resilient Infrastructure
IRIS	Infrastructure Resilience for Island States
IoT	Internet of Things
IPCC	Intergovernmental Panel on Climate Change
IT	Information Technology
IRIS	Infrastructure for Resilient Island States
LiDAR	Light Detection And Radar
LMICs	Low- and Middle-Income Countries
MDB	Multilateral Development Bank
MEL	Monitoring, Evaluation, and Learning
MHEWS	Multi-Hazard Early Warning System

ML	Machine Learning
MR	Mixed Reality
NbS	Nature-based Solutions
NGO	Non-Governmental Organization
OEDS	Open Exposure Data Standards
OGC	Open Geospatial Consortium
PDNA	Post-Disaster Needs Assessment
PWD	People With Disabilities
R&D	Research and Development
RDLS	Risk Data Library Standards
RFP	Request For Proposal
RS	Remote Sensing
SAR	Synthetic Aperture Radar
SDG	Sustainable Development Goal
SFDRR	Sendai Framework for Disaster Risk Reduction
SIDS	Small Island Developing States
SPC	Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Programme
SWP	Strategic Work Plan
ToC	Theory of Change
ToR	Terms of Reference
UAV	Unmanned Aerial Vehicle
UIRP	Urban Infrastructure Resilience Programme
UN	United Nations
UNDP	United Nations Development Program
UNDRR	United Nations Office for Disaster Risk Reduction
UNFCCC	United Nations Framework Convention on Climate Change
UN-IGIF	United Nations Integrated Geospatial Information Framework
VR	Virtual Reality
WB	The World Bank
XR	eXtended Reality

1

Situational Analysis

Situational Analysis

1.1 Data and Technology Challenges for CDRI Member Countries

The starting point for integrating resilience into infrastructure development is understanding the risks to infrastructure from climate change and hazard impacts, as highlighted in the Sendai Framework for Disaster Risk Reduction (SFDRR) Priority 1 - Understanding disaster risk. There are numerous tools, models, and technologies available for quantifying the risk to infrastructure with varying degrees of sophistication and resolution. Several financial metrics are also available, representing estimates of such risks. All of these require data in the three dimensions critical to understanding and assessing infrastructure risk: climate and geophysical hazard data, infrastructure asset data (exposure), and the degree to which these infrastructure assets could be damaged by disaster events (vulnerability).

Climate and Geophysical Hazard Data:

This includes information about potential natural hazards such as floods, earthquakes, hurricanes, and droughts. It also encompasses data on the intensity, frequency, and spatial distribution of these hazards.

Infrastructure Asset Data (Exposure):

This refers to the specific infrastructure elements at risk, such as ports, roads, bridges, power plants, water systems, telecommunications infrastructure, and buildings. It includes information about their location, type, capacity, and condition.

Vulnerability:

This includes the susceptibility of infrastructure assets to damage from the identified hazards. Factors influencing vulnerability include construction materials, design, age, maintenance, and the socio-economic context.

Data on Disaster Loss and Damage is crucial for effective resource allocation and DRR. It provides a basis for loss accounting, informs mitigation strategies, and helps secure financing for DRR initiatives.

Loss Accounting:

Accurate data on disaster loss and damage enables a clear understanding of the actual costs of disasters, including both direct and indirect impacts. This information is crucial for financial planning, resource allocation, and the development of effective disaster risk management strategies.

Informing Mitigation:

By analysing loss data, countries can identify vulnerable areas and sectors, understand the root causes of losses, and prioritize mitigation efforts accordingly. This data-driven approach enables the design of targeted interventions to reduce future disaster risks and foster resilience.

DRR Financing:

Data on disaster losses and damages serves as a powerful tool to advocate for increased investment in DRR. Evidence-based decision-making, supported by robust loss data, can demonstrate the economic and social benefits of investing in DRR, thus attracting financial resources for prevention, preparedness, and response.

The SFDRR also emphasizes the importance of tracking progress towards reducing disaster losses. Data on disaster losses and damages is essential for monitoring the effectiveness of DRR policies and strategies.

Additional data is needed to transition from risk assessment and loss modelling to resilience levels, which includes the ability of infrastructure assets to absorb, respond to, recover from, and adapt to climate change impacts and disaster risk. This includes data on the physical condition of assets, the age, maintenance records, performance metrics including effectiveness (capacity; service; and quality –which includes safety, satisfaction, and availability), reliability, and cost (capital; replacement; operation and maintenance), as well as interconnectedness with other infrastructure systems.

While CDRI is a global coalition, the data and technology gaps and challenges for implementing disaster resilient infrastructure (DRI) are felt far more acutely by its least developed, low-income, and SIDS Member Countries, and to a lesser extent by its middle-income Member Countries. This section is focused on the least developed, low-income and SIDS countries.

The data and technology gaps and challenges for implementing DRR in SIDS have been comprehensively documented[1]. The Antigua and Barbuda Agenda for SIDS (ABAS), adopted in May 2024, acknowledges that SIDS face significant challenges. These include data collection, analysis, and limited technical and institutional capacity, which hinder evidence-informed policymaking. ABAS emphasizes the need for capacity building to support stronger data governance, which will enable SIDS to enhance data collection, protection, transparency, and sharing. Many Least Developed Countries (LDCs) face similar challenges, which have been validated through recent consultations with CDRI Member States and Organizations. While the priorities and extent of these gaps and challenges vary by country, these can be grouped into three categories as shown in Table 1.

[1] United Nations Department of Economic and Social Affairs (UN DESA) and United Nations Office for Disaster Risk Reduction (UNDRR), 'Gaps, Challenges and Constraints in Means of Implementing the Sendai Framework for Disaster Risk Reduction in Small Island Developing States', 2022.

Table 1: Data and technology challenges faced by LDCs and SIDS in implementing DRR

Human Resource Capacity	Data Generation, Access, and Analysis	Access to Technology and Innovation
Limited staff available to manage and monitor and monitor projects, design new initiatives and consult with stakeholders due to a small talent pool.	**Inadequate data**, especially downscaled climate hazard data and projections, and socio-economic data[2], incomplete or insufficient data on critical national infrastructure exposure, and loss and damage data[3].	**Dependency on donors** for technologies leads to procurement delays and training gaps.
Low baseline capacity to conduct disaster risk management activities.	**Lack of storage and timely access** to data.	**High total cost of ownership:** acquisition, maintenance and warranties, upgrades, and depreciation costs.
Lack of analytical expertise and trained geospatial and risk analysts with data and risk modelling skills to perform DRR activities.	**Lack of digital data and metadata** as much of the historical data remains in paper format and lacks metadata.	**Dependency on regional hubs** for data and technology.
Challenges in **retaining skilled staff.**	**Lack of standardization** of DRR related data hampers data sharing and reuse.	**Limited internet availability** and **connectivity**
Risk knowledge gaps among stakeholders and decision makers limit their ability to comprehend and act upon complex analytics and metrics.	**Disparate pools** of data and institutional data silos due to project-based culture. Private sector data are often unaffordable or inaccessible.	

[2] Lindsay, Courtney, Dupar Mairi, Beauchamp, Emilie, 'Mapping the information and learning landscape for adaptation in Small Island Developing States (SIDS)', ODI: Think Change Working Paper, May 2024

[3] United Nations Office for Disaster Risk Reduction (UNDRR) and United Nations Development Programme (UNDP), 'Data and Digital Maturity for Disaster Risk Reduction - Informing the Next Generation of Disaster Loss and Damage Databases', November 2022.

1.2 Data and Technology Needs

Data

ABAS calls for increased support to improve SIDS' data collection, governance, management, analysis, and assessment of hazards, disaster events, and their impacts, including losses and damage, to build their resilience to disasters. In line with this, and drawing on extensive consultations conducted by the CDRI Data and Technology Unit with Member Countries and Organizations (see Figure 1), it is evident that SIDS and LDCs require the following types of data that are currently lacking.

Climate and Geophysical Hazard Data:

This includes information about potential natural hazards such as floods, earthquakes, hurricanes, and droughts. It also encompasses data on the intensity, frequency, and spatial distribution of these hazards.

- Downscaled, high-resolution regional and local data:
  - Climate and hydrometeorological hazard data
  - Infrastructure asset data
  - Hazard risk mapping data
  - Infrastructure vulnerability data
  - Socio-economic data
  - Pre- and post-disaster infrastructure damage data
  - Post-disaster infrastructure reconstruction data
- Data to make the case for investing in DRR. This includes loss and damage data as well as data to determine the resilience of the asset and the infrastructure system.
- Mitigating environmental threats, with a focus on local and lived experiences.

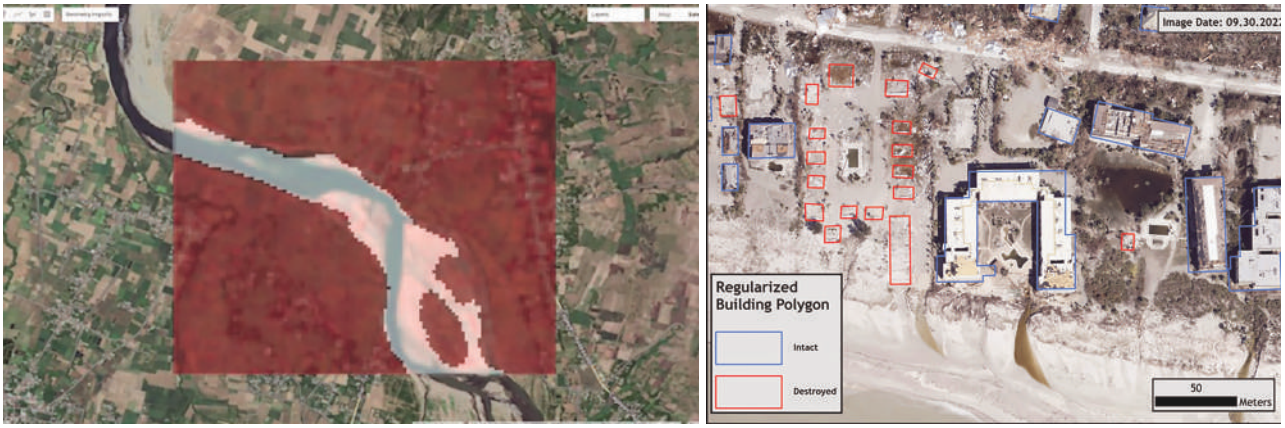
Figure 1: Organizations consulted during the data and technology strategy development

Technology

SIDS, in particular, need technology, equipment, and systems for:

- Hydrometeorological hazard monitoring, forecasting capabilities, and associated infrastructure.
- Expansion of multi-hazard early warning systems (MHEWS), and other observing and monitoring networks[4].
- Risk data collection, storage, processing, management, and transmission.
- Nowcasting to monitor weather and climate hazards such as lightning, thunderstorms, and heavy rainfall.
- Risk analysis to better understand multi-hazard risk and how it impacts the vulnerability of infrastructure and people to support decision-making (see Figure 2).
- Telecommunication systems.

Figure 2: Examples of geospatial technologies for disaster mapping; CDRI Fellowships 2023



1.3 CDRI Capacity

CDRI will enhance its technical and human resource capacities to assist its Member Countries in addressing the identified data and technology challenges, and to achieve its mission of supporting them in making informed decisions and building resilience to climate and geophysical hazards. This has been further elaborated in CDRI's internal work plans for the Strategy.

CDRI can serve as a knowledge platform for accessing, generating, acquiring, and analysing data. CDRI will enhance the technical capacities and data management practices of its Member Countries. It will also provide resources, including technical expertise, to countries to access and utilize data and technologies to inform infrastructure resilience.

[4] United Nations Office for Disaster Risk Reduction (UNDRR) and World Meteorological Organization (WMO), 'Global Status of Multi-Hazard Early Warning Systems', 2024

2

Objectives of CDRI's Data and Technology Strategy

Objectives of CDRI's Data and Technology Strategy

2.1 CDRI Mandate and Value Proposition

CDRI is a partnership of national governments, UN agencies and programmes, multilateral development banks and financing mechanisms, the private sector, and knowledge institutions. It aims to promote the resilience of new and existing infrastructure systems to climate and disaster risks in support of sustainable development.

CDRI has been envisioned and established as a global network to advance this resilience agenda, support coordinated action among stakeholders, and bring voices from vulnerable geographies and populations to international policy forums[5]. CDRI's vision, mission, and impact are shown in Figure 3

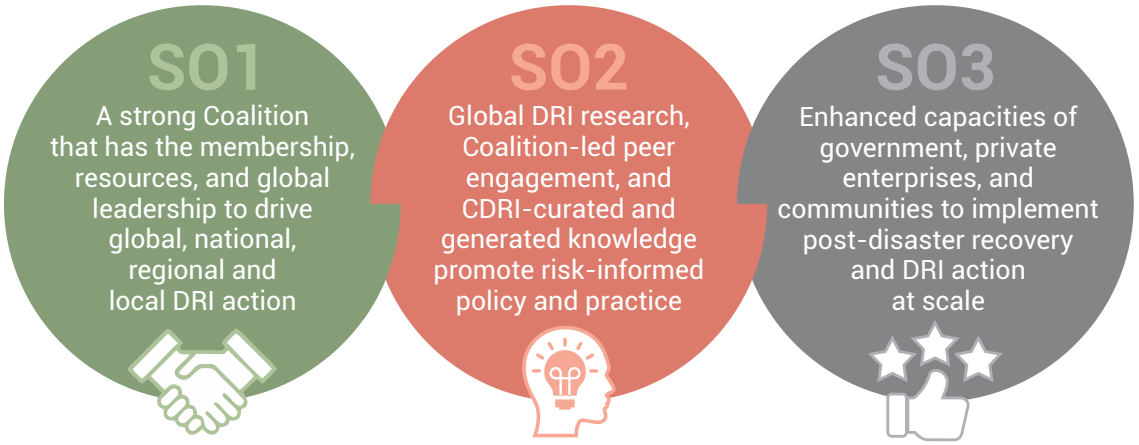
Figure 3: CDRI vision, mission, and impact

2.2 CDRI Strategic Outcomes 2026

The CDRI Secretariat's Strategic Work Plan (SWP) 2023-26 outlines the planned initiatives for these four years, aligned with CDRI's mandate and Theory of Change (ToC). The SWP is guided by the three interdependent and mutually reinforcing Strategic Outcomes shown in Figure 4.

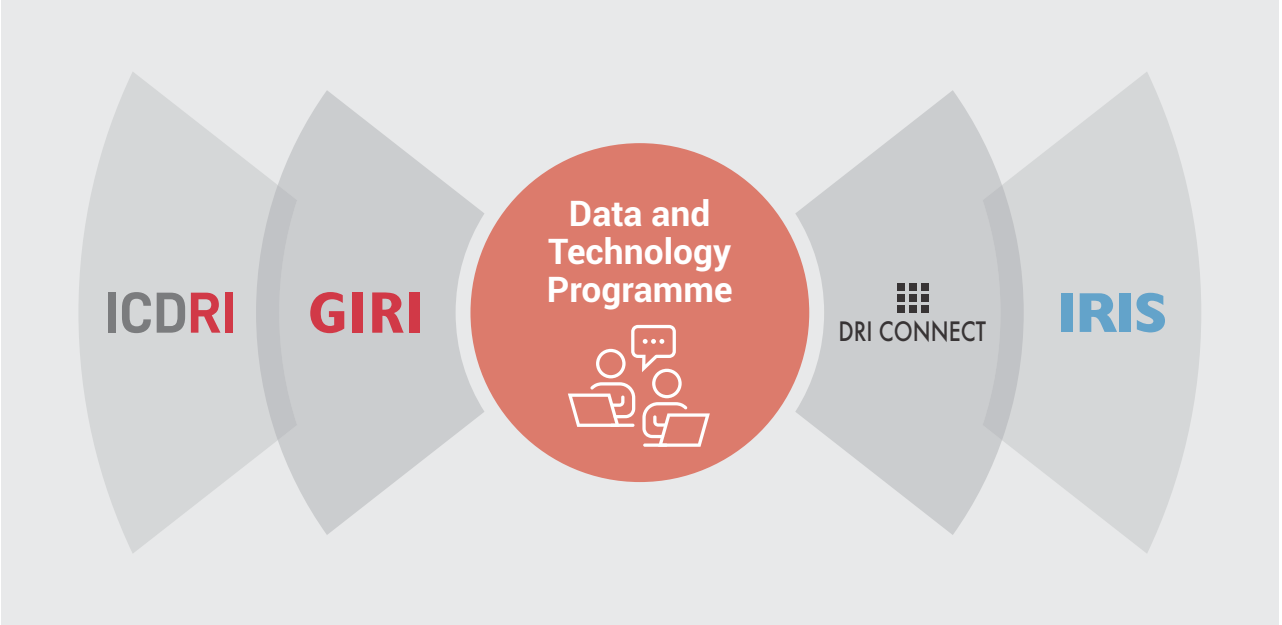
[5] CDRI Strategic Work Plan 2023-26

Figure 4: CDRI Strategic Outcomes - 2026



2.3 Data and Technology Support to CDRI's Strategic Outcomes and Initiatives

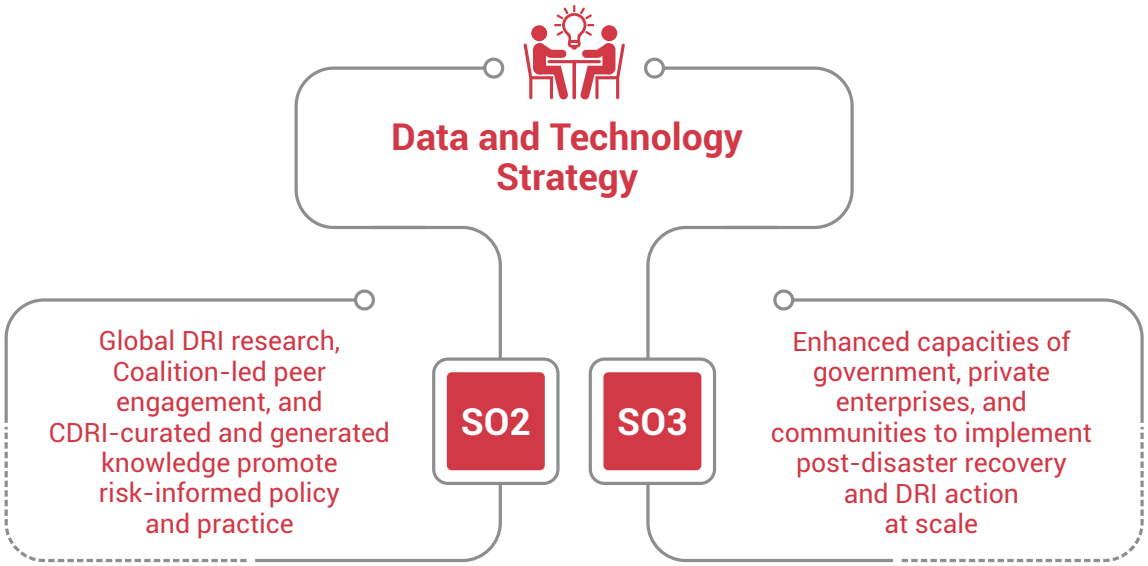
Figure 5: Cross-cutting support provided by the Data and Technology Strategy to existing CDRI programmes



CDRI's Data and Technology Strategy is a cross-cutting initiative (see Figure 5) that bolsters CDRI's mission, enhances its value proposition, and supports achievement of Strategic Outcomes.

More specifically, the Strategy will help in realizing Strategic Outcome 2: CDRI-curated and generated knowledge promotes risk-informed policy and practice. It will also support Strategic Outcome 3: Enhanced capacities of stakeholders to implement post-disaster recovery and disaster resilient infrastructure (DRI) actions at scale (see Figure 6).

Figure 6: Cross-cutting support of the Data and Technology Strategy to CDRI's Strategic Outcomes



Two flagship CDRI initiatives advance the Strategic Outcomes and align closely with the Data and Technology Strategy.

One is the Global Infrastructure Risk Model and Resilience Index (GIRI), the first publicly available and fully probabilistic risk model that estimates infrastructure asset exposure to major geological and climate-related hazards. GIRI is a global public good and a fully interactive geospatial open data platform that enables anyone to freely access and use all the geospatial data layers, as well as the risk and resilience metrics produced. CDRI also publishes a Global Infrastructure Report, a comprehensive report on infrastructure resilience, and GIRI is one of its significant components.

The other initiative is the Infrastructure for Resilient Island States (IRIS), which is dedicated to achieving sustainable development through a systematic approach to promote resilient, sustainable, and inclusive infrastructure in SIDS. IRIS aims to provide technical support on infrastructure systems in SIDS, promote disaster and climate resilience of infrastructure assets, and strengthen knowledge and partnerships to integrate resilience into SIDS infrastructure.

CDRI's other technical programmes, including the Urban Infrastructure Resilience Programme (UIRP), the critical infrastructure sectoral programmes, the Mountain Resilience Programme, and the Resilient Africa programme will also strongly cross-benefits from the Data and Technology Strategy.

2.4 Desired Impact

> ***"CDRI Member Countries make risk-informed strategic policy, regulatory, and investment decisions that strengthen the climate and disaster resilience of their existing and future infrastructure by leveraging geospatial and infrastructure risk data and technologies as strategic assets."***

The Data and Technology Strategy aims to strengthen CDRI Member Countries' ability and capacity to collect, access, and use high-quality earth observation, geospatial, and infrastructure risk data, tools, and technologies to develop robust disaster resilience strategies, policies, and regulations.

Outcomes

1. Member Countries enhance and strengthen their capacity to generate, collect, analyse, utilize, and manage high-quality geospatial and infrastructure risk data and information.

2. Member Countries develop their risk knowledge and analytical capacities to utilize and deploy models, tools, and technologies for assessing infrastructure risk and resilience.

3. Member Countries develop and adopt risk-informed policies and regulations to reduce the disaster risk to their infrastructure and improve infrastructure resilience.

4. CDRI transforms into a data-driven organization with the technical and human resource capabilities to use geospatial and risk data and technologies as strategic assets for DRI action.

Objectives

The Data and Technology Strategy will focus on the following objectives for CDRI (Figure 7):

1. Facilitate timely access to high-quality, i.e., *accurate, timely, relevant, interoperable, and context-specific* geospatial and infrastructure risk and resilience data, as well as tools, technologies, and knowledge resources for Member Countries.

2. Provide technical assistance, capacity building, and training to Member Countries to enhance their risk awareness, knowledge, and capacity to utilize data, models, tools, and technologies for assessing infrastructure risk and strengthening resilience.

3. Develop CDRI's human and technical resources that leverage data and technologies to support Member Countries in achieving their DRI objectives.

Figure 7: Data and Technology Strategy Objectives

Access to Data & Tools

Member countries have timely access to high-quality geospatial and infrastructure risk data, as well as tools, technologies, and knowledge resources.

Enhanced Capacity & Decision Making

Decision-makers and other stakeholders in member countries have improved awareness, knowledge, and capacity to use data, models, tools, and technologies to access infrastructure risk and strengthen disaster resilience.

Tech Enabler

CDRI has the human and technical resources that leverage data and technologies to help member countries achieve their DRI objectives.

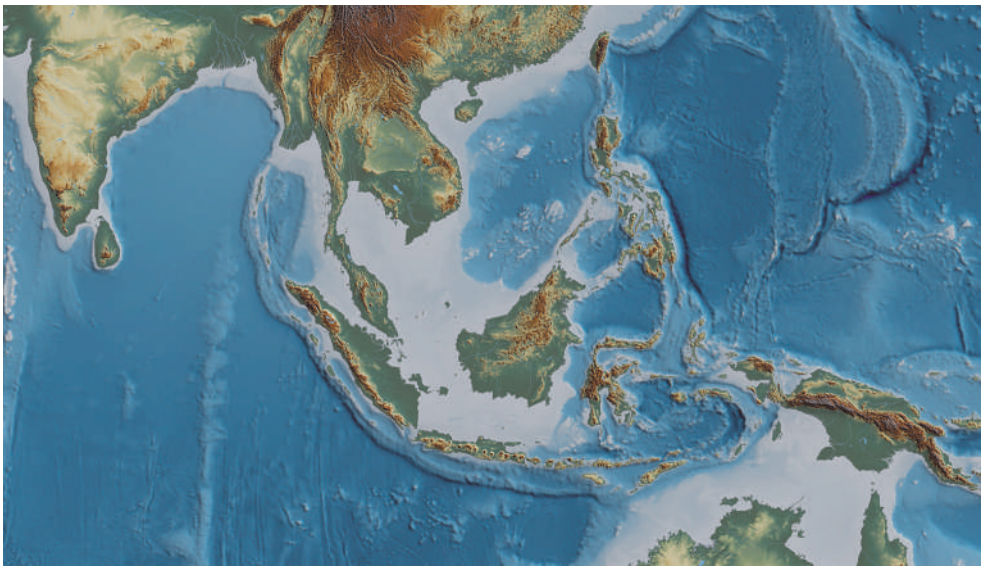
2.5 Scope of the Data and Technology Strategy

As noted earlier, the data and technology challenges for DRI are felt most acutely by LDC and SIDS countries. This Strategy will therefore focus on assisting CDRI Member Countries in these categories. Since many CDRI Member Countries are also middle-income and developed countries, CDRI can play a pivotal role in accelerating the transfer of knowledge, experience, and advanced technologies from these countries to LDCs and SIDS.

The data elements prioritized in the initial phase of the Strategy (2025-26) are based on the requirements for infrastructure risk assessment and loss modelling, including those used by CDRI initiatives such as GIRI:

- Earth observation data (Figure 8)- climate and weather data derived from orthoimagery that includes satellite-based remote sensing, drones, and airborne sensors.

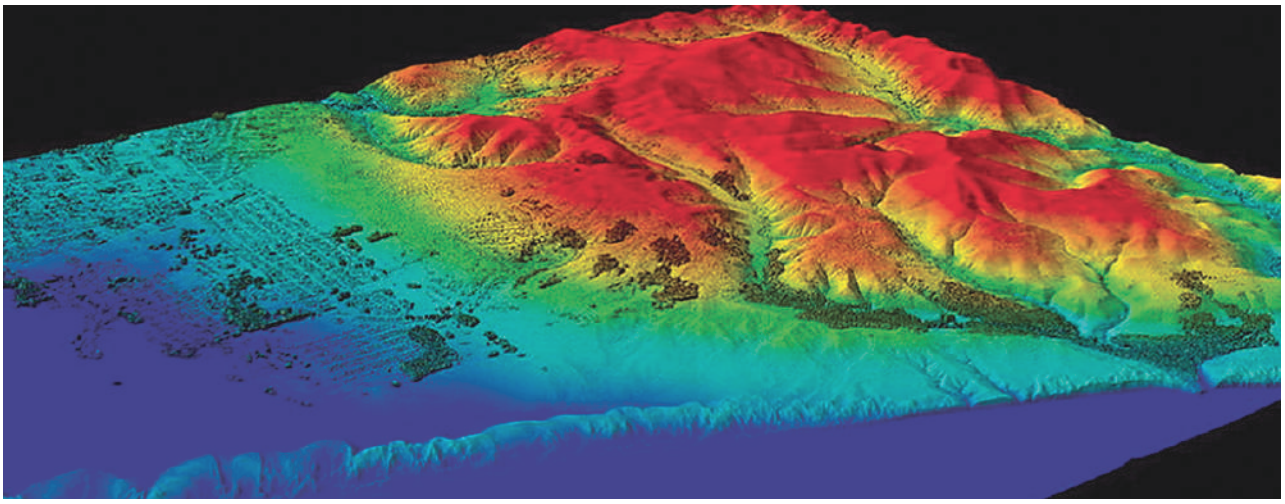
Figure 8: Earth Observation Data



Source: Shutterstock

- Geospatial topographic data (Figure 9)- digital elevation and surface models, digital line graphs representing features such as functional areas (geographic extents), water, etc., in both vector and raster formats.

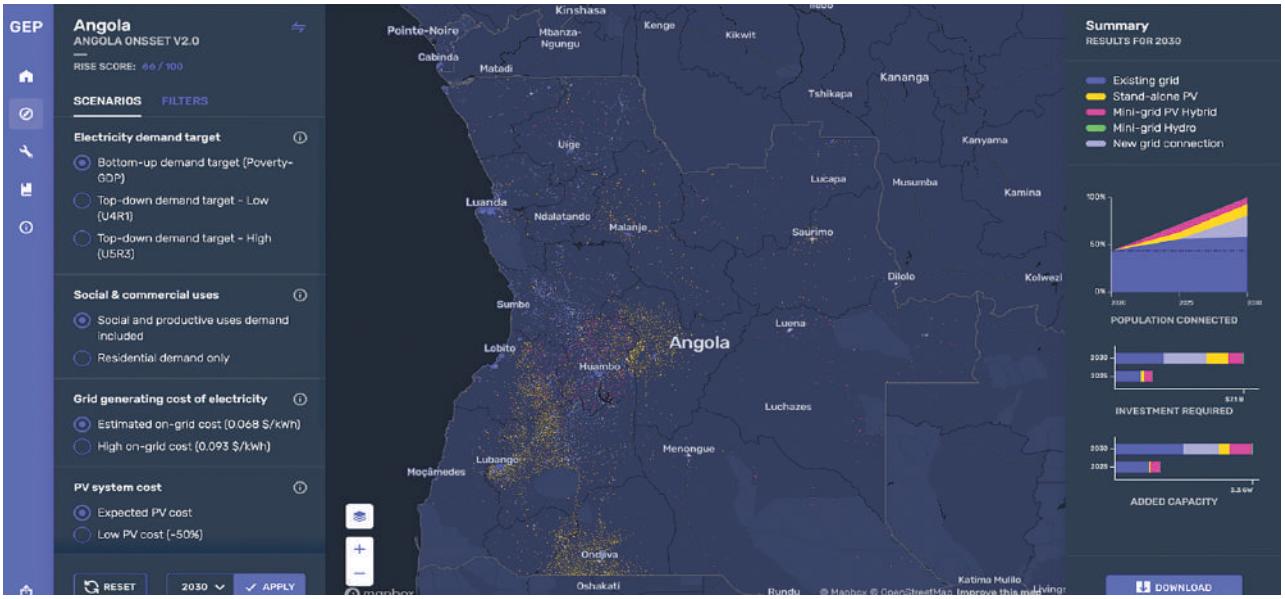
Figure 9: Topographic Data



Source: Wikimedia Commons

- Infrastructure-related risk data:
  - Hazards: Geological (earthquake, landslide triggered by earthquake, tsunami) and hydrometeorological (flood, tropical cyclone, drought, and landslide triggered by rainfall).
  - Exposure (Figure 10): Power, transport (roads, railways, ports, and airports), waste and wastewater, telecommunications, oil and gas, education and health facilities, buildings (including commercial, residential, and industrial).
  - Vulnerability.
  - Loss and damage.

Figure 10: Infrastructure Asset Data



Source: energydata.info

In the second phase (2027-2030), the Strategy will expand to include infrastructure resilience data elements such as physical condition of the asset, construction quality, maintenance records, performance metrics (including capacity, efficiency, reliability, and redundancy), and interconnectedness with other infrastructure systems. Other local, regional, and country-level data will include telecommunications network coverage, macroeconomic and political stability, and research and development (R&D) intensity. Other measures used by the GIRI methodology may also be added to the scope of the Strategy at a later stage.

Another expansion of the scope of the Strategy may look at ocean data (bathymetry, ocean temperatures) and ocean hazards (sea level rise, surface wave heights, coastal erosion), given that SIDS and coastal resilience are key focus areas for CDRI programmes. There may be a need to include this aspect of data in the scope during the initial phase of the strategy, if additional feedback from Member Countries indicates the growing importance of ocean observation data and hazards.

Technologies for infrastructure resilience could be categorized in many ways:

- Based on their nature or format – digital (high-tech and low-tech), phygital (spanning the digital and physical worlds), and physical.
- Based on the objectives they serve - enhancing the risk data value chain (collection, processing, integration, analysis, and impact/use), strengthening communication and collaboration between the stakeholders of infrastructure assets or improving the physical performance of infrastructure itself.
- By their application to each phase of the infrastructure resilience cycle - Prepare, Respond, Recover, and Adapt.

The tools and technologies covered in the initial scope of the Strategy are digital technologies that focus on enhancinge the risk data value chain and have application across all phases of the infrastructure resilience cycle. These include:

- Geospatial: Geographic Information Systems (GIS), internet mapping
- Remote Sensing (RS) and Earth Observation (EO): photogrammetry, Synthetic Aperture Radar (SAR), Light Detection And Ranging (LiDAR), satellite, Unmanned Aerial Vehicle (UAV), aircraft
- Internet of Things (IoT): smart sensors, sensor networks, edge computing
- Artificial Intelligence (AI) and Machine Learning (ML)
- Geospatial AI (GeoAI): integrating AI/ML with geospatial technologies
- Data Sciencescience: Big Data, predictive analytics, statistical modelling, data mining, data visualization
- Modelling and simulations: for disaster risk assessment
- Computing: cloud and on-premise
- Software applications and platforms: on mobile devices, cloud, and desktop tools for data collection, management, and analysis

The role of low-tech solutions such as messaging apps, SMS, mobile feature phones, and other simple data collection and analysis tools (combined with advanced technologies) will also be explored in the initial phase of the Strategy.

In the second phase of the Strategy, digital and phygital technologies that strengthen communication and collaboration between stakeholders of infrastructure assets and improve the physical performance of infrastructure will be included. These include:

- Software apps and platforms on mobile, cloud, and desktop – for collaboration
- Digital Twins and Building Information Models (BIM)
- Immersive technologies such as 360-degree, 3D, Augmented Reality (AR), Virtual Reality (VR), eXtended Reality (XR), Mixed Reality (MR)
- Gaming
- Social media
- Blockchain
- Communication systems and networks, including satellite, cellular, high-frequency radio, and optical fibre
- Robotics
- 3D printing

Physical technologies such as materials (repurposable, smart, self-healing), advanced construction technologies, energy storage, and Nature based solutions Solutions (NbS) are not within the scope of this Strategy.

3

Strategy Selection

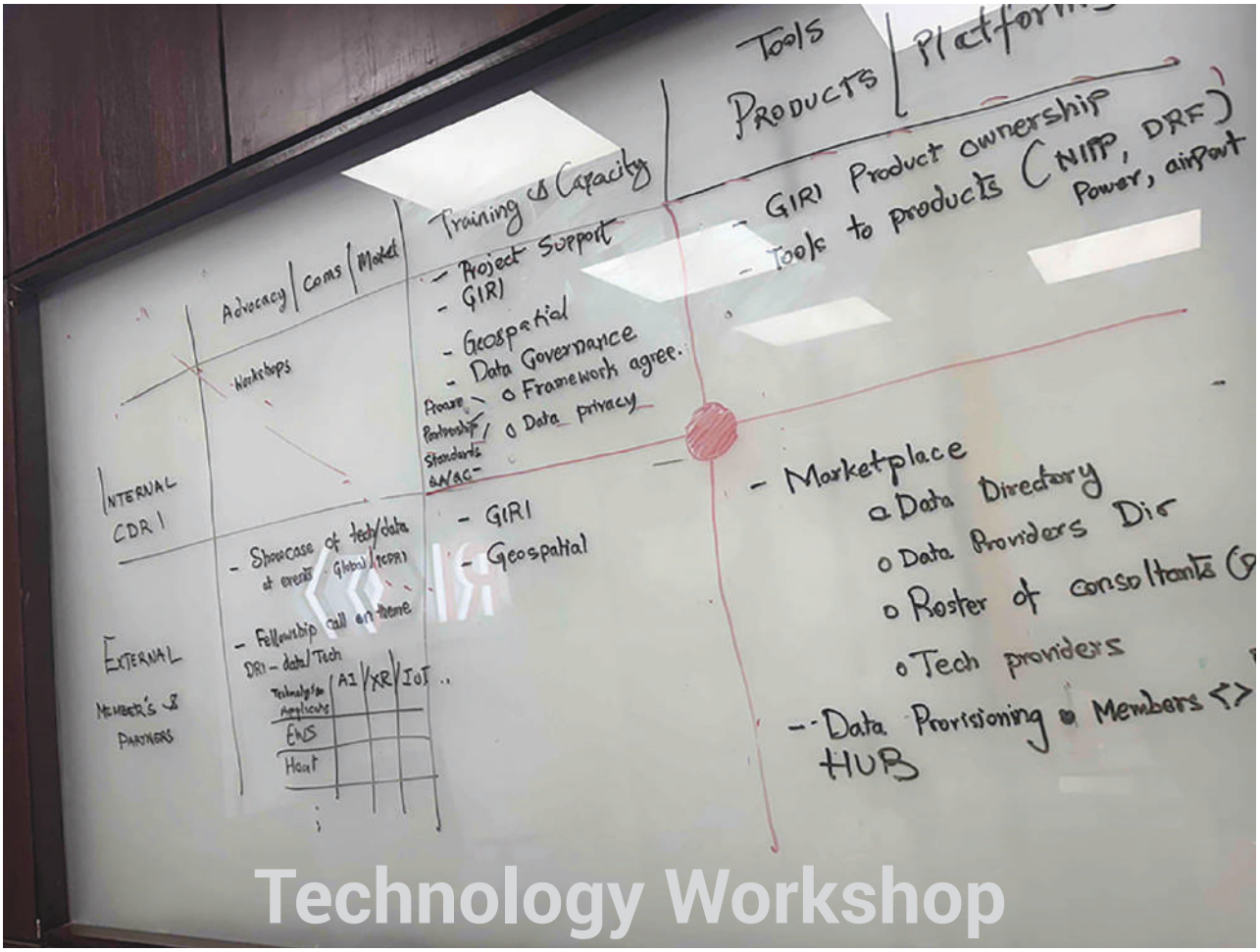
Strategy Selection

3.1 Process for Developing the Data and Technology Strategy

The process of developing a data and technology strategy for CDRI was initiated in October 2024. The initial landscape analysis involved compiling geospatial and infrastructure risk databases and knowledge platforms, reviewing articles, reports, and documented studies on data and technology gaps in LDCs and SIDS, and engaging with CDRI's senior leadership team to test a set of initial hypotheses for the strategy.

An internal Data and Technology Workshop was conducted in early December 2024, with participation from CDRI teams, including the Global Infrastructure Report and IRIS teams. They shared the challenges they had encountered, and their suggestions were documented (Figure 11).

Figure 11: Internal Data and Technology Workshop, Dec 2024



The CDRI Charter and CDRI SWP 2023-26 were carefully studied to ensure that the data and technology strategy aligned closely with the organization's vision, mission, and Strategic Outcomes. Various articles, reports, reference guides, and research papers produced by CDRI and organizations working on different aspects of disaster risk and reduction, such as UNDRR, UNDP, and the World Bank, were reviewed. Where available, the data and technology strategies of these organizations were also reviewed. A list of relevant reports is also included in the bibliography at the end of this document.

Over a five-month period, from December 2024 to April 2025, the CDRI Data and Technology Unit consulted external stakeholders, including Member Organizations, Member Countries, regional organizations, and individual experts, to validate and refine the hypotheses and options. The organizations that were consulted in the process are listed in Annexure A. A word cloud that describes the challenges and key themes from the consultations was generated and is shown in Figure 12.

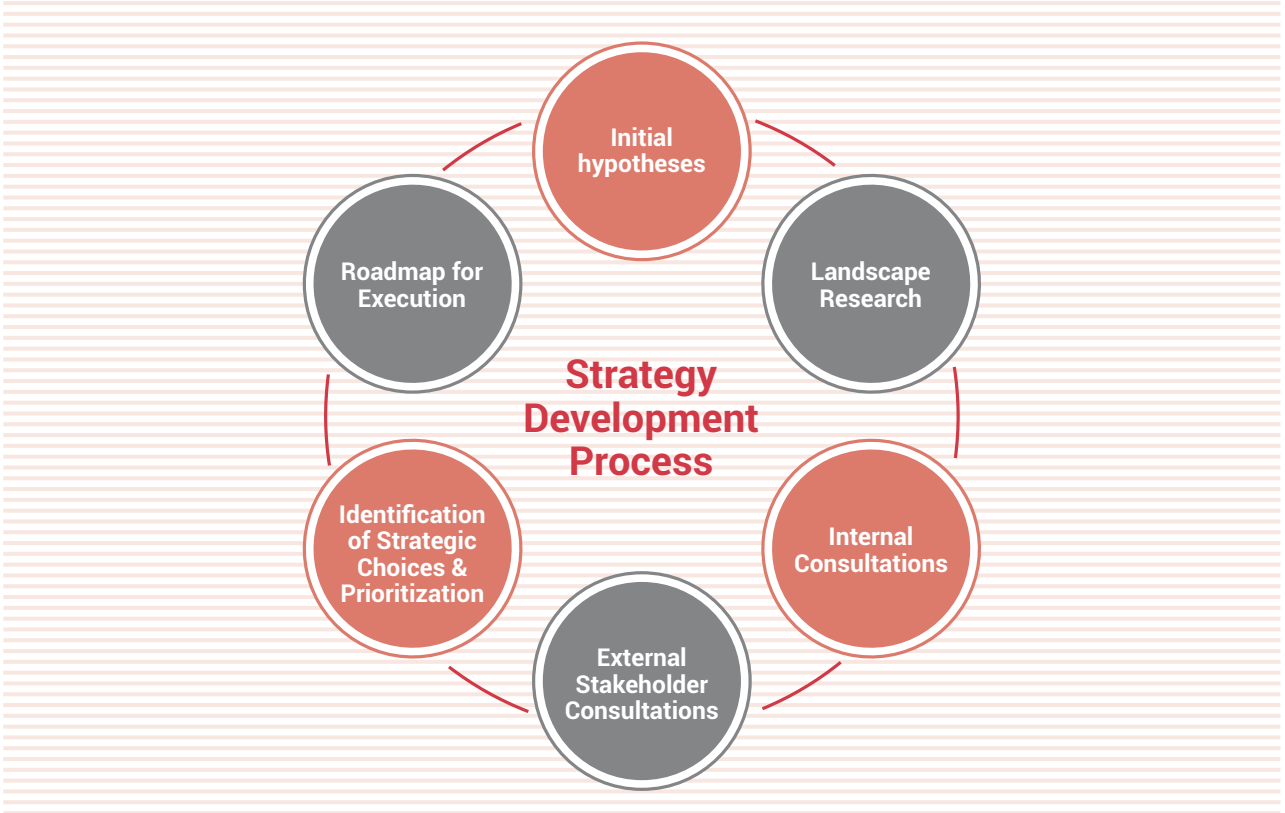
Figure 12: Word cloud from CDRI consultations with stakeholders on data and technology challenges

A Data and Technology Strategy Working Group, comprising nominated representatives from Member Organizations and Countries, was constituted to guide and approve the strategy. The group met once a month over four months (Figure 13), starting in February 2025, and provided feedback and suggestions to the CDRI Data and Technology Unit on candidate strategies, their relative priorities, and required effort. Annexure B includes the list of Member Organizations and designations of the nominated members in the Working Group.

Figure 13: A snapshot of the Data and Technology Strategy Working group; CDRI, February 2025

The process and timelines are also shown in Figure 14.

Figure 14: CDRI Data and Technology Strategy development process



3.2 Core Operating Principles of the Data and Technology Strategy

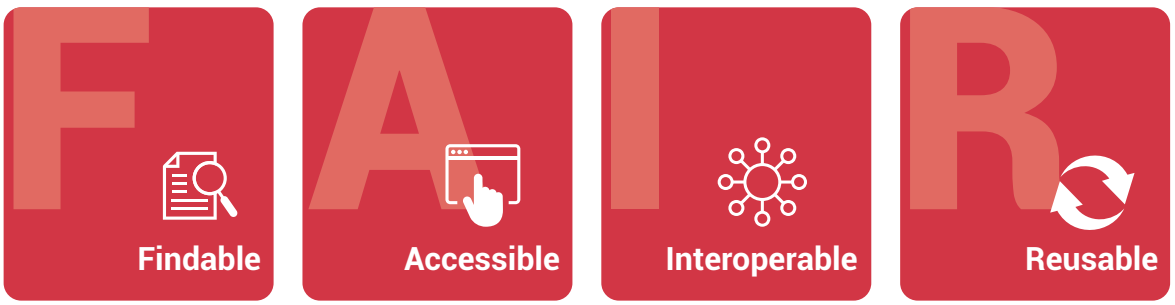
The Data and Technology Strategy has been developed with the following operating principles in mind:

Principle 1 - Partnerships: CDRI is a diverse, engaged, and strong coalition driving collaborative DRI action as a global partnership of national governments, UN agencies, multilateral development banks, the private sector, and knowledge institutions. Partnerships are a key driver of CDRI's value proposition, and the Strategy will leverage these relationships and networks to collaborate with relevant partners in implementing its activities and initiatives.

Principle 2 - FAIR Data Principles: The Strategy will adopt the FAIR Data principles (Figure 15) for the long-term care of valuable data, models, algorithms, and other digital knowledge assets used and produced in our work through sound data management. The four principles, applicable to both machines and people, are:

- Findability - Data should be easily locatable and retrievable for both computers and humans. Machine-readable metadata is essential for the automatic discovery of datasets.
- Accessibility - Data should be publicly accessible via trusted repositories in various formats and be understandable to both humans and machines.
- Interoperability - Data should integrate with other data and efficiently operate with different applications or workflows for analysis, storage, and processing.
- Reusability - Data should carry clear usage licenses and be capable of being replicated and/or combined in different contexts.

Figure 15: FAIR principles for the social sciences and humanities



To put these principles into practice, the Strategy will:

- Provide data repository directories to facilitate data discovery.
- Coordinate with Member Countries, Organizations, and implementing partners to identify previously relevant past projects and data developed with them.
- Champion and adopt well-established data formats and metadata standards
- Promote standard open data protocols.
- Ensure metadata is always public and remains available even when the underlying data is private or no longer accessible.
- Advocate strongly for data governance and data management within CDRI and across Member Countries.

Principle 3 - Avoid Duplication of Work and Effort: The Strategy will aim, to the greatest extent possible, to avoid duplicating work that has been undertaken by:

- Coordinating and communicating with partners, regional organizations, and vendors.
- Creating directories that link to existing repositories of risk data, tools, and technologies.
- Following the FAIR principles and promoting the use of open data and open platforms.

3.3 Candidate Strategies

The strategic options identified support the objectives and outcomes outlined in the Theory of Change. In alignment with CDRI's offerings - grouped under (i) technical assistance, (ii) capacity building, and (iii) global advocacy - the strategic options evaluated are similarly organized into three output categories through which the strategy will be delivered, as summarized in Table 2.

Table 2: Strategic options/activities grouped by output category

Technical Assistance	Capacity Building and Training	Advocacy and Communications
Help countries develop and maintain national infrastructure asset registries via regional/national data hubs or platforms.	Provide training on how to develop asset registries and collect asset data.	Advocate for the importance of open data standards such as Open Exposure Data Standard (OEDS) and Risk Data Library Standard (RDLS) that promote data sharing and interoperability.
Increase and improve access to GIRI data and models via new distribution channels, data services, help desk, hackathons.	Organize training workshops on infrastructure risk and resilience - Use of geospatial and risk data - How to create risk maps - Understand and interpret risk analytics output	Facilitate data and risk literacy communication between technical teams and ministries/political leaders in Member Countries - using GIRI and the Global Infrastructure Report.
Assist Member Countries in conducting infrastructure risk and resilience assessments.	Provide GIRI training and create a cadre of GIRI-certified DRI professionals.	Advocate for minimum standards for risk assessment to increase understanding of DRI.
Provide advisory services - strategies and road maps to help governments leverage data and technology from open sources/regional data hubs for DRI.	Establish a Community of Practice (CoP) around infrastructure risk data, tools, technologies, and innovations in DRI.	Showcase innovation via - Existing regional centres (e.g., PCCCC, A&B CoE) - DRI Connect - ICDRI - Geolab at CDRI
Enable data and tool discovery by creating online directories and virtual marketplace.		Promote and advocate easy-to-use tools and technologies (e.g., DesInventar Sendai – a disaster information management system hosted by UNDRR).
Participate in the development of data standards.		

3.4 Co-creation Processes:

The strategic options identified were then distilled into themes based on the interpretation and synthesis of stakeholder consultations, including those from the Data and Technology Strategy Working Group.

A four-step synthesis process, described in Annexure C, enabled the CDRI Data and Technology Unit to parse through the extensive information generated through by these consultations and identify themes that focus the strategy on outcomes and phases of implementation, as detailed in the next section of the report.

3.5 Synthesizing Candidate Strategies into Themes

We have defined the following themes around which the strategy will be focused:

Theme 1 - Infrastructure Asset Data (Exposure Data)

Why this is important:

Quality information about a country's infrastructure assets is the foundation for assessing infrastructure risk, reducing risk, and strengthening resilience. Attributes such as the location of an infrastructure asset, the replacement cost value of the asset, the structural characteristics of the asset, and the condition of the asset are essential for assessing risk, measuring resilience, and designing strategies for risk reduction and improved resilience - both at the individual asset level and for the portfolio of assets.

Infrastructure asset information is also needed for effective asset management, operations and maintenance, investment and financing, and insurance.

Objectives of the Strategy supported:

- Member Countries have timely access to high-quality infrastructure risk data (infrastructure exposure) and related knowledge resources.
- Decision-makers and stakeholders have increased awareness, knowledge, and capacity to utilize data in assessing infrastructure risk and resilience.

Technical Assistance

- Engage with Member Countries in developing their infrastructure asset registries, including:
  - Geospatially referenced asset registries (location and spatial connection to other assets);
  - Data on asset replacement cost values, structural attributes and age, asset condition, performance, and maintenance;
  - Mapping infrastructure assets in regions or countries where data is scarce.

Capacity Building and Training

- Conduct training programmes and workshops on:
  - Creation of infrastructure asset registries.
  - Use of simple tools to collect infrastructure exposure, loss, and damage data (e.g., DesInventar Sendai).

Advocacy

- Participate in shaping and creating infrastructure exposure data and metadata standards, such as the Open Exposure Data Standards (OEDS) and Risk Data Library Standards (RDLS). This promotes exposure data sharing and compatibility across countries and sectors, supporting investors and regulators in assessing the performance of infrastructure as a distinct asset class and integrating it effectively into regulatory frameworks.
- Participate in shaping and creating infrastructure asset taxonomy standards - such as playing an active role in the Global Infrastructure Hub's Infrastructure Working Group.
- Advocate for and promote standardized infrastructure asset taxonomies, as well as exposure risk data and metadata standards in various forums. Request for asset exposure data in these standard formats in CDRI Requests for Proposals and contracts.

Technologies Leveraged

- Geospatial (including GIS and mapping), Remote Sensing and Earth Observation, combined with data from open geospatial data and IoT sensor networks, to map and define infrastructure assets
- AI/ML for automated mapping of infrastructure assets from imagery
- AI/ML to predict asset attribute information, classification, and structural attributes using imagery (e.g. construction material, height of the building, roof type)
- Software applications and platforms that support data collection, storage, and analysis, including participatory mapping and crowdsourced initiatives to collect asset information using simple mobile apps and tools

Theme 2 - GIRI Democratization

Why this is important:

GIRI is CDRI's flagship initiative, offering an open-source probabilistic risk model. It serves as an alternative to commercial catastrophe models that are often very expensive and rarely available to governments and infrastructure risk investors.

Beyond its technical value, GIRI also serves as CDRI's key global advocacy tool for promoting its vision and mission on disaster resilient infrastructure.

Technical Assistance

- Increase and improve access to, and use of, GIRI data and models:
  - Downscaling of GIRI data and models for countries, regions, and cities.
  - Activate new distribution channels for GIRI data.
  - Provide GIRI data-as-a-service to enable integration with other data repositories.
  - Ensure interoperability of GIRI layers to support exposure and risk data and metadata formats (e.g., OEDS, RDLS).
  - Set up a helpdesk to assist Member Countries in running GIRI, accessing and using relevant data sets, and interpreting GIRI results.

Capacity Building and Training

- Use GIRI as a key model in developing infrastructure risk and resilience training modules, that can be integrated into existing risk assessment and loss modelling training programmes.
- Conduct GIRI user training for both technical and non-technical users.
- Improve GIRI model and data documentation.
- Organize hackathons to promote exploration of GIRI datasets and encourage their combination with other data for new applications.
- Explore online certification – 'GIRI-certified DRI professionals' programme.

Advocacy

- Facilitate data and risk literacy to improve communication between technical teams, political leaders, and ministers using GIRI outputs and the Global Infrastructure Report.

Technologies Leveraged

- Geospatial, Remote Sensing and Earth Observation, and GeoAI technologies, along with open data for GIRI data downscaling.
- AI-powered search to explore GIRI methodologies and documentation.
- Data visualization, interactive dashboards, and other digital techniques for the communication of GIRI information and layers.

Theme 3 - Infrastructure Risk and Resilience Assessment

Why this is important:

Identifying and estimating disaster and climate risk embedded in infrastructure assets is an essential step toward infrastructure resilience. This enables governments and other infrastructure owners to identify and assess the contingent liabilities they are responsible for in each sector and territory. Financial risk metrics help identify funding gaps, and clarify the economic case for investing in resilience, and also pinpoint the most effective strategies for investment.

Technical Assistance

- Assist Member Countries in conducting infrastructure risk and resilience assessments through the development of hazard and risk maps, vulnerability assessments, and deterministic and probabilistic loss models via initiatives such as IRIS.
- Provide advisory services, in collaboration with consulting and delivery partners, to help governments design strategies and roadmaps for collecting, utilizing, and leveraging data, models, and technologies from national and regional data hubs and open data and model platforms for infrastructure risk reduction and resilience.
- Develop tools (such as the Resilience Cost-Benefit Analysis tool) from CDRI-funded or executed technical and sector-specific programmes and studies.

Capacity Building and Training

- Develop infrastructure risk and resilience training modules that can be integrated into existing risk assessment and loss modelling training programs -. These includ the development of risk maps, the use of geospatial data and tools, the application of risk models, and the interpretation of model and analytics outputs, as well as communicating the results for decision-making.

Advocacy

- Promote minimum standards for risk assessment tailored to different use cases. Instead of complex state-of-the-art assessments, this makes it easier for state and central governments to begin utilizing the risk assessment results.
- Facilitate communication of data and risk between technical teams and political leaders and ministers.

Technologies Leveraged

- Geospatial and GIS
  - Remote Sensing and Earth Observation
  - AI/ML and GeoAI
  - Data science
- Modelling and simulation for risk assessment with Computing - sophisticated software including AI-driven modelling and forecasting for climate modeling using high-performance computing, on cloud or on-premise

Theme 4 - Infrastructure Risk Data, Tools, and Innovative Technologies

Why this is important:

To achieve its mission of supporting countries in upgrading their systems to ensure climate and disaster resilience of existing and future infrastructure, CDRI will promote technological innovation.

To deliver Strategic Outcome SO2 (advancing global DRI research, coalition-led peer engagement, and CDRI-curated and generated knowledge to promote risk-informed policy and practice), CDRI will establish clusters of excellence to aggregate knowledge, facilitate new research, and champion experiential learning by nurturing, incubating, and promoting new and innovative technologies.

This will help realize CDRI's ambition to develop as a DRI Centre of Excellence, nurturing, incubating, and promoting new and innovative technologies.

Technical Assistance

- This initiative will support the discovery of data, tools, and technologies for CDRI's Member Countries by providing online directories with links to open data sources, portals, and knowledge resources on infrastructure risk data, as well as by creating a Virtual Marketplace. CDRI will pilot these initiatives in a specific region (e.g., the Pacific SIDS region).

- CDRI will assist Member Countries with the procurement of data, tools, models, and software via programmes such as GIRI, IRIS, UIRP, and other CDRI technical programmes. This would include:
  - Granular climate and disaster risk data - hazard maps (e.g., urban heat island or urban flood maps), infrastructure exposure data, vulnerability curves, infrastructure loss and damage data.
  - Risk analysis tools and models.
  - Geospatial and risk software and technologies, including those provided by the private sector, for Member Countries.

Capacity Building and Training

- Train Member Countries to use simple tools to collect asset exposure data (e.g., UNDRR's DesInventar).
- Establish a CoP around innovative risk tools and DRI technologies.

Advocacy

- Provide avenues for showcasing DRI innovations:
  - Support existing Centres of Excellence such as the Antigua & Barbuda SIDS CoE and the Pacific Climate Change Centre.
  - Use CDRI's platforms, such as DRI Connect and ICDRI, as well as programmes like the CDRI Fellowships, to showcase DRI innovations.
- Create interactive exhibits of digital technologies to be displayed in the new Experience Lab in CDRI.

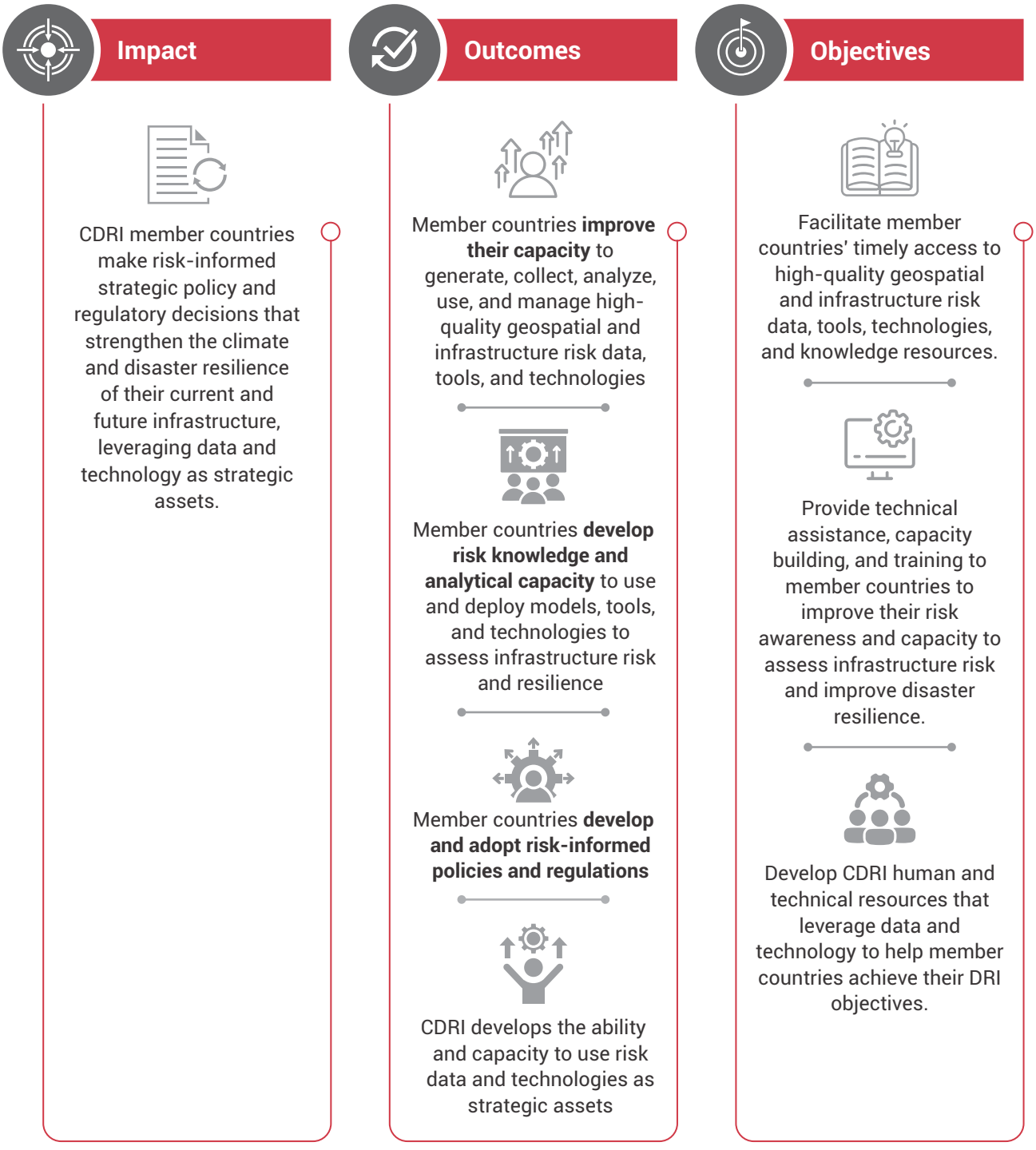
Technologies Leveraged

- The technologies showcased will be prioritized based on the objectives they serve for infrastructure resilience. The initial focus will be on technologies that enhance the data value chain, such as Geospatial, Remote Sensing and Earth Observation, IoT, AI/ML, Data science, Modelling and simulation, Computing, and Software apps and platforms on mobile, cloud, and desktop for data collection, management, and analysis. In the next phase of the Strategy, technologies that improve connectivity, communication, and collaboration between infrastructure stakeholders will be included., These technologies include Digital Twins, BIM, immersive technologies including AR/VR/XR and 360-degree, Gaming, social media, Blockchain, and Communication systems and networks, will be included.
- While showcasing high-tech applications, promote and advocate for simple, easy-to-use tools for risk data collection and risk analysis, as they are likely to see more adoption at the country government level, especially in LDCs and SIDS.

3.6 Theory of Change

In preparing the strategy, a Theory of Change (ToC) framework was adopted (Figure 16) to convey how and why the Data and Technology Strategy will achieve its desired outcomes and impact.

Figure 16: CDRI Data and Technology Strategy Theory of Change



Themes	Activities	Intermediate Outcomes	Outcomes	Impacts
1 Infrastructure Asset Data	Support development of infrastructure asset registries	-	Member countries improve their capacities to generate, collect, analyze, use, and manage high-quality geospatial and infrastructure risk data and information.	Improved infrastructure risk assessment, planning, and resilience in member countries.
	Participate in shaping exposure (AAL) metadata standards	Contributions to international and national regulatory alignment through guidance for sharing and integrating data		
	Information on asset values, structural attributes, and functions	-		
	Training to develop asset registries	Workshop materials and toolkits developed for training		
	Use of simple tools to collect asset exposure data	Trained personnel in asset data collection and management		
	Advocate the benefits of infrastructure exposure open data & metadata standards and taxonomies	Infrastructure data standards advocated in forums and adopted in CDRI procurement and contracts		
2 GIRI Democratisation	Help desk for GIRI users	Support data access, interpretation, and integration for member countries	Member countries develop and adopt risk-informed policies and regulations for infrastructure disaster risk reduction.	Broader, cost-effective access to risk analysis enabling better-informed infrastructure investments.
	New distribution channels for GIRI data	GIRI datasets made more accessible		
	Hackathons based on GIRI data	Innovation hackathons conducted to encourage novel applications of GIRI data		
	GIRI Data-as-a-Service	GIRI data services integrated with national repositories		
	GIRI user training	Trained personnel in asset data collection and management		
	"GIRI-certified" DRI professionals	GIRI-based risk assessment modules embedded in infrastructure resilience training programs		
	Facilitate data and risk literacy communication between the technical and political leaders at ministerial summits using GIRI & Biennial Report	Bridged communication between technical experts and political leaders through reports and briefings		

Technical Assistance *Capacity Building* *Advocacy and Communication*

Themes	Activities	Intermediate Outcomes	Outcomes	Impacts
3 Infrastructure Risk and Resiliency Assessment	Assist countries with infrastructure risk assessments	Hazard maps, vulnerability assessments, and loss models developed	CDRI transforms into a data-driven organization with the technical ability and capacity to use geospatial and digital technologies as strategic assets for DRI action.	Disaster and climate resilience integrated into national infrastructure planning and design.
	Provide advisory services	Strategies and roadmaps delivered to governments for leveraging risk data, models, and open platforms		
	Develop CDRI tools for risk assessments	Sector-specific resilience tools created		
	Risk and resilience assessment workshops & clinics	Trained personnel for risk mapping, model usage, analysis, and communication for decision-making		
	Advocate for mainstreaming infrastructure risk assessment for governments and financing institutions	Advocacy materials created to support simplified, actionable risk assessment tools for government use		
	Facilitate data risk literacy for policymakers	Communication tools and briefings designed to convey technical risk insights to decision-makers		
4 Infrastructure Risk Data, Tools, and Innovative Technologies	Directories and links to risk datasets, tools, and methodologies	-	Member countries develop risk knowledge and analytical capacities to use and deploy models, tools, and technologies to assess their infrastructure risk and resilience.	Adoption of cutting-edge technologies for resilient infrastructure across member countries.
	Assist countries to use tools and technologies from CDRI partners (e.g., UNDRR, UNDP, World Bank, Urban for Resilience)	Member countries supported in accessing climate risk data, models, and geospatial tools through CDRI programs		
	Develop infrastructure data marketplace	-		
	Establish Community of Practice (CoP)	Active Community of Practice formed		
	Showcase DRI innovations	DRI innovations showcased through Centres of Excellence, DRI Connect, ICDRI, and CDRI Fellowships		
	Promote user-friendly risk tools for policymakers	Advocacy campaigns launched for simplified, adaptable tools to support country-level risk data and analysis		

Technical Assistance *Capacity Building* *Advocacy and Communication*

Linkages to CDRI's Vision, Mission, and Strategic Outcomes

The Data and Technology Strategy will bolster CDRI's mission to support its Member Countries in upgrading their systems to ensure climate and disaster resilience of existing and future infrastructure, aligning with the UN SDGs and the Sendai Framework.

The Strategy will support CDRI's Strategic Outcome 2 (CDRI-curated and generated knowledge to promote risk-informed policy and practice) by:

- Promoting GIRI as an open-access geospatial data platform that enables access to infrastructure data and global risk and resilience metrics.
- Championing experiential learning by nurturing and promoting innovative technologies through showcases at centres of excellence, ICDRI, and DRI Connect.
- Leveraging existing CDRI initiatives, such as DRI Connect, to develop a virtual marketplace that connects data and technology solutions and providers with on-ground demand in Member Countries.

The Strategy will also support CDRI's Strategic Outcome 3 (enhanced capacities of stakeholders to implement post-disaster recovery and DRI action at scale) through:

- Capacity building and training in Member Countries - focus on geospatial, asset registries, and other risk data collection, understanding outputs of risk models such as GIRI.
- Promoting the use of data hubs for Member Countries and encouraging them to contribute to existing hubs such as the SIDS Global Data Hub.
- Assisting Member Countries in procuring geospatial and risk data tailored to their individual needs.
- Supporting the provisioning of data and technologies for informed planning and decision-making for CDRI programmes such as IRIS, UIRP, Mountain Region Resilience Programmes, Resilient Africa programme, and critical infrastructure sectoral programmes across LDC and SIDS geographies.

The Strategy is linked primarily to three key CDRI offerings: GIRI, the Global Infrastructure Report, and the IRIS programme. Activities under the 'Democratization of GIRI' theme include expanding the distribution of GIRI data and its risk and resilience analytics; using GIRI to demonstrate key concepts in risk assessment training programmes; training more users on the capabilities of GIRI, including GIRI certifications for DRI professionals; and positioning GIRI as a flagship CDRI product.

The themes of Infrastructure Asset Exposure Data and Infrastructure Risk and Resilience Assessments can be operationalized through the IRIS programme as themes in future calls for proposals and/or through specific bilateral projects or programmes.

As per the SFDRR Priority 1 and Target 4, CDRI will promote access to, as well as the collection, analysis, management, and use of relevant risk data and technologies by its Member Countries at the global, regional, national, and local levels.

Implementation Plan

The implementation plan translates the Strategy into action, in alignment with CDRI's Strategic Work Plan 2023-26.

Prioritization of Themes and Activities

To support a more focused and strategic roll-out, the Strategy adopts a phased implementation framework spanning a 10-year horizon. This framework outlines clear time-bound objectives and aligns initiatives with long-term programmatic outcomes.

The implementation timeline is categorized as follows:

Short-term engagements (0 - 1 years): Early-stage initiatives that are expected to be operational within the first year of the Strategy.

Medium-term engagements (1 - 5 years): Initiatives that require wider coordination or development and are expected to reach full implementation within five years.

Long-term engagements (5 - 10 years): Systemic interventions that will evolve over a decade and are critical to sustaining the Strategy's long-term impact.

Theme: Infrastructure Asset Data (exposure data)

Short Term	Medium Term	Long Term
• Develop training programs on infrastructure asset registries for Member Countries.	• Develop/support a basic infrastructure asset registry/database project with a country. • Develop a defined asset inventory offering (knowledge product) based on pilot infrastructure asset registry projects.	• Develop a detailed asset inventory database offering to include resilience attributes.
	• Conduct training programs on infrastructure asset registries for Member Countries. • Include training and advocacy of simple tools to collect and manage risk data.	
	• Participate in existing infrastructure taxonomy standard groups (IAM UN, G20 IWG). • Participate in shaping and creating infrastructure exposure open risk data and metadata standards (OEDS, RDLS). • Advocate the benefits of standard infrastructure asset taxonomies and asset exposure open risk data formats.	

Theme: GIRI Democratization

Short Term

- Establish a Help Desk to assist GIRI users.
- Use GIRI to develop risk and resilience training modules.

Medium Term

- GIRI data-as-a-service to enable integration with other data repositories.
- Ensure interoperability of GIRI data layers to support open risk data/metadata formats.
- Activate new distribution channels for GIRI data.
- Improve documentation of GIRI model and data.
- Assist Member Countries with downscaling of GIR data and models.
- Conduct GIRI user training for technical and non-technical users.

Long Term

- Create GIRI-certified DRI professionals' program.
- Facilitate data and risk literacy for improved communication between the technical teams and political leaders and ministers using GIRI and Global Infrastructure Report.

Theme: Infrastructure Risk and Resilience Assessment

Short Term	Medium Term	Long Term
• Participate in the development of, and promote minimum standards for risk assessment.	• Develop guidance document on approach/methodology and compilation of knowledge resources on different approaches for risk and resilience assessment. • Empanel consultants, experts and agencies to assist countries with risk assessments. • Provide support to countries in the implementation of risk / resilience assessment.	
• Develop outreach materials to facilitate communication of data and risk literacy communication between technical teams and political leaders and ministers.		• Conduct need assessment on countries' requirement strategies/roadmaps for use of data and technology for resilience leading to identification on scope of operations. • Develop/Sign service level agreements and terms of reference leading to empanelment of agencies for providing advisory services. • Capture Member Country interests and delivery of advisory services.
	• Create roadmap for possible tools which could be developed (e.g. NIP, Health Systems Assessment). • Issue call for proposal for tool development. • Develop and pilot tool and scale in a country/region.	
	• Identify content partner for design and development of training modules for decision makers. • Develop training modules for decision makers. • Deliver training to decision makers.	
	• Engage with political leadership at internation and regional forums (e.g. COP, G20).	

Theme: Infrastructure risk data, tools, and innovative technologies

Short Term	Medium Term	Long Term
• Conduct literature review of the existing sources of data platforms and virtual marketplace.	• Create an infrastructure risk data discovery platform.	• Create a virtual marketplace that includes active engagement from users.
• Identify CoEs that need support/ partnerships.	• Support in-country centers of excellence with knowledge and content development.	
• Extend existing CoP on EWS or extend existing CoP for risk data, tools and technologies, to be hosted in DRI Connect.		
• Identify partners for procurement of data, tools and models in CDRI funded procurement of data, tools and models. • Establish Data governance clauses to assist countries for procurement.	• Enter contracts with countries and vendors on the procurement of data, tools and technologies.	
• Establish an Experience Lab at the CDRI office. • Showcase innovation - data, tools and tech using CDRI platforms (DRI Connect, ICDRI, CDRI Fellowships).		

Risks

We have identified a few risks to the Data and Technology Strategy

- Funding in CDRI's next Strategic Work Plan – the Strategy is funded through FY 2025-26. The subsequent Strategic Work Plan will need to provide adequate funding for this Strategy that is commensurate with its ambitions.
- Hiring for key positions in the Data and Technology Unit – the Strategy envisions several technical roles that CDRI has not traditionally hired for. Delays in recruitment or inability to attract high-calibre candidates for these positions are risks to the implementation plan.
- Execution of the short-term priorities – since this is a new plan, good execution of the short-term priorities will be essential to sustain organizational and Member Country support.

GEDSI Integration in the Data and Technology Strategy

Incorporating Gender Equality, Disability, and Social Inclusion (GEDSI) principles into CDRI's Data and Technology Strategy is critical to ensure that this initiative to strengthen infrastructure resilience is grounded in equality, accessible, and impactful for all, including women, persons with disabilities (PWD), minority groups, and other vulnerable populations. CDRI's GEDSI policies outline institutional measures that have been adopted to help advance GESDI inclusion in all CDRI programmes. This section outlines how GEDSI will be mainstreamed via the Strategy throughout the outputs in the 4 thematic areas:

Theme 1: Infrastructure Assets (Exposure Data)

- Integrate GEDSI focal points into technical working groups overseeing infrastructure mapping. Ensure consultations include women, PWDs, and excluded community representatives.
- Support GEDSI-responsive asset inventories and risk assessments to inform equitable investment prioritization. Some countries have more accurate and granular information on asset inventories, which may also be disaggregated by gender and disability data. The Strategy will identify a pilot use case in a country with such information available, and a pilot study of GEDSI-informed asset inventories can be created.
- Disseminate asset registry information in accessible formats (digital, print, audio, local languages). Apply Universal Design Principles to asset visualization tools.
- Conduct GEDSI screenings as part of asset mapping initiatives to identify vulnerable users. Integrate GEDSI requirements in ToRs for data collectors and consultants.
- Encourage participation of women and marginalized communities in asset data collection roles through targeted outreach and partnerships.
- Establish avenues for data collection that enable crowdsourcing of information from diverse groups, such as youth, women, and PWD.

Theme 2: GIRI Democratization

- Nominate a GEDSI champion within the GIRI Steering Committee. Engage with women-led and regional advocacy groups, such as the Pacific Community, in its governance and the development of use cases.
- Improve the design of GIRI with a GEDSI lens—ensuring visual, linguistic, and technical accessibility for marginalized users.
- Enable users to access disaggregated data layers (e.g., gendered exposure, disability vulnerability). Crowdsource data from youth, women, and PWD for localized inputs.
- Embed GEDSI criteria into GIRI outreach, training, and calls for application. Require inclusive participation in use-case piloting and testing.
- Promote participation of underrepresented groups in GIRI-hosted challenges and innovation forums.

Theme 3: Infrastructure Risk and Resilience Assessment

- Facilitate consultations and participatory meetings at all skill levels for data and technology, to ensure all relevant stakeholder voices are heard and incorporated into project planning and implementation.
- Design print and digital content with a GEDSI lens that ensures accessibility and inclusivity for all users, regardless of their background or abilities. This involves considering factors such as language, visual design, culturally relevant messaging, diverse imagery, and functionality across all content platforms to create a welcoming and user-friendly experience for diverse audiences.
- Partner with advocacy organizations, women-led networks, and disability inclusion groups to ensure representation in training cohorts.
- Develop case studies and exercises that incorporate gendered and intersectional vulnerability scenarios in urban and rural infrastructure contexts.

Theme 4: Infrastructure Risk Data, Tools, and Innovative Technologies

- Develop participatory digital forums such as Communities of Practice and tools that enable women, PWD, minority groups, and other stakeholders to actively engage in decision-making processes. Additionally, enhance collaborations with existing organizations and groups that are women-led, such as the Pacific Community.
- Develop sector-specific GEDSI programmes that highlight the challenges of GEDSI integration in the field of data and technology.
- Offer training programmes for women and PWDs in technical domains; develop GEDSI-specific modules on data and technology.
- Apply Universal Design Principles across all digital tools and directories. Ensure websites and platforms are screen reader-compatible, multilingual, and culturally inclusive.
- Include GEDSI benchmarks in technology procurement, pilot testing, and documentation, and track accessibility and inclusion performance.
- Engage inclusive tech networks and support women and PWD technologists through grants, fellowships, and innovation support.

Addressing Gaps

The Data and Technology Strategy is envisioned as a dynamic and adaptive initiative, guided by a strategy designed to evolve in response to emerging opportunities for collaboration across development partners, the private sector, and other stakeholders. While the Strategy maintains a strong alignment with its overarching goals, it also envisions allocating approximately 20 percent of its resources to support high-impact, opportunistic initiatives.

While initially centred on hazard and risk-related data, the Strategy will expand its scope in the second phase (2027 onwards) to include resilience-oriented data indicators. This includes growing engagement with metrics such as resilience indices, loss and damage data, and post-disaster assessments from countries in the aftermath of events.

Looking ahead, the Strategy aims to systematically integrate these time- and place-specific indicators to better inform infrastructure resilience planning and policy formulation.

Additionally, as the Strategy evolves, greater emphasis will be placed on sector-specific hazard data, particularly in priority areas such as oceanic monitoring, sea level rise, and extreme heat. These thematic sectors will be explored in greater depth to support the existing programme strategy.

Conclusion

As part of the next phase, CDRI's Data and Technology Unit will transition from strategy design to implementation, initiating pilot applications and offering support to interested Member Countries. Several foundational initiatives are already underway, including the formal establishment of the Data and Technology Unit, early-stage collaborations with partners such as the World Bank and the European Space Agency, and initial pilots of the Virtual Directory and Technology Showcase. Additionally, drafts of RFPs, contracts, and supportive legal clauses for data and technology engagement are in development. Moving forward, our efforts will continue to prioritize the creation of interoperable systems, strengthening of strategic partnerships, and integration of GEDSI principles across all programmatic pillars. The long-term success of this strategy will rely on sustained engagement from members and partners, continuous learning, and capacity building at every level.

Annexure A - List of Organizations Consulted CDRI Member

Organizations

1. **Asian Development Bank**
   - ADB Pacific Disaster Resilience Program
   - Climate Change, Resilience and Environment Cluster
2. **The World Bank Group**
   - Global Facility for Disaster Reduction and Recovery (GFDRR)
   - Geospatial Operations Support Team (GOST)
   - Sustainable Development Practice
3. **United Nations Development Programme (UNDP)**
4. **United Nations Office for Disaster Risk Reduction (UNDRR)**
5. **arise**
   - Private Sector Alliance for Disaster Resilient Societies

CDRI Member Countries

Bhutan
- Department of Survey and Mapping, National Land Commission Secretariat
- Department of Disaster Management (DDM), Ministry of Home and Cultural Affairs

Cuba
- Institute of Tropical Geography
- Environmental Agency

The Dominican Republic
- Several organizations that are stakeholders linked to the Emergency National Council (CNE), such as the National Institute of Land Transit and Transportation (INTRANT), National Geological Survey (SGN), Dominican Institute of Meteorology (INDOMET), Ministry of Industry and Commerce (MICM), Ministry of Education (MINERD), Ministry of Natural Resources, and others.

Ghana
- Accra Metropolitan Authority

Other Multilateral Development Banks (MDBs) and International Government Organizations (IGOs)

Inter-American Development Bank (IDB)

United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM)

United Nations Department of Economic and Social Affairs (UN DESA)

Regional organizations in the Pacific

Pacific Catastrophe Risk Insurance Company (PCRIC)

Pacific Islands Forum Secretariat (PIFS)

Pacific Regional Disaster and Emergency Managers Meeting, April 2025

Pacific Regional Infrastructure Facility (PRIF)

The Pacific Secretariat (SPC)

The Secretariat of the Pacific Regional Environmental Programme (SPREP)

The Working Group for resilient housing and resilient infrastructure meeting, March 2025

Regional Organizations in the Indian Ocean

Earth Systems Science Organization - Indian National Centre for Ocean Information Services (ESSO-INCOIS)

International Research Organizations

International Water Management Institute (IWMI)

World Resources Institute (WRI)

Academia

Oxford University - Oxford Programme for Sustainable Infrastructure Systems (OPSIS)

Private Sector

Consulting and Engineering Firms

Arup

NACO, Royal HaskoningDHV

WSP

Industry Networks

Insurance Development Forum (IDF)

Technology and Venture Capital

Google

Tailwind

Non-profits

Artha Global

Council on Energy, Environment and Water (CEEW)

Climate Resilience For All (CR4A)

IPE Global and Triple Line Consulting

PVBLIC Foundation

Annexure B - Composition of the Data and Technology Strategy Working Group

World Bank
Global Lead, Disruptive Technologies

Dominican Republic
Advisor for the Implementation of the System for Climate Adaptation, National Council for Climate Change and Clean Development Mechanisms

Japan
Programme Manager, Space-based Disaster Management Programme, Satellite Applications and Operations Center (SAOC), Japan Aerospace Exploration Agency (JAXA)

Antigua & Barbuda
Chief Surveyor

Tonga
Assistant Secretary, GIS Officer

Madagascar
Interim Executive Secretary, Cellule de Prévention et d'appui à la Gestion des Urgences (Prevention and Emergency Management Support Unit), PMO

Expert
Lead author of CDRI's Global Infrastructure Report 2025, Former Regional Director, Africa, Sustainable Development Practice Group, World Bank

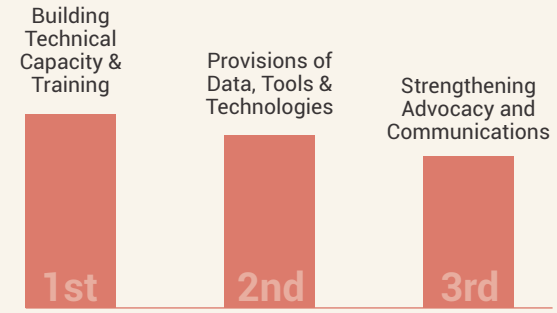
UNDRR
Head of Global Risk Analysis and Reporting

Annexure C – Details of the Programme Strategy Co-creation Process

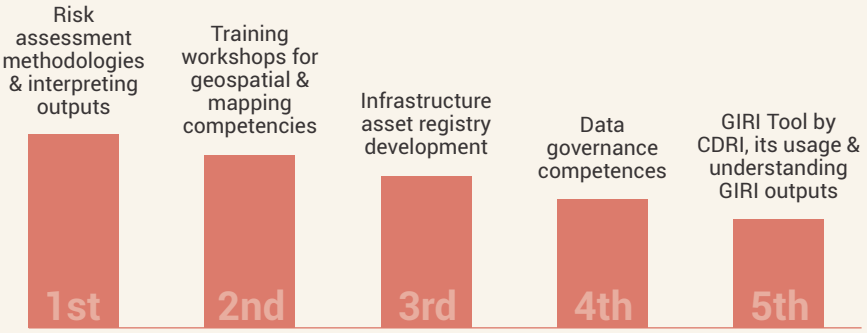
1. Polling by the Working Group on the priorities of strategic choices

Figure 17: Preliminary results of polls of the working group

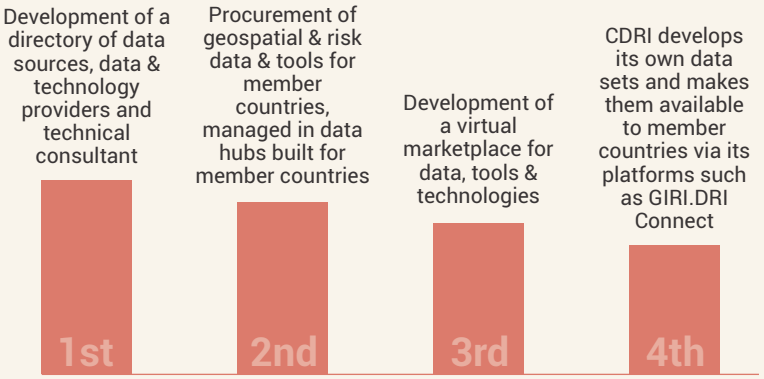
Please rank each of the strategic options for CDRI by priority



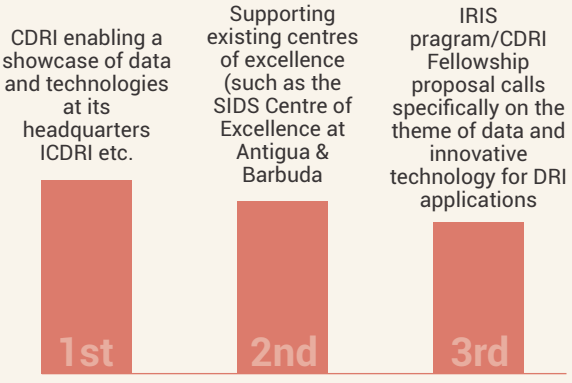
For building Technical Capacity & Training, please rank the options by priority



For Data, Tools & Technologies, please rank the options by priority



For strengthening Advocacy and Communications, please rank the options by priority

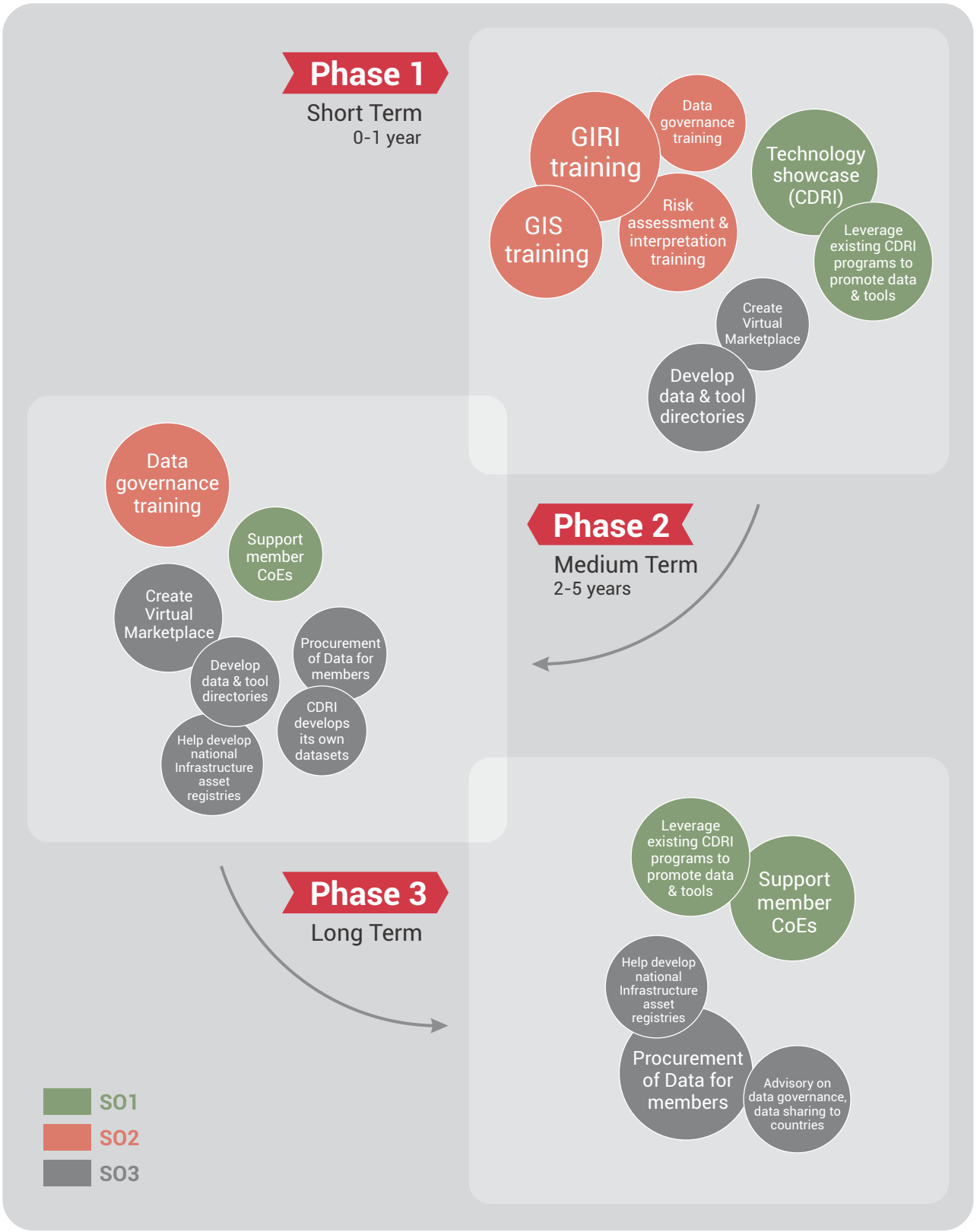


2. Use of a collective Miro board to synthesize strategic options by level of priority and effort, primarily engaging the Working Group.

Figure 18: Prioritization matrix of strategic options

2. Use of the Miro board to synthesize strategic options by phase-wise outcomes, primarily engaging with the Working Group.

Figure 19: Time-wise distribution of strategic priorities



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