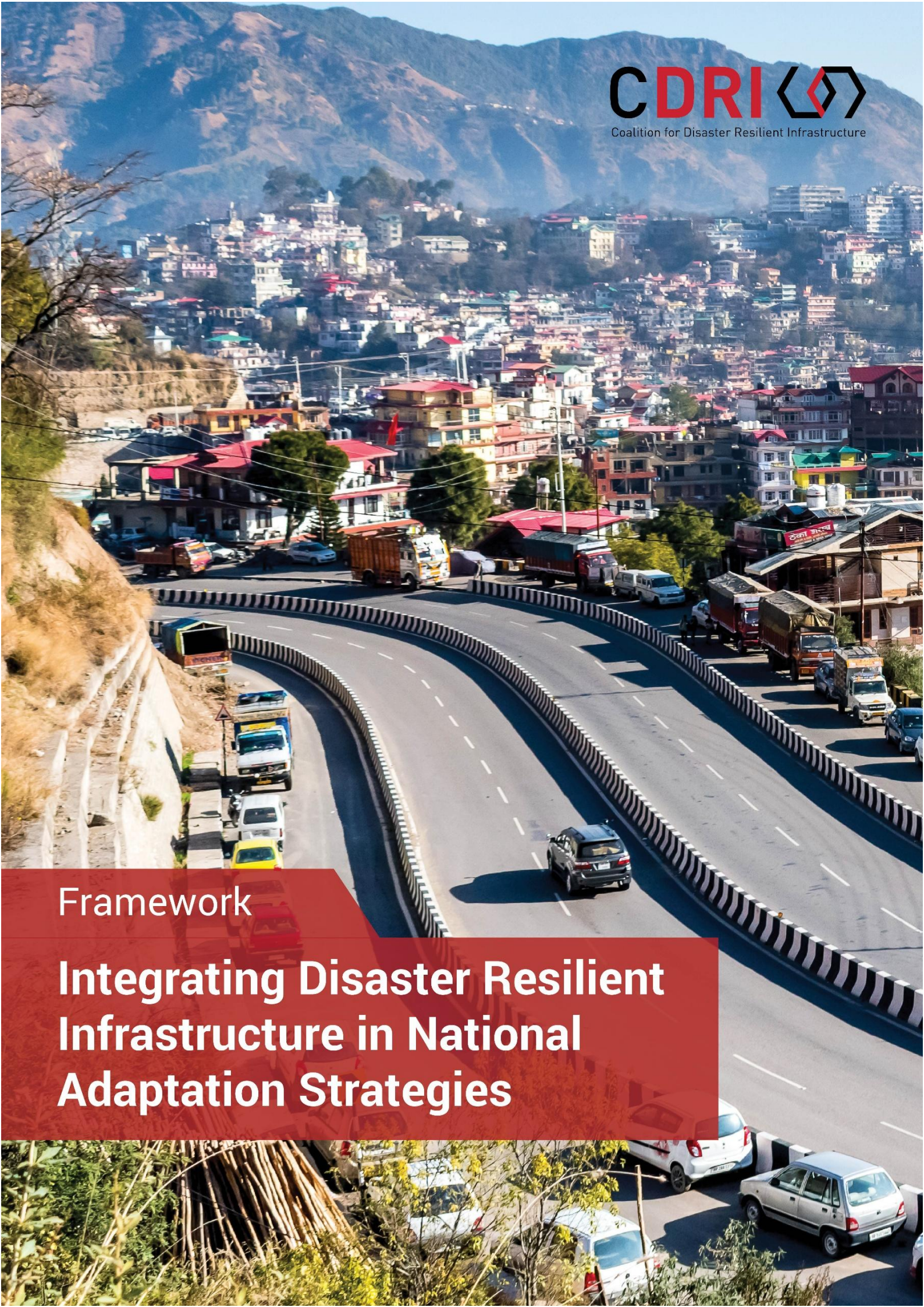


CDRI
Coalition for Disaster Resilient Infrastructure

Framework

Integrating Disaster Resilient Infrastructure in National Adaptation Strategies

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Suggested Citation: Coalition for Disaster Resilient Infrastructure (CDRI). (2026). *Framework: Integrating Disaster Resilient Infrastructure in National Adaptation Strategies.*

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Introduction

1.1 billion	900 million	38%	One-third
more people exposed to heavy rains by 2050	additional people exposed to intense drought by 2050	of the world's population, well over 2.8 billion people, lives within 100 km of the coast	of the global infrastructure needed to advance development by 2050 is yet to be built
UNEP 2025	*UNEP 2025*	*UN World Ocean Assessment*	*Brady et al., n.d.*

By 2050, climate change is estimated to expose about 1.1 billion more people to heavy rains and an additional 900 million people to intense drought (UNEP 2025). The past two decades have witnessed more than 50 high impact heatwave events, and half of the world's population experienced at least 30 days of extreme heat from May 2024 to May 2025 (UNEP, 2026). The evidence suggests that human-induced greenhouse gas emissions are increasing the frequency and intensity of climate extremes particularly precipitation, droughts, tropical cyclones, and compound extremes. Many such events now occur in geographies where these were extremely unlikely (IPCC, 2023). Surpassing 1.5°C by even relatively small increases can significantly scale the impact globally and increase the frequency of rarer extreme events (IPCC, 2018; IPCC, 2023; UNEP, 2026). The world is approaching climate-related thresholds from where there may be no return (UNEP 2025).

While the impact of climate change on lives and livelihoods is well acknowledged and documented, its impact on physical infrastructure assets and systems on which these lives are dependent is often understated. Existing infrastructure is not designed for the changing climate scenarios, and so may not be able to withstand the impact of these events (NOAA, n.d.). Such extreme weather events also affect the most vulnerable communities most severely especially when physical infrastructure including telecommunication, energy, transportation, etc. are disrupted, thus cutting off access to critical public services.

When an infrastructure asset is impacted, it affects the entire interconnected system. For example, massive rainfall can exceed storm water drainage capacity and lead to flooding, soil erosion, and degradation, which further destabilizes infrastructure, damages materials (concrete, iron, steel, etc.) and leads to substantial economic costs of maintenance, repair, or replacement. This can also result in cascading and compounding losses such as road closures, supply chain disruptions, and temporary suspension of services, largely impacting dependent and vulnerable population. Many communities as well as the infrastructure they have built are not yet prepared to face such challenges. As per the UN's World Ocean Assessment, approximately 38% of the world's population, which is well over 2.8 billion people, lives within 100 kilometres of the coast. And so, sea level rise and its impact on coastal infrastructure and economy directly influences nearly one-third of the global

population. As per the projections, some regions could end up at or below sea level by the year 2100. The options that communities are left with are to adapt their infrastructure and plan to strategically retreat from the shoreline (NOAA, n.d.).

Global average annual loss to infrastructure and buildings from disasters is estimated at $732–845 billion, equivalent to roughly a seventh of the economic benefits the same assets generate. Climate change increases these losses by 11 % in high-income countries but 33% in low-income countries. One-third of the global infrastructure required by 2050 is yet to be built (Brady et al., 2021). With growing urbanization, the demand for infrastructure will grow. Given the increasing frequency of unprecedented and rarest of rare extreme weather, it is vital to build infrastructure considering both current and future climate risks. To prevent climate shocks from escalating into a systemic crisis, it is imperative to build disaster resilient infrastructure (DRI) and embed resilience in the infrastructure lifecycle from planning to operation and maintenance.

Adaptation is the process of adjusting human and natural systems to actual or expected climate impacts. Resilience is the practical expression of that process that helps the capacity of a system to absorb a climate shock, keep functioning, and recover quickly. Without proper adaptation, the ongoing mitigation efforts might also be at risk as the assets built to cut emissions might be impacted (UNEP, 2026). In the aftermath of a disaster or an extreme weather event, the efforts put into recovery and reconstruction to restore normalcy in lives and livelihoods demands investments. This rebuilding and reconstruction also add to a significant share of global CO_2 emissions, extraction of natural resources, as well as generation of solid waste (UNEP, 2024; Brady et al., 2021). DRI brings tremendous opportunity to also reduce these added emissions and material inefficiency (Brady et al., 2021).

Unless infrastructure resilience becomes one of the core priorities deeply integrated in the national development planning, this will remain a missing piece in the global efforts to address the impact of climate change on people and economies globally. The decisions made now about where to build, to what standard, and under whose authority will determine whether that infrastructure locks in resilience or losses in the long term. In addition, coordination between concerned agencies, information flows, adequate financing channels, and appropriate skills will help bridge the gap between the intent of integrating resilient infrastructure in adaptation planning and its implementation and delivery.

Why should DRI be considered as an enabler for climate adaptation?

The Global Commission on Adaptation's Adapt Now (2019) report, which names resilient infrastructure as one of five priority areas, estimates that $1.8 trillion invested across those areas between 2020 and 2030 would generate $7.1 trillion in net benefits. DRI goes beyond being one sector for adaptation. It is instrumental in the transition from reactive disaster response to proactive systemic and forward-looking climate adaptation. From food and water security to health, livelihoods, ecosystems, and safe settlements, each outcome depends on reliable infrastructure and continuity of essential services. Resilient infrastructure will therefore not just address one priority but enables all others. By protecting interconnected systems and ensuring continuity of essential services, resilient infrastructure prevents cascading disruptions, protects vulnerable communities, and reduces climate-related loss and damage.

Investing in infrastructure resilience also delivers substantial long-term economic and social benefits. Incorporating resilience measures can add approximately 5–15 % to upfront infrastructure costs while delivering a 'Resilience Dividend' of 7–12 times the investment over the asset lifecycle (CDRI, 2025a). Hence, resilience is an investment in avoiding future losses rather than paying for recovery. It also enables adaptation across the wider economy, translates climate information into practical investment decisions, and reduces the burden of repeated disaster recovery and reconstruction.

DRI is integrated into national adaptation planning when climate and disaster risk considerations are embedded in the institutions, information systems, planning processes, investment decisions, financing mechanisms, technical standards, capacities, and lifecycle processes through which infrastructure is delivered. Integration here does not mean a standalone DRI programme, a new fund or a new agency, it is a change in how existing systems work and perform. As countries develop their National Adaptation Plans (NAPs) and sectoral adaptation frameworks, there is an opportunity to systematically integrate infrastructure resilience into these processes, and realizing the resilience dividend of building infrastructure that is resilient, inclusive and sustainable.

Resilient Infrastructure in the National Adaptation Strategies

The climate agenda is gradually recognizing this as a priority. The Paris Agreement (2015) established the Global Goal on Adaptation (GGA) under Article 7, calling for "enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change" (Article 7.1). This was further advanced through the UAE Framework for Global Climate Resilience (2023) which explicitly identifies "infrastructure and human settlements" as a thematic adaptation target (Decision 2/CMA.5, paragraphs 9(e) and 10(b)). In this context, National Adaptation Plans (NAPs) provide a critical mechanism for operationalizing this ambition (Decision 5/CP.17, paragraph 1(b)).

CDRI analyzed the NAPs submitted by 41 member countries as of 15 September 2026 with a set of 35 questions assessing the recognition and integration of disaster resilient infrastructure. The action areas including governance, data, technology, risk assessment, and capacity development were assessed to understand how DRI is reflected in the NAPs.

- **Infrastructure Resilience in NAPs:** Every country has used a terminology that corresponds to infrastructure resilience in their NAPs and 38 of the 41 NAPs (93%) have assigned a standalone adaptation priority, pillar, or sector for addressing infrastructure. Thirty-two NAPs include an infrastructure-resilience indicator, but only 26 (63 %) also name a custodian to track implementation.

- **Sectoral Coverage of Infrastructure Resilience:** Out of the eight sectors studied (namely, water, urban & housing, energy, transport, agriculture, health, education, and telecom), infrastructure resilience was most frequently addressed for water and urban & housing sectors–in nearly 95% of the NAPs, followed by energy and transport sectors in 90% of the NAPs. 35 of 41 NAPs considered agriculture and 31 of 41 NAPs considered health sector infrastructure but only 51% of the NAPs mentioned education and 39% of the NAPs mentioned telecommunication sector.

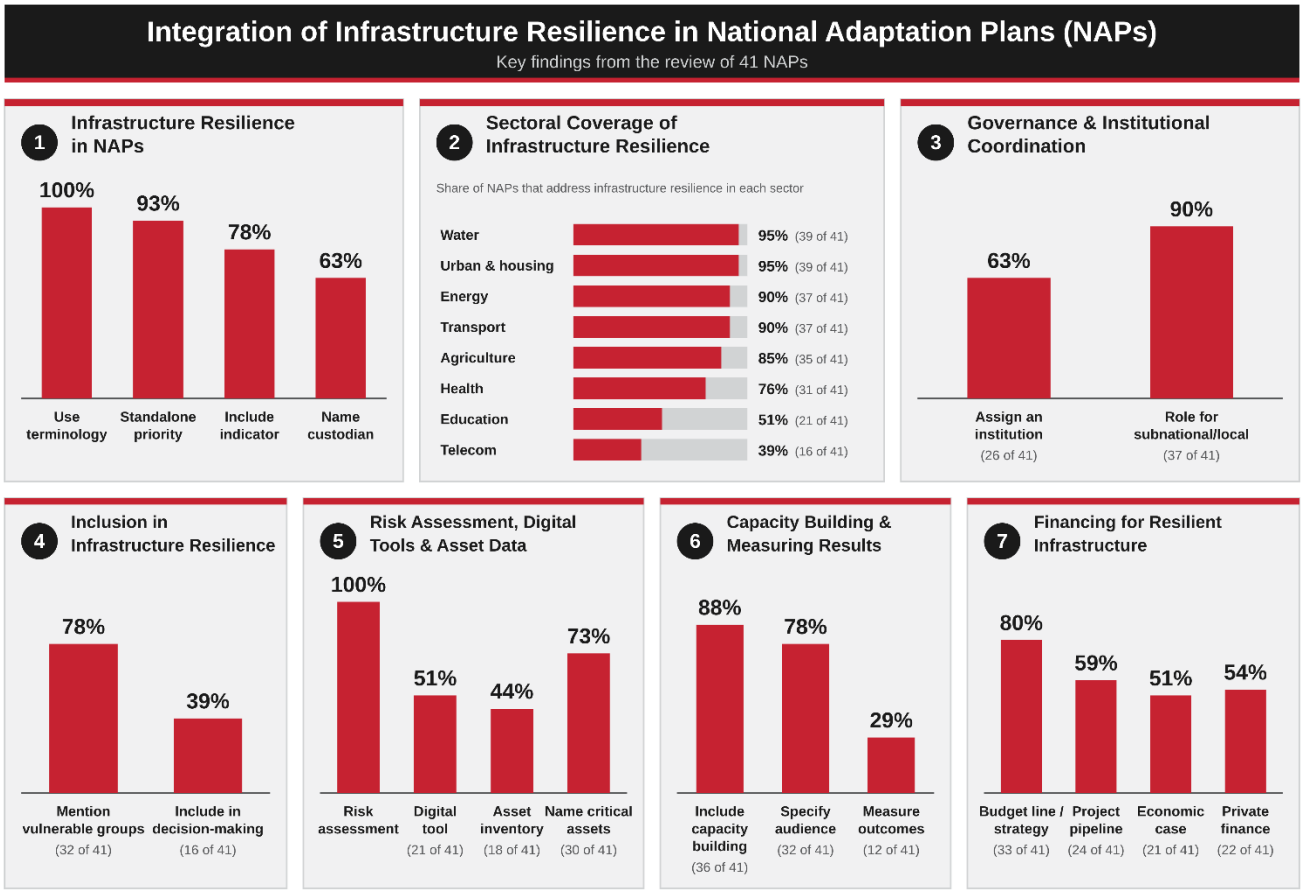


Figure 1. Key findings from the review of 41 NAPs on the Integration of Infrastructure Resilience in NAPs

- **Governance & Institutional Coordination:** Twenty-six out of 41 NAPs (63%) assign a specific institution, a lead ministry or an agency or formulate a cross-ministry coordination body to deliver infrastructure resilience across sectors; whereas 90 % of the NAPs have a stated role for subnational or local governments in coordinating at these levels.

- **Inclusion in Infrastructure Resilience:** For 78% of the NAPs, different vulnerable groups, including women, children, elders, persons with disabilities or marginalized groups, were mentioned as beneficiaries of infrastructure resilience actions but only 39 % of these NAPs include these groups in infrastructure related decision-making.

- **Risk Assessment, Digital Tools & Asset Data:** All the NAPs studied are reporting or commissioning a detailed climate risk, hazard, or vulnerability assessment wherein at least one slow-onset hazard is included but only 51% of the NAPs included a digital tool or platform that supports in planning, designing, and managing the resilient infrastructure. Only 18 of 41 NAPs referred to an inventory, registry, or database of infrastructure assets and 30 NAPs named specific critical or lifeline infrastructure asset for at least one sector.

- **Capacity Building & Measuring Results:** Thirty-six NAPs include capacity building for infrastructure resilience with 32 NAPs specifying the audience for whom the capacity building programme or training is to be held. But only 29% (12 out of 41) NAPs have identified an indicator measuring the outcomes of such initiatives.

RR CAFE

About the Framework

In 2025, CDRI constituted a Community of Practice on 'Integrating DRI in National Adaptation Strategies' and developed an Action Agenda on Integrating DRI in National Adaptation Strategies to advance embedding resilient infrastructure considerations within national adaptation efforts (CDRI, 2025b). The Action Agenda identified 10 key priority areas (Fig.1) for governments to strengthen the integration of DRI within adaptation planning and implementation processes.

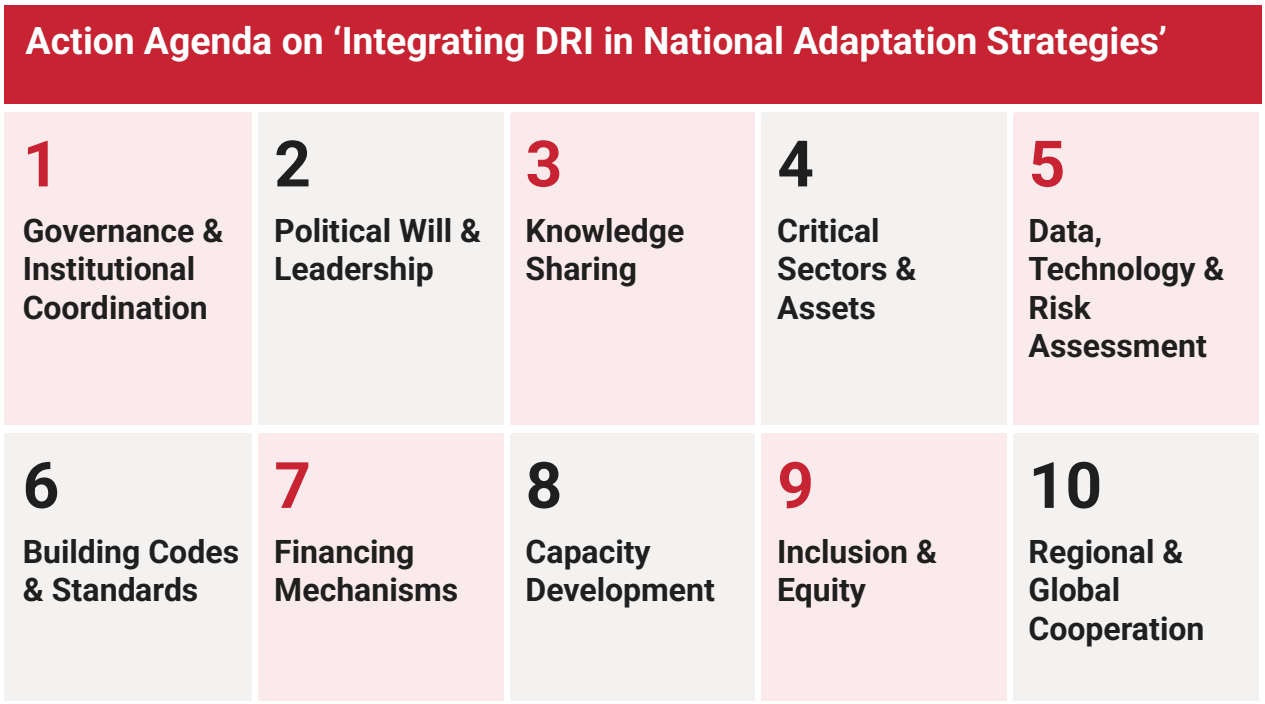


Figure 2. The ten priority areas of the Action Agenda on integrating DRI in National Adaptation Strategies (CDRI 2025b)

In 2026, the Community of Practice was renewed under the title 'DRI for Adaptation', expanding its scope and bringing together 66 experts from 20 countries and 31 organizations to take this action agenda towards operationalization. Three action areas *viz.* 'governance and institutional coordination,' 'data, technology, and risk assessment,' and 'capacity development' were picked to develop a framework to guide the strategic integration of these priority actions for DRI into the national adaptation strategies.

The 'Framework for Integrating DRI in National Adaptation Strategies' provides guidance on translating the Action Agenda priority action areas into concrete decisions and actions to embed resilient infrastructure as a key pillar in the NAPs. It considers the institutional arrangements, risk information, technical capacities, planning and investment systems, regulatory instruments, financing mechanisms, and monitoring processes required to operationalize DRI within adaptation. It seeks to bridge the gap between recognizing infrastructure resilience as an adaptation priority and systematically integrating it into

institutions, planning processes, investment decisions, technical systems, and infrastructure lifecycles.

The Framework is designed to be flexible and adaptable to different national contexts. It does not prescribe a single institutional model, planning process, or technical solution. Instead, it identifies the functions and enabling conditions required to effectively integrate DRI into adaptation planning and implementation. Countries can use the Framework to identify existing strengths, gaps, and priorities, and progressively strengthen their systems according to their national circumstances, institutional arrangements, risk profiles, and development priorities.

The Framework builds on CDRI's analysis which recognizes that countries are at various stages of NAP development, and that resilient infrastructure has received varying levels of recognition in the submitted NAPs. The Framework aims to mainstream DRI within a country's climate adaptation priorities and enable risk-informed, whole-of-society development. It supports government ministries–including environment and climate change, planning, finance and budgeting, and infrastructure– as well as sector regulators, disaster management authorities, public utilities, infrastructure operators, and subnational and local governments. It is also relevant for the development banks, bilateral partners, regional organisations, professional bodies, and civil society organisations.

The Framework is structured around four interconnected pillars: Governance and Institutional Coordination; Data, Technology, and Risk Assessment; Capacity Development; and Finance. While the first three address the core institutional, technical, and human capacities required for DRI integration, finance serves both as a fourth pillar and a critical enabler across all stages of adaptation. 'Governance and Institutional Coordination' establishes mandates, ownership, convening, and accountability, alongside regulatory, permitting, and compliance functions that make requirements binding. 'Data, Technology, and Risk Assessment' supplies hazard, climate projection, exposure, vulnerability, asset condition, and criticality information, together with the standards, design information, and asset data that translate risk into engineering decisions. 'Capacity Development' builds the institutional, professional, and local ability to apply that information–from risk assessors and planners to finance and procurement officials, engineers, inspectors, utilities, contractors and artisans. 'Finance' directs budgets, public investment systems, climate and development-partner funds, private capital, concessions, insurance, and project preparation towards resilient outcomes, acting as a lens across every other pillar.



Framework Architecture

NAPs are formulated through a continuous, progressive, and iterative process to reduce vulnerability by building adaptive capacity and resilience, and by integrating adaptation into development planning. The four components of the NAPs (hereafter referred to as 'stages') are 'impact, vulnerability, and risk assessment (IVRA); planning; implementation; and monitoring, evaluation, and learning (MEL)'. Recommendations for the Framework's three action areas (hereafter referred to as 'pillars')–Governance and Institutional coordination; Data, Technology, and Risk Assessment; and Capacity Development, are laid out for each NAP stage. For each pillar and stage, the Framework provides progressive entry points for countries depending on where they are in their adaptation journey. At each stage the Framework identifies four phases of maturity that form an iterative improvement cycle: evaluation informs new or revised foundations, while institutionalization and sustained implementation ensure that progress is maintained. The four phases apply across all the pillars, with specific recommendations varying according to the function addressed. Financing cuts across every phase and pillar.

This Framework is aimed at guiding countries from establishing DRI related functions to institutionalizing them in routine practice, sustaining their operation, and refining them through evidence. It enables governments to evaluate not merely the existence of resilient infrastructure policies and systems, but whether they are adequately resourced, operationalized, and continuously strengthened.

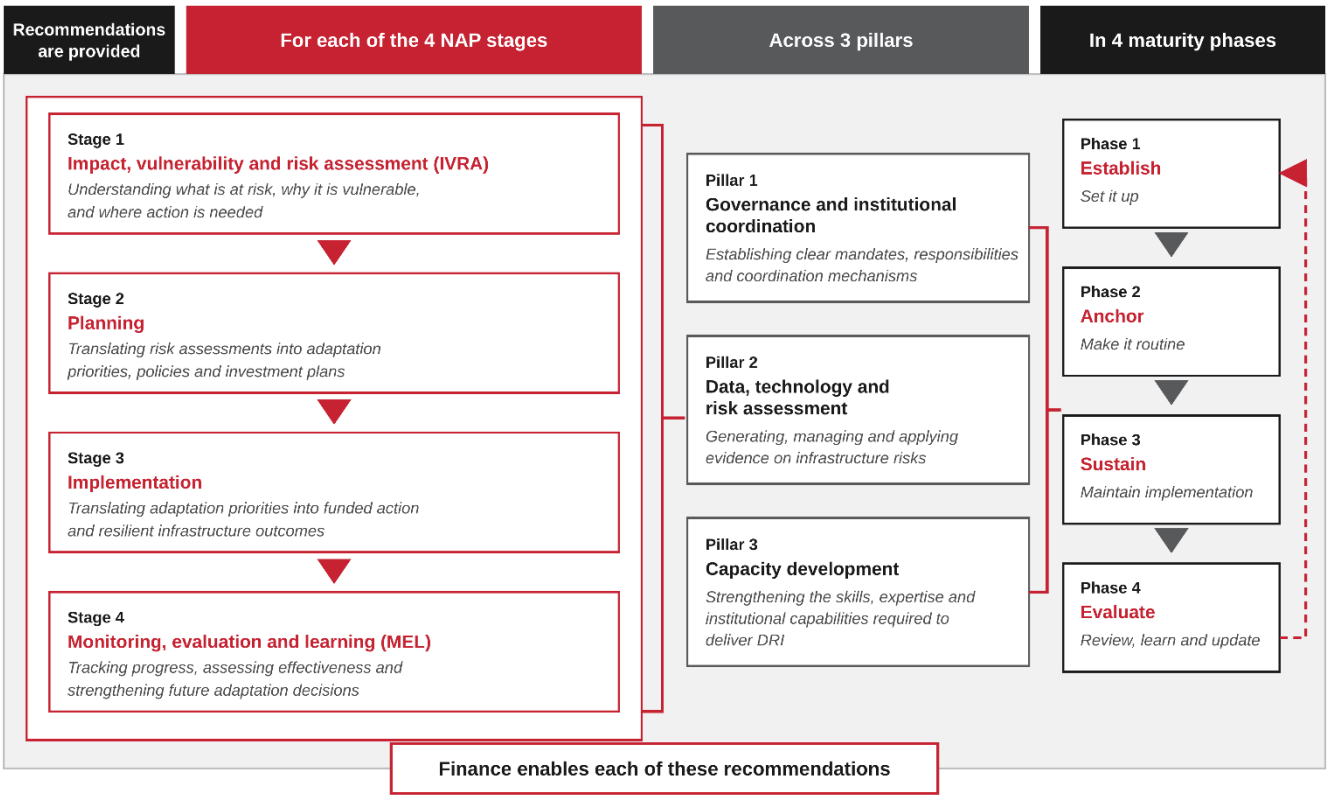


Figure 3: Framework Architecture

Stages of the Framework

STAGE 1

Impact, Vulnerability and Risk Assessment (IVRA)

Understanding what assets and systems are at risk, why it is vulnerable, and where action is needed

Guiding Question

How does a country transition from assessing infrastructure hazards and climate vulnerabilities to implementing resilience measures?

This stage establishes the evidence base for adaptation planning by identifying current and projected climate hazards, assessing exposure and vulnerability, and understanding their potential impacts on people, economies, ecosystems, and infrastructure. It examines how hazards–such as floods, cyclones, droughts, heatwaves, and sea-level rise–affect infrastructure assets, interconnected networks, and essential services. For DRI integration, the assessment should identify critical infrastructure assets and networks, evaluate their exposure to present and future climate risks, examine vulnerabilities and interdependencies, and identify potential service disruptions, and cascading impacts. Drawing on climate projections, geospatial data, infrastructure inventories, historical disaster losses, and sectoral risk assessments, these findings identify resilience gaps and determine where adaptation interventions are most urgently needed.

Key Outputs

Climate risk and vulnerability assessments; identification of critical and vulnerable infrastructure; analysis of infrastructure interdependencies; and an evidence base for prioritizing adaptation options.

STAGE
2

Planning

Translating risk assessments into adaptation priorities, policies and investment plans

Guiding Question

How does a country convert risk evidence into a defined infrastructure priority and an actionable adaptation measure?

Risk assessments provide the foundation for defining a country's vision and priorities. This stage translates assessments into clearly defined adaptation priorities, strategic objectives, and actionable plans. For DRI integration, this involves explicitly incorporating infrastructure resilience into the NAP and relevant sectoral plans, identifying priority assets and systems, and establishing criteria for selecting and appraising investments. Countries can define resilience objectives, identify structural and non-structural measures, assess lifecycle costs and benefits, and establish implementation responsibilities and financing strategies. Planning should also incorporate nature-based solutions, resilient design, asset retrofitting, and measures to strengthen interconnected networks.

Key Outputs

Prioritized adaptation actions; infrastructure resilience objectives and targets; integration of DRI into national and sectoral plans; costed implementation plans; and financing and resource mobilization strategies.

STAGE
3

Implementation

Translating adaptation priorities into resilient infrastructure outcomes

Guiding Question

How can countries move from a climate adapted, and risk-informed infrastructure plan to a financed, built, operated and maintained disaster-resilient asset?

This stage focuses on operationalizing NAP priorities by mobilizing finance, assigning institutional responsibilities, developing and delivering projects, strengthening enabling policies and regulations, and embedding adaptation measures into relevant programmes and investments. A system for observing and monitoring of these adaptation interventions can also be established here. Implementation requires coordination across national and subnational governments, infrastructure sectors, financing institutions, private operators and other stakeholders. For DRI integration, countries incorporate climate and disaster risk considerations into project preparation, design, construction, procurement, and operation and maintenance; apply appropriate building codes and engineering standards; strengthen regulatory oversight and inspection; and ensure assets remain resilient throughout their life cycle. It also requires securing resources for both capital investment and ongoing maintenance, developing a pipeline of bankable projects, and strengthening the technical and institutional capacity of implementing agencies.

Key Outputs

Funded and implemented resilience measures; infrastructure projects designed or upgraded to address climate risks; strengthened standards and regulatory enforcement; improved operation and maintenance practices; and strengthened institutional capacity for delivery.

STAGE
4

Monitoring, Evaluation, and Learning (MEL)

Tracking progress, assessing effectiveness, and strengthening future adaptation decision

Guiding Question

How does a country know whether risk information is changing decisions and whether infrastructure is performing better?

MEL should be designed alongside the NAP process and operate throughout implementation, rather than being treated solely as an end-of-cycle exercise. At this stage, MEL systems are developed and applied to periodically evaluate the progress and efficacy of implemented adaptation solutions, identify gaps, and inform the next NAP cycle. This stage assesses whether adaptation actions are being implemented as intended and whether they are reducing vulnerability, strengthening resilience, and delivering the expected outcomes. This involves establishing indicators, collecting and analysing data, reviewing progress, evaluating effectiveness, documenting lessons and reporting results. For DRI integration, MEL examines whether resilience priorities are embedded in policies, plans, budgets, and infrastructure investments, and whether these measures reduce climate-related damage, service disruptions, and recovery costs. It tracks the application and enforcement of infrastructure standards, the condition and performance of critical assets, disaster-related infrastructure losses, institutional coordination and capacity improvements, and the effectiveness of resilience investments. Monitoring should also identify gaps, unintended consequences and emerging risks, while capturing lessons from extreme events and infrastructure performance to inform revisions to the NAP and future investment decisions.

Key Outputs

DRI related indicators and reporting systems; evidence of implementation progress and resilience outcomes; evaluations of policy and investment effectiveness; documented lessons and identified gaps; and recommendations for updating the NAP and related sectoral plans.

Pillars of the Framework

PILLAR 1

Governance and Institutional coordination

Establishing clear mandates, responsibilities and coordination mechanisms

This pillar ensures that appropriate institutional arrangements, policies, regulations, and accountability mechanisms are in place to integrate DRI into national adaptation planning. It defines the roles and responsibilities of ministries, infrastructure agencies, regulators, local governments, and other relevant stakeholders, towards shared resilience objectives. It emphasizes coordination across sectors and levels of government, the alignment of adaptation and infrastructure policies, and the integration of climate and disaster risk considerations into planning, project selection, implementation, and oversight. It also establishes the regulatory frameworks needed to enforce resilience standards and the accountability mechanisms required to monitor progress and inform future NAP updates. This pillar institutionalizes coordination both vertically (across national and subnational levels) and horizontally (across responsible agencies, including planning, disaster risk management, finance, and infrastructure).

What it enables

Clear institutional ownership, coordinated decision-making, enforceable resilience requirements, and accountability for infrastructure resilience outcomes.

PILLAR
2

Data, Technology, and Risk Assessment

Generating, managing, and applying evidence on infrastructure risks

This pillar makes critical infrastructure asset inventories, risk-informed standards, codes and design information as well as asset and performance data integral to adaptation planning. It develops the data systems, analytical tools, technologies, and assessment methodologies needed to understand how climate hazards and disaster risks affect infrastructure assets, networks, and essential services. These tools support the identification of exposed and vulnerable infrastructure, the assessment of asset criticality and interdependencies, and the evidence-based prioritization of resilience measures. The pillar also addresses data availability, quality, standardization, interoperability, and sharing across institutions. It promotes the use of climate projections, geospatial information, risk models, infrastructure inventories and appropriate technical standards to inform decisions throughout the infrastructure life cycle–from planning and design to construction, operation, maintenance, and upgrading. Regularly updating risk information helps countries respond to shifting hazard patterns and emerging vulnerabilities, while ensuring national climate risk assessments capture infrastructure exposure, vulnerability, and potential impacts.

What it enables

Evidence-based adaptation priorities, risk-informed infrastructure investment, improved technical standards, and informed decisions on where resilience measures are most needed.

PILLAR
3

Capacity Development

Strengthening the skills, expertise, and institutional capabilities required to deliver DRI

This pillar assesses existing and required capacities, resources, and institutions for building climate- and disaster-resilient infrastructure, guiding the development of competencies across risk assessment, project appraisal, design, procurement, and operation and maintenance. This will help build technical expertise for developing 'bankable' infrastructure projects that clearly quantify risks and the broader benefits of resilience investments, while strengthening the technical, institutional, administrative, and financial capabilities required to translate NAP priorities into action. It recognizes that policies, risk data, and technical standards are only effective when practitioners have the means to apply them. This pillar addresses capacity gaps through targeted training, professional education, technical assistance, peer learning, and knowledge-sharing programs for policymakers, planners, engineers, operators, regulators, procurement officials, and local authorities. It also focuses on strengthening institutional capabilities for project preparation, risk-informed investment planning, regulatory enforcement, infrastructure inspection, monitoring and evaluation. Capacity development must be a continuous process rather than a one-off training activity. It requires sustained investment in people, institutional systems, professional standards, and knowledge transfer so that expertise is retained and applied in practice.

What it enables

Stronger technical and institutional capabilities, better-prepared infrastructure projects, more effective implementation and sustained improvements in infrastructure resilience.

Phases of the Framework

1

Establish

Establishing the foundations

This phase focuses on putting the essential building blocks in place for integrating DRI into adaptation planning. It involves identifying lead institutions, defining mandates and responsibilities, assessing existing systems and capacities, and establishing the initial mechanisms, tools, and resources required to address infrastructure resilience. The emphasis is on determining what needs to be done, who will be responsible and the foundational arrangements needed to get started.

2

Integrate

Embed DRI in policies, systems, and procedures

Once the foundations are in place, this phase embeds DRI into the formal rules, institutional processes, and decision-making systems that guide adaptation planning and infrastructure development. This includes incorporating resilience considerations into policies, regulations, project appraisal criteria, data-sharing protocols, professional standards, and capacity-development. The objective is to move beyond isolated initiatives or voluntary practices and make DRI integration a recognized and systematic part of government operations.

3

Sustain

Ensure continuity, resources, and enforcement

This phase focuses on ensuring that established systems and institutionalized practices remain functional and effective over time. It requires sustained financing, dedicated personnel, ongoing technical support, regular monitoring, enforcement of standards, and continued capacity development. For infrastructure, this is critical because resilience depends not only on initial planning and construction, but also on compliance, inspection, operation, and maintenance throughout an asset's lifecycle. The emphasis is on ensuring that DRI integration continues to deliver results well beyond the initial establishment of policies and systems.

4

Evaluate

Use evidence to strengthen the next cycle

This phase focuses on assessing whether the measures introduced are functioning as intended and whether they are improving infrastructure resilience and adaptation outcomes. It involves reviewing progress against indicators, evaluating institutional performance, identifying implementation gaps, capturing lessons from climate-related events and asset performance, and updating policies, standards, risk assessments, and capacity-development priorities accordingly. The findings feed into subsequent NAP revisions and future risk assessments, ensuring that the Framework responds to evolving climate risks, emerging technologies, and lessons from the implementation.

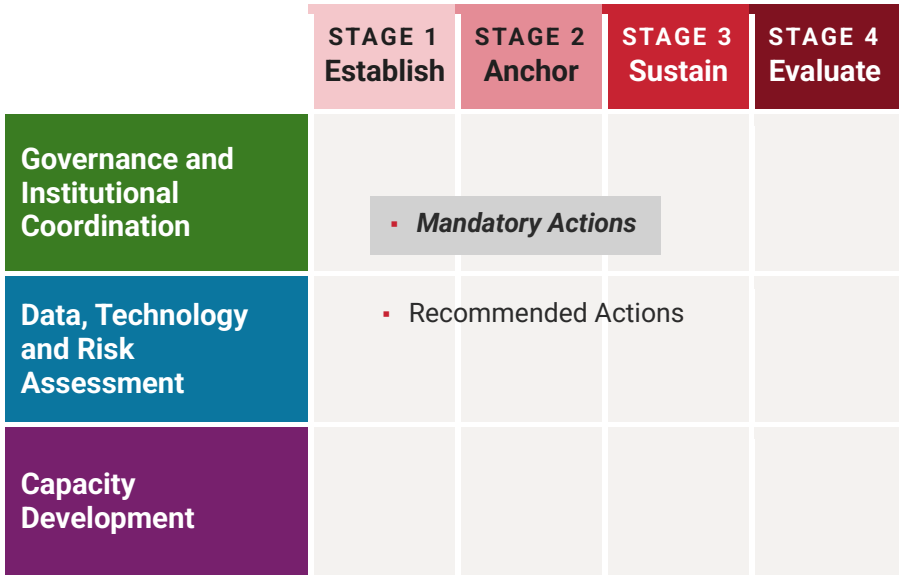
The Framework

PURPOSE

This Framework guides governments in integrating Disaster Resilient Infrastructure (DRI) into National Adaptation Plans (NAPs) and related adaptation strategies, so that infrastructure is planned, financed, built, operated and maintained to withstand current and projected climate risks and keep essential services running after extreme events.

It follows four stages of the adaptation cycle (Impact, Vulnerability, and Risk Assessment; Planning; Implementation; Monitoring, Evaluation, and Learning) across three pillars (Governance and Institutional Coordination; Data, Technology and Risk Assessment; Capacity Development), with finance as a cross-cutting enabler. Within each stage, actions progress through four steps: establish the function, make it a requirement, apply it routinely, and review and improve it. Countries may start at the step that matches their capacity. Actions marked 'Context example' show application to specific hazard settings and should be adapted nationally.

Each Stage Table: Three Pillars X Four Phases



Finance cuts across every pillar and phase

Stage 1: Impact, Vulnerability, and Risk Assessment (IVRA)

How does a country transition from assessing infrastructure hazards and climate vulnerabilities to implementing resilience measures?

PILLAR	Set-up risk assessment	Make it a requirement	Run it routinely	Update the assessment
Governance and Institutional Coordination	**Map institutions for risk assessment function** ▪ ***Establish a standing technical unit (STU), within existing national institutional arrangement for developing National Adaptation Plans (NAPs), to coordinate the integration of Disaster Resilient Infrastructure (DRI). The STU may comprise representatives from ministries, both subnational and local governments.*** ▪ Within the STU, identify dataset stewards who will be responsible for collecting, validating, interpreting, sharing, and updating datasets related to rapid as well as slow-onset climate impacts on infrastructure—including asset-condition and post-disaster loss and damage data. ▪ Build on existing national mandates of disaster risk management, climate change including meteorological, hydrological, and geological, as well as infrastructure agencies. ▪ STU defines inter-agency data-sharing mechanisms and clear entry points for infrastructure risk data in the overall risk assessment, including transboundary data such as shared river basins, upstream catchments, and cross-border hazard sources.	**Mandate the assessment** ▪ ***Mandate multi-hazard, multi-sectoral infrastructure risk assessments periodically, especially for high-hazard source areas, such as unstable slopes, flood-prone catchments, dams and embankments, as part of national climate risk assessments for current and future climate scenarios. Evaluate the impacts of cascading hazards on interconnected infrastructure systems and associated essential services and supply chain.*** ▪ Map institutional stakeholders by identifying every entity that owns, operates, or regulates infrastructure assets including cultural and heritage sites serving community, administrative or post-disaster evacuation functions.	**Risk assessment rounds** ▪ ***Run the infrastructure risk assessment rounds through the STU, which will also provide technical support to participating institutions.*** ▪ Integrate local, traditional, and community knowledge into assessments through subnational institutions including those dealing with informal, community-built, rural and heritage infrastructure. ▪ Update assessments after major disaster events leading to change in infrastructure asset data and retain institutional knowledge between assessment rounds. ▪ Encourage owners and operators to periodically assess infrastructure asset condition and vulnerability.	**Revise scope and roles** ▪ ***Revise the scope and roles of the STU after each assessment round, to include gaps in hazards, infrastructure, and populations data—including slow-onset hazards (such as rising temperatures, changing rainfall patterns, drought, sea-level rise, ocean warming/acidification, glacier retreat and permafrost thaw), and informal, community-built, rural, and heritage infrastructure.*** ▪ Hold participatory reviews of assessment updates with national, sectoral, and local stakeholders. Publish results and use them to update the NAP and adaptation strategies. ▪ Consider independent validation or regional peer review of national risk datasets, models, and methods, and publish the results.

Stage 1: Impact, Vulnerability, and Risk Assessment (IVRA)

PILLAR	Set-up risk assessment	Make it a requirement	Run it routinely	Update the assessment
Data, Technology, and Risk Assessment	**Build the infrastructure risk picture** ▪ ***Use open-source global and national hazard data (e.g. CDRI's GIRI tool), satellite imagery and, portfolio-level models to conduct baseline risk assessment.*** ▪ Build a standardized country level infrastructure risk profile tailored to national governance structures with prioritization of hazards. ▪ Compile an inventory of existing critical infrastructure assets and systems at risk, drawing on existing asset registries. ▪ Develop quantified loss and impact metrics to cover potential impact on assets, the services they provide, and dependent populations. ▪ Map and spatially overlay existing and planned critical infrastructure with hazard risk maps and inventories. Intersect this with population exposure and socio-economic vulnerability to identify high-risk infrastructure hotspots, using both current hazard data and future climate projections.	**Set the technical rules** ▪ ***Define critical infrastructure at national, subnational, and local levels including housing as well as small, locally owned assets.*** ▪ Adopt existing open data standards and ontologies for hazard, exposure, asset, and loss data, extending them only where needed, and publish national schemas openly. ▪ Develop national guidance on climate scenarios and uncertainties. ▪ The common definition of critical infrastructure should include lifeline roads and bridges serving isolated communities, even where traffic volumes are low.	**Assess at asset level** ▪ ***Move to asset-level assessment of condition, vulnerability, and criticality for priority systems, collecting local data where it reduces uncertainty.*** ▪ Assess interdependencies and cascading failures across sectors, in service-continuity and monetary terms, where possible. ▪ Publish results through a shared national or regional hub at the scale that decisions are made. ▪ Promote remote sensing (e.g. InSAR) for slope monitoring where ground access is limited.	**Recalibrate against reality** ▪ ***Recalibrate hazard layers and vulnerability assumptions after every major event using losses, damage and service disruptions data.*** ▪ Use real-time monitoring and remote sensing of priority assets to verify performance. ▪ Update national risk maps and consider scenario-based cascade analysis to enable better planning and decision-making. ▪ Use data from early warning systems and operator monitoring networks, such as river gauges, dam and hydropower monitoring.

Stage 1: Impact, Vulnerability, and Risk Assessment (IVRA)

PILLAR	Set-up risk assessment	Make it a requirement	Run it routinely	Update the assessment
Capacity Development	**Find the skill gaps** ▪ ***Assess the ability of national and local authorities, infrastructure agencies and operators, contractors, inspectors and local engineers to conduct risk assessment and translate the results into decisions.*** ▪ Provide hands-on capacity support with open data, screening tools and national models, prioritizing the most exposed and least-resourced jurisdictions. ▪ Draw on universities, regional bodies and professional organizations through targeted partnerships. ▪ Name the scarce skills in the regions e.g. geotechnical and slope-stability engineering, glaciology, hydrology, seismic engineering, etc.	**Make the capacity permanent** ▪ ***Embed climate-risk assessment in accredited modules and university curricula.*** ▪ Conduct regular trainings for data stewards working with the STU to handle data to interpret and integrate DRI data in NAPs. ▪ Define competencies for each assessment tier, from rapid screening to full professional assessment.	**Use the skills routinely** ▪ ***Train engineers, planners and local officials to interpret projections, return periods, risk scores and uncertainty in siting and design.*** ▪ Identify a help desk and peer learning opportunities at the regional, national and subnational levels. ▪ Include community members to support data collection in less-resourced settings.	**Retarget the training** ▪ ***Use Monitoring, Evaluation, and Learning (MEL) findings on assessment to redirect training to the skills whose absence blocks it usability.*** ▪ Review whether capacity survived turnover, leadership change and project closure; retain arrangements that have worked favourably. ▪ Consider building capacity for developing socially disaggregated data including women, children, the elderly, rural, and indigenous communities.

Stage 2: Planning

How does a country convert risk evidence into a defined infrastructure priority and an actionable adaptation measure?

PILLAR	Set the priority rules	Write them into plans	Apply them every cycle	Improve the rules
Governance and Institutional Coordination	**Strengthen institutional coordination and multi-level governance** ▪ ***Give infrastructure, finance and planning ministries a standing, decision-making seat in NAP development alongside environment and disaster agencies.*** ▪ Define how subnational priorities enter national planning, aligned with the existing governance structure of the country, through relevant institutions that consolidate local assessments, and how national standards, assistance and finance flow back. ▪ Bring state-owned enterprises, utilities, infrastructure operators, private owners and community representatives into the planning mechanism with defined roles.	**Translate priorities into actionable plans** ▪ ***Identify the type of infrastructure or service at risk, intervention required, responsible institution, financing route, timeframe and tracking indicator for every infrastructure risk identified in the NAP.*** ▪ Incorporate identified NAP priorities in sectoral adaptation plans and infrastructure master plans with clear owners, timelines and targets. ▪ Require spatial, land-use and public-investment planning to consider climate risk.	**Align plans at all the levels of governance** ▪ ***Align national, sector and local plans through the agreed mechanism on each planning cycle. Use city and local pilots to inform national planning frameworks.*** ▪ Run structured participation in prioritization — women's groups, informal settlements, persons with disabilities, Indigenous peoples — and give community organizations a recognized role. ▪ Align the planning and investment cycles with the national budget calendar and construction seasons so that approved measures can be delivered before the occurrence of an extreme event.	**Review and revise the coordination mechanism** ▪ ***Hold a recurring national and subnational review of implementation experience, including failures, maintenance constraints, changed risk to feed into NAP revisions, sector plans and investment guidelines.*** ▪ Revise planning responsibilities and institutional mandates to address gaps identified through the review, particularly those relating to slow-onset climate risks and infrastructure assets without clearly designated institutional ownership.

Stage 2: Planning

PILLAR	Set the priority rules	Write them into plans	Apply them every cycle	Improve the rules
Data, Technology, and Risk Assessment	**Agree core data points at decision scale** ▪ ***Agree a list of core data points for planning such as hazard exposure, criticality, condition, population served, travel time to services, seasonal accessibility, alternate routes. Make these data points available at different decision-making scales.*** ▪ Prioritize the systems, territories and populations where investments in resilience can protect lives and livelihoods, avoid post disaster recovery and reconstruction costs and ensure business continuity and economic stability, by combining hazard modelling with socio-economic vulnerability indices. ▪ Put the risk layers into the tools and investment databases already being used by the planners. ▪ Build resilience criteria into project selection tools and public investment databases, so that the proposals that enter the portfolio are risk informed.	**Adopt common prioritization criteria in selection tools** ▪ ***Adopt common prioritization criteria for sector and subnational plans including network redundancy, so that different levels rank infrastructure the same way.*** ▪ Fix the climate scenario and planning horizon for each priority, in line with the asset lifetimes. ▪ Develop a common framework for standardizing the criteria and approach to prioritization, while allowing the resulting priorities to vary according to regional risk, function and criticality.	**Rank every portfolio by the criteria** ▪ ***Rank every sector and subnational portfolio against the agreed prioritization criteria to identify the priority list of infrastructure projects for integration of resilience measures and send the highest-ranked items forward with their risk evidence.*** ▪ Plan adaptation pathways specific for different infrastructure assets. ▪ Plan infrastructure investments in a phased manner to allow adjustments according to changing climate conditions. ▪ Steer development away from high-risk areas through zoning, buffers and guided growth plans drawn from the risk layers.	**Test whether rankings followed risk** ▪ ***Track whether plans and pipelines changed in response to new risk information and improved evidence on cascading impacts and slow onset risk, revise prioritization criteria accordingly.*** ▪ Extend national planning datasets to include informal, community-built, rural, heritage and social infrastructure (housing, schools, hospitals, local roads, etc.). ▪ Send new data including transboundary data needs back to the IVRA stage.

Stage 2: Planning

PILLAR	Set the priority rules	Write them into plans	Apply them every cycle	Improve the rules
Capacity Development	**Pair adaptation and infrastructure expertise** ▪ ***Pair NAP drafting teams with infrastructure and engineering expertise to draft holistic plans.*** ▪ Provide templates, methods, and technical assistance to subnational planners, with additional support for high-exposure, low-capacity jurisdictions. ▪ Use peer learning to understand how other countries turned adaptation priorities into sector plans and pipelines using dedicated platforms such as CDRI's DRI connect. ▪ Capacitate decision makers to understand climate-related accounting practices to interpret physical risks and vulnerabilities and their financial implications for accounting, lending, mortgages and insurance.	**Set planner competencies in curricula** ▪ ***Set risk-informed planning competencies in professional accreditation and development programmes for planners, with clear targets and timelines.*** ▪ Embed climate risk in planning, spatial and urban-development curricula in universities. ▪ Consider a central standard-setting institution or academy that keeps planning methods and curricula consistent across sectors.	**Planners produce risk-informed project concepts** ▪ ***Strengthen the ability of officials across different governance structures and levels of authority to turn plans into infrastructure investment programmes.*** ▪ Train planners in risk-informed spatial and investment planning and project formulation. ▪ Move beyond classroom training to run national–subnational mentoring around actual plans and projects.	**Update guidance and training programmes** ▪ ***Improve planning templates and tailor trainings to build capacities for assigning institutional responsibilities, identifying financing pathways, and defining measurable resilience indicators.*** ▪ Update curricula, accreditation, and planning guidance with lessons from implemented projects and reviews of plans. ▪ Consider facilitating cohort-building or other peer-learning opportunities for subnational governments to address planning gaps.

Stage 3: Implementation

Moving from a climate-adapted, and risk-informed infrastructure plan to a financed, built, operated, and maintained disaster-resilient asset

PILLAR	Set delivery requirements	Build resilience into funding and contracts	Build, maintain, and monitor	Learn from results
Governance and Institutional Coordination	**Assign ownership and maintenance; adopt right-sized codes** ▪ ***Adopt a stepwise, right sized and localized code for the most critical hazards, backed by a compliance plan.*** ▪ Assign ownership and maintenance for every new or existing financed asset before its construction or retrofitting begins. ▪ Consider publishing infrastructure designs before construction so that local engineers with site knowledge can review them. ▪ Use systems such as Building Information Modelling (BIM) and Asset Information Models (AIM) to maintain information in a structured environment, to allow sharing of lessons learned among similar projects and sites. ▪ Develop guidance to include traditional knowledge and heritage values for retrofitting infrastructure.	**Include resilience requirements into approval, procurement and contracts** ▪ ***Make feasibility approval, permits, public funding and procurement conditional on risk screening, with requirements scaled to project type, size and the capacity of the proponent. For example, road contracts should require drainage, slope protection and controlled spoil disposal.*** ▪ Regulate and mandate public-private partnerships (PPPs) and concession contracts to incorporate multi-hazard assessment, service-continuity standards, maintenance obligations, data sharing, and clear risk allocation.	**Inspection and enforcement in operation** ▪ ***Implement permitting, inspection and compliance processes for financed projects, leveraging professional associations and accredited third parties to support licensing, inspections and product testing where public-sector capacity is limited.*** ▪ Strengthen compliance institutions by equipping them with trained officials who have clear enforcement authority, and agency to phase implementation in alignment with available institutional capacity and resources. ▪ Extend technical supervision to informal and incremental construction where most losses occur.	**Revise codes and enforcement from compliance outcomes** ▪ ***Review enforcement effectiveness through audits of design submissions and site inspections.*** ▪ Adjust code priorities, inspection capacity and third-party oversight arrangements where compliance gaps are identified. ▪ Incorporate provisions into contracts and loan agreements that allow hazard-related design parameters to be updated as climate and risk information improves. ▪ Review procurement and tendering criteria, including recent-experience requirements, to ensure they include local engineers with relevant site-specific hazard knowledge and expertise. ▪ Recognize owner-driven construction as a delivery channel. Housing subsidies conditional on technical assistance, municipal technical support for owner builders, regularization instruments that grant permits for existing homes can be seen as implementation levers for financing.

Stage 3: Implementation

PILLAR	Set delivery requirements	Build resilience into funding and contracts	Build, maintain, and monitor	Learn from results
Data, Technology, and Risk Assessment	**Public design standard checklist and asset register** ▪ ***Maintain a public checklist of current hazard-specific design standards depending on the asset type and region. For example, design standards for roads in mountain regions will be different from roads in the plains.*** ▪ ***Maintain an asset register to record location and access condition, criticality, and design parameters of infrastructure assets, to enable maintenance and assessment.*** ▪ Retrofit standards and guidelines that are separate from new-build codes.	**Name datasets and standards in manuals and tenders** ▪ ***Require feasibility studies and designs to use reliable hazard data and forward-looking scenarios. The datasets and standards used should be clearly mentioned in tender, licensing and financing documents.*** ▪ Update sector-specific design manuals and codes to include multi-hazard and climate-resilient standards covering local materials and nature-based options. ▪ Take stock of existing design manuals to update or revise.	**Record condition and performance through operation and maintenance** ▪ ***Maintain asset condition and performance data for maintenance scheduling and retrofit prioritization.*** ▪ ***Maintain updated asset register for retrofits, new assets and decommissioned projects, so that network dependencies and priorities stay accurate.*** ▪ Consider maintaining a secured access information platform for all concerned ministries, funders, project proponents. This platform will provide information on assessments, design, financing, construction and reporting to ensure structured data generation at each delivery phase.	**Stress-test assets; raise standards from performance** ▪ ***Stress-test critical assets periodically against updated scenarios and schedule retrofit or upgrade where required.*** ▪ Revise standards and design checklists using post-disaster performance and monitoring evidence. ▪ Feed performance evidence by asset type back to IVRA, so that vulnerability assumptions reflect observed behaviour.

Stage 3: Implementation

PILLAR	Set delivery requirements	Build resilience into funding and contracts	Build, maintain, and monitor	Learn from results
Capacity Development	**Map preparation and frontline workforce gaps** ▪ ***Build project-preparation capacity in sectoral departments and agencies and subnational governments including risk assessments, engineering design, economic appraisal, financing applications, etc.*** ▪ Identify frontline workforce gaps among masons, small contractors, inspectors, local engineers, especially for informal and small-scale housing and school construction. ▪ Train government engineers through classroom instruction with field visits.	**Formalize apprenticeship, licensing and inspector cadres** ▪ ***Establish licensing, certification and continuing professional development for contractors, builders and designers, shared with professional bodies.*** ▪ Create inspector and procurement-official cadres trained to specify, evaluate and enforce resilience requirements. ▪ Restore supervised apprenticeship for artisans, with master-artisan cohorts audited by professional engineering bodies over several years.	**Deliver technical assistance to different stakeholders** ▪ ***Train contractors, inspectors and operators in inspection, maintenance, asset-condition monitoring and business-continuity routines. Run tiered, hands-on trainings for different skill levels.*** ▪ Provide access to technical assistance for homeowners, community organizations and small builders, bundled with financing, for incremental and informal construction and retrofit.	**Realign training and accreditation** ▪ ***Realign training and accreditation, to address deficiencies as highlighted through audits of design submissions and sites.*** ▪ Embed government technical staff in code and standard revision, as a test of whether capacity survives staff turnover.

Stage 4: Monitoring, Evaluation, and Learning (MEL)

How does a country know whether risk information is changing decisions and whether infrastructure performs better?

PILLAR	Set-up monitoring	Make reporting mandatory	Report into decisions	Create a feedback loop
Governance and Institutional Coordination	**Assign the MEL custodian, focal points, and reporting lines** ▪ ***Assign a custodian to monitor DRI integration within the STU.*** ▪ Define reporting lines from subnational governments and communities to the custodian, using existing national performance management systems or Five-Year Plan rather than creating a separate monitoring structure.	**Mandate reporting** ▪ ***Mandate the time and frequency of DRI reporting.*** ▪ Link resilience reporting to transfers, concessions and programme funding. ▪ Align DRI reporting with Sendai, Nationally Determined Contributions (NDC) and transparency reporting, so that one dataset serves several frameworks.	**Review annually, before the budget, and publish** ▪ ***Run an annual review of infrastructure risks, pipelines, financing gaps, disaster losses and results, aligned with planning and budget cycles.*** ▪ Publish the findings on the shared information platform (identified under data pillar of implementation stage). ▪ Provide communities and civil society an opportunity to contribute to monitoring infrastructure performance as well as reporting potential disruptions and emerging risks.	**Revise the NAP based on evidence** ▪ ***Use regional and peer review to compare progress with countries at similar stages and adopt good practices.*** ▪ Evaluate whether coordination arrangements changed planning, budgeting and procurement decisions, and use the evaluation to revise mandates, thresholds and the NAP. ▪ Commission independent evaluation of the resilient infrastructure projects, to ensure resilient design standards and robust construction practices are followed.

Stage 4: Monitoring, Evaluation, and Learning (MEL)

PILLAR	Set-up monitoring	Make reporting mandatory	Report into decisions	Create a feedback loop
Data, Technology, and Risk Assessment	**Define indicators and baselines for DRI integration** ▪ ***Establish a baseline and set the frequency for updating indicators of DRI integration such as critical assets assessed for their condition and climate-informed budget allocations.*** ▪ Include region and sector relevant indicators such as days of closure on critical road corridors, hydropower generation lost to flood or sediment events, hazard specific monitoring and early warning, communities and groups impacted by the disasters and for how long, etc. ▪ The indicators may be validated and adapted to different contexts, such as gender, age, indigeneity and socio-economic status.	**Mandate interoperable loss and disruption reporting** ▪ ***Require interoperable reporting of damage, service disruptions, reconstruction costs and resilience integration after every event, at different levels and operators.*** ▪ Adopt common indicator definitions and publish the methodology, so that results are comparable across sectors and levels. ▪ Include transboundary event reporting where hazards originate or impacts extend across borders.	**Collect disaggregated data into one system** ▪ ***Track losses and disruptions to infrastructure services after every event.*** ▪ Feed real-time performance data from monitored critical assets into the system, so that resilience outcomes are observed rather than assumed. ▪ Integrate budget, procurement, investment, loss and risk data on shared information platform.	**Measure outcomes** ▪ ***Measure resilience outcomes where feasible — service continuity during events, time taken to restore services, losses avoided, reduced vulnerability of dependent populations.*** ▪ Consider periodic independent validation of indicator data and methods, so reported progress is credible to finance ministries and partners. ▪ Use the findings at this stage to inform IVRA, Planning and Implementation stages and subsequently updating the NAP.

Stage 4: Monitoring, Evaluation, and Learning (MEL)

PILLAR	Set-up monitoring	Make reporting mandatory	Report into decisions	Create a feedback loop
Capacity Development	**Baseline practice; track commitments** ▪ ***Identify the capacity gaps at the design and construction phase through audits of planning authorities and sites.*** ▪ ***Track institutional commitments to capacity development based on defined targets, timelines, ownership, and funding allocations.*** ▪ Equip focal points with skills to shape the logic model for measuring capacity and identifying context-appropriate approaches to knowledge mobilization. ▪ Develop a public roster of trained personnel, accredited professionals, licensed firms and trained artisans as well as projects that have successfully integrated resilience.	**Adopt audited change in practice as the indicator** ▪ ***Adopt change in practice such as improved designs, risk-informed procurements, better construction quality, rather than number of people trained as success indicators of capacity development.*** ▪ Encourage NAPs to commit DRI integration capacity targets with defined timelines, ownership and funding allocations. ▪ Measure capacity at outcome level through performance, stability and adaptability of institutions.	**Re-audit periodically, including local capacity** ▪ ***Consider regular tracking of the public roster developed earlier.*** ▪ Monitor subnational capacity to understand whether mandates are matched by means. ▪ Re-audit a sample of design submissions and sites periodically and record changes in designs, procurement documents and construction quality.	**Identify what lasted; shift capacity investment** ▪ ***Evaluate which capacity approaches demonstrated sustained impact such as embedded programmes, champions, apprenticeships, and standing advisory relationships.*** ▪ Feed findings into curricula, accreditation and technical-assistance design. ▪ Share audit and evaluation results through national and regional learning platforms, so other jurisdictions adopt what worked.

Finance as an Enabler

Disasters and climate-related extreme events significantly increase the budgetary demands for response and relief. Taking climate change into account, the global Average Annual Loss (AAL) for infrastructure, including buildings, is estimated at $732–845 billion (CDRI 2023). Cascading impacts, supply chain disruptions, and temporary suspensions of essential services compounds economic losses, placing public finances under significant strain. Many vulnerable countries do not have sufficient fiscal space to absorb such economic shocks. Investing in resilience provides critical stability to maintain infrastructure assets and services before, during, and after a disaster. Hence, it is important that infrastructure resilience is integrated into a country's climate adaptation strategy and development planning, ensuring that resources are available for adaptation. Four categories of cost are routinely under-resourced or omitted from budgets: risk information, operation and maintenance, project preparation, and the post-disaster recovery and reconstruction.

Finance is a cross-cutting dimension and an essential enabler that must be integrated across all four stages of the NAP cycle across the three pillars of this Framework. Adequate and predictable financing is vital to advance the NAP process from initial risk assessments and planning to implementation, monitoring, and evaluation. Efforts must focus on integrating DRI priorities into existing national budgetary, sectoral, and public investment frameworks, while mobilizing additional resources to close financing gaps. Strengthening the integration of climate risks into project appraisal, budgeting, and oversight is equally important to ensure that resilience guides investment decisions. Yet the financing gap remains substantial. UNEP (2025) estimates that developing countries will need $310–365 billion annually for adaptation by 2035, compared with $26 billion in international public adaptation finance in 2023. Despite its critical role in adaptation, infrastructure remains underrepresented in projects financed through major multilateral climate funds.

Strengthening infrastructure's capacity to absorb, respond to, and recover from disasters can effectively redirect reactive disaster spending towards proactive, risk-informed investments. Hence, countries should systematically identify the financial requirements for resilient infrastructure, estimate investment needs and lifecycle costs, and identify funding gaps. Ministries of finance should be involved from the very beginning of prioritization to allocate funding for initial infrastructure risk assessment within existing budgets. These assessments clarify the potential financial consequences of infrastructure damage, service disruption, recovery costs, GDP at risk, and the value of public assets threatened. Mapping existing funding such as sector funds, infrastructure facilities, climate funds, development partners, and concessions help attach an estimated cost, financing need, and expected source for every stage of the infrastructure lifecycle.

Tools such as CDRI's Resilience Cost-Benefit Analysis (RCBA) can be used to compare investment options by weighing resilience costs against potential avoided losses, reduced service disruptions, and broader economic benefits. While resilience measures increase upfront costs, the returns are substantial. The World Bank estimates that making infrastructure in low- and middle-income countries more resilient would add about 3% to overall investment needs, while providing a 'resilience dividend' of $7-12 in benefits for every $1 invested (CDRI 2025a). These estimates strengthen the rationale for integrating resilience into project appraisal and public investment decisions. To strengthen future budget cases, a comprehensive review can be conducted to analyse whether risk assessment could change

siting, design, and investment decisions; how each financing instrument performed; and after events, what losses were avoided and what resilience dividend were realized.

Governments should adopt proactive, risk-informed, and financially sustainable approaches by developing comprehensive disaster risk financing strategies that address both pre-disaster risk reduction and post-disaster recovery. This should be underpinned by regular fiscal risk assessments to identify potential liabilities, quantify financing gaps and inform the use of appropriate financing instruments, including dedicated budgetary allocations, contingency funds, insurance, risk-pooling mechanisms, and contingent credit. Furthermore, resilience should be systematically integrated into infrastructure planning, appraisal, procurement, and implementation, supported by robust risk assessments, resilience cost-benefit analysis, and appropriate institutional and contractual arrangements. Stronger collaboration is needed among governments, multilateral development banks, international climate finance institutions, national development finance institutions, and private investors to mobilize innovative financing and scale up investment in resilient infrastructure, particularly in developing countries and highly vulnerable regions.



The Way Forward

Disaster resilient infrastructure appears as a priority in almost every national adaptation plan. However, bridging the gap between the stated priority and a reality where the critical infrastructure of the nation survives the next disaster requires tangible action, not mere statements. Achieving this requires transforming the systems through which infrastructure is assessed, planned, prioritized, financed, designed, built, operated, maintained, and monitored, making resilience the default outcome across all infrastructure planning.

The Framework sets out what this transformation requires. It recommends mainstreaming DRI through existing systems rather than new ones, focusing on function rather than institutional structure, the lifecycle rather than the design stage, the essential services people lose rather than physical asset failure, the small and informal construction where losses concentrate alongside large public assets, and indicators of decision change rather than mere activity.

The measure of successful integration is whether finance ministries, infrastructure ministries, and local governments can systematically apply the Framework to answer three fundamental questions: What needs to change in the way infrastructure is planned, financed, delivered, and managed? At what stages of existing public investment processes must these changes be introduced? And how will their effectiveness be assessed in terms of the resilience of the resulting infrastructure?

This means embedding resilience in the instruments that govern public investment and infrastructure development, including public investment management manuals, procurement regulations, sector financing and fund allocation rules, professional accreditation and competency frameworks, budget circulars, and annual government performance and accountability reports. Institutionalization is achieved when DRI consistently shapes the decisions, procedures, standards, incentives, and accountability mechanisms through which infrastructure investments are prioritized, appraised, financed, procured, implemented, and maintained. When resilience considerations become an integral and measurable part of these processes, DRI moves beyond being a stated adaptation priority to becoming an established function of public sector governance and infrastructure management.

The Framework provides the pathway, the diagnostic establishes the starting point, and sustained institutional reform makes the transformation possible.



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Annexure

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