Compendium of Good Practices on Resilient Infrastructure

This compendium of good practices was developed by the CADRI Partnership with inputs from UNDP, UNOPS & the Sustainable Infrastructure Partnership / UN Environment in February and April 2020.

I. Definition

Resilient infrastructure is that which is located, planned, designed, procured, built, maintained, operated, and decommissioned in a way that considers existing and potential hazards and is able to anticipate, absorb, recover, prepare for, learn from, and adapt to changing conditions over its lifecycle.

Infrastructure incorporates assets, institutions, and knowledge to achieve and sustain resilient outcomes.

- Assets are the physical components. Assets need to be strong, well-maintained and well-resourced in order to be resilient.
- Institutions are the governance mechanisms that control how sustainable and resilient infrastructure assets are planned, delivered and managed.
- Knowledge is the human component that ensures that there are the appropriate skills and understanding to work within the governance mechanisms.

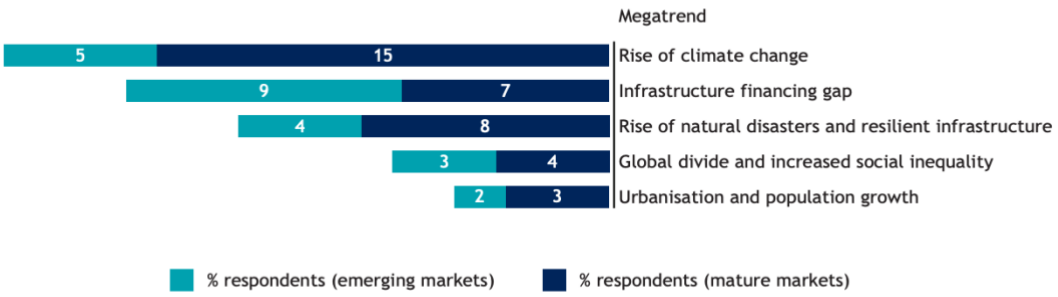
Resilient infrastructure is also about networks of people. To ensure the resilience of physical infrastructure and societal systems, public and private sector and communities should work together to integrate disaster risk reduction measures both pre-and post-disaster across infrastructure, energy, transportation, communications, agriculture and water and sanitation as well as all critical facilities, including health, education, and government institutions.

II. Relevance

Resilient infrastructure is important to:

- Protect occupants and maintain well-being
- Reduce direct losses and minimize damage to structural and non-structural elements
- Reduce the indirect costs of disruption
- Minimize service disruption and cascading failures of facilities and services
- Promote disaster risk reduction
- Safeguard Investments
- Contribute to sustainable development
- Manage risk within the built environment

Figure 2a: Overall survey results
Top five risks



Source: Global Infrastructure Hub. *Infrastructure Futures:* The impact of megatrends on the infrastructure industry (2020)

III. Key principles emerging from the review of good practices

Context. Measures to safeguard the resilience of infrastructural assets vary greatly according to context, as challenges vary by region and country. The additional up-front cost of more resilient assets depends on the asset and the hazard. The primary challenge in emerging economies is to build new infrastructure for the development and expansion of urban areas, while managing the risk of natural disasters, biological hazards, security risks, climate change, resource scarcity, population growth, etc. Industrialized countries predominantly face the challenge of replacing and upgrading existing and aging infrastructure and networks.

Systems Perspective. Cascading risks require a systems approach—considering infrastructure resilience as part of a wider system. A more integrated approach to assessing climate and disaster risk must be taken, exploring the consequences of damage beyond impact on the functioning of the individual assets alone. To increase resilience of both strategic and local[1] infrastructure, it is necessary to monitor and measure systemic risks – their vulnerability, sensitivity, inter-dependency and exposure to risk. Infrastructure stakeholders should develop and use indicators that enable systems thinking that understand the complexity and interdependencies of such a system in a particular context and region. This requires data collection and system modeling to identify critical assets which are exposed to specific hazards to then further identify which assets should be protected, upgraded, or retrofitted. Recovery of infrastructural assets needs to be viewed holistically, as part of a continuum and inseparable from preparedness, response, mitigation, and sustainable development.

Preparedness. Early investment in prevention and preparedness in relation to infrastructural assets is cost effective and prevents human and economic loss. For example, to inform various climate change scenarios when locating and constructing new infrastructure, projects should utilize an efficient and effective National Meteorological and Hydrological Services (NMHS) to provide essential and high-quality meteorological, hydrological and climate (hazard) information. Early Warning Systems (EWS) should be put in place to warn communities when critical thresholds are expected to exceed the quality of construction. Projects should conduct ongoing monitoring of existing infrastructure to reduce the risk of challenges as climate conditions change and risks evolve. Infrastructure systems should cultivate a culture of resilience and prevention by strengthening capacities for better integration of meteorological, hydrological and climate products and services in DRR across infrastructure design and build.

Risk and Needs Assessment. The main focuses of a risk assessment are *hazard* (the probability that an event occurs), *exposure* (the population and assets located in the affected area), and *asset vulnerability*

[1] Strategic Infrastructure – like deep-sea ports, international airports, oil/gas pipelines, usually managed by national authorities and Local Infrastructure – like roads, power transmission, sanitation, that are managed by local governments and communities.

(the fraction of asset value lost when affected by a hazard). Risk assessments should also examine the effectiveness in reducing risks, feasibility of design and maintenance, urgency of risks, and other externalities such as providing benefits to the ecosystem and minimizing unintended negative consequences. Needs assessments should support post-disaster damage assessment of needs, including damage to infrastructure and requirements for repair or replacement.

Enhance Knowledge and Capacity Building. Infrastructure development involves multiple stakeholders, who play a critical role.[2] To attain true resilience, it is necessary to improve the knowledge and capacities of all the involved stakeholders. Government should dedicate adequate human and financial resources to processes that support resilient infrastructure. Designing and delivering infrastructure for a changing and uncertain climate will require new skills and abilities in a diversity of fields. Infrastructure stakeholders should improve knowledge of how structural and non-structural resilience options perform, particularly the new focus on holistic approaches (integrating eco-based, financial, and social and institutional resilience), implemented individually or in portfolios. Cooperation and consultation should be facilitated between sector stakeholders to better understand and address infrastructure interdependencies and the knowledge and capacities associated to manage those relationships.

Cost Effectiveness. Cost effectiveness can be assessed based on a "no adaptation" approach which analyses a changing future climate on existing design standards or a proactive "adaptation" approach which reduces future risk and damages by changing design standards at upgrades or re-construction. Using a revised approach to cost benefit analysis to the financial analysis of infrastructure investments can improve risk assessments and identify resilience measures that lower financial risks. Treating climate risks as an integral part of the overall financial analysis of infrastructure investments has the potential to enhance not only the physical resilience of infrastructure but also the financial resilience of the investment.

Data and Information. National agencies and local government offices should build strong linkages between each other to ensure cohesive communication, and coordination and mitigate exploitation. Decision makers need to have access to high quality information, consistent and transparent data and capacity to use this information to inform planning, delivery and management of resilient infrastructure. Countries that effectively gather and use data for economic and spatial planning and disaster management will find it easier to apply climate data. Spatial mapping of vulnerable populations and infrastructure should integrate updated hazard risks. Public and private sector need to be regularly collecting pre-disaster baseline information on hazard and asset associated risks and ensuring its transparency and access by other stakeholders. Institutionalized assessment of risks occurs at all government levels and in all sectors in order to establish an accurate understanding of vulnerability and risk at the international, national, regional, and local levels. Local actors should be engaged to identify and assess risks, location of infrastructure, and existing capacities. Assessment data should be used to develop metrics and methodologies to measure the resilience of infrastructure and support decision-making.

Enabling Environment. Building and maintaining resilient infrastructure requires high levels of government commitment to and public support for building infrastructural systems and frameworks. The development and revision of standards is typically a slow process. While much climate science has advanced to appropriate levels to inform decisions, a central challenge is to bring this progress to engineering practice. There is likely to be an important role for standards and norms in creating incentives for private sector involvement in initiatives to develop infrastructure resilience. Developing, updating, and implementing building codes and land-use regulation is an iterative process. It requires nations to develop national level frameworks, legislation and institutional capacities to learn from past events and drive future resilience. Laws, regulations, and procedures may need to be revised to facilitate reconstruction – loosening some requirements and strengthening others and giving greater amounts of flexibility to reduce bottlenecks. Enforcement systems and capacities need to be adequate

[2] These include the public sector, investors, lenders, contractors, service providers/ operators and the end users.

to support standards and regulations. Given the wide array of approvals required by asset owners and at multiple stages of infrastructural development, clarity of ownership and adequate knowledge and capacity is needed to ensure compliance. An established National Platform for Disaster Risk Reduction should exist to support and guide the recovery, rehabilitation, and reconstruction phases and administer DRR-driven regulations.

Partnerships and Funding. Collaboration between public and private sectors can reduce redundancies and capitalize on private sector finance and experience, while building more comprehensive risk resilience across societies. Private financing, including public-private partnerships (PPPs), can lead the way in bridging the gap in public financing. Public sector finance should be screened for infrastructure and include resilience specific criteria in public procurement. Public - Private Partnerships should review the allocation of liabilities and investment responsibilities between the public and the private sector related to climate resilience and evaluate financing alternatives. The insurance industry has developed risk coverage solutions for the entire infrastructure life cycle, and there are major opportunities for new technologies and innovations, and for the implementation of market-based solutions.

Safeguard Critical Facilities. Substantially reduce disaster damage to critical infrastructure and disruption of basic services, specifically health, education, and government facilities. It is essential to ensure that these critical facilities and services are functional at all times to provide support in the aftermath of a disaster – this requires adequate design and planning to address vulnerability and exposure to hazards. Protecting non-structural elements, such as equipment sustain the function of operations. Critical facilities are highly interdependent and need to be designed with higher performance standards and with backup facilities to ensure redundancy and continued operation during an event. Reducing the downtime of a facility by adequate planning and provisions to expand services can improve critical response functions and restore normalcy.

Gender. Gender-blind infrastructure fails to consider the different roles, responsibilities and particular needs of women, men, girls and boys in a specific context and how this affects their ability to use or access infrastructure. In times of crisis, this can have life-threatening consequences for women and girls. Gender-responsive infrastructure design has the power to address gender inequalities and empower women by responding to diverse needs in society. Stakeholders at all levels should use an evidence-based decision-making process for the planning, delivery and management of their infrastructure systems to ensure sustainable, resilient and inclusive development. To achieve this, it will be important to ensure women's meaningful participation in decision-making, and that their needs and perspectives are systematically taken into account.

Nature-based Infrastructure. Nature-based infrastructure can provide a cost-effective complement or alternative for traditional built (or "grey") infrastructure. The use of these solutions can help reduce risks, enhance resilience, generate employment and support other objectives, including ecosystem restoration, protection or creation of green space and recreation areas, and climate change mitigation through carbon sequestration. On its own, green infrastructure may be able to reduce risks from some hazards. A combination of nature-based and conventional infrastructure is under experimentation to increase overall resilience. This combined approach can provide redundancy and improve resilience to unexpected events that coincide or cascade.

Community-based Resilience Infrastructure. This principle is intended to develop social and institutional resilience – operating locally and on a small scale. Using an analysis of multidimensional vulnerability, particularly exposure to natural hazards and the effects of climate change, this approach encourages communities to design and implement infrastructure and associated livelihood solutions to meet needs. As part of this practice, stakeholders should consider an approach for at-risk groups to ensure that no one is left behind. Inclusive consultations should be conducted to identify whether these groups have pre-existing infrastructure solutions and institutions, which can be incorporated into wider designs/processes.

IV. Examples of good practices & resources

Good Practices/ Tools

1) **Capacity Assessment Tool for Infrastructure (CAT-I)**
Developed by UNOPS

CAT-I was developed by UNOPS, as part of the Evidence Based Infrastructure initiative, to help countries facilitate better infrastructure development. The tool is designed to help governments identify gaps in the capacity of their enabling environment to plan, deliver, and manage sustainable, resilient, and inclusive infrastructure systems. Based on these gaps, the tool can be used to develop a pipeline of projects to build national, state, city, or ministerial capacity using technical and advisory services.

2) **National Infrastructure Systems Model International (NISMOD-Int)**
Developed by the University of Oxford led ITRC and UNOPS

As part of UNOPS Evidence Based Infrastructure initiative, NISMOD-Int is used to support the strategic planning of national infrastructure, in a variety of countries and contexts around the world. NISMOD-Int models key infrastructure systems using a system of systems-based approach. Using infrastructure data and information on specific hazards, NISMOD-Int is able to identify which assets are exposed to specific hazards and if they are to fail what the potential is for cascade failure. This information is used to identify critical assets of upgrading, retrofitting or replacement to support the management of risk within the built environment.

3) **Infrastructure Sector Assessment Program (InfraSAP)**
Developed by World Bank

InfraSAP is a structured diagnostic and pragmatic joint planning exercise that informs how the World Bank Group and a client government will partner to improve infrastructure access and performance. An InfraSAP may be undertaken on a standalone basis in response to a country's demands, or in the context of preparing a new Country Partnership Framework. The purpose of the InfraSAP is to articulate a roadmap for priority infrastructure sectors.

Highlights:

- ✔ Sector objectives and the types and level of investment needed to meet those objectives
- ✔ How those investments can best be delivered, including systematically considering options for drawing on commercial capital to complement scarce public resources
- ✔ An assessment of the binding constraints on pursuing those options
- ✔ The coherent, sequenced set of actions at the project, sector and country level needed to overcome these constraints and deliver on priority infrastructure investment plans

4) **CIrcle – Critical Infrastructures: Relations and Consequences for Life and Environment**
Developed by Deltare

A CIrcle workshop helps stakeholders to understand the complex and interdependent relations between critical infrastructure systems.

Highlights:

- ✔ Can be used within the context of a relatively data poor environment.
- ✔ CIrcle uses open data and Deltares's own models in combination with the valuable information provided by the workshop participants to analyze and visualize the impact of cascading effects on critical infrastructures.
- ✔ The knowledge and experiences that have been collected with the CIrcle tool are stored in the CIrcle knowledge database. This knowledge helps us to understand differences between case studies where CIrcle methodology has been employed both objectively, namely physical impacts and possible cascading effects, and also subjectively, in pertaining to differences in resilience and risk perception between differing settings.

5) **ThinkHazard**
Developed by GFDRR and World Bank

ThinkHazard is an intuitive, easy tool to identify natural hazards in a project area and understand how to reduce their impact. It provides a general view and risk level of the hazards, for a given location, that should be considered in project design and implementation.

6) **Global Infrastructure Hub Project Preparation Tool**
Developed by World Bank – 2019

The tool synthesizes lessons and practices from global, national and subnational level experiences to support governments in making project preparation processes more effective and was designed with input and expertise from multilateral agencies, private-sector organizations and government officials from 15 countries. It blends conceptual inputs with country-case examples and effective methodologies, and references other tools and frameworks used in project preparation.

Highlights:

- ✔ Case studies from 15 countries
- ✔ Enabling environment for project preparation
- ✔ Financing project preparation
- ✔ Infrastructure planning and project prioritization
- ✔ Project feasibility, reviews and approvals
- ✔ Project communication

7) **Urban Community Resilience Assessment Tool**
Developed by World Resources Institute - 2018

UCRA tool links local knowledge from neighborhoods and individuals with broader city assessments. UCRA provides city planners with a clear method of collecting data that will enable them to assess how resilient cities are to the impacts of climate change. With surveys, workshop materials and insight from pilots in three cities - Rio de Janeiro, Brazil - Surat, India - and Semarang, India, UCRA helps city planners and government officials understand a specific neighborhood's vulnerability; identify infrastructure gaps; and involve poor urban residents in planning and implementation processes.

Highlights:

- ✔ Proposes a bottom-up resilience planning process that aims to link local knowledge with top-down planning priorities.
- ✔ The UCRA includes three dimensions, subdivided into 10 categories and up to 60 indicators. The three dimensions include the vulnerability context at the city level, the community resilience potential of the neighborhood, and household capacities to respond to climate

disasters. Within each dimension are flexible indicators that can be customized to the local context.

8) **Innovation in Disaster Rapid Assessment**
Developed by UNESCAP[3] and AHA Centre[4] - 2017

This handbook provides a methodology for performing rapid disaster assessment looking at both immediate humanitarian needs and asset-based damage and loss estimates within a short time frame making use of innovative technologies, to provide early estimates of recovery and reconstruction needs.

Highlights:

- ✔ Relevance to existing mechanisms
- ✔ Augmented data sets
- ✔ Rapid assessment innovation framework
- ✔ Institutional arrangements for sustainability

9) **Partnership for Resilience and Preparedness (PREP)**

PREP is a public-private collaboration launched in September 2016 that seeks to improve access to useful data and empower communities and businesses to better plan for and build climate resilience. There are two key elements to PREP: the partnership itself and the online platform it supports (PREPdata).

Highlights:

- ✔ Data maps
- ✔ Collections of communities' data, indicators, stories, and tools for climate resilience
- ✔ Create your own dashboards
- ✔ Data-driven stories that spotlight specific climate-related risks and solutions

10) **Climate-Resilient Infrastructure: Adaptive Design and Risk Management**
Developed by American Society of Civil Engineers – 2018

This manual provides guidance for and contributes to the developing or enhancing of methods for infrastructure analysis and design in a world in which risk profiles are changing and can be projected with varying degrees of uncertainty requiring a new design philosophy to meet this challenge. The underlying approaches in this manual of practice are based on probabilistic methods for quantitative risk analysis, and the design framework provided focuses on identifying and analyzing low-regret, adaptive strategies to make a project more resilient.

Highlights:

- ✔ observational methods, illustrative examples, and case studies
- ✔ estimation of extreme events particularly related to precipitation with guidance on monitoring and measuring methods
- ✔ flood design criteria and the development of project design flood elevations
- ✔ computational methods of determining flood loads
- ✔ adaptive design and adaptive risk management in the context of life-cycle engineering and economics

[3] United Nations Economic and Social Commission for Asia and the Pacific

[4] ASEAN Coordinating Centre for Humanitarian Assistance on Disaster Management

- ✔ climate resilience technologies

11) **The Reference Tool on Inclusive Infrastructure and Social Equity**

This Reference Tool presents the results of global research on the lessons learned from inclusive practices. It builds on a detailed literature review, as well as consultations with infrastructure experts, institutional leaders and practitioners, and the assessment of more than 70 projects, including the eight case studies presented in Section 4 of this report. The Reference Tool provides practical advice on inclusive infrastructure, primarily for government officials responsible for infrastructure projects. It is also designed to be a user-friendly resource for practitioners around the world who are responsible for projects at any stage of their development, implementation or monitoring. First, the tool provides a working definition of inclusive infrastructure that establishes a baseline to further understand the concept. It also includes a framework that details the critical Action Areas that need to be considered and addressed to ensure successful implementation of inclusivity in infrastructure projects. These Action Areas are then broken down into practices to provide a full list of recommendations, illustrated by real examples for practitioners to use in the process of developing and/or implementing more inclusive infrastructure.

Highlights:

- ✔ Stakeholder Identification, Engagement, and Empowerment
- ✔ Governance and Capacity Building
- ✔ Policy, Regulation and Standards
- ✔ Project Planning, Development, and Delivery
- ✔ Private Sector Roles and Participation
- ✔ Affordability and Optimizing Finance

12) **Global Rapid Post-Disaster Damage Estimation**
Developed by GFDRR – 2018

The GRADE approach introduces key risk modeling methodologies and processes into the early post-disaster response phase. The GRADE approach can provide an initial rapid (within two weeks) estimation of the physical post-disaster damage incurred by key sectors. The approach prioritizes the housing and infrastructure sectors, followed by other sectors, like agricultural production, as desired.

Highlights:

- ✔ The GRADE approach has been successfully used after more than four disasters, including Madagascar (after Cyclone Enawo in March 2017), Haiti (after Hurricane Matthew in October 2016), Ecuador (after the earthquake on April 16, 2016), and Nepal (after the earthquake on April 25, 2015).
- ✔ GRADE is used to assess direct damages to property; direct damage estimations by economic sector; potential impacts on gross domestic product (GDP) and the economy; and, in the case of earthquakes, estimations of human casualties.
- ✔ Indirect losses due to reduced productivity, business interruption, and output loss are not at present addressed by GRADE.

13) **Global Library of School Infrastructure Database**
Developed by the World Bank in Partnership with Ministries of Education

The GLOSI is a live global repository of evidence-based knowledge and data about school infrastructure and its performance against natural hazard events. The GLOSI includes a catalog of typical school building types found in different countries, with the respective vulnerability data which is needed to conduct quantitative risk assessments.

Highlights:

- ✔ GLOSI is a tool to mainstream quantitative risk assessment in investment planning
- ✔ GLOSI is an open access library. The in-country data section is limited to country data sharing policies.
- ✔ GLOSI highlights information, including:
    - Guiding development of scalable and cost-efficient vulnerability reduction solutions to maximize safety for children.
    - Learning and sharing knowledge from global experience to make schools safer and resilient at scale.

Resources

1) **Lifelines: The Resilient Infrastructure Opportunity**
   Developed by the World Bank – 2018

This report assesses the cost of infrastructure disruptions to low- and middle-income countries and the economic benefits of investing in resilient infrastructure. It examines four essential infrastructure systems: power, water and sanitation, transport, and telecommunications. And the report lays out a framework for understanding the ability of infrastructure systems to function and meet users' needs during and after natural shocks.

2) **Investing in Sustainable and Resilient Infrastructure - Principles for Recovery**
   Developed by UNEP – 2020

This framework provides 10 principles for decision-making on infrastructure spending for post-COVID-19 recovery and stimulus packages. They cover a range of important considerations, including SDG alignment, systems-level planning, employment creation, social and natural infrastructure integration, biodiversity and human rights impacts, and transparency and consultative processes.

3) **Bringing Resilience to Scale – Annual Report**
   Developed by GFDRR - 2020

This Annual Report highlights the progress and results achieved during FY19. It provides an overview of grant making activities in six regions and across GFDRR's eight targeted areas of engagement.

4) **Options for Addressing Infrastructure Resilience – Working Paper**
   Developed by UNDRR – 2020

This paper sets out UNDRR's recommendations, lessons learned and highlights opportunities to build infrastructure resilience. Insights are relevant to partners locally, nationally and internationally.

5) **Building Resilient Infrastructure for the Future**
   Developed by Asian Development Bank – 2019

This working paper focuses on building resilient infrastructure and opportunities for future partnerships and synergies regionally and internationally. It provides insights on the experience of and lessons learned by the Asian Development Bank on resilient infrastructure and highlights opportunities for future partnerships and synergies with partners in the development and finance communities regionally and internationally. It also explores new financing modalities for building resilient infrastructure.

6) **Infrastructure for Gender Equality and the Empowerment of Women**
   Created by UNOPS – 2020

This report focuses on infrastructure as an agent of change by ensuring gender mainstreaming in the infrastructure life cycle. It shows how reflecting women's rights and realities in the planning, delivery and management of infrastructure projects that impact their lives can help to narrow gender inequalities. The tools and methodologies that have been developed to support gender mainstreaming in infrastructure are the sustainABLE tool and the Capacity Assessment Tool for Infrastructure (CAT-I), which are discussed in detail in the final section of this report.

7) **Disaster Resource Partnership**
Created by World Economic Forum

The Engineering and Construction Disaster Resource Partnership is a successful model for coordinated private sector partnership in response to natural disasters. The main objective of the DRP is to form an ongoing collaboration between private industry and the public sector/humanitarian organizations to leverage the core strengths and existing capabilities and capacities of the Engineering and Construction community when natural disasters occur. This will ensure the fast and effective deployment of E&C expertise and means before, during and after the rapid-onset natural disasters.

8) **G20 Principles for the Infrastructure Project Preparation Phase**
Developed by the Infrastructure Working Group – 2018

The following principles could be considered when preparing national and regional infrastructure projects. The principles consist in a list of critical aspects to consider under the following dimensions: Project rationale; Options appraisal; Commercial viability; Long-term affordability; and Deliverability.

9) **Ready for Tomorrow: Seven Strategies for Climate-Resilient Infrastructure**
Developed by Hoover Institution – 2018

The following strategies are distilled from the work of thought leaders across many sectors and disciplines. They are key concepts that should drive the design, funding, and building of climate-resilient infrastructure, and they apply to both individual projects and systems. They may involve changes in policies, advances in science and technology, and new practices by decision makers, including policy makers, practitioners, and investors. These strategies, if broadly applied, can produce robust and sustainable infrastructure, more cost-effective investments, and reliable services to our growing cities and populations.

10) **Resilience Shift**

Supported by Lloyd's Register Foundation and Arup, the Resilience Shift provides knowledge and tools for those responsible for planning, financing, designing, delivering, operating and maintaining critical infrastructure systems.

11) **For community, by community: Building resilience through infrastructure in rural India**
Developed by the Resilience Shift, DFID, and Acclimatise – 2019

This is a story of infrastructure creation that does not begin with the asset. It begins instead with the people; specifically, the needs of some of the poorest and the most vulnerable in rural India. By linking to an established social security program, the Infrastructure for Climate Resilient Growth in India (ICRG) project provides technical assistance to support the development of over 900 resilient infrastructure works in just 4 years. Funded by DFID, ICRG has cleverly combined technology with traditional techniques to ensure that the assets build community resilience to climate change and can be built and maintained by the communities themselves.

12) **Coalition for Disaster Resilient Infrastructure (CDRI)**

A partnership of national governments, UN agencies and programs, multilateral development banks and financing mechanisms, the private sector, and knowledge institutions that aims to promote the resilience of new and existing infrastructure systems to climate and disaster risks, thereby ensuring sustainable development.

13) **Supporting safer housing reconstruction after disasters: Planning and implementing technical assistance at scale**
Developed by UNHABITAT – 2019

This publication builds upon extensive experience in post-disaster housing recovery efforts from all over the world. UN-Habitat has been supporting local government, construction sector professionals, and communities in housing recovery for over twenty years. This document draws on this experience and is aimed at decision makers across four main stakeholder groups (government, assistance agencies, the built environment sector, and disaster-affected communities) to increase the level of knowledge about technical assistance and operationalize its implementation. The guidelines seek to ensure that the reconstruction of housing in disaster-affected communities results in sustainably safer housing.

14) **Building back better: achieving resilience through stronger, faster, and more inclusive post-disaster reconstruction**
Developed by GFDRR – 2018

This report shows how the benefits of building back better could be greatest among the communities and countries that are hit by disasters most intensely and frequently. This report is a follow-up to the 2017 Unbreakable report, which made the case that disaster losses disproportionately affect poor people.

15) **Guidance on Critical Facilities**
Developed by Asian Disaster Preparedness Centre (ADPC) – 2015

A reference document to provide strategic guidance on incorporating DRR measures in critical infrastructures during the post-disaster phase. It also aims to accompany and enrich the handbook and the learning workshop module with key considerations on 'why and how' to bring DRR in recovery and reconstruction of critical facilities.