Mahidol University
Faculty of Environment and Resource Studies
ECO-INDUSTRY Research and Training Center
ENVI MAHIDOL Top Priority

Advancing Infrastructure Resilience through Risk-Informed Decision Tools

Introduction

As climate change speeds up and disasters happen more often, infrastructure systems need to be more resilient for sustainable development. Infrastructure underpins 92% of the Sustainable Development Goals (SDGs) [1]. Infrastructure damage from shocks and stresses interrupts essential services and increases operational expenses, resulting in a global average yearly loss of USD 700 billion and low- and middle-income countries (LMICs) bear 54% of this loss [2]. **The United Nations Office for Project Services (UNOPS) released Scaling Infrastructure Resilience: A Suite of Tools for Resilient Infrastructure Planning** to assist governments, particularly in low- and middle-income countries (LMICs), in incorporating resilience into their national infrastructure plans and investments [3].

Understanding Today's Infrastructure Resilience Landscape

Planning for resilient infrastructure must be grounded in data, consider multiple hazards, and analyze the interactions among various systems, including transportation, energy, water, and communication networks. Many LMICs face limitations in their capacity and possess inconsistently organized data, which restricts evidence-based decision-making. The report emphasizes the significance for governments to employ **adaptable, scalable, and easy to adopt tools** that enable the identification of vulnerabilities, risk simulation, and informed decision-making regarding resource allocation to enhance resilience [3].

Recommended Suite of Tools by UNOPS

UNOPS evaluated more than 75 existing resources and identified three tools with the highest potential to facilitate risk-informed planning:

The Global Infrastructure Risk and Resilience Index (GIRI)

The Coalition for Disaster Resilient Infrastructure (CDRI) created GIRI which provides probabilistic risk data across hazards and infrastructure sectors, supporting fiscal risk evaluation and investment prioritization.

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UNDRR Stress Testing Tool

Designed by the UN Office for Disaster Risk Reduction, this participatory tool helps governments identify infrastructure weaknesses and interdependencies, and align policies and institutional frameworks for resilience.

Systemic Risk Assessment Tool (SRAT)

Created by the University of Oxford, SRAT offers adaptation planning and loss-and-damage estimation by analyzing cascading risks and economic impacts geographically.

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Benefit Highlights

- Enable risk-informed decisions for national and subnational systems.
- Strengthen integration of resilience into NAPs, NDCs, and development planning.
- Guide prioritization and costing of adaptation measures.
- Support loss-and-damage assessments for planning.
- Each dollar invested in resilience can yield up to four dollars in benefits [4].

Conclusions

Low- and middle-income countries (LMICs) may utilize the Suite of Tools suggested by UNOPS to speed up the planning process for infrastructure that is resilient and meets the Sustainable Development Goals (SDGs) and the Sendai Framework. Thailand can use these ideas to make its National Adaptation Plans (NAPs), Nationally Determined Contributions (NDCs), climate financing readiness, and integrated risk assessment as Thailand's critical infrastructure is increasingly exposed to significant climate risks including recurrent flooding and prolonged drought. Incorporating resilience into infrastructure decisions can protect economic assets while promoting long-term sustainability, community safety, and regional leadership in climate resilience.

References

[1] Thacker, S., et al. (2018). *Infrastructure: Underpinning Sustainable Development*. UNOPS, Copenhagen.

[2] Coalition for Disaster Resilience Infrastructure (CDRI). (2023). *Global Infrastructure Resilience: Capturing the Resilience Dividend – A Biennial Report from the Coalition for Disaster Resilient Infrastructure*. New Delhi: CDRI.

[3] Uchil, R., Mutyaba, R., Soriano, A., Stratton-Short, S., & Morgan, G. (2025). *Scaling Infrastructure Resilience: A Suite of Tools for Resilient Infrastructure Planning*. UNOPS, Copenhagen, Denmark.

[4] Hallegatte, S., Rentschler, J., & Rozenberg, J. (2019). *Lifelines: The Resilient Infrastructure Opportunity*. Sustainable Infrastructure, World Bank.