

Task Force 02

SUSTAINABLE CLIMATE ACTION AND INCLUSIVE JUST ENERGY TRANSITIONS

Accelerating Risk-Informed Investments in Climate-Resilient Urban Infrastructure: A framework-based approach

Ahana Chatterjee, Research Analyst, Council on Energy, Environment and Water (India)

Shreya Wadhawan, Programme Associate, Council on Energy, Environment and Water (India)

Savina Carluccio, Executive Director, International Coalition for Sustainable Infrastructure (United Kingdom)

Niladri Gupta, Senior Water Resources Management Specialist, Asian Disaster Preparedness Center (Thailand)

Deo Raj Gurung, Chief Scientist, Aga Khan Agency of Habitat (Switzerland)

Sana Dharani, Head for Habitat Improvement, Aga Khan Agency of Habitat (India)

Sharmala Naidoo, Technical Principal, Engineering Leadership Group (United Kingdom)



Abstract

The brief provides a framework to accelerate investments in climate-resilient critical infrastructure, emphasising risk quantification and a lifecycle approach for enhancing resilience. Extreme climate hazards cause asset loss and service disruption, exacerbating inherent inequalities as socio-economically marginalised citizens are disproportionately impacted. By 2050, 68% of the global population will live in urban areas, with 84% of the fastest-growing cities facing 'extreme' climate risks, especially in the Low and Middle-Income Countries (LMICs).

To address the infrastructure gap in LMICs, an estimated USD 2.8 trillion is needed by 2050. Thus, forthcoming investments must be risk-informed through scientific evidence, best practices, research, and technological innovation. This highlights the need for a unified multi-hazard climate-inclusive risk assessment framework to quantify and map infrastructure at risk, facilitating risk-informed investments, streamlining adaptation finance and providing targeted, nature-positive solutions. The framework should promote resilience, sustainability, and inclusivity in all stages of infrastructure development through equitable access.

This policy brief also highlights the crucial role of G20 in mobilising climate finance through international cooperation and knowledge sharing. In 2020, Foreign Direct Investments (FDIs) met only 5% of the required USD 1.5 trillion annual infrastructure in LMICs. The G20 can attract more capital through global collaboration among governments, policy analysts, financial institutions, and private actors. The last G20 established 'Principles on Financing Cities of Tomorrow' for sustainable urban development, which involves interventions in policy and planning to upgrade infrastructure. In the 2024 G20, Brazil can move this initiative further by elucidating the

value, benefits, costs, and risks of climate-resilient infrastructure, and building technical capacity of decision-makers, policymakers and investors.

Keywords: Climate-resilient infrastructure, risk assessment, Low-and-middle-income Countries, Climate Finance

Diagnosis of the Issue

The twenty-first century has ushered in an era of unprecedented challenges, chief among them being the escalating impacts of climate change. Climate and weather-related disasters have surged five-fold over the past half-century (World Meteorological Organisation 2021); an 83% jump was observed during 2000 – 2019 compared to 1980 – 1999, along with a resultant rise in economic loss (United Nations Office for Disaster Risk Reduction 2020). In 2023 alone, total losses amounted to a staggering USD 250 billion, with weather-related events comprising a majority of 76% (Munich Re 2023). The alarming reality is further underscored by the global Annual Average Loss (AAL) in principal infrastructure sectors due to disasters and climate change, which currently stands between USD 301 and USD 330 billion (Coalition for Disaster Resilient Infrastructure 2023).

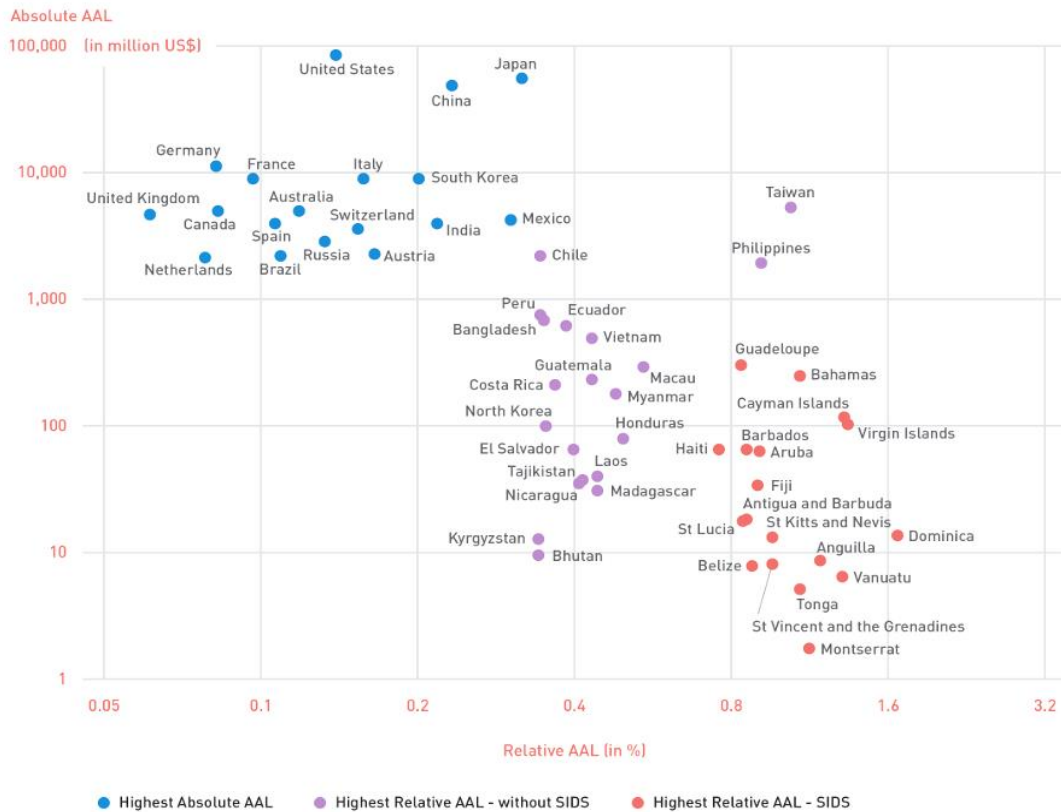


FIGURE 1 - Absolute and Relative Annual Average Loss (AAL) for Infrastructure Sectors. Source: Global Infrastructure Resilience Report, CDRI, 2023

Moreover, the consequences of these disasters are particularly acute in urban areas, where rapid urbanisation has led to the proliferation of poorly planned settlements and infrastructure systems. Densely populated cities, especially in low-and-middle-income countries (LMICs), are emerging as disaster hotspots, with 90% of urban dwellers living in unsafe, exposed housing (UNDRR 2013). Alarmingly, since 1985, 82% of settlements built in the highest flood-risk zones have been in LMICs alone (World Bank 2022), underscoring the urgent need to mitigate risk and build resilience in these countries.

Extreme events disrupt critical infrastructure networks such as transportation, electricity, and telecommunications, causing socio-economic losses that amplify the impact of climate change. Additionally, rapid urbanisation in LMICs exacerbates the challenge, as critical infrastructure is often unplanned and hastily constructed, leaving it vulnerable to the impacts of climate change (United National Human Settlements Programme 2007). However, investments in climate-resilient infrastructure remain woefully inadequate, particularly in LMICs, which require them the most. This not only jeopardises essential services but also hampers economic growth and development.

LMICs bear annual losses amounting to around USD 280 billion, with South Asia and Latin America facing losses equivalent to 0.42% and 0.22% of their Gross Domestic Product (GDP), respectively (Tripathi 2023). Despite the urgent requirement for substantial investment—estimated at USD 1.5 trillion annually—in infrastructure projects in LMICs, the actual inflow of funds remains alarmingly low. Only USD 85.6 billion in Foreign Direct Investments (FDI) was directed towards this sector through 2020, exacerbating the infrastructure deficit (United Nations Conference on Trade and Development 2023).

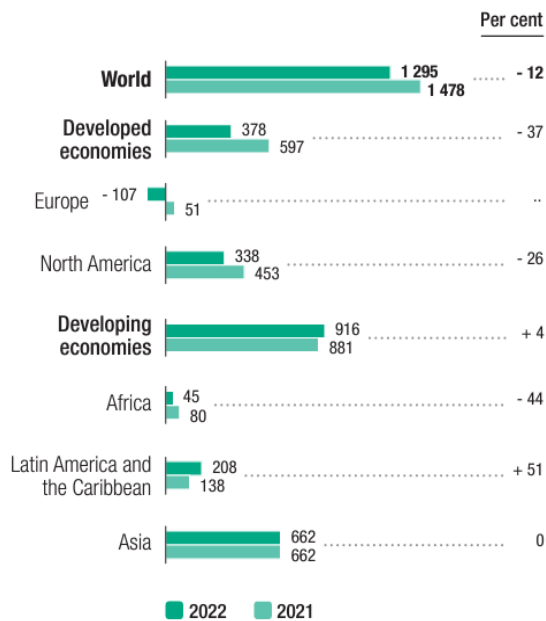


FIGURE 2 - FDI inflows by region, 2021–2022

Source: UNCTAD, FDI/MNE database

Taking urgent action to invest in climate-resilient urban infrastructure is crucial for long-term economic growth. While addressing climate risks may involve higher initial costs, the financial benefits from risk avoidance and improved service reliability make it worthwhile.

Achieving this requires thorough risk assessments to account for climate impacts. Accurate risk assessment and vulnerability identification should inform future investments. A robust policy framework with innovative solutions incentivises climate risk disclosure, while standardised methodologies for climate-inclusive risk assessments are crucial for consistency and comparability, improving accuracy and facilitating informed decision-making. We propose five key recommendations to drive this resilient transition.

Recommendations

Recommendation 1: Mandating the development and use of standards that address climate risks throughout the infrastructure lifecycle

In light of the increasing loss of assets to climate-induced hazards, sustainable infrastructure investment mandates the full integration of risk assessments into investment decisions at every stage of the infrastructure development lifecycle. This approach aligns with the Quality Infrastructure Investment (QII) Principles endorsed by the G20 in 2019, emphasising robust infrastructure governance throughout the project lifecycle for resilient infrastructure development.

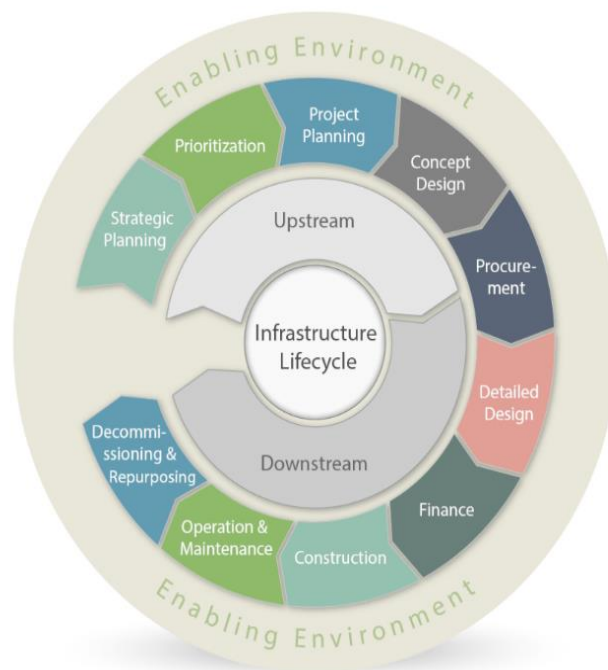


FIGURE 3 - Infrastructure Life-cycle

Source: Sustainable Infrastructure Tool Navigator, developed by UNEP and GIZ

Comprehensive risk-informed planning reduces delays and cost overruns in critical infrastructure, easing the fiscal strain on governments and financial institutions while ensuring infrastructure quality. Prioritising risk-informed design, quality construction, and effective operation and maintenance practices yield high returns, mitigating economic losses from disasters.

Therefore, infrastructure-specific Operation and Maintenance manuals and Standard Operating Procedures must borrow inferences from the risk assessment, which pinpoints the service delivery parameters that can be upgraded to build resilience. For example, the Indian Ministry of Power developed a Disaster Management Plan in 2022, which followed the recommendations of the Sendai Framework¹. The plan comprises resilient design standards, asset-level restoration plans, and capacity-building frameworks for the power sector. The IWG, by compiling such global best practices, should develop a compendium of resilient design standards that can serve as a worldwide reference point. By enforcing these standards in its member countries, the G20 can accelerate resilient development and pave the way for cross-country innovation.

Risk assessment can thus be integrated throughout the infrastructure lifecycle, reducing disruptions and improving recovery time. As per the priorities of the WGDRR, the resultant outcome would be a quicker and more coordinated disaster response, incorporating inclusivity and resilience in infrastructure planning.

¹ The Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework) was the first major agreement of the post-2015 development agenda and provides Member States with concrete actions to protect development gains from the risk of disaster. ([link](#))

Recommendation 2: Implementing a comprehensive framework for assessing climate risks to infrastructure

To make risk-informed decisions, stakeholders must grasp three key dimensions: the geographical location of at-risk infrastructure assets, the level of risk they face, and the underlying contributors to this risk. Hence, conducting data-driven quantitative climate-inclusive risk assessments is imperative to generate scientific evidence guiding need-based investments.

Extreme climate events impact all hazard-prone countries, but variations in risk quantification methods arise from differing capacities, priorities, and data availability. Ambiguity in vulnerability assessments hinders comparisons and solution identification. The lack of a unified framework for infrastructure risk assessment complicates this further and offers an opportunity to standardise the process across infrastructure-deficient LMICs.

The Intergovernmental Panel on Climate Change (IPCC) offers a scientifically rigorous, globally recognised formula for assessing climate risk that is adaptable to any system². This enables the development of a comprehensive framework using scalable and replicable indicators to measure infrastructure risk, such as geospatial data, asset location,

²The term ‘risk’ refers to the potential, when the outcome is uncertain, for adverse consequences on lives, livelihoods, health, ecosystems and species, economic, social and cultural assets, services and infrastructure

and hazard occurrence. Inspiration can be drawn from the European Union Climate Risk Assessment report to create a similar approach for the Global South.

| Climate risks for 'Infrastructure' cluster | Urgency to act | Risk severity | | | Policy characteristics | | |
|---|-----------------------|---------------|-------------|--|------------------------|------------------|----------------|
| | | Current | Mid-century | Late century (low/high warming scenario) | Policy horizon | Policy readiness | Risk ownership |
| Pluvial and fluvial flooding | Urgent action needed | High | Critical | Substantial | Long | Medium | Co-owned |
| Coastal flooding | Urgent action needed | High | Critical | Catastrophic | Long | Advanced | Co-owned |
| Damage to infrastructure and buildings (*) | More action needed | High | Substantial | Substantial | Long | Medium | Co-owned |
| Energy disruption due to heat and drought (hotspot region: southern Europe) | More action needed | High | Critical | Critical | Medium | Medium | Co-owned |
| Energy disruption due to heat and drought | Further investigation | High | Substantial | Limited | Medium | Medium | Co-owned |
| Energy disruption due to flooding | Further investigation | High | Critical | Critical | Long | Advanced | Co-owned |
| Marine transport | Further investigation | High | Substantial | Substantial | Medium | Medium | Co-owned |
| Land-based transport | Further investigation | High | Substantial | Substantial | Medium | Medium | Co-owned |

| | | |
|--------------------------|----------------------|-------------------|
| Legends and notes | | |
| Urgency to act | Risk severity | Confidence |
| Urgent action needed | Catastrophic | Low: + |
| More action needed | Critical | Medium: ++ |
| Further investigation | Substantial | High: +++ |
| Sustain current action | Limited | |
| Watching brief | | |

(*) Urgency based on high warming scenario (late century).

FIGURE 4 - Assessment of major risks to infrastructure sector in Europe. Source: European Union Climate Risk Assessment Report, 2024

To overcome data gaps in LMICs, indicators must adapt to regional variations while adhering to IPCC methodology. Standardising the method allows the identification of risks and resilience across borders and promotes data capacity building. The Working Group on Disaster Risk Reduction (WGDRR) should standardise these indicators for climate risk assessment in LMIC cities. By incentivising cross-border infrastructure development aligned with international standards, WGDRR can thus ensure all countries follow similar methodologies in their risk assessments.

Recommendation 3: Strengthening technical capacity through international collaboration

Enhancing the risk assessment framework's efficacy requires bolstering the technical skills of decision-makers, enabling them to grasp and effectively communicate risks, opportunities, and solutions to policymakers and investors. International collaboration leverages diverse experiences and innovations, allowing decision-makers to implement tailored best practices. These partnerships enable access to global knowledge on climate-related risks to critical infrastructure and can, therefore, accelerate the development of frameworks for planning, designing, and maintaining resilient urban infrastructure, ensuring effective and sustainable investments.

Technical capacity building empowers cities and periurban areas to adopt proactive approaches for climate adaptation. For instance, the Indian state of Odisha has created an early warning system for disseminating critical disaster-related information to the last mile, with nearly 1,200 villages receiving cyclone or tsunami warnings through sirens and mass messaging. Similarly, Japan has saved millions of dollars by building flood tunnels in Tokyo that protect the city from flooding, funnelling floodwaters to the river with the help of turbines.

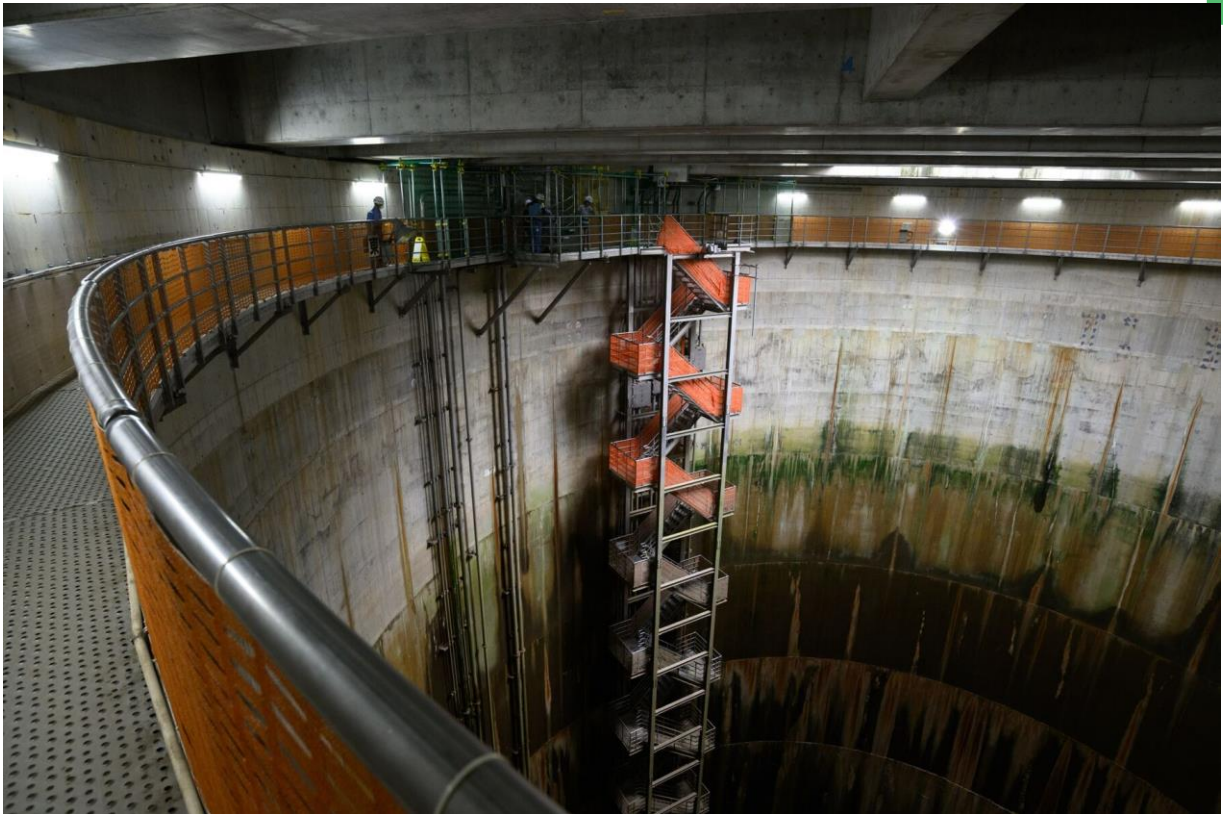


FIGURE 5 - Levees carry the excess water to the five underground cylindrical shafts in Tokyo. Source: Akio Kon, Bloomberg, 2023

A priority identified by the WGDRR is to foster innovation and research in disaster management by exchanging scientific and technological expertise. Global organisations such as the CDRI³ provide technical support, facilitate knowledge management, develop capacities, and foster partnerships among member countries. The WGDRR can work

³ The Coalition for Disaster Resilient Infrastructure (CDRI), launched in 2019 by the Prime Minister of India, is a partnership national governments, United Nations, multilateral development banks, etc that aims to promote the resilience of new and existing infrastructure systems to climate and disaster risks in support of sustainable development. <https://www.cdri.world/>

closely with such organisations and knowledge platforms to accelerate knowledge-sharing through international dialogue.

Thus, global partnerships can help LMICs access technical assistance, financing, and policy guidance. This could facilitate the implementation of large-scale projects that might otherwise be unattainable for LMICs.

Recommendation 4: Catalysing global infrastructure finance for infrastructure resilience solutions

While a standardised risk assessment framework provides a deeper understanding of the exposure and repercussions of physical climate risks, a transformation in the financial landscape is imperative to foster a long-term outlook that incentivises climate-resilient infrastructure.

However, a significant barrier to financing resilience is the unclear definition, measurement, and value communication of climate-resilient infrastructure. Expanding the scope of benefits and improving risk communication is necessary to improve understanding and communication of systemic risks. Also, presenting context-specific measures as prudent investments boosts investor confidence. For example, a study by the International Finance Commission (IFC) in 2020 across India, Colombia, and Kenya, titled "Her Home: Housing Finance for Women," demonstrates a sizable market for

financial products tailored to women. Leveraging IFC tools like EDGE⁴ (Excellence in Design for Greater Efficiencies) for green building and access to finance addresses resilient housing needs, especially women-led green homes in the Global South.

Developing economies can utilise such global instruments to scale up financing for resilient infrastructures. Green bonds offer reliable funding for climate-resilient projects by drawing socially responsible investors and combining financial returns with environmental and social goals. At the same time, climate funds like Impact Funds, the Green Climate Fund (GCF) and Climate Investment Funds (CIFs) attract public and private sector investments for initiatives including water management and renewable energy. Climate risk insurance further reduces financial risks from disasters.

By mobilising innovative financing mechanisms, LMICs can unlock resources for climate-resilient infrastructure projects, attract private investment, and promote global collaboration. The G20 Task Force for Global Mobilisation Against Climate Change fosters dialogue between governments and financial institutions to explore areas of alignment. The Infrastructure Working Group (IWG) can then tailor these mechanisms to specific sectors, identifying the best-fit solutions for financing resilient infrastructure.

⁴ An innovation of IFC, a member of the World Bank Group, EDGE makes it easy to design and certify resource-efficient and Zero Carbon buildings of every type, everywhere. <https://edgebuildings.com/>


Scenario of Outcomes

By implementing the outlined recommendations, the upcoming G20 can foster a shared understanding of risk, encourage systems thinking, and pave the way for a synchronised global market for investing in resilient infrastructure.

However, addressing infrastructure resilience in LMICs faces formidable challenges. Given the diverse interests among G20 nations, securing political will and commitment, both internationally and nationally, presents hurdles. Resource constraints pose significant barriers, requiring a careful balance between resilience investments and other development priorities. Moreover, building technical capacity for risk assessment and resilience measures demands substantial investment. Therefore, international coordination is vital, and G20 countries must champion coordinated action to integrate DRR financing into sectoral investments, as stressed by UNDRR's mid-term review of the Sendai Framework.

India's establishment of a dedicated G20 working group for DRR and discussions on Resilient Infrastructure and Financing sets a precedent for Brazil to leverage. However, it must be noted that interconnected decisions impact infrastructure variables uniquely—trade-offs depend on policy, regulation, markets, services, and customers. Therefore, the recommendations of each G20 Working Group must be synchronised and tailored to optimise impact.


Actionable outputs from the WGDRR, such as standardising risk assessment indicators and harmonising global resilience standards, can build an internationally established understanding of risk factors. The IWG, by increasing technical capacity, can then direct risk-informed investments to feasible projects, thus creating pipelines of bankable



projects for sustainable growth. The Sustainable Finance working group can align finance streams to support global agendas. It can operationalise national resilience funds and systems for monetising dividends, signalling a commitment to financial markets and encouraging private investment.

Since LMIC cities face significant losses, the G20 must endorse multilevel governance for climate finance in cities, using regions as links between national and local policies. The recommendations of each task force should encourage national governments to collaborate with Multilateral Development Banks and International Finance Institutions to provide pre-development funds and technical capacity. The Multilevel Climate Action Playbook, which proposes strengthening Nationally Determined Contributions cycles through regional and local governance, can be used as an example for tailoring policies, improving resilience, and leveraging innovative financing for infrastructure.

The Sustainable Development Goals Report 2023 states that while global research and development expenditures are increasing, they are still too low in the least developed countries. These countries also face challenges in achieving the manufacturing target, while urban sprawl outpaces population growth in most cities, demanding larger volumes of sustainable infrastructure. Through a deeper understanding of risks and returns that illustrate the benefits of climate-resilient investments, the G20 can help these countries change their current development trajectory and inch closer to their 2030 targets.



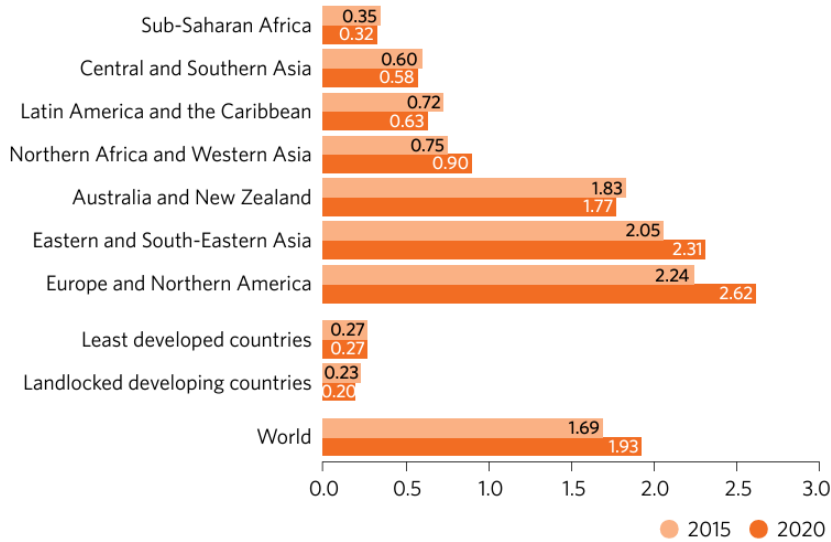


FIGURE 6 - Research and development expenditure as a proportion of GDP, 2015 and 2020. Source: Sustainable Development Goals Report, 2023

The SDG 2023 report also notes a significant increase in countries with DRR strategies since 2015. The G20, through the IWG and WGD RR, can further enhance policymakers' capacity to align national policies with global goals. This includes embedding low-carbon strategies and measures while improving the resilience of infrastructure systems to benefit communities and natural ecosystems.

Ultimately, the upcoming G20 should result in the emergence of innovative, risk-aware international climate finance options to finance infrastructure that can reduce the costs of implementing NDCs and National Adaptation Plans (NAPs) in LMICs. The G20 can incentivise public funds and leverage private investment needed to cover the additional finance requirements—above and beyond national budgets—that SDGs, NDCs and NAPs require.

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