

Introduction

Infrastructure investment serves as a critical foundation for sustainable economic development in developing nations. By improving transportation, energy, water, and communication networks, these investments catalyse productivity, connectivity, and growth. However, recent climate change impacts such as increasing temperatures, shifting patterns of precipitation, increased intensity or recurrence of extreme weather events and rising sea levels have highlighted the vulnerability of infrastructure systems, resulting in disruptions and substantial losses.

Home to over 3.2 billion people¹, the BRICS countries – Brazil, Russia, India, China and South Africa – are projected to account for 44% of the US\$94 trillion infrastructure investments needed by 2040.² Coupled with the changing and extreme climate conditions as temperatures are likely to rise by more than 1.5°C above pre-industrial levels by 2027³, infrastructures within the nations have not been spared of climate-related risks and will only suffer more economic losses should they not be well adapted to climate change.

Investing in infrastructure that is robust and adaptable to climate is now imperative. Studies show that making infrastructure more climate-resilient can add up to 3% to upfront costs, however it has a benefit-cost ratio of about 4:1, accruing improved rate of return with enormous net benefits from investing in climate adaptation and resilience⁴. World Bank also found that investing \$1 trillion in the incremental cost of making infrastructure more resilient in developing countries would generate \$4.2 trillion in benefits.⁵ Aside from the avoided losses and economic benefits, climate adaptation investments also offer non-market societal benefits. An International Labour Organisation study on BRICS countries suggested for every \$1 million invested in the construction sector, close to 120 jobs are expected to be created in the

Russian Federation, 160 in Brazil, 200 in China and 650 in India.⁶ By building climate-resilient infrastructure, these projects can withstand and adapt to these climate-related challenges, minimizing the potential for significant disruptions and economic losses, and ensuring long-term viability for infrastructures.

NDB's General Strategy for 2022–2026, titled "*Scaling Up Development Finance for a Sustainable Future*", has set the course for the Bank's evolution into a leading provider of solutions for infrastructure and sustainable development for emerging market economies and developing countries, and has committed to direct 40% of total financing to projects contributing to climate change mitigation and adaptation.



What is climate-resilient infrastructure?

Climate change is impacting infrastructure through increased risks of extreme weather events, such as storms, floods, and heatwaves. These events can damage and disrupt infrastructure systems, including transportation, energy, and water, leading to infrastructure failures, service disruptions, and economic losses. To become climate resilient, infrastructure is planned, designed, built, and operated in a way that anticipates, prepares for, and adapts to

changing climate conditions. It can also withstand, respond to, and recover rapidly from disruptions caused by these climate conditions.⁷ Ensuring climate resilience is a continual process throughout the life of the asset which reduces, but may not fully eliminate, the risk of climate-related disruptions.

CLIMATE RISK CASE. Brazil's hydropower accounted for 63% of the country's energy mix, however its hydroelectric production capacity is at significant risk from rising temperatures and changing precipitation patterns.

A case in point is the giant Itaipu dam on the Parana River dividing Paraguay and Brazil and supplying around 86% and 10% of these countries' energy consumption respectively. In 2021 it recorded its lowest output since operating at full capacity in 2005 due to extreme droughts. Projected precipitation drops and changes in seasonal rainfall patterns are likely to reduce hydropower generation potential and revenues meaning drought situations will be exacerbated by a simultaneous energy crunch.



Common challenges among investors and developers when starting to consider climate resilience:

- a) **Knowledge and Capacity Gaps:** Implementing climate resilience strategies requires specialized knowledge and expertise.

Investors and developers may face challenges in accessing the necessary technical skills, data, tools and solutions. Collaborating with experts, engaging consultants, and investing in capacity-building can help overcome these barriers.

b) **Tragedy of the Horizon⁸:**

While climate change creates tremendous risk for infrastructures' long-term viability, the tendency of short-term thinking on upfront costs and returns among investors may lead to climate resilience and adaptation being ignored. Evaluating the long-term cost-to-benefits and potential avoided losses associated with climate-resilient infrastructure can facilitate more informed and balanced investment decisions.

c) **Regulatory and Policy Frameworks:**

The lack of supportive policies and regulations can hinder the mainstreaming of climate resilience in infrastructure projects. Investors and developers should advocate for policy changes that incentivize and facilitate climate-resilient investments. Engaging with policymakers and participating in industry forums can help shape the regulatory landscape.

Overcoming challenges of climate change:

As the world is working to close its \$18 trillion infrastructure financing gap through 2040⁹, it is critical for investors and developers to recognise the increasing risks posed by climate change, the economic and societal benefits from climate-resilient infrastructures, and their role to play in building climate resilience throughout their investments. By adopting proactive climate-resilient strategies, scenario-based assessments, adaptation planning and broader engagement, investors can contribute to a future where infrastructure withstands the challenges of a changing climate, ensuring the well-being and prosperity of communities for generations to come.

How can financiers and developers start building climate resilience with their infrastructure investments?

a) UNDERSTAND – Scenario-based Climate Risk Assessment:

Conducting a comprehensive climate risk assessment, considering relevant future climate scenarios based on internationally-recognised bodies such as the Intergovernmental Panel on Climate Change (IPCC), across different time horizons, will enable you to gain insight into potential physical risks to climate change. It is important to evaluate climate risk based on three pillars: 1) *Hazards*, both acute and chronic, that may cause potential damages and interruptions; 2) *Exposure* of infrastructure, such as location and physical attributes, that could be affected by the hazards; and 3) *Vulnerability* of infrastructure, in terms of the propensity or predisposition of an asset to be adversely affected by a certain hazard. Results from climate risk assessment on infrastructure will make visible to financiers and developers a good set of insights for further adaptation planning and integrate resilient measures.



b) PLAN – Incorporating Climate Models into Infrastructure Adaptation Planning:

Utilizing climate data and projections is essential for informed decision-making. Financiers and developers should integrate climate data into their design process, considering factors such as temperature, rainfall patterns, extreme weather events, as well as their future evolutions under plausible climate scenarios over time. Climate risks to infrastructure can be reduced through this data-driven approach by locating assets in areas that are less exposed to climate hazards (e.g. avoiding new construction in flood plains), and by making the assets better able to cope with climate impacts through design modifications, such as improved drainage systems or elevated structures, deploying alternative materials, or introducing flexible infrastructure systems, etc.

c) INTEGRATE – Integrating Climate Resilience Cost-benefits into Investment Decisions:

Ensuring infrastructure decisions are made with a proper consideration of climate risks requires a review of current approaches and procedures to infrastructure investments and a rethink on how individual projects assess for their long-term cost-benefits from climate adaptation. Investment policies, lending strategies and due diligence should build in financial considerations to the long-term risks of climate changes projected during their lifetimes to be climate-proof.

d) COLLABORATE – Engaging with Broader Stakeholders for Collective Actions:

Building climate resilience requires collaboration among various stakeholders. Financiers and developers should engage with local communities, government agencies, and environmental experts to understand local climate risks, incorporate local knowledge, and ensure that infrastructure projects align with community needs. Collaboration can also lead to innovative solutions and shared resources, ensuring climate resilience is effectively reflected in the decisions that public and private actors make.

CLIMATE RISK CASE. India's second-largest state, Madhya Pradesh, faces numerous climate change risks, including more frequent and intense rainfall, a rise in temperatures and changes in spatial and temporal distribution of the monsoon. This will impact the state's existing infrastructure, particularly its gravel-surfaced roads, causing deterioration, increased maintenance costs and accessibility disruptions.¹⁰

To adapt, the local authority has factored in climate change risks into its project design and implemented a series of adaptation measures, including surface sealing, embankment pitching, and balancing culverts as flood prevention measures, as well as switching to asphalt resilient to temperatures up to 48°C. Maintenance costs for these climate-proofed roads will shrink by 25% with the benefits from adaptation far outweighing the cost.¹¹

References:

- ¹ World Population Review
- ² Global Infrastructure Hub/ NDB/ Ministry of Finance Republic of South Africa
- ³ [World Meteorological Organisation \(WMO\)](#)
- ⁴ [Global Commission on Adaptation: Adapt now - A global call for leadership on climate resilience](#)
- ⁵ [The World Bank: Lifelines for Better Development](#)
- ⁶ [International Labour Organisation \(ILO\): The employment impact of climate change adaptation](#) – Input Document for the G20 Climate Sustainability Working Group; Comparable estimates for South Africa were not available.
- ⁷ [OECD Environmental Policy Paper No.14 : Climate-resilient infrastructure](#)
- ⁸ The term "Tragedy of the Horizon" was coined by Mark Carney, the former Governor of the Bank of England. He first used this phrase in a speech on September 29, 2015, during an event at Lloyd's of London.
- ⁹ Global Infrastructure Hub
- ¹⁰ [Asian Infrastructure Investment Bank \(AIIB\) Investing in Climate-Resilient Roads for a Better Tomorrow](#)
- ¹¹ Ibid

Useful Tools and Resources

'The Triple Dividend of Building Climate Resilience'

<https://www.wri.org/research/triple-dividend-building-climate-resilience-taking-stock-moving-forward>

By: World Resource Institute (WRI)	The working paper explores the triple dividend of building climate resilience and demonstrates that the benefit of adaptation investments can often exceed expectations and contribute to effective climate risk management.
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Climate Change Adaptation Resources and Case Studies Portal

<https://www.adaptation-undp.org/climate-resilient-infrastructure>

By: UNDP	This portal provides resources and case studies on climate resilient and offers insights into infrastructure planning, ecosystem-based adaptation, early warning systems, and flood and coastal protection measures.
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Global Infra-structure Hub (GI Hub)

https://infrastructure-transition.gihub.org/?gad_source=1

By: Group of Twenty (G20)	The Hub provides strategies, data, case studies, and consultation services to support the development of net-zero and resilient infrastructure, contributing to the achievement of the SDGs.
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IPCC AR6 Interactive Atlas

<https://www.ipcc.ch/report/ar6/wg1/chapter/atlas/>

By: Intergovernmental Panel on Climate Change (IPCC)	This Atlas provides information on changes in regional climate due to global warming, including observed trends, attribution analysis, and projections for various climate variables, helping policymakers and researchers understand the regional impacts of climate change.
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Altitude - Climate and Nature risk screening platform

<https://www.axa-altitude.com/>

By: AXA Climate	The platform provides infrastructure and private equity funds with climate and nature data for informed decision-making during sourcing and due diligence. It offers customizable risk assessments, actionable information, and expert insights to help investors integrate climate change and biodiversity analysis into their investment processes.
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New Development Bank was established by Brazil, Russia, India, China and South Africa to mobilize resources for infrastructure and sustainable development projects in BRICS and other emerging market economies and developing countries, complementing the existing efforts of multilateral and regional financial institutions for global growth and development.

AXA Climate is an AXA Group entity dedicated to climate and environmental challenges. By integrating advanced climate modelling, scientific knowledge, and satellite data, AXA Climate supports different sectors through insurance, consulting, training, and tech solutions, to help them successfully adapt and create positive interactions between planet Earth and their activities.

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NDB Sustainability



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