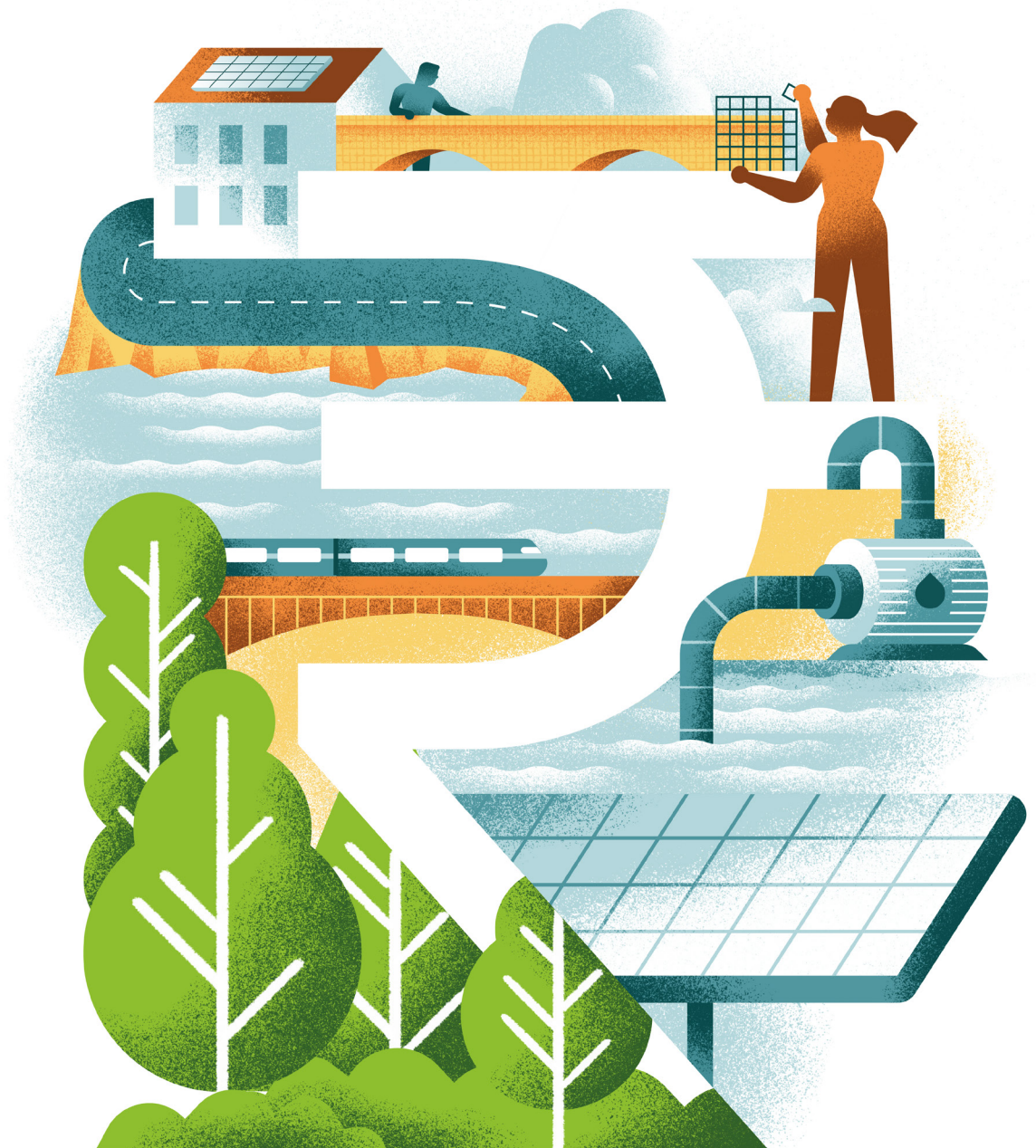


SNAPFI STUDY

India

Mobilizing the Private Sector for Developing Resilient Infrastructure in India

JULY 2021



UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD



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Mumbai shrouded in fog
by Abhay Singh



CHAPTER ONE —————>

Introduction

India is a highly climate vulnerable country, with increasing frequency and intensity of climate related natural disasters.¹ According to the National Disaster Management Authority (NDMA), in India around 12% of total land area is exposed to floods, about 68% of land is vulnerable to droughts, landslides and avalanches, 58.6 % landmass is earthquake-prone, and 5,700 km of the 7,516-km long coastal line is highly vulnerable to frequent tsunamis and cyclones.² This vulnerability to climate events along with the vulnerability to slow onset climate change processes, like sea level rise and desertification, highlights the need to prioritize adaptation to irreversible climate impacts.

There is an urgent need to build resilience of the people, society and economy, to mitigate the increasing cost of disasters and minimize the risk to human life. Over the last few years, assessing the damage caused by climate events is showing alarming results. For instance, floods caused by extreme precipitation has led to losses, conservatively estimated in the USD 3 billion to USD 4 billion range in Uttarakhand (2013), Chennai (2015), and Kerala (2018).³ According to a UN study, the Cyclone Amphan in 2020 caused damage, largely for infrastructure, of ~USD 14 billion in India, estimated to be the costliest cyclone in the region.⁴ The escalating economic cost of these disasters needs to be minimized by incorporating adaptation action and resilience building in the overall governance and development policy framework of the country.

This has been recognized under Article 7 of the Paris Agreement, which sets the global goal of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change. The Agreement's focuses also goes on to commit developed countries to support the efforts of developing country Parties, under Articles 9 (finance), 10 (technology) and 11 (capacity building). The adaptation action spectrum, on one hand looks at the response mechanisms to climate impacts, and on the other at the reduction of vulnerability and resilience building to climate stress.⁵ Reducing climate vulnerability and increasing climate resilience has especially become need of the hour and is critical to increasing the efficacy of response and recovery to climate shocks.

The objective of this study is to assess the role of the private sector in developing climate resilient infrastructure in India, focusing on the interface between the policy framework and finance for effective realization of this critical climate objective. This is directly relevant to achieving the goals of the Paris Agreement, where according to Article 2.1c of the Paris Agreement, all Parties must develop the policy and investment frameworks to support the alignment of all domestic and international financial flows with a “low greenhouse gas (GHG) emissions and climate-resilient development” pathway.

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- 1 Ali H., Modi P., Mishra V. 2019. “Increased flood risk in Indian sub-continent under the warming climate” (Article). *Weather and Climate Extremes*, Volume 25. Accessible at: <https://doi.org/10.1016/j.wace.2019.100212>.
 - 2 National Disaster Management Authority (NDMA). 2018. “National Disaster Management Authority (NDMA) Annual Report 2018-2019” (Report). Government of India. Accessible at: <http://ndma.gov.in/sites/default/files/PDF/Reports/NDMA-Annual-Report-2018-19-English.pdf>
 - 3 Ali H., Modi P., Mishra V. 2019.
 - 4 The Hindu. 2021. “Cyclone Amphan of 2020 resulted in \$14 billion economic losses in India: U.N. report” (News Article). Accessible at: <https://www.thehindu.com/news/national/cyclone-amphan-of-2020-resulted-in-14-billion-economic-losses-in-india-un-report/article34364773.ece>
 - 5 Global Center on Adaptation. 2021. “Adaptation Finance in the Context of Covid-19” (Report). Global Center on Adaptation and Climate Policy Initiative. Accessible at: <https://gca.org/wp-content/uploads/2021/01/GCA-Adaption-in-Finance-Report.pdf>

To set the context for this study, in this chapter we briefly look at the prevailing issues of financing climate adaptation and resilience in general, we then develop a basic understanding of what constitutes resilient infrastructure, and finally, we identify the need for private sector participation in developing this segment.

1.1 The Issue of Finance for Climate Adaptation and Resilience

A pre-requisite for adaptation planning and implementation is adequate adaptation finance, and in developing countries, this is sought not only from the national actors but also from international sources, as per the spirit of the Paris Agreement. Global adaptation finance increased in 2017-18 to USD 30 billion from USD 22 billion in 2015-16 (35% increase), however it still falls short of the average estimated requirement of USD 180 billion for the period 2020-2030.⁶ This is a major challenge for developing countries, which are often amongst the most vulnerable. Even though their adaptation costs may be lower than that of developed countries in absolute terms, the burden is higher due to constrained financial, technical and human capacities.⁷

With the growing need to increase the amount of finance towards climate adaptation, the fundamental issue of defining adaptation finance at the global level has become a critical barrier. Similar to the issue of defining climate finance, the challenge of defining adaptation finance arises from the unclarity around what constitutes climate adaptation. The Intergovernmental Panel on Climate Change (IPCC) defines adaptation as, “*Adjustment in natural or human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities*”,⁸ and a financial activity can be classified as adaptation if it helps in adjusting “*to actual or expected climate and its effects*”⁹; which is very broad, leaving much room for debate.

Climate change adaptation action is an indispensable aspect of building resilient socio-economic and ecological systems. The ideas of adaptation and resilience, support sustainable development and formation of societies with high adaptive capacity. However, it is important to understand how adaptation action, which consequently leads into the need for adaptation finance, can be hyper-contextual, with significant variations from place to place.

6 Global Commission on Adaptation (GCA). 2019. “Adapt Now: A Global Call for Leadership on Climate Resilience” (Report). Accessible at:

<https://gca.org/reports/adapt-now-a-global-call-for-leadership-on-climate-resilience/>

7 United Nations Environment Programme (UNEP). 2021. “Adaptation Gap Report 2020” (Report). Nairobi.

8 IPCC. 2007. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

9 IPCC. 2014. “Glossary of the Fifth Assessment Report” (Report). Accessible at: <https://www.ipcc.ch/report/ar5/syr/ar5-syr-glossary-english/>

The difference in the vulnerabilities of different communities, and adaptive capacity to cope with the impacts of climate change, varies on the basis of the socio-economic context, as well as the spatial and geographic conditions, along with the projected climate change impacts, which pose problems when looking at what fits into the overarching adaptation sphere.¹⁰ The barrier of context specificity also translates into barriers¹¹ in terms of political landscape, which influences the prioritization of adaptation action and in turn, the flow of finance.

The challenge for defining adaptation finance can also be understood from the regulatory and institutional landscape of the country. A weak governance landscape, due to limited resources, limited technical capacity or limited knowledge of adaptation options, and lack of accountability, acts as constraining factor to initiate adaptation interventions and mobilize the subsequent investments.¹² The issues with financing adaptation actions, especially by the private sector, primarily arises from a lack of perceived 'business case' for adaptation. This results in an imperfect capital market, that doesn't allow the efficient allocation of capital for adaptation projects.¹³ This is made worse by the high upfront costs of adaptation interventions with limited clarity on payback due to incomplete or asymmetric information, which hampers the process of making the required financial assessments. Additionally, the uncertain causality of investments made, lack of impact metrics, and confidentiality and reporting requirements, also play into the difficulty of tracking private sector adaptation finance.¹⁴

The issue of defining what constitutes finance for adaptation is important, especially under the United Nations Framework Convention on Climate Change (UNFCCC) process, in the context of the USD 100 billion that developed countries committed to mobilize by 2020, for climate mitigation and adaptation initiatives. To develop an understanding on this, a voluntary joint initiative with members of the Multilateral Development Banks' (MDBs) Climate Finance Tracking Working Group and the International Development Finance Club's (IDFC) Climate Finance Working Group, came up with the Common Principles for Climate Change Adaptation Finance Tracking in 2015, which have guided the adaptation related interventions by MDBs and several IDFC members.

10 Carvalho, A.P., & Terpstra, P. 2015. "Tracking Adaptation Finance- An Approach for Civil Society Organizations to Improve Accountability for Climate Change Adaptation" (Report). World Resources Institute (WRI) & Oxfam. Accessible at: <https://s3.amazonaws.com/oxfam-us/www/static/media/files/adaptation-finance-final-web.pdf>

11 Moser, S., Ekstrom, J., Kim, J., & Heitsch, S. 2019. "Adaptation finance archetypes: local governments' persistent challenges of funding adaptation to climate change and ways to overcome them" (Article). Ecology and Society, 24(2):28. Accessible at: <https://www.ecologyandsociety.org/vol24/iss2/art28/>

12 Micale, V., Tonkonogy, B., & Mazza, F. 2018. "Understanding and Increasing Finance for Climate Adaptation in Developing Countries". Climate Policy Initiative. Accessible at: https://www.weadapt.org/sites/weadapt.org/files/understanding-and-increasing-finance-for-climate-adaptation-in-developing-countries-1_0.pdf

13 UNEP. 2016. "Demystifying Adaptation Finance for the Private Sector" (Report). Accessible at: <https://www.unepfi.org/wordpress/wp-content/uploads/2016/11/DEMYSITIFYING-ADAPTATION-FINANCE-FOR-THE-PRIVATE-SECTOR-AW-FULL-REPORT.pdf>

14 International Institute of Sustainable Development (IISD). 2020. "Understanding Adaptation Finance as Investment in Equity" (Article). Accessible at: <https://sdg.iisd.org/commentary/policy-briefs/understanding-adaptation-finance-as-investment-in-equity/>

With this context, process-based approach, that encompasses the context specific nature of climate change adaptation and climate resilience, was understood as an appropriate method for adaptation-related interventions, and for consequently tracking and reporting adaptation finance.¹⁵

Understanding the context specificity of adaptation action and finance should translate into resilience building being targeted at reducing the vulnerability of different sectors, communities and regions, thus guiding the path of investment. Different aspects of resilience building can include investment in the health sector, reducing poverty, increasing food productivity and security through adaptation investment in agriculture, etc. Infrastructure systems play a pivotal role across these sectors and focus areas and thus is key in building society's resilience to the changing climate.

1.2 Climate Resilient Infrastructure

Infrastructure has been used by economists and governments from across the world, as a lever to drive economic growth and development. Infrastructure as a segment, is also central for mitigating future climate impacts, due to its long-lasting nature which results in possible 'lock-in' of GHG emissions, and exposure to climate impacts, for decades, especially for segments such as buildings, power plants, and transportation infrastructure. The construction phase of infrastructure development, including supply of materials, is another area of concern, as it can be a significant contributor of GHG emissions. Climate adaptation strategies for infrastructure are focused on building the resilience of infrastructure.

Resilience can be understood as *"the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions"*.¹⁶ Infrastructure's climate resilience is developed to address the direct impacts, to sudden shocks (disasters) or slow-onset impacts (climate change); the coping costs, to the direct adverse climate impacts; and indirect impacts, in terms of effects of depleting natural resources or environment degradation.¹⁷ Building infrastructure resilience will also help reduce the direct costs associated with climate damage, and the indirect costs of disruptions.

Thus, climate resilient infrastructure can be understood in terms of, reducing exposure and vulnerability of infrastructure assets to climate change and developing adaptive capacity to ensure better coping capability and quick recovery of infrastructure systems.

15 Multilateral Development Banks (MDBs) Climate Finance Tracking Working Group and International Development Finance Club (IDFC) Climate Finance Working Group. 2018. "Lessons learned from three years of Implementing the MDB-IDFC Common Principles for Climate Change Adaptation Finance Tracking" (Report). Accessible at: https://www.idfc.org/wp-content/uploads/2018/12/mdb_idfc_lessonslearned_execsum_web.pdf

16 <https://www.unisdr.org/we/inform/terminology#letter-c>

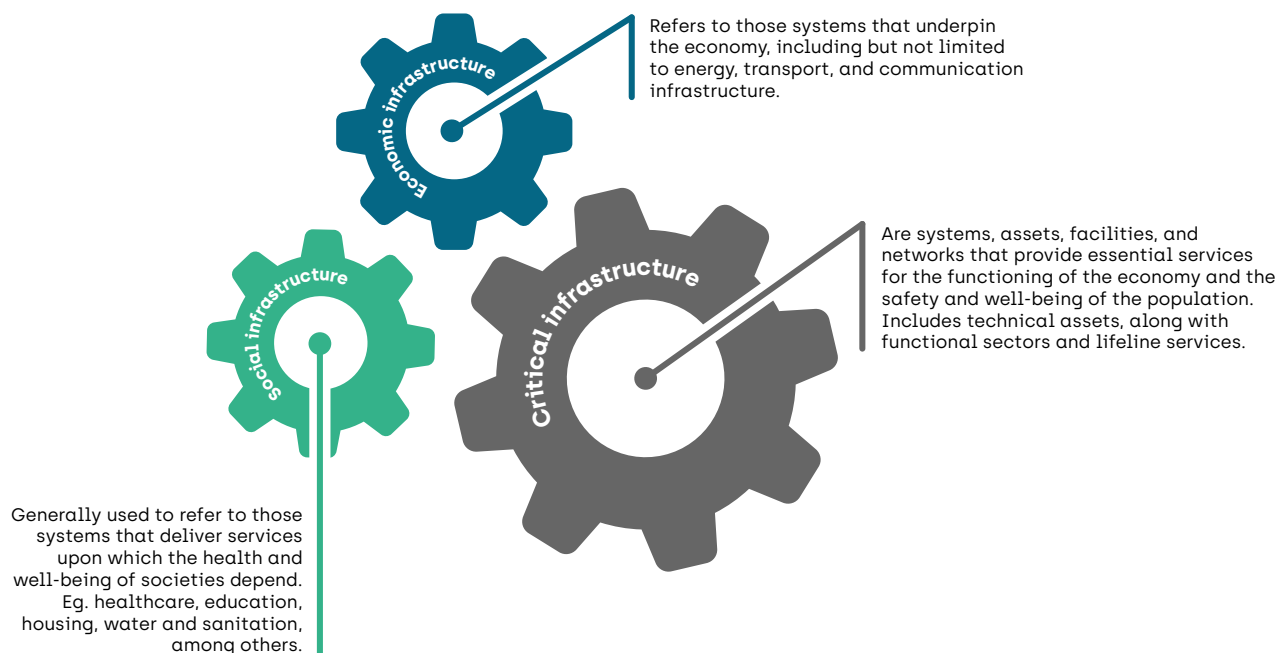
17 Hallegatte, Stéphane, Jun Rentschler, and Julie Rozenberg. 2019. *Lifelines: The Resilient Infrastructure Opportunity*. Sustainable Infrastructure Series. Washington, DC: World Bank. doi:10.1596/978-1-4648-1430-3.

Building the resilience of infrastructure using adaptive approaches, reduces the costs of building and integrating climate resilience into the larger economy, given the uncertainty around climate impacts. Building the adaptive capacity involves the infrastructure asset or system adjusting to hazards or coping with change, taking advantage of the new opportunities presented. It becomes important to understand what constitutes this infrastructure, and the adaptation approaches that may be required to encourage resilient infrastructure.

Infrastructure, as per its objectives, can be broadly categorized as Social and Economic infrastructure, with both having specific components which are further categorized as Critical infrastructure, depending on the context, and all these need to be made climate resilient for long-term socio-economic benefits. (See Fig. 1.1)

FIGURE 1.1

Types of Infrastructure where Climate Resilience can be Incorporated



Source: United Nations Environment Programme¹⁸; OECD¹⁹.

18 United Nations Environment Programme. 2021. International Good Practice Principles for Sustainable Infrastructure.

19 OECD. 2019. Good Governance for Critical Infrastructure Resilience, OECD Reviews of Risk Management Policies. OECD Publishing, Paris. Accessible at: <https://doi.org/10.1787/02f0e5a0-en>

Infrastructure under all the categories have hard infrastructure and soft infrastructure components.²⁰ Hard Infrastructure refers to “*physical structures or facilities that support the society and economy, such as transport (ports, roads and railways); energy (electricity generation, electrical grids, gas and oil pipelines); telecommunications (telephone and internet); and, basic utilities (water supply, hospitals and health clinics, schools, irrigation, etc.)*”, which is where the private investments in the sector are largely focused. While, soft Infrastructure refers to “*non-tangibles supporting the development and operation of hard infrastructure, such as policy, regulatory, and institutional frameworks; governance mechanisms; systems and procedures; social networks; and transparency and accountability of financing and procurement systems*”, and this largely falls under the public sector purview.

Infrastructure systems are developed interdependently, with feedback and feedforward paths. This can be especially seen through the ripple effects of disruptions, caused by climate change, felt over the larger infrastructure system. Infrastructure in many sectors is either directly affected through climate events – for instance in the water sector, agriculture sector, transport (roads) – or indirectly – in terms of financial system effects or effects on the health sector.²¹ Identifying critical infrastructure, like transport, water supply and sanitation, drainage, built environment, coastal infrastructure, waste, public works, etc., becomes important to understand the areas required for intervention in terms of building resilience.²²

BOX 1

Climate Resilient Infrastructure for Critical Sectors

Critical sectors that require adaptation actions to make existing or new infrastructure climate resilient are mainly water, energy, telecommunications, transport, urban development and built environment. Examples of the types of resilience building interventions required for these are as follows:

- › Adaptation in the infrastructure side of water sector includes assessing the existing constraints on water supplies, and build the resilience of water and sanitation services, drainage systems, dams, irrigation systems, and develop resilient infrastructure to natural hazards like floods.

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- 20 Bhattacharyay, B. N. 2009. Infrastructure Development for ASEAN Economic Integration. ADBI Working Paper 138. Tokyo: Asian Development Bank Institute. Accessible at: <http://www.adbi.org/working-paper/2009/05/27/3011.infrastructure.dev.asean.economic/>
- 21 Farhad, N., Garg, S., Huxley, R., & Pillay, K. “Understanding infrastructure interdependencies in cities” (Report). C40 Cities. Accessible at: https://c40-production-images.s3.amazonaws.com/researches/images/79_Understanding_infrastructure_interdependencies_in_cities.original.pdf?1574851306
- 22 United Nations Office for Disaster Risk Reduction (2009) Terminology on Disaster Risk Reduction. Accessible at: <https://www.unisdr.org/we/inform/terminology#letter-c>

- › Urban infrastructure resilience involves enabling built environment to endure and adapt to changing climate and extreme events, for example by identification of disasters risk, planning new infrastructure or maintaining and upgrading existing infrastructure, following new climate resilient guidelines and spatial planning. Integration of risk assessment or future climate parameters into the urban infrastructure- eg. flood risk assessment, developing solutions against urban heat island, or climate proof area development through vulnerability and adaptation potential analysis can also be to support resilient urban development.
- › Resilience of power systems, and the larger energy sector has also been growing area of concern, especially when looking at the rising natural disasters like cyclones, floods, heatwaves etc. Improving resilience of electricity distribution network, supporting adaptation in relation to renewable energy infrastructure of hydropower, or integrating adaptation measures into business strategies of energy infrastructure can be developed to make energy systems resilient.
- › For the transport sector, there is need of risk assessment to transport infrastructure- for instance, identifying flood risk, risk of infrastructure which is in close proximity to coastline, or risks associated with infrastructure elements like roads, bridges to hazards of flooding, landslides. Understanding these risks should translate into building the resilience through adaptive measures like revising road construction standards, reducing disaster risks by increasing preparedness through better design, asset management, maintenance practices, and contingency planning.

Given the context-specific nature of climate adaptation, different types of measures and activities can be used to achieve resilient infrastructure. These are broadly of two types:²³

- › **Structural adaptation measures:** The physical adaptation measures for infrastructure assets, for example, altering road surface composition so that climate extremes like high temperatures do not deform them, or building resilience against heavy rainfall by building seawalls or reducing runoff using permeable paving surfaces. This can also include a specific category of interventions – Nature-based Solutions (NbS). These are defined as “*actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits*”.²⁴

23 OECD. 2018. Climate-resilient Infrastructure: Policy Perspectives. OECD Environment Policy Paper No. 14. OECD Environment Directorate. Accessible at: <https://www.oecd.org/environment/cc/policy-perspectives-climate-resilient-infrastructure.pdf>

24 Environmental and Energy Study Institute. 2019. “Fact sheet- Nature as resilient infrastructure- An overview of nature-based Solutions”. Accessible at: <https://www.eesi.org/papers/view/fact-sheet-nature-as-resilient-infrastructure-an-overview-of-nature-based-solutions>

These include Ecosystem based Adaptation (EbA), which is a people- centric concept which *“links traditional biodiversity and ecosystem conservation approaches with sustainable socio-economic development as part of an overall strategy for helping people adapt to climate change.”*²⁵ EbA, using natural infrastructure to design adaptation measures, is a way of developing resilient infrastructure that can be considered alongside more conventional structural adaptation measures. EbA includes storm water management, green facades for buildings, coastal realignment, etc. Similar to the concept of NbS, are the concepts of green infrastructure or natural infrastructure.²⁶ Elements of natural infrastructure either incorporated into grey infrastructure or used to complement grey infrastructure, result in hybrid infrastructure, which are known to *“improve resilience to climate impacts, while also often resulting in environmental, economic, and social co-benefits”*.²⁷

- › **Non-structural adaptation measures:** The methods not using structural measures but adaptive management measures that allow enhancing the monitoring of existing assets allowing flexibility over its lifetime. For example, investing in early warning systems, or in readjusting the maintenance schedule of energy sector on grounds of changing patterns of energy demand and supply, or from a financial perspective, purchasing insurance to address climate variability.

From a global perspective, infrastructure resilience enhancing activities are key development interventions, and can be addressed under the Sendai Framework, The Paris Agreement on Climate Change and the 2030 Agenda for Sustainable Development Goals. Under all these frameworks, it is recognized that the state and public sector has to play the leading role in driving infrastructure resilience, with the aim of mitigating disaster risk and losses in lives and livelihoods. However, the private sector is expected to play a critical and increasing role for supporting these objectives, especially in the face of increasing climate related losses to industries and corporates.

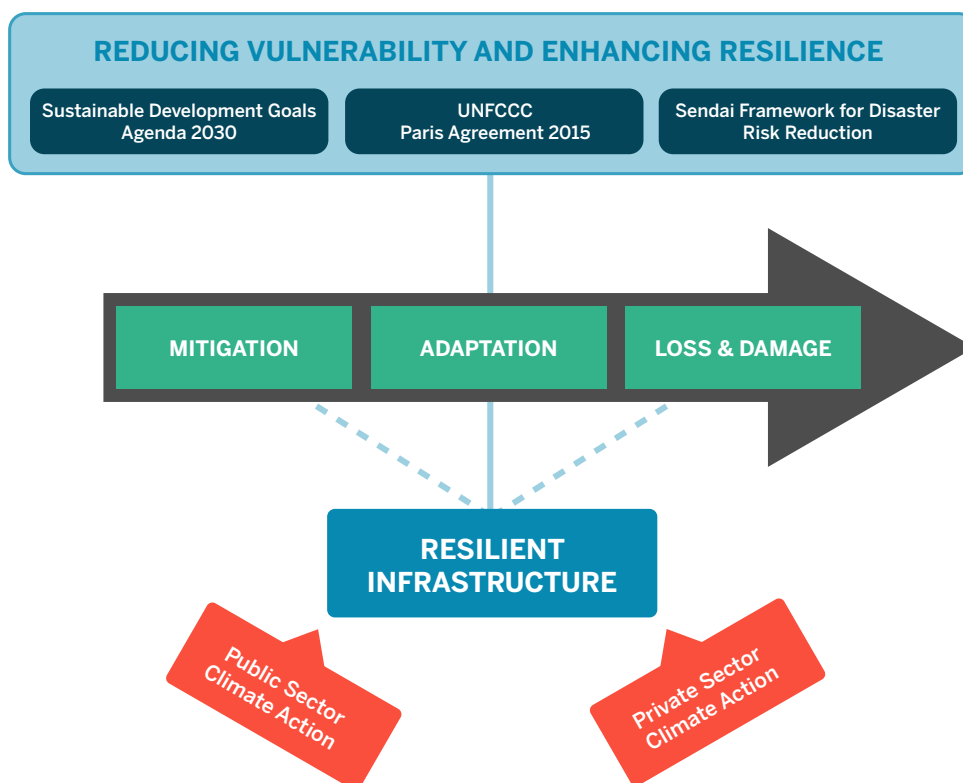
25 Ecosystem-based Adaptation. Accessible at: <https://www.adaptationcommunity.net/ecosystem-based-adaptation/>

26 Environmental and Energy Study Institute. 2019.

27 Environmental and Energy Study Institute. 2019.

FIGURE 1.2

Resilient Infrastructure in the International Discourse



1.3 Need of Private Sector for Developing Climate Resilient Infrastructure in India

Ensuring climate resilience is a critical action that has to be taken by all the stakeholders of the economy- governments, development organizations, financial institutes and the private sector, to build a sustainable future. Developing countries face challenges in terms of a limited resource availability, lack of financial capacity, limited access to financial resources, and competing uses for available finance, which makes investments for the long-run, based wholly on projections, difficult to 'sell'. This indicates to the need for involving the private sector to close the finance gap. The private sector can play a dual role in providing not only necessary finance and technical services for managing climate risk, but also in ensuring future investments prioritize climate resilience. With its greater financial capability, the private sector can better mobilize financial resources and technical capacity at the sectoral level, and boost the efforts of public interventions.

Greater private participation may also catalyze participation from civil society and communities, and further act as a catalyst for creating an enabling environment, increasing climate investments and reducing societal vulnerability to climate change.²⁸

It is important to keep in mind that private sector engagement for climate adaptation is most feasible when it is developed to complement public sector adaptation finance interventions, and not wholly substitute it. This also follows the UNFCCC negotiations, where developing countries have emphasized their preference of public grants, to be provided under the developed countries commitments, over private financing for adaptation activities. Globally, efforts for mobilizing private sector participation seems limited to large companies based out of developed markets, and do not touch on the activities of small or medium scale private enterprises based in developing countries, which has become a point of contention between developed and developing countries.²⁹ Regardless, it is important to recognize the potential role and necessity of private sector participation in adaptation, in this early stage of developing large-scale adaptation interventions, which most developing countries, including India, are in.

The urgent need for private sector intervention in building the climate resilience of critical sectors, is evident when assessing the observable impacts on business activities due to physical, transitional and liability risks of climate change. The risks can broadly be understood in terms of direct risks like disruption of supply chain, impacts on markets, reputation risks or indirect risks like increased competition for limited resources, regulatory risk or financial risk.³⁰ Adapting and building resilience in the infrastructure assets offers the private sector with longer-term climate risk mitigation opportunity, which can also provide a competitive advantage.

Investment in the infrastructure sector to build it sustainably and promote resilience especially becomes important in India, where this sector being a key focus area for the Government for spurring growth and development, especially for planning a recovery from the COVID pandemic, with plans to spend over a trillion dollars in the short term as per the National Infrastructure Pipeline. India's infrastructure needs spread across diverse sectors ranging from building of roads, highways and ports, power generation and dissemination, to enhancing social infrastructure for education, healthcare, water and sanitation, which have involved private participation to large extents in the previous years.³¹ Private sector participation in adaptation action is also important for adaptation services like early warning systems, agricultural products and water management

28 Global Center on Adaptation. 2021. "Adaptation Finance in the Context of Covid-19" (Report). Global Center on Adaptation and Climate Policy Initiative. Accessible at: <https://gca.org/wp-content/uploads/2021/01/GCA-Adaption-in-Finance-Report.pdf>

29 Pauw, P. W. 2014. "Not a panacea: Private- sector engagement in adaptation and adaptation finance in developing countries" (Article). Climate Policy, Vol. 15, Issue 5, pp. 583-603. Accessible at: <https://doi.org/10.1080/14693062.2014.953906>

30 UNEP. 2016. "Demystifying Adaptation Finance for the Private Sector" (Report). Accessible at: <https://www.unepfi.org/wordpress/wp-content/uploads/2016/11/DEMYSITIFYING-ADAPTATION-FINANCE-FOR-THE-PRIVATE-SECTOR-AW-FULL-REPORT.pdf>

31 Ministry of Finance. 2020. "National Infrastructure Pipeline". Government of India. Accessible at: https://dea.gov.in/sites/default/files/Report%20of%20the%20Task%20Force%20National%20Infrastructure%20Pipeline%20%28NIP%29%20-%20volume-ii_1.pdf

infrastructure.³²

Initiating greater private sector participation first requires defining who the private sector actors are and what their role is in the adaptation process. The private sector participation can be seen as a response to climate risks and hence investing in climate adaptation to reduce the physical risks of climate change and build resilience from an opportunity perspective. This financial opportunity, to invest in adaptation, can be understood from what role the private sector plays in the adaptation process.^{33, 34}

1. Provision of Adaptation Finance through Private Finance Institutions: Private financial institutions like banks and other lenders, institutional investors, and specialized vehicles like private equity and venture capital funds, form the supply side of private finance, using mechanisms for debt (bonds, loans), equity, (venture capital) or mezzanine financing
2. Provision of Adaptation Products and Services through Private Enterprises: Private enterprises, like Micro, Small and Medium Enterprises (MSMEs), large corporations or project sponsors (for example in infrastructure projects) constitute the demand side of adaptation finance from the private sector. They have the opportunity to invest in implementable adaptation and resilience building projects, and their demand for adaptation finance develops from the opportunity to reduce physical climate risk faced by their businesses with the aim of strengthening long-term business resilience.

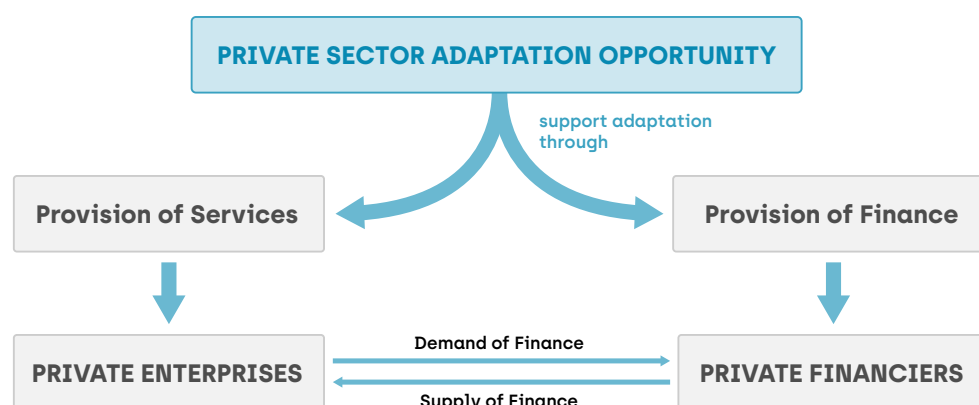
32 Miller, A. 2014. "Why we must engage the private sector in climate change adaptation efforts" (Blog). World Bank. Accessible at: <https://blogs.worldbank.org/climatechange/why-we-must-engage-private-sector-climate-change-adaptation-efforts>

33 Cochu, A., Hausotter., & Henzler, M. 2019. "The roles of the private sector in climate change adaptation- An Introduction". Adelphi. Accessible at: <https://www.adelphi.de/en/system/files/mediathek/bilder/EXPLAINER%20The%20roles%20of%20the%20private%20sector%20in%20climate%20change%20adaptation%20-%20adelphi.pdf>

34 UNEP. 2016. "Demystifying Adaptation Finance for the Private Sector" (Report). Accessible at: <https://www.unepfi.org/wordpress/wp-content/uploads/2016/11/DEMYSITIFYING-ADAPTATION-FINANCE-FOR-THE-PRIVATE-SECTOR-AW-FULL-REPORT.pdf>

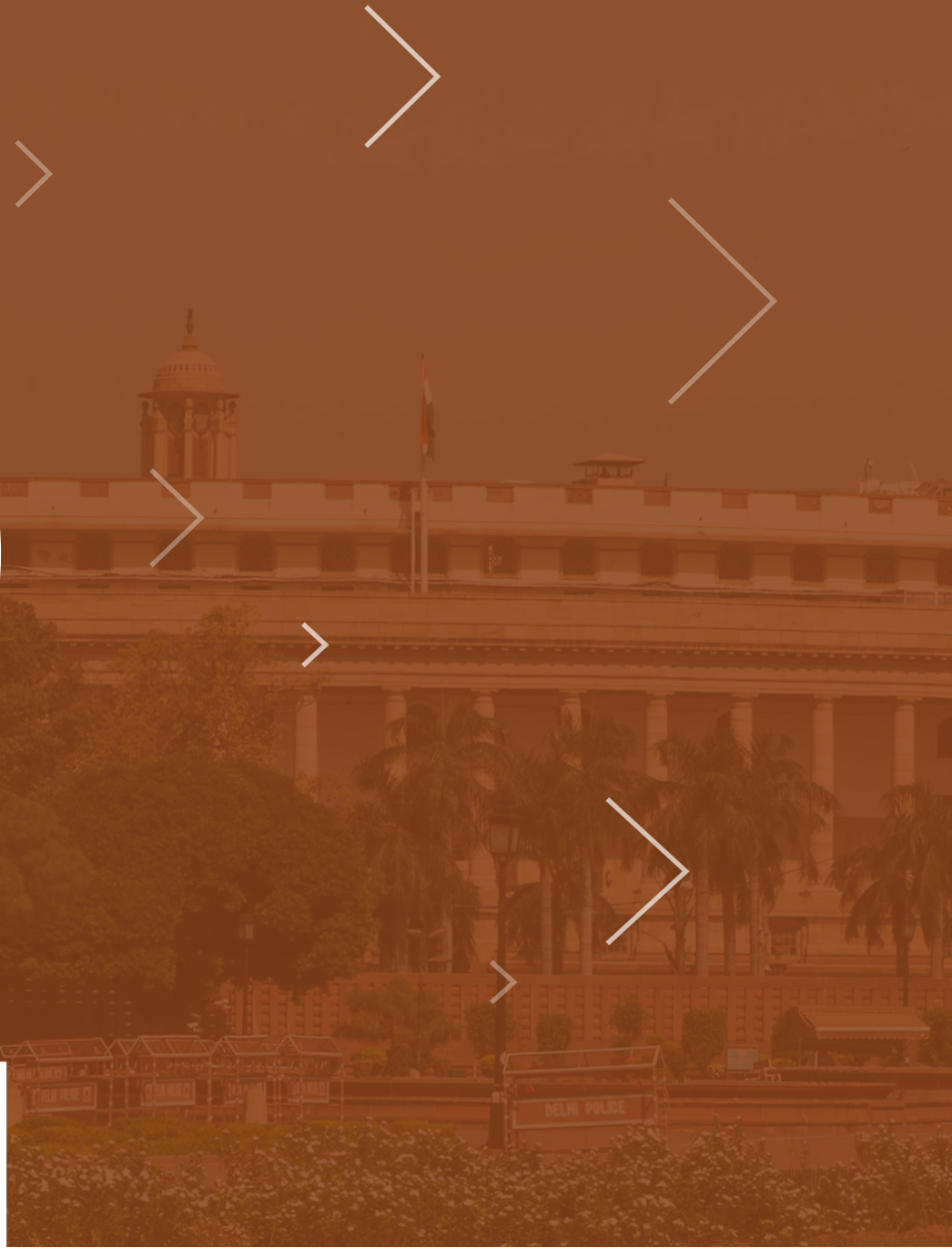
FIGURE 1.3

Adaptation Finance Opportunity for Private Sector



To reiterate, the infrastructure being constructed today, has an intended lifetime of decades or even centuries, making it critical to take into account climate considerations, so that lock-in of high emission generation, as well as buildings that are not resilient to future climate impacts, can be avoided. This is essential as a public service, for example while planning new housing developments, bridges, underpasses or power stations, as well as for private gains in the form of avoided infrastructure damage and operational disruptions. However, the private sector participation in building the climate resilience of the infrastructure sectors, needs to be stimulated and effectively leveraged by public sector support and drivers. To achieve this, the policy landscape of a country plays a key role and helps define how projects are designed and investments are directed for resilient infrastructure. In the next chapter, we explore the Indian policy landscape and its impact on resilient infrastructure.

With the context of the study provided in this chapter, in the next chapter we analyze the policy and regulatory landscape in India, with the objective of understanding whether development of climate resilient infrastructure receives policy support or a regulatory push. To further understand the background for this issue, in the third chapter we will assess the finance available for financing climate resilient infrastructure, focusing on climate and adaptation finance, with an aim of identifying the financing gap. In the fourth chapter, we will assess the key barriers and challenges faced by the private sector for effectively participating in the development of resilient infrastructure. Next, in chapter five, we explore some good practices from across the world, where public and development sector measures have been successful in either mobilizing the private sector for climate interventions and adaptation investments, or for supporting the development of resilient infrastructure. Finally, in the last chapter, we build on the key insights and learnings gathered, to recommend priority actions across focused categories for supporting and developing an enabling environment for mobilizing the private sector for investing in climate resilient infrastructure.



CHAPTER TWO —————>

Governance Landscape for Resilient Infrastructure

There is a growing need to build community-level climate resilience in developing countries. India has recognized the importance of climate adaptation and resilience building in its Nationally Determined Contribution (NDC) framed in 2015. Largely, the adaptation objectives, under India's NDC are designed to "...better adapt to climate change by enhancing investments in development programs in sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan region, coastal regions, health and disaster management". This allows a broad range of public development programs to incorporate climate actions and align them with sub-national and national budgets and investment plans.

Since then, India has furthered its climate adaptation ambitions and actions, especially focusing on the need to develop resilient infrastructure. In 2016, India released its National Disaster Management Plan, aligned with the Sendai framework and with an emphasis on its objective of "...investing in disaster resilient infrastructure and committing to improved disaster preparedness and building back better in recovery." In 2019, India launched the Coalition for Disaster Resilient Infrastructure (CDRI), an international coalition of countries, development organizations and the private sector, aligned with the UN objectives of supporting developing countries in covering their infrastructure deficit and building climate resilience.

India does not have a specific policy aimed at climate adaptation, as it intends to address climate adaptation by enhancing its overall climate policy framework. Institutional arrangements around climate interventions at the sub-national level in the country are mostly on the basis of the national programmes and missions and their governance structures. This has potential to ensure that development action and investments also translate into reducing underlying climate vulnerabilities in the sectors being targeted, which also ensure better adaptation measures, and better resource efficiency.³⁵

Under the Paris Agreement, national level adaptation processes are expected to be reported by all countries, where 72% of the countries have adopted at least one national-level planning instrument, as per the Adaptation Gap Report 2020. In India, the National Action Plan on Climate Change, is that instrument, which recognizes both climate adaptation and mitigation, and is developed as a relevant adaptation planning instrument.

35 Schipper, L. 2007. "Climate change adaptation and development: Exploring the linkages" (Article). Tyndall Centre for Climate Change Research. Tyndall Centre Working Paper No.107. Accessible: https://www.researchgate.net/publication/228391167_Climate_change_adaptation_and_development_Exploring_the_linkages

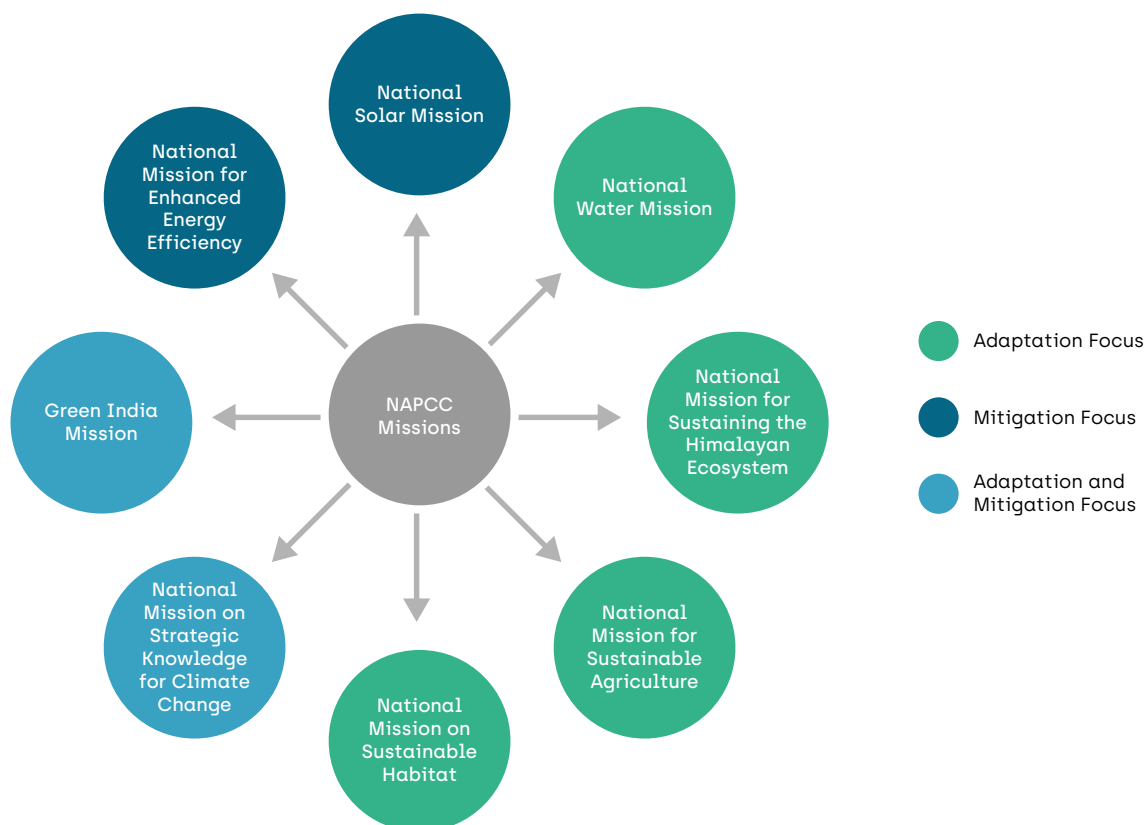
2.1 National Action Plan on Climate Change (NAPCC) and Resilient Infrastructure

The NAPCC, prepared in 2008, is the overarching umbrella under which India's climate actions are framed. The NAPCC was designed as a comprehensive policy action to tackle climate change through adaptation and mitigation measures. It was developed on the principle of sustainable development, with the focus on different sectors, broadly under eight National Missions at present, in the areas of solar energy, energy efficiency, water, agriculture, Himalayan ecosystem, sustainable habitat, green India and strategic knowledge on climate change.

The eight missions under the NAPCC have been developed with both mitigation and adaptation goals (Fig. 2.1), covering a variety of sectors, directly or indirectly, integrating them in the development planning process. Though not directly linked to resilient infrastructure, most of the missions have infrastructure components in them related to the sector the mission is focused on, especially around the critical infrastructure needs.

FIGURE 2.1

National Missions under NAPCC



These missions, however, fail to fully articulate and specify how infrastructure resilience in the sectors under focus can be achieved and do not integrate infrastructure resilience ideas in these missions.

The scope for resilient infrastructure under these National Missions is most articulated under the adaptation focused missions of National Mission for Sustainable Agriculture (NMSA) and National Mission for Sustainable Habitat (NMSH). Infrastructure, in general, is an important focal point in the NMSA, with the objective of creating enabling infrastructure to enhance the resilience of the agriculture sector, with solutions such as cold-chains, warehousing, market connectivity and transport, along with water efficient irrigation systems (which is also a key aspect under the National Water Mission), soil preservation nature-based solutions, etc. Similarly, the NMSH which specifically looks at the built environment side of infrastructure, promotes improved ability of urban habitats to adapt to climate change by improving resilience of infrastructure in the areas of buildings, city development and public services, and mobility. The National Mission on Sustaining Himalayan Ecosystem (NMSHE) looks at climate related physical risks and disasters and directs building critical infrastructure which is able to withstand natural disasters, and has scope for including nature based solutions for this objective.

The mitigation focused missions, National Solar Mission (NSM) and National Mission for Enhanced Energy Efficiency (NMEEE) also have the scope for being indirectly relevant resilient infrastructure, as both the missions aim at ensuring long-term resilience of energy systems and its related infrastructure. This also provides the opportunity to strengthen the resilience of vulnerable communities by providing required infrastructure for off-grid/ decentralized energy solutions, which are critical, especially during natural disasters.

Developed as a roadmap for climate action in the country, the NAPCC follows a top-down approach of guiding sub-national climate actions under priority national plan components. After the NAPCC was introduced, in 2009 Indian states and union territories (UTs) were encouraged to prepare their State Action Plans on Climate Change (SAPCC), in line with the basic framework of the NAPCC. Due to the wide geographic and socio-economic differences in India, SAPCCs brought in the sub-national perspectives and recognized specific regional vulnerabilities and consequently the development of adaptation actions for addressing these. The implementation plans and targets laid out in the SAPCCs are funded by national and state government budgets and designated national funds, as well as programmatic and project funding by different international organizations.

2.2 National Programmes that Enable Resilient Infrastructure for Development

Developing resilient infrastructure also forms an integral part of many development related objectives and works towards the achievement of Sustainable Development Goals (SDGs), due to infrastructure's cross cutting relevance to all sectors. There are interlinkages between infrastructure systems, sectors, regional locations, as well as economic, social and environmental aspects of sustainability. Institutions and governance mechanisms also support interlinking various SDGs with different policies, at national or sub-national levels. NITI Aayog has developed the SDG India Index³⁶, which shows that at the macro-country level, many development policies and programs are aligned around different sector specific SDGs.

With regard to assessing adaptation finance in India, the Department of Economic Affairs, Ministry of Finance, estimated and aggregated the programme costs of different policies that contribute to the achievement of various SDG goals. An analysis of the expenditure on various such schemes showed an estimate of INR 660,372.03 crore (~ USD 88.7 billion)³⁷, i.e., ~3.86% of GDP, for 2017-18.³⁸ This assessment also estimated an expenditure of INR 326,393.56 crore (~ USD 43.8 billion) or 1.9% of GDP for selected SDGs which contribute to improving resilience.

The NITI Aayog has developed an SDG Index & Dashboard, that relates the different schemes, policies and programs of the country, with SDG implementation.³⁹ When looking specifically at resilient infrastructure, SDG 9 which focuses on 'Industry, Innovation and Infrastructure' and SDG 11 which looks at 'Sustainable Cities and Communities', are the most directly relevant.

SDG 9 - Industry, Innovation and Infrastructure: As assessed under the SDG India Index & Dashboard 2019-20, India has addressed the component on infrastructure, under SDG 9 through construction of National Highways/roads (increasing from 4,410 km in 2014-15 to 10,824 km in 2018-19), growth of cargo handling capacity of 12 major ports (by 84% from 2014-15 to 2018-19) and investment of ~USD 90 billion for the infrastructure project on India's industrial corridor. India has also aimed to increase the public investment to boost infrastructure creation, where the Union Budget for 2019-20 announced INR 70,000 crores (~USD 9 billion) capital in public sector banks to boost credit growth in the economy.⁴⁰

36 NITI Aayog. 2020. "SDG India Index & Dashboard 2019-20" (Report). Accessible: <http://www.niti.gov.in/sites/default/files/2020-07/SDG-India-Index-2.0.pdf>

37 Using the exchange rate of 1 USD= 74 INR, as being the closest rate prevailing at the time of publication.

38 Department of Economic Affairs. 2020. "Report of the Sub-Committee for the Assessment of the Financial Requirements for Implementing India's Nationally Determined Contribution (NDC)" (Report). Ministry of Finance, Government of India. Accessible: <https://www.dea.gov.in/sites/default/files/Sub%20Committee%20Report%20Final.pdf>

39 NITI Aayog. Reports on SDG. Accessible: <http://www.niti.gov.in/reports-sdg>

40 NITI Aayog. 2020. "SDG India Index & Dashboard 2019-20" (Report). Accessible: <http://www.niti.gov.in/sites/default/files/2020-07/SDG-India-Index-2.0.pdf>

SDG 11 - Sustainable Cities and Communities: The major objective of this SDG is “to make cities inclusive, safe, resilient and sustainable”. The large-scale urbanization in the country highlights the need of access to proper infrastructure, and reducing vulnerability to disasters, pollution and other risks have become a growing concern. The cities need better resources management systems to be developed, to improve the adaptive capacity of vulnerable populations in these cities. In India, this is being aimed at through schemes like Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Pradhan Mantri Awas Yojana- Housing for all in urban areas, the Faster Adoption and manufacturing of Hybrid and Electric Vehicles (FAME-II) Scheme and the Smart Cities Mission (SCM).⁴¹

BOX 2

Examples of SDG Target Indicators and the Relevant Indian Programmes

SDG Global Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans-border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all

Indian Indicator: This target is in line with the national scheme Pradhan Mantri Gram Sadak Yojana (PMGSY), that is aimed at providing access to all-weather roads to all eligible unconnected habitations in the country. By 2019, an estimated 70% of targeted habitations were connected by all-weather roads under this scheme.

SDG Global Target 11.1: Ensuring access for all to adequate, safe and affordable housing and basic services and upgrade slums, by 2030.

Indian Indicator: The progress of this target can be assessed through the indicator of Pradhan Mantri Awas Yojana (PMAY), whereas of 2019, 31.01% houses have been completed under this scheme (as against the total number of houses sanctioned for construction).

Source: NITI Aayog. 2019. SDG India Index and Dashboard 2019-20.

While most existing development policies and programmes do not have an explicit focus on integrating climate resilient infrastructure for the economy, they do consider the service delivery of better infrastructure for the society, with some components of resilience integrated into them. In the table below, the key national programmes, which already include a resilient infrastructure focus, or can be leveraged to develop this, are listed.

41 NITI Aayog. 2020.

TABLE 2.1

Key National Programmes Relevant for Climate Resilient Infrastructure

NATIONAL PROGRAMS SUPPORTING RESILIENT INFRASTRUCTURE			
AREA OF FOCUS	KEY POLICY/ SCHEME/ PROGRAMME	NODAL MINISTRY	RELEVANCE FOR RESILIENT INFRASTRUCTURE
Urban Development	Pradhan Mantri Awas Yojana (Affordable Housing scheme)	Ministry of Housing and Urban Affairs	Increasing demand for urban housing infrastructure can be built by integrating a green-lens. Under this program, a Technology Sub-Mission has been especially set up to facilitate adoption of modern, innovative and green technologies and building material. The Technology Innovation Grant (TIG), has also been developed to ensure disaster resilient, sustainable and resource efficient construction. It also provides support for slum re-development to improve their resilience.
	Atal Mission for Rejuvenation and Urban Transformation (AMRUT)	Ministry of Housing and Urban Affairs	The components of the mission consist of capacity building, reform implementation, water supply, sewerage and seepage management, storm water drainage, urban transport and development of green spaces and parks, which all have relevance for resilient infrastructure. For instance, the component of storm water drainage aims at construction and improvement of drains and storms water drains in order to reduce and eliminate flooding, further improving resilience.
	Smart City Mission	Ministry of Housing and Urban Affairs	Urban renewal and retrofitting program to develop sustainable and inclusive cities that provides core infrastructure, and enables a clean and sustainable urban environment.
Rural Development	Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)	Ministry of Rural Development	In addition to guaranteeing livelihoods to the rural population, the Act helps provide basic employment by building infrastructure for vulnerable sectors (like agriculture and water) in rural areas, to minimize future climate uncertainties. Some of these works includes building water and soil conservation infrastructure- such as check dams, ponds and trenches- for individual and community natural resource management; building roads, footpaths, sanitation infrastructure and community buildings; etc.
Mobility/ Connectivity	Pradhan Mantri Gram Sadak Yojana (Road Connectivity for Rural India)	Ministry of Rural Development	Building all-weather, sustainable and resilient road infrastructure to provide connectivity for unconnected villages and equitable access to all.
	Green Highways (Plantation, Transplantation, Beautification & maintenance) Policy, 2015	Ministry of Road Transport and Highways	To reduce the impact of air pollution and dust by planting trees and shrubs along the National Highways. Trees as carbon sinks, also contribute to the NDC of carbon sequestration; and arrest soil erosion at embankments and slopes due to increasing rainfall and floods.

NATIONAL PROGRAMS SUPPORTING RESILIENT INFRASTRUCTURE

AREA OF FOCUS	KEY POLICY/ SCHEME/ PROGRAMME	NODAL MINISTRY	RELEVANCE FOR RESILIENT INFRASTRUCTURE
Water and Agriculture Sectors	Pradhan Mantri Krishi Sinchai Yojana (Irrigation scheme)	Ministry of Agriculture	Aimed at development of irrigation sources for providing a permanent solution from drought. The key initiative will mainly undertake rain water conservation, construction of farm pond, water harvesting structures, small check dams and contour bunding etc.
Health	Swachh Bharat Mission	Ministry of Housing and Urban Affairs (for Urban areas) and Ministry of Drinking Water and Sanitation (for Rural areas)	Climate risk management for sanitation infrastructure and promoting cleanliness and sanitation, which also supports adaptation through a health perspective.
Disaster Resilience	National Policy on Disaster Management	Ministry of Home Affairs	Preparedness driven approach for disaster management instead of relief centric strategy, aligned with the Sendai Framework requirements. Also aims at ensuring disaster resilient construction of buildings and infrastructure.

Source: Various Government of India Ministry websites; Soanes, M, Kaur, N, Venkataramani, V, Shakya, C and Kaur, D (2019) Financing a climate-resilient MGNREGS. IIED Working Paper, IIED, London.

2.3 Regulatory Directions with potential for enabling Resilient Infrastructure

Infrastructure development in India follows a decentralized method of regulation, with a wide range of national level laws, policies and programs overseeing infrastructural growth in the country. The central government has power to legislate infrastructure development in sectors like transport (railways, national highways, major ports, airports), telecommunications, energy grid, etc. The states also have a role to play and legislate on issues which are not under the Centre's jurisdiction, including bridges, ferries, water works, drainage and embankments, water storage, hydropower, land rights, tenures and town planning. These have bearing on resilient infrastructure development at the ground level. Regarding the planning and enforcement at the sub-national level, local bodies like village administrations, municipal corporations, have authority and are responsible for developing plans and implementation.⁴² This results in a complex and multi-layered approach to infrastructure development.

⁴² Sapatnekar, S., Patnaik, I., & Kishore, K. 2018. "Regulating Infrastructure Development in India" (Working Paper). NIPFP Working paper series, Working paper no. 230. Accessible: https://macrofinance.nipfp.org.in/PDF/PatnaikSapatnekarKishore-regulating_infrastructure_development_in_india.pdf

The hierarchical structure of governance in India and infrastructure's cross-sectoral nature, makes assessing the climate related enforcement and implementation of infrastructure specific policies difficult. Nonetheless, many central government initiatives can be assessed, which have direct relation to infrastructure sector, at the overall national level. However, the existing guidelines and regulations are currently lacking in terms of integrating resilience into infrastructure development, but have the scope to be strengthened further.

- › **Model Building Bye Laws, 2016:** Legal rules to regulate architectural design and construction aspects of buildings, to help protect from hazards like fires, earthquakes, structural failures, etc. were framed by Ministry of Housing and Urban Affairs (MoHUA). The rules also take an environmental and climate perspective, by covering environmental clearances and land, air, noise, water pollution, low emissions energy systems, biological/ solid/ and other waste management. They also encourage, but not enforce, green buildings and sustainability provisions and norms such as rainwater harvesting, wastewater reuse and recycle and installation of solar roof top PV.
- › **Coastal Regulation Zone (CRZ) Notification, 2019:** Under the aegis of the Ministry of Environment, Forest and Climate Change (MoEFCC), the regulations were designed with the objective of promoting sustainable development, on basis of scientific principles, recognizing natural hazards and increasing sea level. This includes the development of hazard line specification, as a tool for disaster management plan for coastal environment, including planning of adaptive and mitigation measures.
- › **National Disaster Management Guidelines (NDMG):** The National Disaster Management Authority framed NDMGs, developed for different natural and man-made disasters, formulate guidelines for preparations of plans to reduce risk, minimize impact on lives and damage to infrastructure. It also provides guidelines for ensuring disaster resilient construction of infrastructure.

Besides these broad infrastructure regulations, almost all key sectors – such as telecom, ports, airports, energy, etc. – have their own specific infrastructure related regulations, which also include environmental aspects, but do not strategically focus on promoting climate resilient infrastructure as of now.

2.4 Green Fiscal Regulations

The monetary and fiscal regulatory landscape in the country helps define the working of the financial sector. This especially becomes important when looking at mobilizing finance for addressing climate change. There is a need to assess this policy framework in the country that is responsible for creating the base guidelines and incentives, guiding the movement of both public and private financial sector to a more green, sustainable and resilient working.

India aims to green the financial system to enable the transition to a more sustainable economy by including climate aspects in the working of the financial sector. At the international level many initiatives like Task Force on Climate-related Financial Disclosures (TCFD), Carbon Disclosure Project (CDP), Global Investor Coalition on Climate Change/Institutional Investor's Statement on Climate Change, United Nations Principles for Responsible Investment (PRI), The Equator Principles and The Portfolio De-Carbonization Initiative (PDC), have been developed to offer guidance to adopt climate friendly practices, in form of recommendations on incorporating climate risk mainstreaming decisions and climate risk disclosure, into the financial space of public and private organizations.⁴³ India has also been increasingly involved in international discussions and initiatives like the Network for Greening the Financial System (NGFS), which was joined by the country's central bank Reserve Bank of India (RBI) in April 2021, allowing for development of climate risk management in the financial sector.⁴⁴

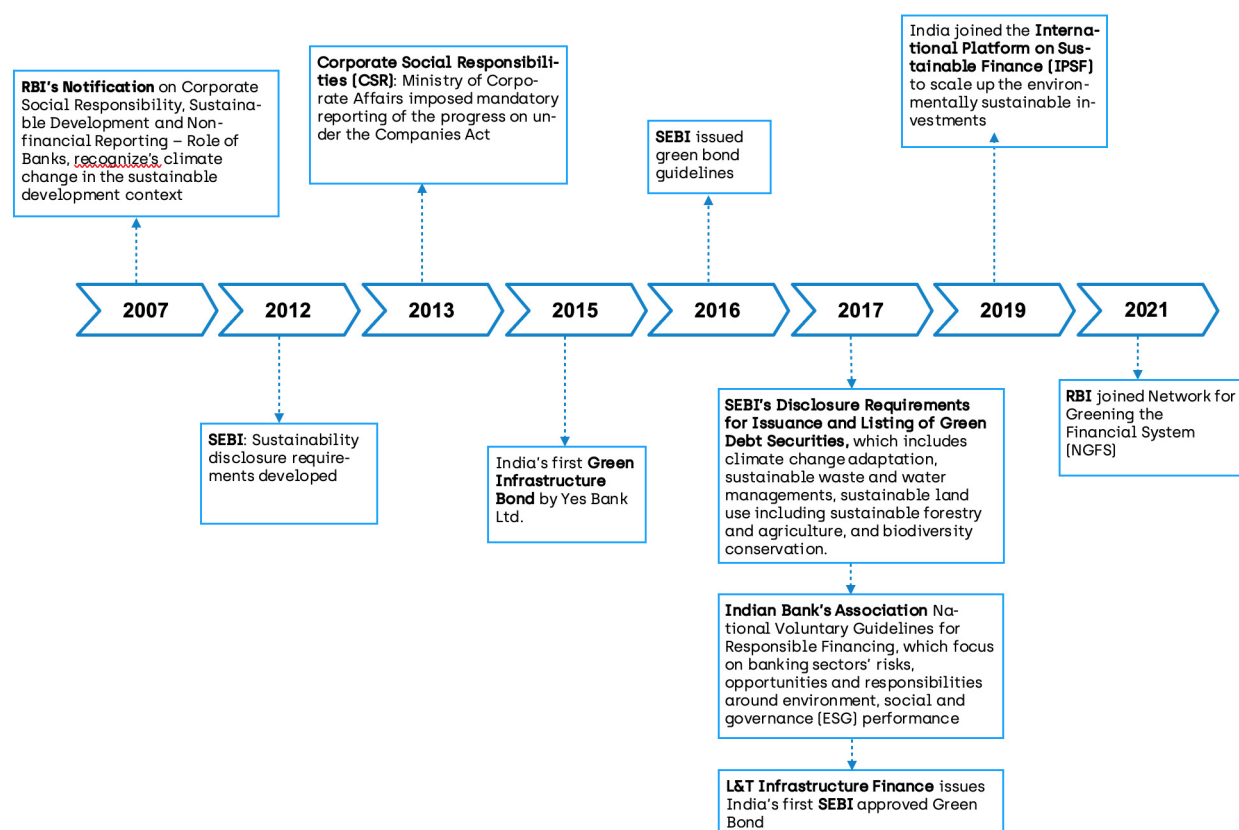
India has been developing public policies related to green finance as long back as 2007. However, India's green financial measures are being developed mostly from the mitigation perspective for renewable energy, energy efficient buildings, etc. Financial measures focused on adaptation are still not prioritized. Additionally, the uptake of internationally recommended measures is still slow. For example, globally climate related risk management is increasingly being looked at through regulatory disclosures like climate stress testing, which assist financial institutions to assess the potential impact of climate events on investment outcomes.⁴⁵ India, however, has still not developed these.

India's green bond market, has also been seeing growth in the past years, with it being the second largest issuer (after China), among emerging markets.⁴⁶ Green bonds in India have been used again to mostly finance mitigation focused projects like renewables, energy efficient buildings and large scale transport infrastructure.⁴⁷ Adaptation and resilience bonds can be developed as an asset class in India, where institutions like NABARD for Zero Budget Natural Farming Project, run by Government of Andhra Pradesh, have assessed the possibility of developing resilience bond. The possibility of financing the infrastructure sector from a climate adaptation perspective, through green resilience bonds, still needs to be assessed.

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- 43 Shakti Sustainable Energy Foundation & Intelicap. 2020. "Climate Risk Mainstreaming Approaches for Indian Financial Institutions: Landscape Study for Investment Portfolios in India" (Report). Accessible at: https://shaktifoundation.in/wp-content/uploads/2020/09/CLIMATE_RISK_MAINSTREAMING_APPROACHES_FOR_INDIAN_FINANCIAL_INSTITUTIONS.pdf
 - 44 Reserve bank of India. 2021. "RBI joins Network for Greening the Financial System" (Press Release). Accessible at: https://www.rbi.org.in/Scripts/BS_PressReleaseDisplay.aspx?prid=51496
 - 45 Lunsford, D., & Verbraken, T. 2021. Stress Testing Climate-Change Scenarios" (Blog Post). MSCI. Accessible: <https://www.msci.com/www/blog-posts/stress-testing-climate-change/02296396936>
 - 46 Amundi Asset Management and International Finance Corporation. 2021. "Emerging Market Green Bonds Report 2020- On the Road to Green Recovery" (Report). Accessible: <https://www.ifc.org/wps/wcm/connect/0fab2dcd-25c9-48cd-b9a8-d6cc4901066e/IFC+Amundi+Emerging+Market+Green+Bonds+Report+2020+%2816April21%29.pdf?MOD=AJPERES&CVID=nzGuFTM>
 - 47 Kuman, N., Vaze, P., & Kidney, S. 2019. "Moving from Growth to Development: Financing Green Investment in India, in Financing Green Transitions, ed. Samir Saran" (Book). Observer Research Foundation. Accessible: https://www.orfonline.org/wp-content/uploads/2019/01/ORF_Monograph_Financing-Green-N1.pdf

FIGURE 2.2

Green Fiscal Regulatory Timeline



Fiscal regulations and norms for financing climate resilient infrastructure is a gap area. Some fiscal measures have been developed for the infrastructure sector, which can be further expanded to cover resilience in the sector as well.

- › Credit Enhancement Scheme, as developed by India Infrastructure Finance Corporation Limited (IIFCL). The scheme has been developed for funding viable infrastructure projects with project bond tenors above five years, with support being provided to renewable energy infrastructure projects. It enables reduction of their costs of debt by refinancing through bonds.⁴⁸

48 Jain, S. 2020. "Financing India's Green Transition" (Issue Brief). Observer Research Foundation (ORF), Issue No. 338. Accessible: https://www.orfonline.org/wp-content/uploads/2020/01/ORF_IssueBrief_338_FinancingGreenTransition_NEW27Jan.pdf

- › Viability Gap Funding (VGF) has been developed for the infrastructure sector, providing Public Private Partnership (PPP) infrastructure projects commercial viability. The scheme has also been developed to have a wider inclusion for social sectors like waste water treatment, water supply, solid waste management, health and education.⁴⁹ Though the scope of the scheme has evolved over time, it's scope for resilient infrastructure is still very limited.

Development Finance Institutions (DFIs) have also been a significant source of finance for development focused sector in the country, with growing involvement in the climate sector, through renewable energy or energy efficiency projects and programmes. DFIs in India have been developed as government supported, but legally independent financial institutions, with explicit objectives to promote the public development agenda and policies of the country. DFIs were developed as policy instruments with the aim of fixing market failures, incubating markets, promoting structural transformation,⁵⁰ with the capability to catalyze investment in private sector. The main advantage of DFIs is their working on the principle of combining profit making objective with developmental objectives of the country, and working on public policy mandate, which provides the option of long term financing and leveraging various financial instruments for sustainable economic growth. However, over time their ability to finance development has been seen to be severely limited, due to increasing non-performing assets and weakening of the financial situation. Additionally, DFIs are largely dependent on the governance structure in the country, which needs to be strengthened.

The evolving climate change scenario in the development perspective of the economy also points out to how DFI funding is being developed to include the same. However, a lack of green finance from DFIs has been observed, where only ~7% of INR 24.9 thousand crore (~USD 3 billion) (between 2016 and 2018) was sourced from DFIs, mainly to power and transportation sectors.⁵¹ The gap in green financing through DFIs can also be attributed to a weak governance landscape, and lack of targeted project development support leading to weak financial pipeline to render support to green projects. Over the past few years, it has been observed how DFIs have the potential to leverage private finance for priority climate actions. DFIs like Small Industries Development Bank of India (SIDBI), Indian Renewable Energy Development Agency (IREDA), Power Finance Corporation (PFC), etc., have been successful in delivering climate mitigation finance, and adaption finance has been delivered through National Bank for Agriculture and Rural Development (NABARD), as the Adaptation Fund National Implementing Entity (NIE). However, the scope of this financing has still been seen to be limited in scale and volume.⁵²

49 Ministry of Finance. 2020. "Cabinet approves Continuation and revamping of the Scheme for Financial Support to Public Private Partnerships in Infrastructure Viability Gap Funding (VGF) Scheme" (Press Release). Press Bureau of India (PBI), Government of India. Accessible: <https://pib.gov.in/PressReleasePage.aspx?PRID=1671914>

50 RBI. 2004. "Report of the Working Group on development Financial Institutions" (Report). Department of Banking Supervision Financial Institutions Division, RBI. Accessible: <https://rbidocs.rbi.org.in/rdocs/PublicationReport/Pdfs/53674.pdf>

51 Sinha, J., Jain, S., & Padmanabhi, R. 2020. "Landscape of Green Finance in India" (Report). Climate Policy Initiative. <https://www.climatepolicyinitiative.org/wp-content/uploads/2020/09/Landscape-of-Green-Finance-in-India-1-2.pdf>

52 Steinbach, D., Varma, A., Madan, P., Pandey, A., Khanna, P. & Nakhooda, S. 2014. "Enhancing India's readiness to access and deliver international climate finance" (Report). Shakti Sustainable Energy Foundation & Ricardo-AEA. Accessible: <https://shaktifoundation.in/wp-content/uploads/2014/10/India-Climate-Finance-Readiness-FINAL-30914.pdf>

2.5 Gaps in the Existing Policy Landscape for Resilient Infrastructure

India's policies for resilient infrastructure can at best be said to be directional in nature, and not strategic, with a few specific sectoral policies including the mention of the need to develop resilient infrastructure, but not putting a focused plan, including regulations or investment plans for enforcing this goal.

In the past year, India faced several extreme weather events leading to a cumulative economic damage of over USD 10 billion, which has also reiterated the necessity of making new infrastructure resilient. Currently, the Government of India spends around 4-5% of GDP on infrastructure investment annually. Over the past decade, a spending of over USD 1 trillion on infrastructure was directed at increasing investment in manufacturing and development in sectors such as transport, power and urban and rural infrastructure.^{53, 54} As per the India Policy Review by IEA and NITI Aayog, India has a very large infrastructure deficit. It is estimated that India would need to spend USD 200 billion (7-8% of GDP) on infrastructure annually and about USD 5 trillion in total between 2020 and 2030 (at current exchange rates) in order to meet this deficit.⁵⁵

As seen in section 2.2, many Indian development policies and programmes are focused on driving economic growth and supporting the vulnerable sections of its society through infrastructure interventions. This creates a large demand for new infrastructure, which should ideally be planned taking a climate lens to avoid high emission lock-ins and enhancing resilience to withstand future impact of climate change. However, the existing policies and plans, fail to make resilience a central component of infrastructure development. India's infrastructure policies have been developed with a more mitigation perspective, with increasing focus on disaster management, not focusing specifically on helping infrastructure adapt or become resilient to changing climate. The current policy landscape has gaps, which act as barriers for enabling this:

Infrastructure not a focus area for public climate interventions

At present, the adaptation and resilience focused policy actions fail to specifically target the infrastructure sector (like transport infrastructure in terms of roads, bridges, ports or buildings, or energy infrastructure).

53 Some schemes and other initiatives include Skill India, Digital India and Make in India and Start-up India initiative. The aim was to encourage entrepreneurship and job creation, boosting the agricultural sector with a focus on micro irrigation, watershed development, soil conservation and credit, and various measures to improve clarity and transparency in economic policy-making.

54 International Energy Agency. 2020. "India 2020 Energy Policy Review" (Report). Accessible: https://niti.gov.in/sites/default/files/2020-01/IEA-India%202020-In-depth-EnergyPolicy_0.pdf

55 International Energy Agency. 2020. "India 2020 Energy Policy Review" (Report).

Planning and investing in all forms of infrastructure development should be aimed at reducing and mainstreaming climate risk assessments to build resilience, which would also result in the triple dividend of saving lives and livelihoods, ensuring resource allocation efficiency and minimizing economic damages.⁵⁶ However, an understanding from the NDC and NAPCC documents show how adaptation in the country broadly spans areas of:⁵⁷

- › Crop improvement and research;
- › Drought proofing and flood control;
- › Forest conservation;
- › Poverty alleviation and livelihoods preservation;
- › Rural education and infrastructure;
- › Health;
- › Risk financing; and
- › Disaster management.

In these, while certain actions may support infrastructure resilience, it is not the primary focus. This results in the issue being under-funded. An assessment of the Adaptation Gap in India, done in 2015, estimated ~USD178 billion required as adaptation finance for the infrastructure sector.⁵⁸

Infrastructure resilience building through policy actions needs to be done from the wider scope,⁵⁹ where the adaptation action can be in form of:

1. Existing Infrastructure Adaptation, this includes adaptation in projects that aim to improve the resilience of existing infrastructure. Incorporating resilience in the maintenance regimes of the already existing infrastructure, climate change adaptation action can be encouraged.
2. New Infrastructure Resilience, making new infrastructure projects climate resilient by ensuring that future climate risks are kept in mind when developing the infrastructure asset, in terms of its location, design, materials, build and operation aspects.

56 Roy, A. 2020. "Assam floods reinforce the need for climate-resilient infrastructure" (News Article). Observer Research Foundation (ORF). Accessible: <https://www.orfonline.org/research/assam-floods-reinforce-the-need-for-climate-resilient-infrastructure/>

57 Department of Economic Affairs. 2020. "Report of the Sub-Committee for the Assessment of the Financial Requirements for Implementing India's Nationally Determined Contribution (NDC)" (Report). Ministry of Finance, Government of India. Accessible: <https://www.dea.gov.in/sites/default/files/Sub%20Committee%20Report%20Final.pdf>

58 Garg, A., Mishra, V., & Dholakia, H. 2015. "Climate Change and India: Adaptation Gap (2015)- A Preliminary Assessment" (Working Paper). Indian Institute of Management Ahmedabad (IIMA), W.P. No. 2015-11-01. Available: <http://hdl.handle.net/11718/17050>

59 Richmond, M., Upadhyaya, N., & Pastor, O. A. 2021. "An Analysis of urban Climate Adaptation Finance: A Report from the Cities Climate Finance Leadership Alliance" (Report). Climate Policy Initiative. Accessible: <https://www.climatepolicyinitiative.org/wp-content/uploads/2021/02/An-Analysis-of-Urban-Climate-Adaptation-Finance.pdf>

The existing regulations for infrastructure rarely integrate resilient infrastructure considerations, and instead loosen the regulations for developmental reasons. For instance, the recent revision of the Coastal Regulation Zone (CRZ) Notification, focuses on development in coastal areas of the country from a tourism perspective, and eased certain environmental regulations which would also have been beneficial for ensuring more resilient infrastructure.

Lack of capacity at the ground level and weak regulatory enforcement

India's infrastructure growth should be developed, keeping in mind the NDC target of reducing GHG emission intensity of GDP by 33-35% from 2005 level. This is supported by many discussions on decarbonizing the energy sector, or the transport sector, both forming an integral part of infrastructure growth the country. While creating new infrastructure, even in the few cases where a climate or environment perspective is incorporated, it is largely focused on reducing emission intensity. Sustainably building the infrastructure sector currently looks at lowering carbon design approaches, improving construction techniques, adopting circular economy approaches, and shifting to lower carbon material options. However, there is limited awareness and capacity to design viable innovative infrastructure projects at the level of the public officials who are responsible for this.

The decentralized measure of infrastructure management, though useful in terms of development in line with the necessary regional requirements, at times results in inefficient and haphazard development, with weak enforcement. Many states have failed to maintain up-to-date record of critical infrastructure, like housing, water systems, transport network, etc. Without proper institutional mechanisms to oversee the development, monitoring and compliance of the infrastructure sector, unplanned development puts the already vulnerable sector at greater risk.

Additionally, regional differences also translate into selective focus and with weak monitoring systems in place, the state or local level action is often limited to on-paper exercises. For example, Model Bill for Flood Plain Zoning, 1975, has been developed at the central level, with the states being asked to develop and enact suitable legislation in line with the central law in accordance with their regions, to mitigate damage. However, this law has not been adopted effectively by states. The bill was developed as a structure for the states to model their own legislations based on their specific context, but has mostly been replicated as is, by the states.

Inadequate and unclear finance flows

The current climate finance flows from international and domestic sources has been observed to be too narrow in its reach in India, with large investments focused mainly on the mitigation of energy sector.

A quick analysis shows that in India, most international funding in the climate sphere has also been focused on the mitigation side, especially the energy sector.⁶⁰ This could be in response to the Government of India's focus on decarbonizing the energy sector as its key climate interventions, with several national programmes and targets being designed for this objective. This also highlights the need to widen the focus of climate interventions to other sectors and create an enabling environment for these by de-risking and scaling up public investments, to make them commercially viable for a wider range of actors.

Finance for infrastructure development come from a range of national and state level programmes and schemes. Furthermore, the decentralized system of infrastructure development also results in overlaps and inefficiency in public finance flows for it, with infrastructure being funded in part from the central government budgets, state budgets as well as local bodies. These public sources of finance are often constrained, with changes made year-on-year based on changing priorities and needs, which makes it challenging to have visibility of long-term finance availability and accordingly plan long tenure infrastructure development works.

Lack of enabling environment for deploying and adopting innovative solutions

There is limited scope for undertaking innovative solutions for resilient infrastructure in the existing policy framework. For instance, ecosystem resilience and nature based solutions also form important aspects for the infrastructure sector to adapt to climate variability. Especially for expanding the infrastructure for ecosystem centric sectors, like agriculture or water.

An example of an area where such solutions would be most needed is watershed development programs, which aim to restore degraded watersheds in rain-fed regions to increase their capacity to capture and store rainwater, reduce soil erosion, and improve soil nutrients and carbon content. This falls under the purview of state governments, with some overlaps with central government mandates. It also requires a range of expertise and experience, involving multi-ministries and other stakeholders for effective design and implementation. This complexity makes it challenging to fix responsibility and accountability for framing effective solutions and implementation plans, resulting in innovative solutions often being sidelines for conventional models.

Another example of a programme where innovative solutions could play a transformative role is in the mobility and transport sector. For instance, the Pradhan Mantri Gram Sadak Yojana, aims at providing access to all-weather roads, especially to unconnected habitations, making it a highly relevant intervention for up-scaling resilient infrastructure. However, the template followed for the construction of these roads is often standardized at the national level, not adequately taking into account the local context, climate conditions or material availability.

60 Muralidharan, R., Malhotra, A., Bhar, S., Vohra, D., & Venkataramani, V. 2021. "The Landscape of Climate Finance in India: Issues with Access and Utilization" (Discussion Note). Shakti Sustainable Energy Foundation and Lead Krea University. Accessible: <https://ifmrlead.org/wp-content/uploads/2021/03/Landscape-of-Climate.pdf>

There is still a need for a more comprehensive and policy framework for resilient infrastructure, with scope for flexibility and a learning approach. This would build the required enabling environment for integrating climate resilience into all aspects of infrastructure development, from construction to operation and maintenance, keeping in mind the technical, financial and capacity gaps present and addressing them simultaneously.⁶¹

Lack of policies to help adapt to climate change risks

Monetary policy instruments have been developed over time to complement fiscal tools and financial policies to mitigate climate change risks. Price policies (carbon taxation), investment and concessional loans and public guarantees have been developed with underlying climate mitigation potential.⁶² However, finance instruments have not been developed with a climate adaptation angle. Additionally, governance is also expected to complement these tools through stronger regulation and awareness generation, which is lacking.⁶³

There is also a lack of understanding of the term 'climate risk mainstreaming' among financial institutions, investors, insurance agencies, ecosystem enablers and service providers. Furthermore, climate risk considerations are still not prioritized by financial institutions for investment decisions. A very small fraction of financial institutions try to price climate risk, while considering Environmental, Social, Governance (ESG) framework, however no Indian financial institution has initiated the process of conducting scenario analysis and modeling of the risk.⁶⁴ This especially becomes important when looking at a lack of well developed fiscal regulatory space for infrastructure resilience.

Lack of sustainable /resilient infrastructure focus in COVID recovery plans

The lack of economically and socially strong built environment, through the state of infrastructure, was highlighted during the COVID crisis. There is a need to better integrate the adaptive perspective of climate resilience into policy and regulatory framework in India. This especially came to light seeing the country's adaptive failure to respond to vulnerability due to the shock created by a health crisis (COVID), which also highlights India's lack of adaptive capability to cope with future shocks because of changing climate. The component of climate resilience needs to be better addressed in this context both from mitigation as well as adaptive angles.

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- 61 Roy, A. 2020. "Assam floods reinforce the need for climate-resilient infrastructure" (News Article). Observer Research Foundation (ORF). Accessible: <https://www.orfonline.org/research/assam-floods-reinforce-the-need-for-climate-resilient-infrastructure/>
- 62 Krogstrup, S., & Oman, S. 2019. "Macroeconomic and Financial Policies for Climate Change Mitigation: A Review of the Literature" (Working Paper). IMF Working Paper, No. 19/185.
- 63 Dilip, A., & Kundu, S. 2020. "Climate Change: Macroeconomic Impact and Policy Options for Mitigating Risks" (Article). RBI Bulletin April 2020. Accessible: <https://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/1CLIMATECHANGE7C6AD14719E43DAA7FA84C1F8F1CFED.PDF>
- 64 Shakti Sustainable Energy Foundation & Intelicap. 2020. "Climate Risk Mainstreaming Approaches for Indian Financial Institutions: Landscape Study for Investment Portfolios in India" (Report). Accessible: https://shaktifoundation.in/wp-content/uploads/2020/09/CLIMATE_RISK_MAINSTREAMING_APPROACHES_FOR_INDIAN_FINANCIAL_INSTITUTIONS.pdf

In the context of COVID recovery, the focus and reliance on infrastructure for reviving the economic slump has increased manifold, with it being one of the key pillars of the Atmanirbhar Bharat (Self-reliant India) scheme. This has resulted in a total of over USD 17 billion (INR 1.26 lakh crore)^{65,66} stimulus being directed for boosting infrastructure spending. The recovery measures focused on building back better, especially the housing facilities for the migrant labour and urban poor. However, there was no specific focus on resilience or sustainability under these programmes. With such a high focus on infrastructure development, it becomes critical to integrate a sustainable and climate resilient infrastructure lens so that these decisions are well planned for the long-run, with the capacity to withstand and recover rapidly from climate caused disruptions, and are able to avoid high carbon lock-ins.⁶⁷

A scheme of Affordable Rental Housing Complexes (ARHC) for migrant workers, under the Pradhan Mantri Awas Yojna, was launched. The main objective of the scheme was to promote ease of living through affordable rent, through conversion of government funded houses in cities to ARHC under PPP mode through concessionaires. This is expected to help migrant labourers, most of whom are employed in construction jobs, as well as ensure avoidance of further construction delays.⁶⁸ The scheme reiterated on the need of resilient construction, however it failed to mention the need of integrating resilience into housing sector from an adaptation perspective.

65 Combining INR 1.10 lakh crores (~USD 15 billion) platform for infrastructure debt financing; INR 6000 crores (~USD 840 million) equity infusion in National Investment and Infrastructure Fund (NIIF) Debt Platform; INR 10,200 crores (~USD 1.43 billion) additional budget outlay to be provided towards capital and industrial expenditure for domestic defence equipment, industrial incentives, industrial infrastructure, and green energy.

66 Ministry of Finance. 2021. “Economic Survey 2020-21, Vol. 2, Chapter 8- Industry and Infrastructure”. Department of Economic Affairs, Ministry of Finance, Government of India. Accessible: https://www.indiabudget.gov.in/economicsurvey/doc/vol2chapter/echap08_vol2.pdf

67 OECD. 2018. “Climate-resilient Infrastructure- Policy Perspectives” (Policy Paper). OECD Environment Policy Paper No. 14. Accessible: <http://www.oecd.org/environment/cc/policy-perspectives-climate-resilient-infrastructure.pdf>

68 Ministry of Finance. 2020. “Finance Minister announces short term and long-term measures for supporting the poor, including migrants, farmers, tiny businesses and street vendors” (Press Release). Press Information Bureau (PIB), Government of India. Accessible: <https://archive.pib.gov.in/archive2/erelease.aspx>

CHAPTER THREE —————>

Financing Adaptation and Resilient Infrastructure

Delayed deployment of at-scale climate interventions is steadily increasing the cost of adapting to unavoidable climate impacts, with the annual economic losses due to adverse climate events rising globally. A recent UNFCCC report, '25 Years of Adaptation Under the UNFCCC', released at the UN Climate Change Conference in Madrid in December 2019, drew attention towards an increasing need for adaptation action. The report noted the rising adaptation costs, which are likely to range from USD 140 billion to USD 300 billion per annum by 2030, and possibly to rise to between USD 280 billion and 500 billion per annum by 2050.⁶⁹

As per the Global Climate Risk Index 2021, India ranked as the 7th most climate affected country with the highest absolute losses in terms of purchasing power parity in 2019. The climate risk is also perceived by the Indian government. A study by the Indian Ministry of Earth Sciences in 2020 projected increasingly intense and variable monsoons, heat stress and extreme weather events for the coming years concluding that these will highly impact human health and well-being, and damage the country's critical ecosystems and infrastructure. India's financial estimates for implementing its NDC states a requirement of at least USD 206 billion to implement adaptation action in sectors like agriculture, forestry, fisheries infrastructure, water resources and ecosystems.⁷⁰ This, however, does not include the additional interventions which were highlighted for strengthening resilience and disaster management. There are international and domestic sources to mobilize finance towards building this adaptive and resilient capacity. This chapter is structured in three parts to develop an understanding on the sources, institutional framework of finance and the role of private sector herewith; what the current state of play under this has been; and lastly, what are the clear bottlenecks in the current state of play. As a result, this chapter tries to answer three broad questions:

- a.** What has been the state of financing for climate actions and climate adaptation?
- b.** How does international finance flow towards adaptation and infrastructure and what is the state of private sector participation here?
- c.** What are the deficits to infrastructural financing in India and how these extend as barriers to financing resilient infrastructure?

The third question gives us a segue to do a deeper understanding in what are the barriers that private players face in mobilizing finance towards adaptation and more specifically resilient infrastructure. These are explored in the next chapter.

69 United Nations Climate Change. 2019. 25 Years of Adaptation under the UNFCCC- Report by the Adaptation Committee. Accessed on 30 March, 2021. Accessible at: https://unfccc.int/sites/default/files/resource/AC_25%20Years%20of%20Adaptation%20Under%20the%20UNFCCC_2019.pdf

70 Government of India. 2015. Nationally Determined Contributions. Accessed on June 30, 2021. Accessible at: <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/India%20First/INDIA%20INDC%20TO%20UNFCCC.pdf>

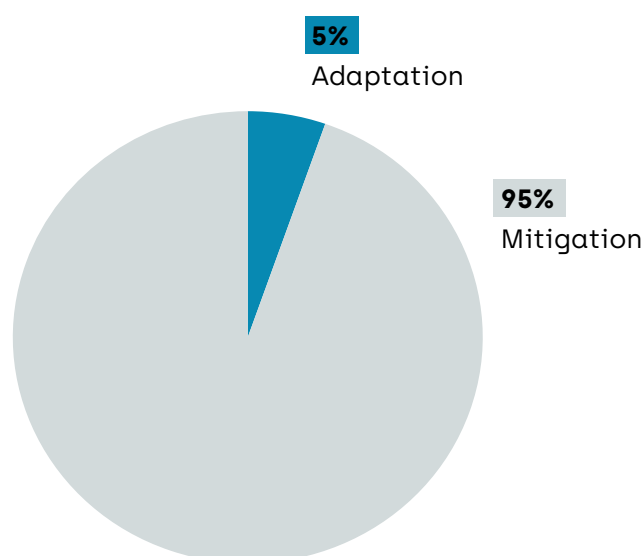
3.1 State of Play of Climate Finance flows

3.1.1 Adaptation is under-financed in the global south

The primary challenge in the case of implementing ambitious adaptation interventions is inadequate access to large-scale and long-term finance. Even the international flow of climate finance has a limited portfolio in the area of adaptation as compared to mitigation. This resonates across all developed and developing countries. According to the latest Climate Policy Initiative assessment, in the years 2017 and 2018, the total financial flow for adaptation was just a little over 5% respectively.⁷¹

FIGURE 3.1

Flow of Global Climate Finance (in the years 2017 and 2018)



Source: Climate Policy Initiative (2020)

According to the study, majority of adaptation finance mobilized globally from international sources, has been observed to be from public sources, whereas only ~ USD 0.5 billion of the tracked climate finance for adaptation (of USD 30 billion for 2017-2018) came from private sector sources. Development Finance Institutes (DFIs) accounted for 79% of total adaptation financing (USD 23 billion for 2017-18). The adaptation finance from public sources has been majorly directed to three sectors – water and wastewater management, agriculture and land use, and disaster risk management.

⁷¹ Macquarie, R., Naran, B., Rosane, P., Solomon, M., Wetherbee, C., & Buchner, B. (2020). Updated View on the Global Landscape of Climate Finance 2019. Climate Policy Initiative.

While, the private financial adaptation intervention has also been largely concentrated towards supporting water and wastewater management, it also has flown towards infrastructure, energy and other built environment.⁷²

According to the same assessment, of the total climate finance mobilized in the South Asian region (i.e., that comprising of Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka), finance towards adaptation has ranged between 12 to 15% in 2017 and 2018. This is understandably due to the higher vulnerabilities from extreme climate events faced by the South Asian countries. In both cases, however, it is clear that the finance mobilized towards adaptation is significantly lower than when compared to finance for mitigation. This emerges from the nature of adaptation activity and the underlying market failure relevant especially in the case of resilient infrastructure. This deficit in financing is further extenuated due to lack of bankable or market-based business models for adaptation.

3.1.2 Adaptation and Resilience remain underfinanced in India

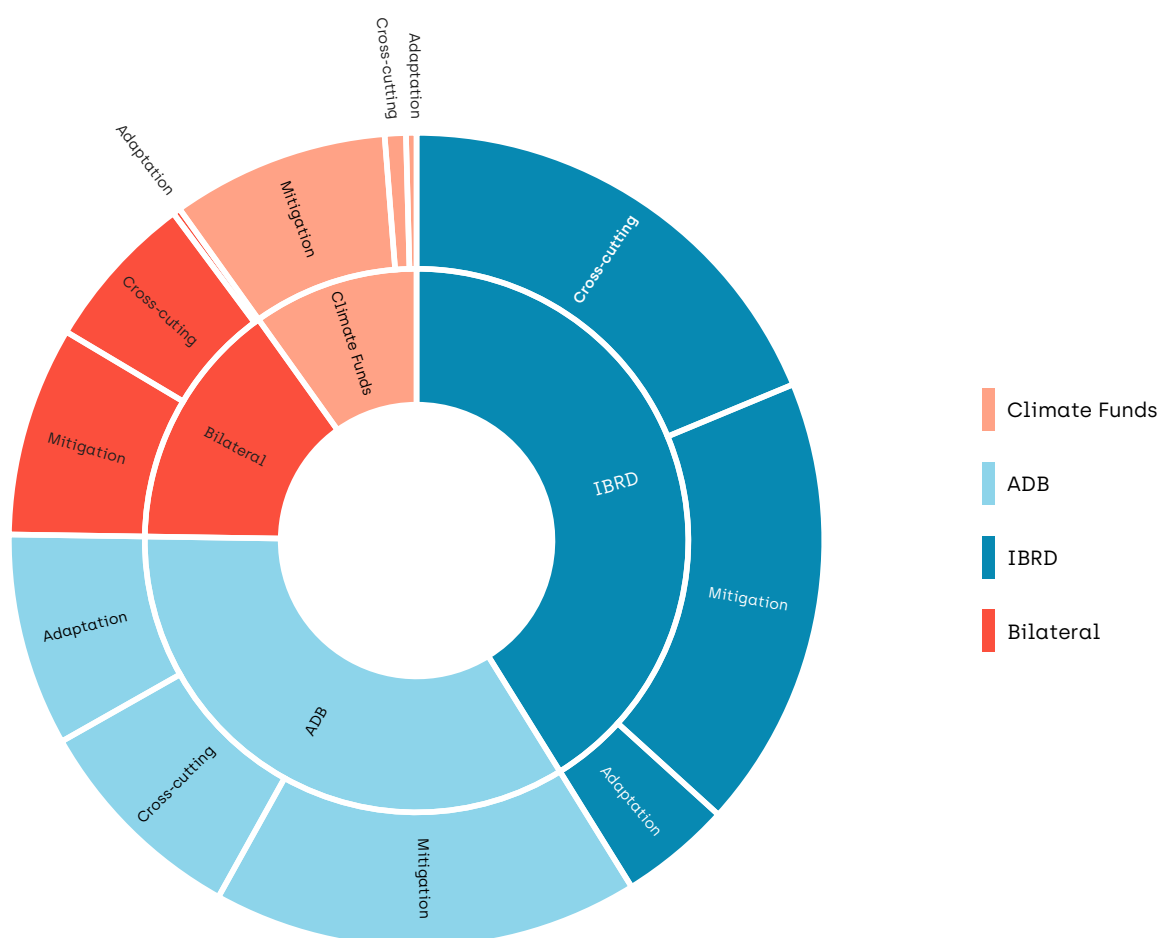
According to India's third Biennial Update Report, for the 2016-2019 period, domestic finance formed a majority of climate finance flows, while the mobilization towards mitigation remains much higher overall from a range of international sources of climate finance (See fig 3.2).⁷³ It should be noted, that for the said period, multilateral sources accounted for almost ten times the total climate finance mobilized by bilateral sources.

72 Climate Policy Initiative. 2019. Global Landscape of Climate Finance. Accessible at: <https://www.climatepolicyinitiative.org/wp-content/uploads/2019/11/2019-Global-Landscape-of-Climate-Finance.pdf>

73 Ministry of Environment, Forest and Climate Change. (2021). India: Third Biennial Update Report to the United Nations. New Delhi: Government of India. Last accessed on June 30, 2021. Accessible at: https://unfccc.int/sites/default/files/resource/INDIA_%20BUR-3_20.02.2021_High.pdf

FIGURE 3.2

Breakdown of Climate Finance from Multilateral and Bilateral Sources in India



The chart depicted in 3.2 gives an overview of how international finance flows in India from three broad channels: dedicated climate funds set up under the UNFCCC finance mechanisms, bilateral sources and multilateral banks. The scale of finance dedicated towards adaptation is negligible as a proportion of the whole. Data from: MOEFCC 2021⁷⁴

In the above figure, climate funds include those set up under the UNFCCC Finance Mechanism, i.e. Green Climate Fund (GCF), Adaptation Fund (AF), Global Environment Facility (GEF) and Clean Technology Fund (CTF). Collectively financing from these funds, since their inception till 2019, has been predominantly towards mitigation. An estimate of total flows shows that from climate funds catering to both mitigation and adaptation, such as the GEF and GCF, there is less than 20% of financing towards purely adaptation.

74 Ministry of Environment, Forest and Climate Change. (2021). India: Third Biennial Update Report to the United Nations. New Delhi: Government of India. Last accessed on June 30, 2021. Accessible at: https://unfccc.int/sites/default/files/resource/INDIA_%20BUR-3_20.02.2021_High.pdf

In fact, GEF has no project which is directed towards only adaptation and only 50% of its financing is dedicated towards cross cutting activities while the other half is purely towards mitigation. Funds such as CTF and AF finance only mitigation and adaptation respectively, however, the scale of finance mobilized towards India via CTF is over 70 times more than the amount mobilized under AF⁷⁵. The instruments used for financing are either grants or loans, with grants being the primary mode of financing adaptation. This deficit in financing adaptation can be witnessed among other sources as well. Among the multilateral banks, financing from International Bank of Reconstruction and Development (IBRD) and International Development Association (IDA), under the World Bank and ADB are the largest sources of finance to India for climate action. The proportion of finance mobilized towards purely adaptive action from these sources is also relatively higher than that mobilized from dedicated funds. Between 2016 and 2019, ADB mobilized about 25% of its total financing towards adaptive activities. These were primarily done through loans. The same has been the case with adaptation financing coming from the IBRD and IDA under the World Bank in the period between 2016 and 2019. The proportion of finance for adaptation is 21.5% and this was entirely mobilized through loans⁷⁶.

Financing through bilateral sources includes sources such as the Germany's Federal Ministry for Economic Cooperation and Development (BMZ), Germany's Federal Ministry of the Environment, Nature Conservation and Nuclear Safety (BMU), UK Aid, EU and Japan International Cooperation Agency (JICA). Between bilateral and multilateral sources of financing sources, more of bilateral financing is directed towards adaptation, however, it remains small in absolute terms thereby still significantly small. This financing is mobilized via grants by all bilateral financiers, except JICA which mobilized finance towards mitigation alone and in the form of loans.

From the above assessments^{77,78}, we build an understanding of the sectors where this finance is flowing.

- › Of the finance which was tracked in 2017 and 2018, more than 88.6% was directed towards the power sector i.e. capacity installation of wind and solar power, and on improvements of power transmission and energy efficiency. This was followed by about 11.2% directed towards furthering electric vehicles. In effect, almost all of the financing was directed towards mitigation action. Even parts of spending on infrastructure was under the broad umbrella of mitigation therefore including activities such as upgrading to smart grids or retrofitting for energy efficiency.
- › Financing from dedicated climate funds under the UNFCCC, has had a focus towards making communities and natural ecosystems resilient to the impacts of extreme climate events. However, there is limited finance directed towards making existing infrastructure resilient. The investment which is directed towards infrastructure is in the form of financing the setting up of solar power plants.

75 Ministry of Environment, Forest and Climate Change. (2021). India: Third Biennial Update Report.

76 Ministry of Environment, Forest and Climate Change. (2021). India: Third Biennial Update Report.

77 Ministry of Environment, Forest and Climate Change. (2021). India: Third Biennial Update Report.

78 Climate Policy Initiative. 2020. Landscape of Green Finance in India.

As per the CPI 2020 report, between 2017 and 18, About 56% of bilateral funding was directed as loans towards infrastructure development for the transport sector. A major chunk of this was given towards Delhi and Mumbai metro rail projects (45% and 25% respectively). Infrastructural spending for the energy efficiency and power transmission sector, including spending on grid infrastructure, retrofitting and renovation and modernization (R&M) in the sector, comprised another large portion towards infrastructural financing.

- › Finance mobilised from Multilateral Development Banks (MDB) such as Asian Development Bank (ADB) and the World Bank, is directed relatively more towards enhancing resilience of built environments along with increasing adaptive capacities. These closely overlap with financing for developmental projects. For example, a lot of financing from ADB between 2016 and 2019, categorized as under adaptation is directed towards construction of roads and highways while keeping in view enhancement of water and other urban infrastructure and services. Similarly, financing under the IBRD also includes finance directed towards dam rehabilitation and improvement. Since these are closely linked with improvement of existing infrastructure or construction of new infrastructure, incorporating resilience building is a much needed climate action in this context.

3.2 Flow of Finance for Adaptation and Infrastructure Resilience

3.2.1 Adaptation financing creates limited space for private sector participation

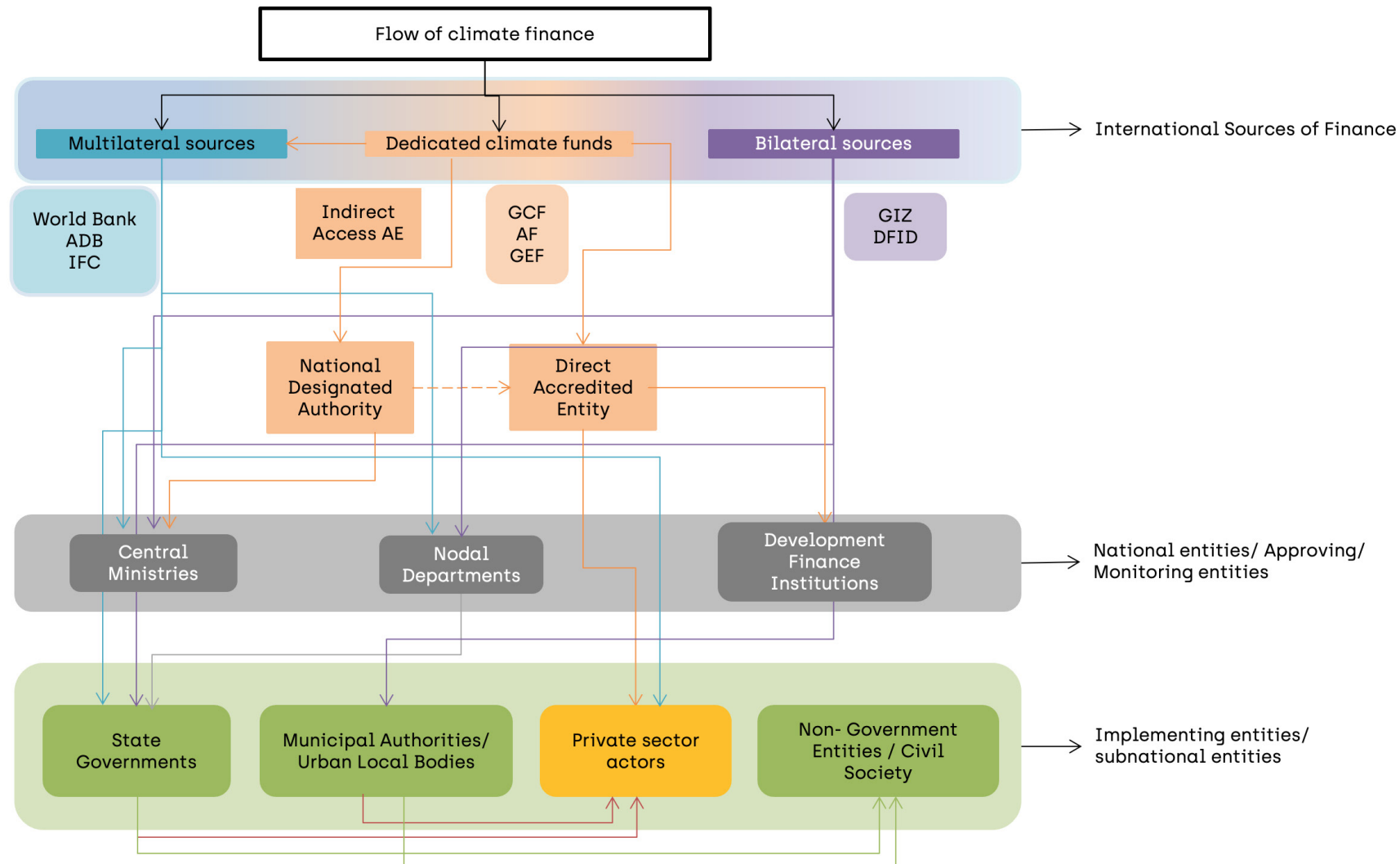
A full architecture of climate finance flows to meet the underlying requirement for finance for adaptation, will have a matrix of public or private sources of funding channeled domestically or internationally through bilateral and multilateral sources. India is a recipient of financing from all these sources from multiple channels. Figure 3.3 charts out this existing flow of finance for climate adaptation in India and highlights the institutional actors involved in enabling it. Closely looking at the institutional flow of finance for adaptation, one can assess the role played by the private sector in the existing mechanism and barriers faced. This assessment also forms the foundation of identifying how international finance can support increased participation by private sector in financing adaptation activities.

Broadly, international finance for adaptation to climate change is broken into three categories of bilateral, multilateral sources and dedicated climate finance funds set up under the UNFCCC financial mechanism.⁷⁹ Each of these sources interacts with several national and subnational actors in varying capacities.

⁷⁹ Watson, C., & Schalatek, L. (2021, February). The Global Climate Finance Architecture. Retrieved from Climate Funds Update: <https://climatefundsupdate.org/wp-content/uploads/2021/03/CFF2-ENG-2020-Digital.pdf>

FIGURE 3.3

Flow of climate finance from major international sources



The first line of contact for most sources of international finance is national ministries or nodal bodies. In case of India, these national entities include the central ministries such as the Ministry of Forests Environment and Climate Change (MoEFCC), Ministry of New and Renewable Energy (MNRE), Ministry of Road Transport and Highways (MoRTH) and others. Several nodal departments within the ministries such as Department of Economic Affairs under the Ministry of Finance (MoF) and Developmental Finance Institutions which include National Bank for Rural Development (NABARD) and Small Industries Development Bank of India (SIDBI), are also direct recipients of finance from international entities. In this regard, the governmental entities act as the National Designated Authorities (NDA), i.e. government institutions that serve as the interface between each country and the dedicated climate fund, as in the case of GCF, AF and GEF. These provide broad strategic oversight of activities in the country and communicate priorities for financing low-emission and climate-resilient development. National entities also act as direct recipients of funds or as national implementing entities. These then ensure the ground level implementation of the projects and periodic disbursement of finances.

In some cases, these implementing entities are also private entities. In the case of GCF, the fund has direct and indirect access accredited entities. Direct access accredited entities in India include IDFC Bank Ltd (IDFC Bank), IL&FS Environmental Infrastructure and Services Limited (IEISL) and Yes Bank Limited as private entities along with NABARD and SIDBI. These however need the approval of the NDA, which in the case of the GCF is MoEFCC. As of now, none of these Private Accredited Entities have been able to access GCF funding.

Among the multilateral sources, a larger chunk of financing has flowed in through the World Bank Group and Asian Development Bank. These entities directly coordinate with national ministries, nodal departments or subnational governmental departments. An example for state level borrowing is an ongoing project by the World Bank is one in the state of Maharashtra, where the implementing entity is Department of Agriculture in Government of Maharashtra, which is directed at enhancing climate resilience of smallholder farming systems in selected districts of Maharashtra.⁸⁰ Other examples include a project focused on the Innovation in Solar Power and Hybrid Technologies in India. The project borrower here is Department of Economic Affairs in Ministry of finance by the implementing entity is the Solar Energy Corporation of India Limited (SECI).⁸¹

In very rare cases financing from multilateral banks has been directed towards private entities. A few of these instances include a project financed by the Asian Development Bank to expand the capacity of a highway in Andhra Pradesh, the funding is specified for a non-sovereign (private) project. The borrower is a private company called DBL Anandapuram Anakapalli Highways Private Limited, which has undertaken a loan of about INR 3800 million (USD 58 million).⁸²

80 The World Bank. (2018). Maharashtra Project on Climate Resilient Agriculture. Retrieved April 9, 2021, from The World Bank: <https://projects.worldbank.org/en/projects-operations/project-detail/P160408>

81 The World Bank. (2019, March 29). Innovation in Solar Power and Hybrid Technologies. Retrieved from The World Bank: <https://projects.worldbank.org/en/projects-operations/project-detail/P160379>

82 Asian Development Bank. (2020, December). India: DBL Highway Project. Retrieved from Asian Development Bank: <https://www.adb.org/projects/53376-001/main#project-pds>

In another example, equity lending of USD 1.6 million to Euler Motors Private Limited was done under a project to increase setting up of charging stations for electric vehicles across Indian cities of Delhi and Bangalore.⁸³

3.2.2 Institutional flow for infrastructure is not directed towards resilience

As a next step to assessing the role of private sector in financing adaptation and resilience action, we turn to the institutional flow of finance for Infrastructure in general and resilient more specifically. Finance related to climate resilience for the infrastructure sector is mostly seen to be from the public side, more so in developing countries as compared to developed ones, with governments and public or development international organizations usually bearing the responsibility of providing financial and technical assistance.⁸⁴ Financial sustainability becomes an important part when looking at infrastructure resilience, where the cost of converting public grey infrastructure into green or sustainable infrastructure comes at a cost. This cost, is many times borne by national and subnational governments with unsustainable debt, which results in creating an unsustainable market for investment.⁸⁵

A much more detailed and complex nuance of flow of finance is witnessed in the case of financing for infrastructure (See figure 3.4 below). As this section explores this flow in greater detail, what stands out in contrast to adaptation financing is the scale of financing and involvement of the private sector in the case of infrastructure. However, in almost all cases, this finance is not necessarily directed towards green/resilient infrastructural financing.

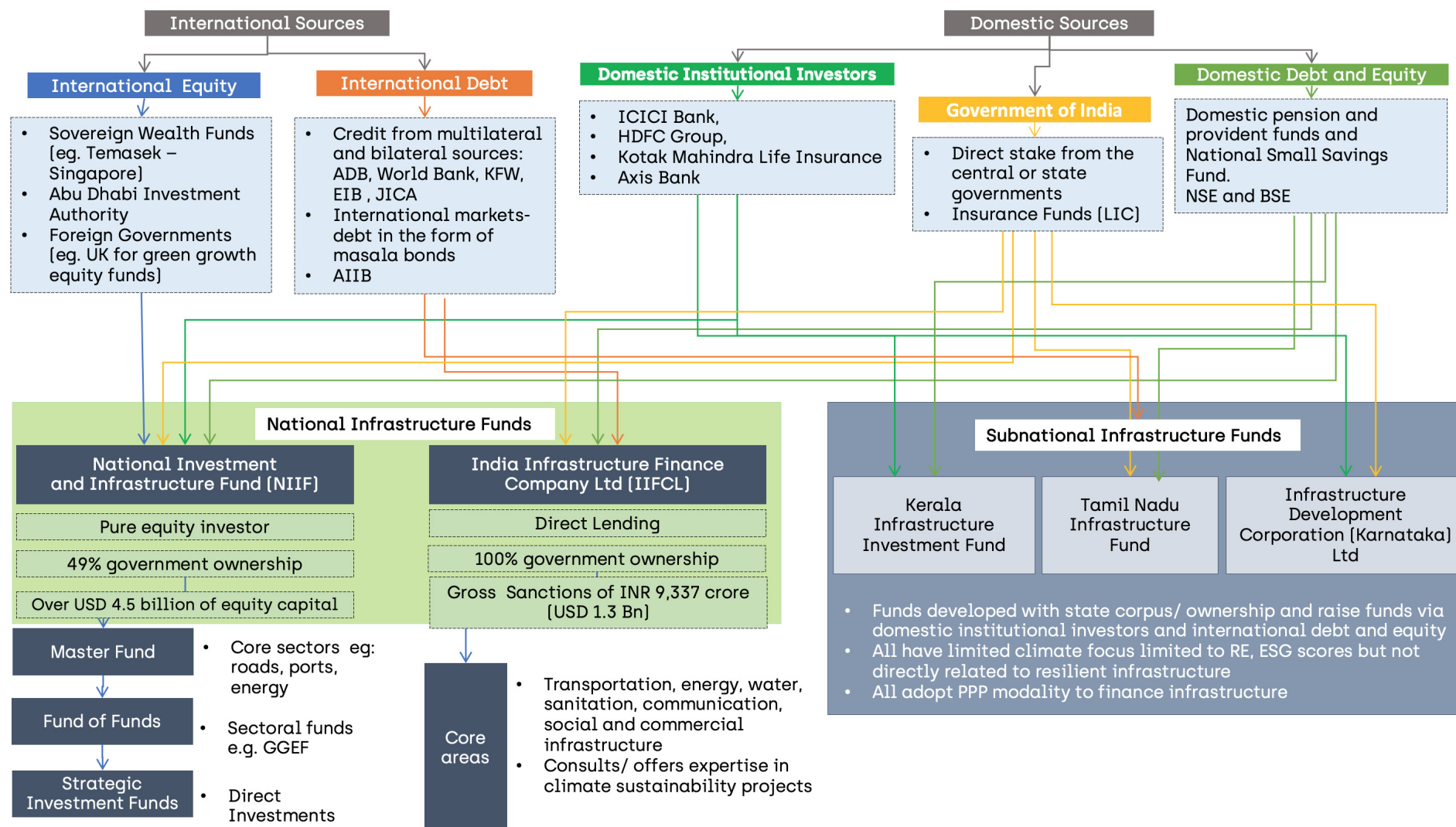
83 Asia Development Bank. (2021, February). *India: Administration of Equity Investment for Euler Motors Private Limited*. Retrieved from Asia Development Bank: <https://www.adb.org/projects/55075-001/main#project-overview>

84 Bhattacharya, A., Meltzer, P. J., Oppenheim, J., Qureshi, Z., & Stern, N. 2016. "Delivering on Sustainable Infrastructure for Better Development and Better Climate" (Report). The Brookings Institution, The Global Commission on the Economy and Climate, and The Grantham Research Institute on Climate Change and the Environment. Accessed on https://www.brookings.edu/wp-content/uploads/2016/12/global_122316_delivering-on-sustainable-infrastructure.pdf

85 UNEP. 2021. "International Good Practice Principles for Sustainable Infrastructure" (Report). Nairobi.

FIGURE 3.4

Flow of Infrastructure Finance in India



As shown, infrastructural financing can be broken down into international and national sources of financing. International sources include international equity and debt. Equity comes in the form of sovereign wealth funds, investments from multilateral banks, and investments by foreign governments. Debt for infrastructure from international sources comes in the form of debt raised from multilateral institutes and bilateral credit. This also includes credit raised in international markets through masala bonds (i.e., rupee denominated bonds). Domestic sources of finance include institutional investors, direct investment by the government of India and finance raised through domestic capital markets. One of the key roles here is played by Insurance Funds, especially the Life Insurance Company of India (LIC), largest and state-owned insurance provider in the country. LIC has been one of the largest long-term financiers for infrastructure projects, where the finance is mostly channeled to infrastructure projects of the central and state governments' State Owned-Enterprises (SOE). These are therefore backed by government guarantees⁸⁶. These domestic and international sources of finance which have both public and private sector participation form the basis of financing large scale infrastructure projects in India.

Another channel through which private sector players can engage is national and subnational infrastructure financing sources. Under national sources, there is the National Investment and Infrastructure Fund (NIIF) and the India Infrastructure Finance Company Ltd (IIFCL).

National Infrastructure Investment Fund (NIIF)⁸⁷

The NIIF, an Alternate Investment Fund in India⁸⁸, provides a collaborative investment platform for international and Indian investors, anchored by the Government of India which holds a 49% stake in the fund. This fund acts as a pure equity investor and its current size is of over 4.5 billion USD. The NIIF is broken down into three types of funds- master fund, fund of funds and strategic investment fund.

The master fund, with a target size of approximately USD 2.1 billion, holds the corpus to finance core infrastructure sectors such as transportation and energy. This corpus has 49% stake by government of India, followed by funding from sovereign wealth funds such as the Abu Dhabi Investment Authority (which has the largest share, with approximately USD 1 billion committed in total investments). The next largest share of financing comes from four domestic institutional investors– ICICI Bank, HDFC Group, Kotak Mahindra Life Insurance and Axis Bank. The private sector banks therefore have a large scale of finance directed towards India's infrastructure building.

86 World Bank (2006). *INDIA – Financing Infrastructure: Addressing Constraints and Challenges*. Accessible at: https://icisa.cag.gov.in/resource_files/4ad63928a7679ad9c19dd533bdf2cea5.pdf

87 Global Infrastructure Hub. (2019). *Guidance Note on National Infrastructure Banks & Similar Financing Facilities*. Global Infrastructure Hub.

88 Alternative investment funds (AIFs) refer to any privately pooled investment fund, whether from Indian or foreign sources, in the form of a trust or a company or a body corporate or a Limited Liability Partnership (LLP). Therefore, in India, AIFs are private funds. Source: https://www.bseindia.com/Static/about/alternative_investment_funds.aspx

The second sub-fund: Fund of Funds, focusses on sectoral financing. Two key projects undertaken under this fund include the Affordable Housing project and Green Growth Equity Fund (GGEF)⁸⁹. The GGEF with a fund size of USD 750 million is anchored through an equal funding of USD 157 million each from both the UK and Indian Governments. The fund has a clear area of investment in sectors such as renewable energy, clean transportation, water, sanitation and waste management. The fund of funds has also received financing from multilateral banks such as Asian Infrastructure Investment Bank (AIIB).

The last sub fund is the Strategic Investment Fund which makes direct investment in existing projects or assets. For example, it acquired an Infrastructure Debt Fund owned by IDFC. This Debt Fund lends to operating infrastructure projects, and thereby enabling the original project financiers to recycle their capital following the commencement of operations.

India Infrastructure Finance Company Ltd (IIFCL)⁹⁰

The IIFCL is a 100% government owned fund and makes no equity investments. IIFCL is Public Financial Institution and is a Non-Banking Financial Institution (NBFI) regulated by the Central Bank. It supports infrastructure financing through lending, viability gap funding and consulting services. The IIFCL has sanctioned finance of about USD 1.3 billion as of April 2021. The IIFCL also raises funds from the domestic markets and raises credits from multilateral and bilateral institutes. Its core area of financing includes transportation, energy, water and sanitation, communication, social and commercial infrastructure. It has limited involvement in directly financing green projects. In fact, the only direct climate related engagement it has is through the consultancy services it offers in climate and sustainability projects.

Similar to national infrastructure funds, there are also subnational funds, operated at a scale smaller than national funds, but driven by the same sources of financing. For this study, we identify three existing subnational funds:

The Kerala Infrastructure Investment Fund⁹¹

Its objective is to mobilize and channel finance for undertaking physical and social infrastructure building that can ensure sustainable development and are integral to overall wellbeing and prosperity of the state. It raises debt for infrastructure development, financed against future receivables from the state. As of December 2018, the government has transferred about USD 350 million as seed capital to the KIIF, which has been used to raise USD 830 million.

89 Also an AIF, therefore a private fund by definition

90 Indian Infrastructure Finance Company Limited. (2018). *Indian Infrastructure Finance Company Limited*. Retrieved from Indian Infrastructure Finance Company Limited- Projects: <https://www.iifclprojects.com/projects/>

91 Kerala Infrastructure Investment Fund. (2021). *Kerala Infrastructure Investment Fund- Projects*. Retrieved from Kerala Infrastructure Investment Fund: <https://kiifb.org/search.jsp>

The state also raises finance through bank loans and debt, including masala bonds.⁹² Some of the green projects of the state include construction of sustainable roads and flood resilient cities.

Tamil Nadu Infrastructure Fund⁹³

The state government currently holds a 49% stake in this fund which is directed towards implementing public-private partnerships in developing, funding and completing critical infrastructure projects.⁹⁴ While this fund too does not have a clear mandate towards green infrastructure, the projects are aimed to be ESG compliant.

Infrastructure Development Corporation (Karnataka) Ltd (IDeCK)⁹⁵

The fund is set up as a joint venture between the Government of Karnataka (GoK), Infrastructure Development Finance Company Limited (IDFC), and Housing Development Finance Corporation Limited (HDFC). IDeCK is built on the stability of a dynamic government department and the impetus of pioneers in infrastructure strategy. The fund, set up by both government and private entities, works with various Ministries, departments and public sector agencies as well as private sector. The core sectors it focusses on include infrastructure in transportation and renewable energy among others such as tourism, urban development, social infrastructure, industrial infrastructure.

Among these sources, private sector participation is primarily from private banks which act as institutional investors for infrastructural financing in India.

3.2.3 Scope for private sector involvement in the existing institutional flow of finance

Across the three broad sources of international finance funding adaptation in India, the private sector can be involved in three roles:

- I. As a **direct accredited entity** of the climate finance funds set up under the UNFCCC financial mechanism. Private sector becomes the recipient of finance and facilitator of action for the country after the approval of the NDA, which is often a national ministry.⁹⁶

92 Mitra, A., Chandra, T., Sarma, N., & Kasliwal, R. (2020). *A Green Investment Architecture for India: Building a Bridge for Global Capital*. New Delhi: Observer Research Foundation.

93 Tamil Nadu Infrastructure Fund . (2019). *Tamil Nadu Infrastructure Fund- Funds Managed*. Retrieved from Tamil Nadu Infrastructure Fund : <http://www.tnifmc.com/tnif.html>

94 Mitra, A. et al. (2020).

95 iDeCK. (2019). *Infrastructure Development Corporation (Karnataka) Limited (iDeCK)*. Retrieved from iDeCK: <https://ideck.in/about-us/>

96 Druce, L., Moslener, U., Gruening, C., Pauw, P., & Connell, R. (2016). *Demystifying Adaptation Finance for the Private Sector*. United Nations Environment Programme.

- II. In some cases, **multilateral developmental banks** have provided debt and equity financing to private sector for large scale infrastructural projects. These are often developmental projects with climate co-benefits and termed as “climate-related developmental financing”.⁹⁷
- III. Private sector entities directly involved as **supporting national or subnational entities** in implementation of projects.

These are different from the kind of participation the private sector has at the level of infrastructural finance. Across the three broad sources of international finance funding infrastructure in India, the private sector can be involved in the following manner:

- I. Private financiers as institutional investors hold a large stake at both national and subnational infrastructural sources of finance. Considering the limited resources available for public finance towards resilient infrastructure, mobilizing private capital – particularly from **institutional investors** is expected to be pivotal in delivering resilient infrastructure at the quality and scale required.⁹⁸
- II. Similarly, private equity raised through **domestic markets** which also finances national and subnational infrastructural funds, can be directed towards resilient infrastructure financing.

As is clear, national public entities, both at the regulatory and implementation level, have played a critical role in driving private sector participation towards adaptation and infrastructure projects⁹⁹. Till now, public sector interventions in adaptation and enhancement of resilient infrastructure are largely in the form of public services, such as storm shelters, dams or flood resistant infrastructure. While, what’s required in sectors where private activities are most impacted due to adverse impacts of climate change, such as large commercial infrastructure or real estate, is technical and structural design solutions for increasing resilience.¹⁰⁰

As the private sector, especially those companies in the infrastructure-dependent sectors, is highly vulnerable to losses accrued due to climate change, their participation for building and investing in resilient infrastructure is critical. The role of the private sector will be pivotal in adapting by managing risks and finding climate- resilient approaches to development. The role and responsibility of the private sector needs to expand beyond the current one, which is largely focused on adaptation actions through corporate social responsibility and other small grants.¹⁰¹

97 Murphy, D., & Parry, J.-E. (2020). Filling the Gap: A review of Multilateral Development Banks’ efforts to scale up financing for climate adaptation. Manitoba: International Institute for Sustainable Development.

98 Swiss RE. (2021). *Closing the Infrastructure Gap: Mobilising Institutional Investment into Sustainable, Quality Infrastructure in Emerging Markets and Developing Economies (EMDEs)*. Swiss RE.

99 Biagini, B., & Miller, A. (2013). Engaging the private sector in adaptation to climate change in developing countries: importance, status, and challenges. *Climate and Development*, 242-252.

100 Mathur, V., & Roy, A. (2018). Financing Resilience. In S. Saran, *Financing Green Transitions* (pp. 15-24). New Delhi: Observer Research Foundation.

101 Nakhooda, S., & Watson, C. (2016). *Adaptation finance and the infrastructure agenda*. London: Overseas Development Institute.

These are not adequate motivators for the private sector to make significant investment towards increasing their own adaptive capacity and infrastructural resilience. Therefore, mandating or regulating such prerequisites are likely to nudge investment in the right direction. Here the public sector is needed to create an enabling environment for motivating the private sector to increase financing and design innovative solutions.

3.3 Financing Gap for Resilient Infrastructure

India, Bangladesh, and other countries in South Asia have regularly witnessed extreme climate events. India with its vulnerability to extreme weather events has witnessed resultant devastation of critical infrastructure due to cyclones like Tuaktae, Amphan, Fani in the very recent past. There is increased focus on enhancing investment in resilient infrastructure as part of furthering India's economic growth. However, financing of this sector comes with challenges. Already infrastructure is a sector facing a mismatch between the high investment demand and the scale of finance supplied towards it.

This limited flow of finance adds to the already highlighted infrastructure gap in India.^{102,103} As has been the case with developing countries in East Asia, India's level of investment towards infrastructure should be about 7-8% of its GDP, which translates to about USD 170 billion to USD 194 billion, annually.¹⁰⁴ However, annual spending on infrastructure has been only about 5.3% on an average in the same time period.¹⁰⁵ As a result, a large scale of India's infrastructural needs remains unmet. While this highlights an explicit gap in the financing requirement, it also creates an opportunity to cover this gap by driving finance specifically towards resilient infrastructure.

A study by the World Bank, estimated that in low and middle-income countries, the extra cost of building resilience into infrastructure is expected to cost only ~3% of overall investment needs, while a potential advantage of an estimated USD 4.2 trillion as net benefits is possible over the lifeline of the new infrastructure developed.

102 Pratap, K. V., & Sethi, M. (2019). Infrastructure Financing in India—Trends, Challenges and Way Forward. In *20 Years of G20* (pp. 183-198). Springer, Singapore.

103 Vishwanathan, N. S. (2016). Issues in Infrastructure Financing in India. ASSOCHAM's Sixth International Summit on Infrastructure financing. Mumbai: Reserve Bank of India.

104 Government of India. (2021, April 14). Data. Retrieved from Ministry of Statistics and Programme Implementation: <http://mospi.nic.in/data>

105 CRISIL. (2019, November 27). *CRISIL Infrastructure Yearbook 2019*. Retrieved from CRISIL: <https://www.crisil.com/content/dam/crisil/our-analysis/reports/Infrastructure-Advisory/documents/2019/november/infrastructure-conclave-summary-presentation.pdf>

Further, in low and middle-income countries, the disruption of infrastructure comes at a high cost, estimated to be around USD 390 billion a year at present (disruption costs to households and firms in low- and middle-income countries).¹⁰⁶ As a result, it is expected, that the majority of expenditure to address climate impacts would be towards making infrastructure climate resilient.

3.3.1 Challenges in Financing Infrastructure Development

Until 2015, large scale infrastructure was financed primarily by the government with additional funding was sought from state-owned banks.¹⁰⁷ As a result, and as has been the trend globally, about two-thirds of India's financing of infrastructure has been through public finance.¹⁰⁸ However, given the huge funding requirements of the sector and strained lending ability of public sector banks, there is limited flow of finance. This led to increased private sector involvement through a spurt in Public Private Partnership (PPP) projects, especially in large sectors such as roads and power sector.¹⁰⁹ While this approach worked in kick-starting infrastructure development, it has been inadequate in fully financing India's infrastructure needs due to specific critical barriers.

Firstly, infrastructure projects are large in scale, in terms of the finance involved and the number of parties involved, and often have complex regulatory requirements. In cases of infrastructure which serves public good, such as highways, the government usually retains control, so as to not allow private sector monopolization. This requires complex legal arrangements to ensure proper distribution of returns and risk-sharing to align the incentives of both public and private sector players.^{110,111,112}

Secondly, in cases where the government and the private sectors undertake infrastructural projects collectively via PPP mode, there have been risks related to delays in clearances and land acquisition. Every such delay leads to delayed implementation and additional cost and time overruns. This in turn impacts the economic viability of the project and requires revisions in the valuation of the end-product.^{113,114}

106 Hallegatte, S., Rentschler, J., & Rezenberg, J. 2019. "Lifelines: The Resilient Infrastructure Opportunity" (Book). World Bank. Accessed on March 31, 2021.
<https://openknowledge.worldbank.org/handle/10986/31805>

107 Jaishankar, P. R. (2018, October). Alternate Sources of Financing Infrastructure - Exploring Sources other than Banks and Public Sector. *FICCI Financial Insights*, pp. 16-19.

108 (Pratap & Sethi, 2019)

109 (Jaishankar, 2018)

110 (Srivastava & Rajaraman, 2017)

111 Ehlers, T. (2014). *Understanding the challenges for infrastructure finance BIS Working Papers No 454*. Bank for International Settlements.

112 OECD. (2015). *Infrastructure Financing Instruments and Incentives*. OECD.

113 (Vishwanathan, 2016)

114 Srivastava, V., & Rajaraman, V. (2017). *PROJECT AND INFRASTRUCTURE FINANCE*. New Delhi: Oxford University Press.

This leads to the third key issue, that of limited sources of finance offering long-term financing for the private sector, which is needed for large infrastructure projects. In the Indian context, finance for infrastructure is raised primarily from banks and non-banking financial companies, with limited amount coming from the corporate bonds market and External Commercial Borrowings (ECBs).^{115,116} Infrastructure projects have a longer development tenure, with some running up to 30 years, so the terms of such long-term finance entail a variety of risks, ranging from political risk, to policy risk, to operational risk, etc., which impacts the interest rates, making the financing prohibitively costly. As a result, the pool of project developers willing to take up long term projects will come with a high risk of default. Morris (2019) explains why this will lead to the risk of adverse selection among project developers, in the cases where the duration of the project is longer than the tenure of commercial finance available, “*worthy developers responsible to their shareholders would not be able to participate*”.¹¹⁷ As a result, developers “*with little reputation and not answerable to their diffuse shareholders, but only to promoters, could bid “taking on this risk”*”. In this case, the private sector bidding may not come from worthy developers.

Lastly, there is a significant risk of currency fluctuation in developing countries in the case of external commercial borrowings (ECB), which significantly limits this channel. Since most infrastructure projects generate revenue streams denominated in domestic currencies, using foreign capital involves higher costs to hedge the currency risk.¹¹⁸ In the past, depreciation of domestic currency coupled with large capital inflows have led to an unfavorably high accumulation of private sector debt in several emerging economies, including India.^{119,120} In fact, in 2014, India was part of the ‘*fragile five*’¹²¹ highlighting the countries with highly vulnerable capital flow reversals.¹²² As a result, securing long term financing for infrastructure is made unviable in many cases due to currency fluctuations.¹²³

To summarize, some of the barriers faced in financing infrastructure in India are legal and financial complexity considering the large number of players (government, developers, financiers etc.), difficulty in attaining long term finance, considering change in interest rates, accounting for delays in clearances and other approvals leading to uncertain delays, thereby making finance increasingly costly.

115 Morris, S. (2019, March). Financing Infrastructure in India – Issues and the Way Forward. *Indian Institute of Management Ahmedabad*, p. 25.

116 (Pratap & Sethi, 2019)

117 (Morris, 2019)

118 (Pratap & Sethi, 2019)

119 Fratzscher, M. (2014). Capital Flow Policies, Monetary Policy and Coordination. *Financial Flows Infrastructure Financing* (pp. 7-38). Sydney: Reserve Bank of Australia.

120 Ray, S. (2015). Infrastructure Finance and Financial ADBI Working Paper 522. Tokyo: Asian Development Bank Institute.

121 Other countries were Brazil, Indonesia, South Africa and Turkey

122 (Fratzscher, 2014)

123 Verdouw, W., Uzsoki, D., & Ordonez, C. D. (2015). *Currency Risk in Project Finance*. International Institute of Sustainable Development.

3.3.2 Challenges in Financing Resilient Infrastructure Development

These general barriers to finance for infrastructure are further extenuated when it comes to financing green or sustainable infrastructure, as these are compounded with the challenges of lack of adequate green finance sources, lack of viable bankable projects for resilient infrastructure, inadequate risk-adjusted returns for the high perceived risk associated with green infrastructure projects.¹²⁴ In India, there is currently no difference in the way climate resilient infrastructure are financed, in comparison to conventional infrastructure. The scale of financing may vary, depending on the type and sector of the infrastructure being developed, but the method of financing remains largely the same. A notable challenges and a critical gap, is retrofitting of existing infrastructure, which leads to specific issues of financing. However, in the study we are not delving into these.

Some of these gaps, in this context, lie in the lack of understanding what comprises resilience building in infrastructure and which activities comprise financing resilience and adaptation. Ideally, decisions regarding the financing of new infrastructure assets and networks should take into consideration its location, design and operational intensity to ensure their longer-term resilience to climate shocks and minimize the consequences of disruptions on business operations. To address the climate impact issues identified, the project developers should be required to take suitable measures, which can be a mix of additional hard and soft infrastructure solutions. This leads to the biggest challenge that comes with low carbon or climate resilient infrastructure, that it is costlier than carbon-intensive or conventional infrastructure.¹²⁵ Therefore, securing financing for these comes with the added difficulty of developing a bankable model, assessing the additional finance risks and returns for the increased scale of finance required. Further, in the case of mitigation or low-carbon projects, the costs and benefits are more easily quantifiable, in terms of carbon assets, emission reductions, energy savings etc. However, this is not that clearly defined for climate adaptation and resilience, which is largely based on long-term climate models and projected impacts, as a full assessment of economic and other benefits is not always available. Therefore, making the case for financing resilient infrastructure becomes more difficult, and constrains the involvement of the private sector.

This chapter of the report gives a first glimpse of how adaptation and infrastructure is financed in India. The next chapter discusses additional barriers faced by private entities in financing resilient infrastructure and adaptation project activities.

124 Bielenberg, A., Kerlin, M., Oppenheim, J., & Roberts, M. (2016). *Financing change: How to mobilize private- sector financing for sustainable infrastructure*. McKinsey&Company.

125 Granoff, I., Hogarth, J. R., & Miller, A. (2016). Nested barriers to low-carbon infrastructure investment. *Nature Climate Change Perspectives*, 1065- 1071.

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by Atharva Tulsi



CHAPTER FOUR —————>

Barriers for Private Sector for Developing Resilient Infrastructure

As laid out in the previous chapter, less than 0.1% of the finance mobilized for adaptation came from the private sector, but over 53% of the finance mobilized for mitigation came from the private sector. This reinforces that the adaptation segment is not as conducive for private sector interests at present and in this chapter, we try to understand the reasons for this. Barriers to private sector participation in adaptation and resilience takes many forms. These are witnessed in the current institutional mechanism which governs the climate finance flows from various sources; inadequate backward linkages in the current regulatory frameworks; and limited capacities of state and non-state actors.

Negative externalities that come along with market failures of climate change are exacerbated when combined the challenges of financing resilient infrastructure. Asymmetric information, high risks with uncertain returns, and negative externalities are among the few market failures that combine in the case of financing resilient infrastructure.

This problem for inadequate private financing for resilient infrastructure multiplies itself in the context of resilient infrastructure. In addition to the uncertainties on return and the long lock-in periods of investments, infrastructure sector and resilient infrastructure as well face large externalities. Benefits from infrastructure investments extend beyond the investor to several companies and households across the economy who do not pay for these investments. It is a classic case of market failure, of free-rider problem. As a result, when left to the market alone, infrastructure investments are often sub-optimal. Since infrastructure development is largely impacted by market failure, private participation has been enabled by the government in the form of different models of private public partnerships (PPP). However, relying solely on private commercial investments may not be sufficient initially as it will divert capital to less riskier sectors. Therefore, to correct this market failure, a first fundamental step would be to develop robust infrastructure standards that incorporate climate resilience aspects and ensure they are adhered to in the PPP models.

4.1 Barrier analysis

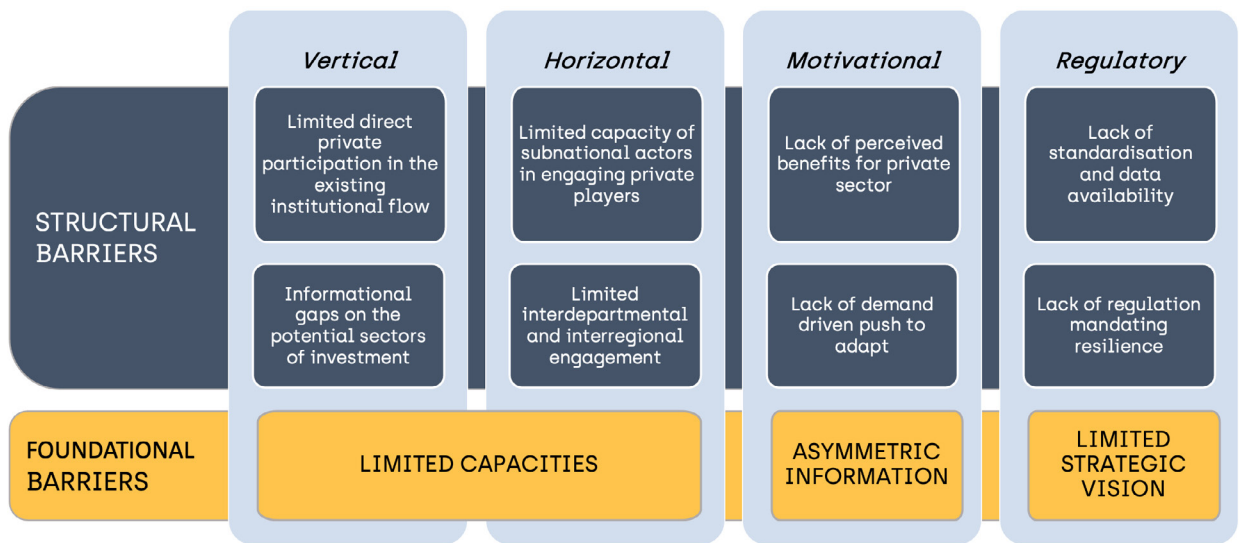
In the course of assessing climate finance flows in the previous chapter, for both adaptation and infrastructure, some fundamental bottlenecks for private sector involvement in adaption finance become evident. In what follows, we break down the barriers based on the institutional flow of climate finance for adaptation and resilience, as observed in the previous chapter.

This chapter discusses barriers emerging from the state of play and institutional flow of finance discussed in the earlier chapters. Each barrier points towards some existing foundational barriers which limit the systemic capacity to involve private sector in adaptation and resilience building activities.

These relate to **lack of standardization** of what constitutes investment in resilient infrastructure, **asymmetric information** on valuation of risks, returns and **development of bankable projects**. In order to address structural barriers such as those in the existing institutional framework, policy makers must focus their attention towards also addressing these foundational barriers. While the barriers may extend farther and wider than what is discussed in this report, this chapter attempts to group the barriers across few categories and frame recommendations for the way forward in this area for policy makers and development finance institutions. Figure 4.1 gives an overview of the same.

FIGURE 4.1

Key Barriers for Private Sector Investments for Resilient Infrastructure



4.1.1 Vertical/ Institutional Bottlenecks

Limited role of private players in the institutional framework for adaptation

In a study from 2016, assessing the private sector adaptation projects undertaken under the Private Sector Initiative (PSI) of the UNFCCC Nairobi work programme, the authors Pauw et al., identify institution building as means of enhancement of climate finance readiness as one of the prerequisites for private sector investment in adaptation.¹²⁶ The institutional flow of adaptation assessed in chapter 3, immediately highlights the lack of institutional coordination in involving private sector for investment in adaptation. This barrier is two-fold.

¹²⁶ Pauw, W. P., & R. J. T. Klein, P. V. (2016). Private finance for adaptation: do private realities meet public ambitions? *Climatic Change*, 489-503.

First, challenge to direct private sector participation in the institutional flow of adaptation

While assessing the institutional flow of adaptation finance from international and domestic sources, the limited scope for engagement and role that the private sector could play in the institutional framework, was highlighted. In some cases, private entities were able to directly engage with climate funds or bilateral or multilateral financiers. However, even here private sector entities were usually amongst the big corporations or financial institutions, and are eligible for undertaking projects after getting approved by a national body, which in India is often the MoEFCC. This makes it difficult for a wide range of private sector actors to be involved in accessing finance from international sources or enabling projects which can access these. This deficit in involvement at the institutional level in the flow of adaptation finance especially shows itself at the subnational level. It is here that private entities have no direct access to green finance from national or international sources. As a result, institutionally, there is limited scope for private players to directly take part in adaptive action.^{127,128} Therefore, in the case of financing for adaptation, the private sector has limited role to play in accessing the international sources of finance or providing scalable finance for adaptation.

The inherent barriers in infrastructure financing, and the market failures of adaptation to climate change, exacerbate due to the lack of clear modalities of where private sector can be involved. As mentioned earlier, managing externalities in infrastructure financing is often done by way of PPP modes, where the involvement of the government not only helps reduce uncertainties but also fairly overcome the free rider problem. This need for participation of the public sector is more so in resilient infrastructure. By its very nature, private sector is unlikely to take up projects which directly build resilience, i.e. it is unlikely to set up cyclone shelters or build flood embankments on its own as business models. However, the limitations and the complexities of the PPP model, as discussed in chapter 3, the incomplete nature of PPP contracts, uncertainty and information asymmetry further challenge the way for resilient infrastructure construction.

There is therefore a need for the public sector, to take the lead in developing the necessary modalities that can guide the private sector towards increasing investment in resilient infrastructure. Developing a standardized set of resilient projects or subcomponents of what comprises resilience, will be a critical first step. There is also a need to further address the fundamental gaps in and strengthening the PPP mode for infrastructure building.

127 Fayolle, V., Fouvet, C., Soundarajan, V., Nath, V., Acharya, S., Gupta, N., & Petrarulo, L. (2019, February). *Engaging the private sector in financing adaptation to climate change: Learning from practice*. Retrieved from Acclimatise: http://www.acclimatise.uk.com/wp-content/uploads/2019/02/ACT-Private-Sector-paper_final_web-res.pdf

128 Ampairea, E. L., Jassognea, L., Providencea, H., Acostaa, M., Twymanb, J., Winowieckic, L., & Astena, P. v. (2017). Institutional challenges to climate change adaptation: A case study on policy action gaps in Uganda. *Environmental Science and Policy*, 81-90.

Second, informational gaps on potential sectors of investments, impacting the scale required and increasing the risks involved

Information pertaining to which sectors the private sector can increase its participation in, is limited. This stems from lack of clear investment avenues specified under existing national and subnational adaptation plans such as National Adaptation Plans and State Action Plans on Climate Change. Considering the nature of adaptive activity required will vary as per region, it is difficult to define priority areas of investment at the national level. However, at the subnational level, i.e. state and municipal governments, provision of clear information on areas of investment can be instrumental in driving private investment. This is also the case for resilient infrastructure. While it is a welcome move by the Indian government to announce an infrastructure pipeline up to 2025,¹²⁹ it lacks a focus on how much investment is required in order to make this infrastructure resilient.¹³⁰ Here too, as mentioned earlier, developing a standardized framework and taxonomy for the pipeline, clearly defining what a climate resilience lens in infrastructural projects would entail, can ensure that all new infrastructure construction, public or private, is aligned with established standards.

Lastly, information related to scale of investment required, assessment of risks involved and means of managing the same, limit the development of bankable projects for private sector participation.¹³¹ Therefore, the existing institutional framework limits the involvement of private players by first, limiting the space where they can directly access international finance; and second, through the lack of information on the areas where investment and participation by private sector is required in both adaptation and resilient infrastructure. The latter barrier closely relates to limited capacity especially at subnational levels, to enable this. This is explored in the next barrier.

4.1.2 Horizontal/ Engagement Bottlenecks

Limited capacity of subnational actors in engaging private players for adaptive action

Engagement between private entities and subnational actors, such as state governments which are often the recipient or implementing entity for adaptation projects, is limited. One of the reasons is due to the fact that subnational governments are often not equipped with the capacity to assess the financial requirement of funds for adaptation.¹³² While vulnerabilities are mapped at both national and subnational levels for guiding adaptive action, climate modelling techniques deployed at present do not completely and adequately assess the financial requirements of actual implementation.

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- 129 Department of Economic Affairs. National Infrastructure Pipeline – Report of the Task Force. Last accessed on June 15, 2021 at: https://dea.gov.in/sites/default/files/Report%20of%20the%20Task%20Force%20National%20Infrastructure%20Pipeline%20%28NIP%29%20-%20volume-ii_1.pdf
- 130 Tall, A., Lynagh, S., Vecchi, C. B., Bardouille, P., Pino, F. M., Shabahat, E., Kerr, L. (2021). *ENABLING PRIVATE INVESTMENT IN CLIMATE ADAPTATION & RESILIENCE*. The World Bank Group.
- 131 Agrawala, S., Carraro, M., Kingsmill, N., Lanzi, E., Mullan, M., & Prudent-Richard, G. (2011). *Private Sector Engagement in Adaptation to Climate Change*. OECD.
- 132 Smoke, P. (2019). *Improving Subnational Government Development Finance in Emerging and Developing Economies: Toward a Strategic Approach*. ADBI Working Paper 921. Tokyo: Asian Development Bank Institute.

Even if some estimates are available for total expenditure required for adaptation, as in India's NDCs, these fail to capture region specific nuances such as costs- real and imputed, economic and social- which are instrumental in driving investment decisions. In the absence of this assessment of costs and similarly that of risks involved, the capacity of subnational actors to engage with private players becomes limited. Take for instance, the case that a private entity is interested in undertaking or directly financing adaptation projects; it will have to first undertake a holistic cost and benefit assessment, risk identification, awareness and management options,¹³³ and thereafter develop a model for investment in the region. The limited assessment of costs at the subnational levels as a limitation for inducing private sector participation in increasing adaption and resilience in the region.

Limited inter-departmental and inter-regional engagement at the subnational levels

Another challenge at the subnational level is the siloed approach towards undertaking adaptive activity. In any urban local body (ULB), as an illustration, developing a climate resilient government building will be a project that will involve experts across sectors such as energy efficiency and cooling, resilient materials and construction design, biodiversity, finance and officials from the public works department. Similarly, projects for adaptation action such as watershed development or storm-water management, will also transcend across expertise and departments within the subnational governments. This challenge has been observed while developing state action plans for various Indian states. This is also a challenge which is true for local level adaptation in other developing countries.¹³⁴ The lack of engagement across departments limits a holistic understanding of not only the costs and benefits, but also the capacity to engage private sector entities in larger projects.

Further, because adaptation is an issue that transcends boundaries, it is essential that municipalities, ULBs or other subnational entities of one region engage with those of another. This is especially critical but and further worsened by lack of regional vulnerability assessments and adaptation planning at the national level. Interaction and co-ordination between different governmental agencies are essential to develop robust developmental plans which include strategies to enable private sector engagement and finance flows.¹³⁵ Inter municipality or local governments engagement can help enhance information and knowledge, account for vulnerabilities as well as enable greater technical and financial capabilities.¹³⁶

As mentioned earlier, Indian states are required to prepare their State Action Plans on Climate Change, which should detail the strategic and prioritized climate interventions with roadmaps and roles defined.

133 (Agrawala, et al., 2011)

134 Moser, S. C., Ekstrom, J. A., Kim, J., & Heitsch, S. (2019). Adaptation finance archetypes: local governments' persistent challenges of funding adaptation to climate change and ways to overcome them. *Ecology and Society* , 35.

135 (Tall, et al., 2021)

136 GIZ. (2018). *Multi-Level Climate Governance Supporting Local Action*. Bonn: GIZ

These are not up to the mark for effective implementation and have proven to be inadequate for engaging the private sector.^{137,138} This further links to the barrier of limited capacities of subnational governments in fully capturing adaptation needs and means of enabling them. Private sector entities are therefore indirectly involved by the state or municipal bodies for implementation of subnational projects and the role of private entities has generally been limited to small-scale activities driven occasionally by their own initiative.^{139,140}

4.1.3 Motivational Barriers

Lack of perceived benefits for the private sector accruing from adaptation

Private-sector engagement in adaptation is driven by at least two factors. **First to adapt to climate change in response to the physical, transitional and liability risks that private sector faces itself.**¹⁴¹ This can further extend to protecting their own interests by the private sector climate proofing respective value chains and business operations.¹⁴² Direct risks that the business or private player faces from the impacts of climate change include exposure to climate impacts such as heat stress, water scarcity, damage due to extreme weather events especially physical assets, infrastructure, production or health.¹⁴³ Businesses may take action to adapt to these risks. These decisions are taken on the basis of short-term climate change risk assessment and, in some cases, modelling.¹⁴⁴ As a result, any adaptive action which is taken will be short term. In some cases, this could lead to maladaptation.¹⁴⁵ In very rare cases, private sector entities and businesses undertake long term climate risk assessments and subsequent planning for action. This is rare due to the cost and difficulty in the use of scenarios and projections. In some cases, private actors, may not take scalable action after a long-term risk assessment, if it is deemed to be far in the future. This can create severe climate risks not just for the business but also sustainability of the region where it operates in.¹⁴⁶

137 Chaturvedi, A., Rattani, V., & Awasthi, K. (2018, September 18). *State action plans on climate change need upscaling and capacity enhancement*. Retrieved from Down to Earth: <https://www.downtoearth.org.in/blog/climate-change/state-action-plans-on-climate-change-need-upscaling-and-capacity-enhancement-66796>

138 Kumar, V. (2018). *Coping with climate change Vol II: An Analysis of India's State Action Plans on Climate Change*. New Delhi: Centre for Science and Environment.

139 C40 & ARUP. (2015). *Powering Climate Action: Cities as Global Changemakers*.

140 Klein, J., Araos, M., Karimo, A., Heikkinen, M., Ylä-Anttila, T., & Juholad, S. (2018). The role of the private sector and citizens in urban climate change adaptation: Evidence from a global assessment of large cities. *Global Environment Change*, 127-136.

141 (Cochu, Hausotter, & Henzler, 2019)

142 Schaer, C., & Kuruppu, N. (2018). *Private-sector action in adaptation: Perspectives on the role of micro, small and medium size enterprises*. UNEP DTU Partnership.

143 Pauw, W. P. (2015). Not a panacea: private-sector engagement in adaptation and adaptation finance in developing countries. *Climate Policy*, 583-603.

144 (Agrawala, et al., 2011)

145 Schaer, C., & Pantakar, A. (2018). Promoting private sector engagement in climate change adaptation and flood resilience: A case study of innovative approaches applied by MSMEs in Mumbai, India. In *Theory and Practice of Climate Adaptation* (pp. 175-191). Springer.

146 (Agrawala, et al., 2011)

This category also includes measures undertaken by private players or businesses in response to reputational risks in response to civil society advocacy, media coverage and change in consumer behaviours.¹⁴⁷ In some cases, businesses have undertaken sustainability measures, predicting consumer demand towards sustainability. This is more relevant towards resilient infrastructure and housing. Other indirect drivers for the private sector towards adaptation is impact on supply chains and operations of businesses.¹⁴⁸ Infrastructure for ensuring resilience of supply chains is an area where private sector can be effectively involved, if they are made aware of the climate risks and adverse impacts that are likely to be faced.

Lack of demand driven push to adapt

Since mobilizing finance towards adaptation is challenges especially due to the low perceived or actual returns on investment, and inability for the private investors to capture the full environmental and social benefits generated by adaptation investments, there is limited motivation for the private sector to invest in adaptation as opposed to mitigation.¹⁴⁹ Indian consumers too are not demanding strong corporate engagement for environmental or climate issues. As seen from the current landscape in chapter 3, for infrastructure and resilience, private sector has been mobilized for finance largely through public funds and NBFCs.

BOX 3

Insurance – Leveraging Negative Incentives to Increase Resilience?

Economic theory emphasizes the crucial role that price signals play in markets. One way of overcoming the motivational barriers that the private sector faces in building resilience is to create an incentive by way of insurance. In addition to financial compensation for losses after an extreme weather event, insurance can provide incentives to reduce risk. By differential pricing of premiums, insurance allows for the possibility of creating a trade-off between premium affordability and risk-reduction incentives.

In the case of climate resilience, this can work as both positive and negative incentive. For example, if insurers offer a discount for climate-proofing new infrastructure, the private sector developers will likewise have an incentive to make that investment.

Discounts in premiums as a means to incentivize resilience measures, can nudge developers to invest in resilience building factors. By investing in such improvements, private developers can lower their premiums. Alternatively, high premiums can be charged in the case insurance is sought for risk prone infrastructure or investments.

147 (Pauw, 2015)

148 (Pauw, 2015)

149 (Tall, et al., 2021)

For this to be effective, some prerequisites must be instated in the existing institutional mechanism. First, clear parameters defining climate risk and activities which count towards resilience building. This will require standardization of terms, activities by way of developing a clear taxonomy on what constitutes resilient infrastructure.

Second, the availability of granular data. For insurers to play their role in increasing resilience, they will require data on predefined metrics to judge the climate risk of the infrastructure in question. Data on vulnerabilities of the region, quantification of risk will also be essential. This especially will require action on the part of the subnational governments.

4.1.4 Regulatory Barriers

Need for Standardization and Data Accessibility

The first step to channel large-scale and long-term finance into resilient infrastructure projects is to identify which measures are required for developing green and resilient infrastructure. The role of developing a taxonomy, and probably sectoral taxonomies, becomes critical in this. Taxonomies are definitions of sustainable finance that aim to be “comprehensive classification systems”. The International Finance Corporation (IFC) has estimated that India has a climate-smart investment potential of USD 3.1 trillion for the period 2018 to 2030¹⁵⁰. Relatively precise and consistent definitions developed through a taxonomy, defining which investments are “green” and “sustainable” can enable mobilisation of large scale investment, and provide confidence and assurance to investors.

Some regions and countries have developed their taxonomies, most prominently and the largest being the EU Taxonomy. Other jurisdictions include China¹⁵¹; Japan¹⁵², Netherlands¹⁵³, and France¹⁵⁴ created the GreenFin label for retail investment funds in 2015. Other countries expressing interest on sustainable finance taxonomies include Canada, Kazakhstan and Indonesia. Such standardisation enforced through robust regulation can initiate effective investment towards resilient infrastructure.

Development of this taxonomy will require engagement with private entities and industries regarding data disclosures to evaluative vulnerability, adaptive capacity and the resultant resilience building. As of now, data collection and accessibilities at both the state and company levels are inadequate and varying. Standardisation on the metrics to be evaluated and data availability is not there in the current institutional mechanism.

150 <https://www.pv-magazine-india.com/2021/04/26/green-taxonomy-first-step-towards-building-a-resilient-society/>

151 In 2015-Green Bond Endorsed Project Catalogue, commonly referred to as “the Chinese taxonomy”

152 the Ministry of the Environment of Japan (MOEJ) launched Japan’s green bond guidelines in 2017

153 The Netherlands has had a legislative approach to green lending since 1995 (Green Funds Scheme)

154 created the GreenFin label for retail investment funds in 2015

Limitations due to lack of regulations mandating resilience

As discussed in Chapter 2, existing infrastructure regulations look at resilience from a very limited approach of disaster resilience. In fact, the focus is on means of improving disaster resilience and not climate resilience.¹⁵⁵ Though infrastructure standards and their enforcement can be effective in increasing resilience towards earthquake; improving resilience to flooding, resilience of critical infrastructure in the face of a calamity and other changing impacts due to climate change¹⁵⁶ also require local knowledge, data-modelling and forecasts to predict current and future extreme climate events.¹⁵⁷

In India, existing laws of disaster management and resilience are focused at improving resilience and preparedness to help build adaptive capacity. These however, look at resilience action from a short-term perspective of climate events, and not long-term perspective of climate stressors. The gap therefore is that it does not take into account the adaptive requirements of infrastructure construction from the need of resilient infrastructure, which would have design implications and require climate risk assessments to be conducted.

A lot of the resilient infrastructure is essential to be incorporated in keep public and critical infrastructure such as electricity systems, roads etc. Private infrastructure developers are also required to follow existing mandates for resilient construction. However, the existing laws around building environmental resilience in coastal regions or building by-laws, are developed with very broad objectives often not clearly focusing on the infrastructure resilience aspect of disaster management. For example, under disaster management, many guidelines have been developed for different disasters, in line with other existing policies. For floodplains and flooding there are National Disaster Management Guidelines for Management of Floods (NDMG), as well as Model Bill for Flood Plain Zoning (MBFPZ), both developed with focus on floods and floodplain zoning. The NDMG mandates infrastructural activities in flood-prone areas to be flood-resilient, as well as discusses the development of a legal framework for construction in flood-prone areas. Similarly, MBFPZ is developed as a prescriptive guideline for floodplain zoning in the country. However, both these legislations, do not have clear policy provision for mandatory clearance to construct infrastructure in flood-prone areas; no clarity on the reclamation of existing wetlands or reviving and maintaining existing wetland or a plan to use the wetlands for flood moderation¹⁵⁸.

Similarly, there are several certifications for green buildings and construction. These are “a medley of codes and standards contained in the State by-laws, the National Building Code, the Energy Conservation Building Code (ECBC) and in the norms set by the ratings programmes, such as Leadership in Energy and Environmental Design-India (LEED-India), the standards and guidelines

155 Gallego-Lopez, C., & Essex, J. (2016). DESIGNING FOR INFRASTRUCTURE RESILIENCE. Department of International Development Government of UK.

156 Power Grid Corporation of India Limited. (2015). *Building Climate Change Resilience for Electricity Infrastructure*. Power Grid Corporation of India Limited.

157 (Gallego-Lopez & Essex, 2016)

158 https://www.orfonline.org/wp-content/uploads/2020/05/ORF_OccasionalPaper_248_FloodplainZoning.pdf

put down for the Residential Sector by the Indian Green Building Council (IGBC), TERI-GRIHA and other such certifications".¹⁵⁹ In effect, because they lack the necessary mandate and regulation and only serve as optional certifications for buildings, they fail to provide adequate incentive to private developers to make buildings more resilient.

Regulatory barriers trickle down to ineffective channelization of private finance towards infrastructure resilience

This barrier of lack of regulatory drivers further extends to channeling finance towards resilient infrastructure. As seen in chapter 3, there is more private sector participation in mobilization of finance for infrastructure than that for adaptation. The lack of regulation or direction risks all infrastructural investment continuing to move towards carbon intensive projects. This is detrimental considering the long lock-in periods for infrastructure.

Due no clear guidelines of existing regulatory framework guiding investment in adaptation and resilience, there is lack of linkage especially in the context of increasing adaptive capacity and resilience against physical risks. It has been found that several practices to enhance DRR overlap with adaptive efforts. This is particularly true for DRR measures, particularly those related to hydrometeorological events such as drought-proofing, flood protection, cyclone warning and shelters, malaria eradication, resistant agriculture, mangrove conservation, saline embankment, and alternative livelihood development.¹⁶⁰ Interlinking action towards both DRR and adaptation is therefore essential to not only decrease overlapping of efforts directed towards adaptive action but to improve the effectiveness of scarce financial resources mobilized towards adaptation.¹⁶¹ The lack of linkage also emerges from the fact that often the officials and departments managing Infrastructure resilience and other adaptive action are different. This results in them working in silos with limited coordination.¹⁶²

159 Kumar, Y. (2014, August). Code for Green Buildings: Need of the Hour. *ARCHITECTURE - Time Space & People*, pp. 42-44.

160 Mall, R. K., Srivastava, R. K., Banerjee, T., Mishra, O. P., Bhatt, D., & Sonkar, G. (2019). Disaster Risk Reduction Including Climate Change Adaptation Over South Asia: Challenges and Ways Forward. *International Journal of Disaster Risk Science*, 14-27.

161 Islam, S., Chu, C., & Smart, J. C. (2020). Challenges in integrating disaster risk reduction and climate change adaptation: Exploring the Bangladesh case. *International Journal of Disaster Risk Reduction*, 14.

162 Buckle, P., Birkmann, J., Renaud, F., Setiadi, N., Sinh, B. T., & Sunarto. (2009). Introduction: challenges in Disaster Risk Reduction and Climate Change Adaptation in South and Southeast Asia . In N. Setiadi, J. Birkmann, & P. Buckle, *Disaster Risk Reduction and Climate Change Adaptation: Case Studies from South and Southeast Asia* (pp. 19-29). Yogyakarta: UNU.

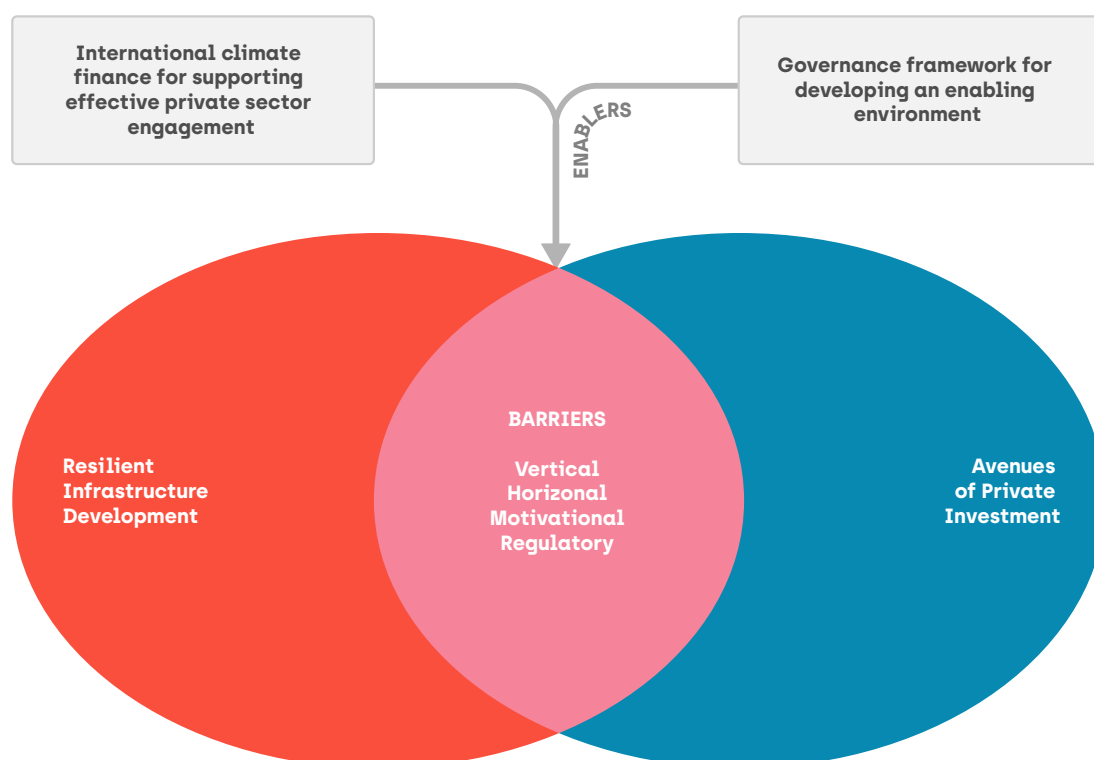
4.2 Role of International Climate Finance and the Public Sector for Overcoming these Barriers

Funding of research and assessments of climate impacts is an important task to arm decision-makers from the private sector with knowledge and capacity to assess adverse climate impacts, and this is usually not prioritized by the private sector. Public sector and international finance can play a role by supporting measures such as providing thorough vulnerability assessments of critical regions, clearly defining adaptive needs and providing necessary data for private investors to assess the costs involved can be useful in incentivizing investment. Similarly, international funders can engage with the public sector to share best practices for developing adequate regulatory frameworks for incorporating resilience and mobilizing private actors, and help design viable incentives, finance instruments and communication modules for enabling this.

It is therefore essential that these information and capacity barriers be overcome to mobilize the private sector towards adaptation. It is here that the role of international climate finance and financiers; along with robust governance frameworks come into play.

FIGURE 4.2

Enabling Resilient Infrastructure



Currently, finance for adaptation largely flows in the form of grants or loans. In several developing countries and especially local regions which are most vulnerable, capacities to access these sources of finance is limited. As a result, local regions either rely on financial allocations from the central or state governments to be channelized towards adaptive measures, or implement adaptation projects that are developed at the national level. This limited access to finance is particularly challenging for financing resilient infrastructure projects. Properly directed international climate finance can enable private sector participation for large scale resilient infrastructure projects. This is already underway under some bilateral and multilateral financing mechanisms. However, instruments for financing adaptation and especially resilient infrastructure, must be diversified beyond just grants and loans. Instruments such as blended finance, concessional and conditional finance can be instrumental in mobilizing more resources towards adaptation. Having said this, effectiveness of these instruments will rely significantly on available information around regional vulnerability, risk assessment and estimation of costs and benefits, and stakeholder inclusion and participation.

International climate financiers can also play a critical role in increasing capacities by designing engagement modules and risk mitigation frameworks, all of which can, in turn, support in increasing bankability of adaptation projects. Considering the cross-cutting nature across mitigation and resilience, finance for resilient infrastructure offers a lucrative avenue to explore new instruments. Unlike other adaptation projects such as watershed restoration or storm water management, a project for developing resilient infrastructure such as that for housing in coastal regions, or resilience of critical infrastructure, the estimation of costs and returns on investments is relatively more manageable for project developers.

In the next chapter, cases from regions are discussed which have overcome these foundational and structural barriers and increased flow of finance towards resilient infrastructure, which are built on to frame a way forward in the Indian context.

Photo by Sharon McCutcheon

CHAPTER FIVE —————>

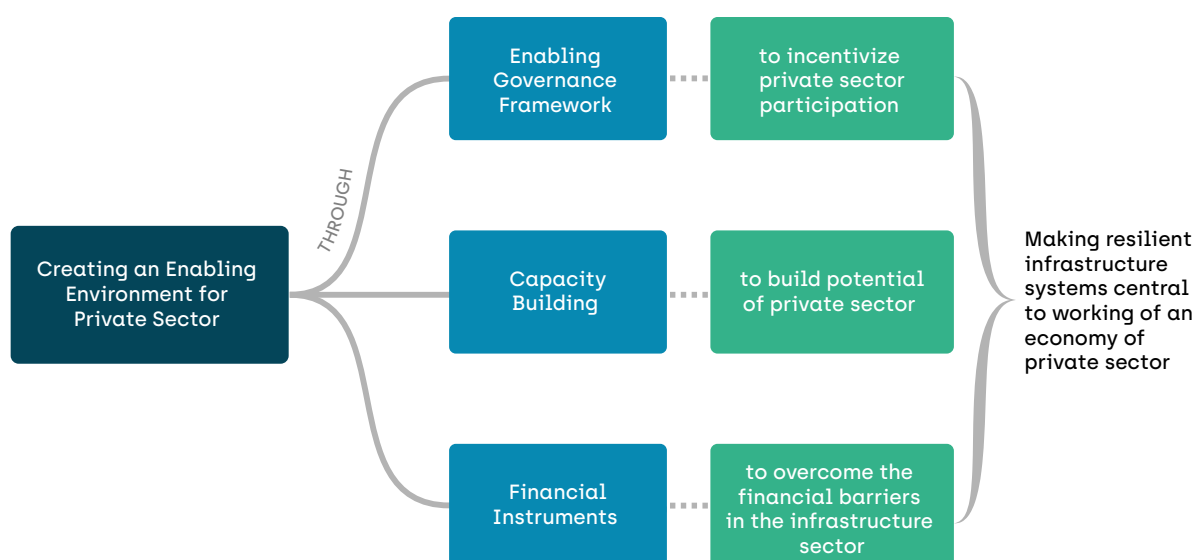
Learnings from Experience

Infrastructure forms a central aspect for developing climate resilience pathways. However, this sector has always witnessed chronic underinvestment globally.¹⁶³ There is a need to understand how investments towards this sector can be increased and what approaches can be developed to integrate the concept of resilience in different infrastructure systems. A shift from siloed approach of planning infrastructure development to a more sustainable and resilient strategy, has been initiated in different sectors and regions globally, reflecting the changing preferences of various stakeholders- governments, financial institutions, civil society and private sector.

The role of the private sector for catalyzing the growth of climate resilient infrastructure is increasingly being recognized, with government policies and financial mechanisms mandating or encouraging this shift. A range of good practices from across the world, where governments and international development finance institutions have worked to either increase private sector participation or increase the scope for leveraging private sector support for the resilient infrastructure segment have been recognized. The lessons learnt from these good practices provide an understanding on how investment by private sector for resilient infrastructure can be enabled.

FIGURE 5.1

Approach for Assessing Global Good Practices



163 OECD/The World Bank/UN Environment. 2018. "Financing Climate Futures: Rethinking Infrastructure" (Report). OECD Publishing, Paris. Accessible: <https://doi.org/10.1787/9789264308114-en>

5.1 Enabling Governance Framework

Pioneering countries, spanning both developed and developing ones, have started aligning their development policies with their climate context- on the basis of their climate vulnerabilities - and targets under various international conventions. In some cases, policy and regulatory landscape has been re-designed to incentivize and influence investment in different climate-relevant sectors, as per the needs of the countries. Following this, public investments are being directed towards climate relevant development programmes, which is leading to corresponding investments from the private sector for resilient infrastructure. It indicates that removing policy distortions, or establishing clear and enforceable regulatory requirements, can drive the private sector to play a more significant role and commit to developing climate resilient infrastructure in their operations.

5.1.1 Redesigning the Policy Landscape

There is a need to enhance already existing regulatory and economic standards or introduce new governance mechanism that incorporate the idea of resilience in infrastructure. The already existing policy landscape in a country can be built upon and enhanced, to incorporate the objective of climate adaptation, especially focused around the sectoral infrastructure needs. Ensuring climate resilience for infrastructure covers both mitigation and adaptive strategies, and stronger policies may also leverage private sector participation in this sector. Policies can help identify the entry points for mainstreaming climate resilience into the project.

A comprehensive approach for this, as taken by the Government of Philippines, which established the Climate Change Committee in 2009 as the sole policy-making authority on climate actions, by combining several agencies with overlapping jurisdictions and roles, is one way forward. India too had adopted a similar approach, though less stringent in terms of concentration of powers, in the form of its Prime Minister's Council on Climate Change in 2008 which was an advisory and oversight committee.¹⁶⁴ This is especially useful in the earlier stages of integrating a climate lens to policy-making, building an information base and establishing effective connects with the local leadership at the ground level, and could be replicated for the resilient infrastructure segment. Alternatively, adaptation policies can be developed to promote cross-sectoral coordination, as done in Brazil, where the National Adaptation Plan has strategies dedicated specifically to infrastructure for urban-mobility, transport and energy.¹⁶⁵

164 Government of India Archives. Last accessed on May 20, 2021. Accessible at: https://archivepmo.nic.in/drmanmohansingh/committeescouncils_details.php?nodeid=7

165 OECD. 2018. "Climate-resilient Infrastructure- Policy Perspectives" (Policy Paper). OECD Environment Policy Paper No. 14. Accessible: <http://www.oecd.org/environment/cc/policy-perspectives-climate-resilient-infrastructure.pdf>

5.1.2 Strategic Planning for Infrastructure Resilience

An integrated strategic planning approach adopted at the national level will improve decision making under uncertainty, which is usually the case with climate risk and impact projections, for the country's infrastructure.¹⁶⁶ It also allows stakeholder interaction, to move away from an isolated approach of infrastructure planning, to a wider and integrated approach of infrastructure governance. The Rebuild Kerala Initiative in India, has been developed with this idea, as a participatory and inclusive process, laying out a strategic roadmap for building the state of Kerala, in a green and resilient manner.¹⁶⁷

For the infrastructure sector, strategic planning based on scientific and objective models and methodologies, has been seen to allow resilience to be integrated into the general infrastructural planning, construction, and maintenance phases of the project cycle. A leading example of this is the United Kingdom, which has applied the National Infrastructure Systems Model (NISMOD) methodology for undertaking national infrastructure planning of both public and private investment, of over USD 800 billion. Developed as an infrastructure planning approach, by the University of Oxford-led Infrastructure Transitions Research Consortium (ITRC), this approach is based on assessing the country's current and future infrastructure needs. This evidence-based infrastructure planning strategic approach helps in developing investment roadmaps various recommendations to the government. It has now been adopted by other countries too – including Argentina, New Zealand, China, Tanzania and Vietnam.¹⁶⁸ The NISMOD has also been developed by Saint Lucia for its National Infrastructure Assessment, which also uses spatial data for assessing the impact of climate-change driven hazards for infrastructure development and planning.¹⁶⁹ There is also the example of performance-based contracts in requiring climate risk assessment and adaptation measures, to be assessed by a standardized tool, such as that developed by World Bank's Public Private Infrastructure Advisory Facility (PPIAF). This has been leveraged in Vietnam, Cambodia and Georgia to mainstream climate risk assessments in the transport sector.¹⁷⁰ For a country with the size and complexity of India, this approach could be taken by the states and urban centres.

Strategic planning for infrastructure development should be enabled by supportive policy and regulatory frameworks, to be effectively initiated. It helps promoting transparency and more conducive multi-stakeholder participation for achieving enhanced resilience of the economy. This has shown to allow coordination between different institutional levels, at sub-national and national level, with active participation from the private side.

166 OECD/The World Bank/UN Environment. 2018. "Financing Climate Futures: Rethinking Infrastructure" (Report). OECD Publishing, Paris. Accessible: <https://doi.org/10.1787/9789264308114-en>

167 Government of Kerala. "Rebuild Kerala" (Website). Accessible: <https://rebuild.kerala.gov.in/en/about>

168 National Infrastructure Commission. 2018. "National Infrastructure Assessment 1 (2018)". Accessible: <https://nic.org.uk/studies-reports/national-infrastructure-assessment/national-infrastructure-assessment-1/>

169 United Nations Environment Programme. 2021. "Saint Lucia's National Infrastructure Assessment, in Integrated Approaches in Action: A Companion to the International Good Practice Principles for Sustainable Infrastructure" (Report). Nairobi. Accessible: <https://wedocs.unep.org/bitstream/handle/20.500.11822/34972/SLNIA.pdf>

170 World Bank Blogs (2021). How do we link private sector participation and climate resilient infrastructure right now? Some ideas from PPIAF. Accessible at: <https://blogs.worldbank.org/ppps/how-do-we-link-private-sector-participation-and-climate-resilient-infrastructure-right-now>

5.1.3 Regulatory Enhancements

Mandatory design standards, regulations, building codes, construction or monitoring norms, etc. have been successfully used across the various buildings and infrastructure sub-sectors to bring in climate and resilience considerations into new infrastructure development. Resilience related standards can be developed with a focus ranging between simplicity and enforceability, to specificity and adaptability.¹⁷¹ Many countries are regularly revising mandatory national infrastructure standards and establishing new norms which are better aligned with projected climate impacts. For example, in 2008, Sweden introduced enhanced road drainage standards, to cope with increasing rainfall due to the changing climate.¹⁷² Standardization for resilience can also be incorporated in the service reliability component of infrastructure as done in Finland. The Electricity Market Act, passed in 2013 in Finland, requires power distribution networks to be designed, built and maintained in line with climate standards by 2028, whereby electricity disruptions because of storms or snow is minimized.¹⁷³

Climate risk assessment and subsequent disclosures allows reducing climate risks to infrastructure. Risk disclosure, especially by private sector, should be encouraged, if not mandated, during different infrastructure development scenarios like during the tender submission for construction or infrastructure service provision.¹⁷⁴ Risk disclosure can also be initiated from the government by communicating climate risks to support decision making. This was seen in Argentina, where the National Climate Change Office has developed an interactive website that provides the risk maps for different climate vulnerabilities and scenarios of threat. The tools were designed for the decision-making process for both public and private sector, to allow climate projections to be incorporated into development of sectoral plans, territorial planning, climate events prevention activities and investment planning, to see affect on infrastructure, health, environment, social development and public works.¹⁷⁵

171 The World Bank. 2019. “Lifelines: The Resilient Infrastructure Opportunity” (Report). World Bank and Global Facility for Disaster Reduction and Recovery. Accessible: <https://www.worldbank.org/en/news/infographic/2019/06/17/lifelines-the-resilient-infrastructure-opportunity>

172 Vallejo, L., & Mullan, M. 2017. “Climate-resilient infrastructure: Getting the policies right” (Working Paper). OECD Environment Working Papers, No. 121, OECD Publishing, Paris. Accessible: <http://dx.doi.org/10.1787/02f74d61-en>

173 Nurmi, V., Sihvola, P. K., Gregow, H., & Perrels, A. 2019. “Overadaptation to Climate Change? The Case of the 2013 Finnish Electricity Market Act” (Article). *Economics of Disasters and Climate Change*, 3, pp. 161-190. Accessible: <https://link.springer.com/article/10.1007/s41885-018-0038-1>

174 Vallejo, L., & Mullan, M. 2017. “Climate-resilient infrastructure: Getting the policies right” (Working Paper). OECD Environment Working Papers, No. 121, OECD Publishing, Paris. Accessible: <http://dx.doi.org/10.1787/02f74d61-en>

175 Argentine State. “Climate Change Risk Map System (SIMARCC)” (Website). Climate Change, Sustainable Development and Innovation. Accessible: <https://simarcc.ambiente.gob.ar>

5.2 Building Capacity for Adopting Novel Solutions and Approaches

To reach an ideal state, regulators, private players and other stakeholders should be enabled to properly assess and understand climate risks and incorporate them in the infrastructure development plans. Platforms that allow for frequent, clear and effective dialogue between these actors should be made available to facilitate partnerships and co-development, due to the interdependencies in the infrastructure sector. This can be achieved through a 'reflexive governance' approach. This form of evolutionary institutional approach provides resilience through its ability to adapt to changing conditions.¹⁷⁶ Such an approach allows decision makers and institutional investors to 'learning by doing' which is critical for designing innovative solutions for emerging segments such as resilient infrastructure.

5.2.1 Information and Knowledge Exchange

Institutional strengthening is important to guide strategy. There is need of data, complemented by climate risks analysis, to allow different stakeholders to participate in the infrastructure sector, with resilience building being incorporated as an integral part of their operations. This especially involves filling the knowledge gaps linking economic growth, climate adaptation and resilient infrastructure, supported by cost-benefit analysis for the private sector.

Developing information tools and knowledge databases can help in building capacities of a wide range of stakeholders from different levels and there are several examples of high-level guidance from government agencies to support the integration of climate risks in infrastructure projects development. An example of this is the tool developed by the United States Federal Highway Agency (FHWA), which helps infrastructure agencies understand the kind of flooding that an area is likely to experience and accordingly select the feasible materials for road surfaces.¹⁷⁷ From a more global perspective, the Sustainable Infrastructure Tool Navigator has been developed as an online platform to help users identify the most relevant tools required to integrate sustainability in different stages of the lifecycle of any infrastructure project.¹⁷⁸ This tool further provides access to other rating system tools, like SuRe Standard- the standard for Sustainable and Resilient Infrastructure. The SuRe Standard is developed as a global voluntary standard initiating integration of sustainability and resilience into infrastructure development.¹⁷⁹ This tool has been developed with an aim to reach out to multiple- stakeholders like infrastructure project developers, financiers and public sector institutions.

176 Ferrari, Mattia. 2020. "Reflexive Governance for Infrastructure Resilience and Sustainability" Sustainability 12, No. 23: 10224. Accessible: <https://doi.org/10.3390/su122310224>

177 Vallejo, L., & Mullan, M. 2017.

178 "Sustainable Infrastructure Tool Navigator" (Website). Accessible: <https://sustainable-infrastructure-tools.org>

179 "SuRe Standard" (Website). Accessible: <https://sure-standard.org>

Further, in Norway, the government has recently offered its banks a climate risk assessment tool for evaluating projects.¹⁸⁰ Also, the European Investment Bank has developed and applied a climate-risk screening tool as part of its climate strategy,¹⁸¹ and such instances indicate how European financial sector players are leading the way by incorporating physical and transitional climate risks into their credit underwriting processes.

These examples highlight how governments and public development banks, can take the lead on this aspect, potentially leading to a transition of a sector and better integration of climate risk assessments in the mainstream.

5.2.2 Enabling Multi-Stakeholder Partnerships

Multi-stakeholder partnerships through all the stages of planning and implementation, allows for exchange of knowledge or capacity building and risk-sharing, thus enabling a larger involvement of the private sector. For developing resilient infrastructure, besides reliable contractual and regulatory frameworks, support in the form of risk-sharing mechanisms can be useful for mobilizing increased private sector participation.

Indonesia promoted a multi-stakeholder approach for its adaptation planning. This started in the city of Semarang, where civil society, academics, practitioners, as well as local and national government actors were brought together under the Initiative for Urban Climate Change and Environment (IUCCE) to gather evidence for local adaptation processes. This is now being replicated through the Best Practice Transfer Program, to other Indonesian cities. Its also emphasizing on including the private sector to effectively institutionalize urban climate resilience practices at scale.¹⁸²

Public-Private Partnerships (PPP) modality have constituted an important part of infrastructure development in many emerging and developing economies. India has a mature PPP segment and vast experience in successfully leveraging these for infrastructure development. The components of resilience and adaptation can also be incorporated into increasing PPPs, by strengthening regulatory frameworks to allow countries to encourage these partnerships.

The World Bank's Public Private Infrastructure Advisory facility (PPIAF), aims to leverage private sector participation, by helping developing countries strengthen their regulatory frameworks, and knowledge sharing capacities, aiming to mainstreaming adaptation and resilience considerations, into PPP infrastructure. A successful example of this is PPIAF's Coastal Cities Sustainable Environment Project in Vietnam. Based on a city's climate vulnerability, the project improved

180 [Bloomberg.com](https://www.bloomberg.com/news/articles/2021-04-14/banks-in-norway-offered-free-climate-risk-tool-by-government) (2021). "Banks in Norway Offered Free Climate-Risk Tool by Government." Accessible at: <https://www.bloomberg.com/news/articles/2021-04-14/banks-in-norway-offered-free-climate-risk-tool-by-government>

181 EIB. "Mainstreaming Climate Action within Financial Institutions." Accessible at: https://www.eib.org/attachments/fi_mainstreaming_epp_overview_en.pdf

182 OECD. 2018. "Climate-resilient Infrastructure- Policy Perspectives" (Policy Paper). OECD Environment Policy Paper No. 14. Accessible: <http://www.oecd.org/environment/cc/policy-perspectives-climate-resilient-infrastructure.pdf>

service contracts and institutional arrangements of local governments for performance, operation, and maintenance of public sanitation facilities, to allow greater private sector participation in the sector.¹⁸³

An issue of lack of clarity of allocation of risk between the public and private players, which can hamper meaningful PPPs, has been observed in many countries. Japan has addressed this issue by building on its extensive disaster risk assessment and PPP experience to effectively share part of disaster risk for critical infrastructure with private operators. Collaborative approaches for improved data and knowledge sharing has helped private sector actors to better assess and allocate risk and thus participate in resilient infrastructure development.¹⁸⁴

5.2.3 Deploying Nature-based Solutions

Governments are increasingly realizing the potential of Nature-based Solutions (NbS), like the ones offered through Ecosystem-based Adaptation (EbA), to contribute to resilience of infrastructure networks. Explicit reference to EbA has been seen in 23 countries' NDCs, and nearly 109 NDCs suggest similar concepts of working with nature to promote climate resilience.¹⁸⁵ The major idea behind investing in ecosystem services, through the people centric EbA is to reduce physical climate risk through a cost-effective approach, linking traditional biodiversity and ecosystem conservation. The cost effectiveness and increasing livelihood and economic opportunities from EbA approaches can be seen through many projects (See Box¹⁸⁶).

183 Weekes, K., Fanas, D. G. 2021. "How do we link private sector participation and climate resilient infrastructure right now? Some ideas from PPIAF" (Blog). Accessible: <https://blogs.worldbank.org/ppps/how-do-we-link-private-sector-participation-and-climate-resilient-infrastructure-right-now>

184 World Bank. 2019. "Technical Brief on Resilient Infrastructure PPPs- Contracts and Procurement" (Technical Brief). World Bank, Washington, DC. Accessible: <http://documents1.worldbank.org/curated/en/925691571416771609/pdf/Technical-Brief-on-Resilient-Infrastructure-Public-Private-Partnerships-Policy-Contracting-and-Finance.pdf>

185 OECD. 2019. "Implementing Adaptation Policies: Towards Sustainable Development" (Issue Brief). prepared by the OECD as input for the 2019 G20 Process. Accessible: <https://www.oecd.org/g20/summits/osaka/OECD-G20%20Paper-Adaptation-and-resilient-infrastructure.pdf>

186 Sources: Talberth, J., Gray, E., Branosky, E., & Gartner, T. 2012. "Insights from the Field: Forests for Water" (Issue Brief). World Resources Institute. Accessible: http://pdf.wri.org/insights_from_the_field_forests_for_water.pdf

Cook, J., & Taylor, R. 2020. "Nature is an Economic Winner for COVID-19 Recovery" (Commentary). World Resources Institute. Accessible: <https://www.wri.org/insights/nature-economic-winner-covid-19-recovery>

OECD. 2019. "Biodiversity: Finance and the economic and Business case for Action", report for the G7 Environment Ministers' Meeting 5-6 May 2019. Accessible: <https://www.oecd.org/environment/resources/biodiversity/G7-report-Biodiversity-Finance-and-the-Economic-and-Business-Case-for-Action.pdf>

BOX 4

Cost-effectiveness of NbS

- › In **Portland** ecosystem restoration for improving water quality was found to be 51-76% cheaper than treatment plants.
- › Planting and restoration of mangroves in **Vietnam**, helps protection from flooding and allows increased market opportunities in form of increased yields of shell and oyster collection, honeybee farming, etc.
- › Investment in nature, in the form of sustainable land management practices in the delta region in **Kenya**, can help increase the agricultural crop yields, hydro-power generation, and savings in water and wastewater treatment, delivering an estimated return of USD 21.5 million (over 30 years).

Sources: Talberth et al., 2012; OECD, 2019; Cook & Taylor, 2020.

EbA is increasingly being promoted by local governments post the pandemic. Many local governments have invested in nature-based solutions, as a part of COVID recovery efforts, for example planning up-gradation of green infrastructure in urban spaces, for cycling or walking cities like Bogotá, Paris, Mexico City and Milan.¹⁸⁷ There is a growing opportunity for mobilizing private sector engagement for EbA. However, this potential opportunity has not yet been leveraged or well understood by the private sector. There is a need to conduct targeted knowledge dissemination to raise awareness and help the private sector in understanding the benefits of these approaches, and how it could impact their business operations, including branding and marketing aspects. It may require incentives and a level of hand-holding from the public sector in the initial stages.

There are examples where the private sector mobilized financing for NbS/ EbA solutions¹⁸⁸:

- › Support of EbA projects, through loans or equity investment, has been initiated through the **Natural Capital Financing Facility**, a blended financing facility created by The European Investment Bank and European Commission. The initial facility was EUR 100-125 million for 2014 - 2017, intended to test and demonstrate the viability of different natural capital models for commercial funding.

187 Tsui, J. 2020. "Cities Prepare for Green Initiatives Post- Coronavirus" (Article). Accessible at: <https://eponline.com/Articles/2020/05/19/Cities-Prepare-for-Green-Initiatives-PostCoronavirus.aspx?Page=1>

188 OECD. 2019. "Implementing Adaptation Policies: Towards Sustainable Development" (Issue Brief). prepared by the OECD as input for the 2019 G20 Process. Accessible: <https://www.oecd.org/g20/summits/osaka/OECD-G20%20Paper-Adaptation-and-resilient-infrastructure.pdf>

- › For **flood management in Cartagena, Colombia**, ecosystem restoration interventions aimed at reducing flood risk was initiated through an IKI supported programme. Domestic intervention was also encouraged through the development of a funding mechanism, which included a 'ring-fenced' rainwater drainage levy on businesses and a voluntary fee on organizations hosting events in the city.
- › **Dow Chemical's "Valuing Nature" initiative** implemented solutions such as installation of "green" retaining walls at the Dow Chemical site in Aratu, Brazil instead of concrete walls, which helped to combat erosion and also reduced surface run-off.
- › **Quintana Roo, Mexico's "Coastal Zone Management Trust"** set a funding mechanism which used a mix of taxes from the local tourist industry and local government funding, to preserve and restore coastal reefs. The fund also purchases insurance against damage to the reef, which then covers additional restoration activities following severe storms.

5.3 Financial Instruments for Catalyzing Private Sector

With resilience forming an increasingly important part of infrastructure development, climate risk analysis and risk reduction is generating interest in terms of new set of business and investment opportunities. The long term risk associated with infrastructure development has been found as a major barrier for private sector to readily invest in it. This is being addressed by financial strategies in forming of developing different mechanisms and instruments, which may allow crowding in of private sector.

5.3.1 Debt Financing

Over the last decade, private sector capital for adaptation projects has been mobilized through financial instruments like bonds or insurance, that ensure sustainability or resilience through their design. Developing solutions of catastrophe bonds or resilience bonds allow transfer of risk to the capital market but not physical risk reduction. Nonetheless, such debt financing instruments are being increasingly adopted for infrastructure sector, as an instrument to quantify and protect against climate risks, and thus reduce the cost of financing.¹⁸⁹

189 United Nations Environment Programme. 2019. "Driving Finance Today for the Climate Resilient Society of Tomorrow- for the Global Commission on Adaptation" (Report). NEP Finance Initiative, Global Commission on Adaptation & Climate Finance Advisors. Accessible: <https://www.unepfi.org/publications/driving-finance-today-for-the-climate-resilient-society-of-tomorrow/>

The advantage of resilience bond can be understood through its ability to leverage finance for risk reduction options for resilient infrastructure. In 2019, the European Bank for Reconstruction and Development (EBRD) issued the first climate resilience bond, with a strong investor appeal, being oversubscribed by USD 200 million. The bond proceeds have been earmarked for resilience and adaptation related projects in developing countries, such as integrating climate resilient solutions in the Qairokkum hydropower plant in Tajikistan.¹⁹⁰ The issuance of this bond and consequent use of proceeds is in line with Climate Resilient Principles, published by Climate Bonds Initiative (CBI) in 2019.¹⁹¹

5.3.2 Dedicated Investment and Blended Finance Vehicles

The emerging resilient infrastructure needs and opportunity, is giving rise to a new market, financing vehicles and emerging funds, which are dedicated to adaptation investment and are able to offer viable commercial returns.¹⁹² An example is the Climate Resilience and Adaptation Finance & Technology Transfer Facility (CRAFT), a private equity commercial investment vehicle, which has been developed specifically with this focus. This private sector investment fund and technical assistance facility for developing countries, focuses on expanding availability of climate adaptation and resilience technologies and solutions for communities, businesses and critical infrastructure globally.¹⁹³

Blended finance, developed as a structuring approach, uses catalytic capital from public sources to leverage private sector investment. These incorporate a specific objective, which can range from sustainable development to adaptation investments and resilience. Different sources of public finance, like from MDBs or climate funds, have been increasingly using the blended finance approach to reduce perceived risks and lower the cost of capital, allowing a crowding-in of private sector capital. Blended finance vehicles also integrate knowledge sharing, networking and capacity building aspects, to allow greater private sector participation in developing countries.

190 Dhanjal, M. 2020. "Why climate resilience bonds can make a significant contribution to financing climate change adaptation initiatives" (News Article). PreventionWeb. Accessible: <https://www.preventionweb.net/news/view/72119>

191 Bennett, V. 2019. "World's first dedicated climate resilience bond, for US\$ 700m, is issued by EBRD" (Article). EBRD. Accessible: <https://www.ebrd.com/news/2019/worlds-first-dedicated-climate-resilience-bond-for-us-700m-is-issued-by-ebrd-.html>

192 United Nations Environment Programme. 2019. "Driving Finance Today for the Climate Resilient Society of Tomorrow for the Global Commission on Adaptation" (Report). NEP Finance Initiative, Global Commission on Adaptation & Climate Finance Advisors. Accessible: <https://www.unepfi.org/publications/driving-finance-today-for-the-climate-resilient-society-of-tomorrow/>

193 Global Environment Facility. "Structuring and Launching CRAFT: the First Private Sector Climate Resilience & Adaptation Fund for Developing Countries" (Website). Accessible: <https://www.thegef.org/project/structuring-and-launching-craft-first-private-sector-climate-resilience-adaptation-fund>

An example of this for developing resilient infrastructure is the Nepal Hydropower project, which demonstrated the potential for using concessional climate funds commercially. The International Finance Corporation (IFC) managed Pilot Programme for Climate Resilience (PPCR) adopted Nepal's Strategic Program for Climate Resilience, aimed at 'Building Climate Resilient Communities through Private Sector Participation'.¹⁹⁴ A sub-project under this was on Strengthening Vulnerable Infrastructure, which aimed to strengthen the country's private sectors risk management capacity by climate proofing vulnerable hydropower plants. Along with IFC investment, a consortium-based approach is being taken to mobilize additional investments for strengthening infrastructure for climate vulnerable hydropower plants.¹⁹⁵

There are also a vast range of national level development finance institutes across the world, which has infrastructure investments as a focus area. Many of them, such as those in EU, have incorporated a climate and resilience lens for their future investments. This influences project developers to also adopt this lens for developing bankable projects, which in turn enhances the overall resilience in a sector or economy.

5.4 Scope of Replicability in India

This wide range of existing experiences and good practices for mobilizing private sector investments for building resilient infrastructure, through distinct approaches, indicates the kinds of opportunities that can be leveraged under a well-planned and comprehensive framework. It however, becomes important to understand the scope of replicating these cases in the Indian context, for formulating recommendations and a way forward that's relevant for the country.

Building on the category focused approach taken in the previous and current chapters, understanding the potential of reproducing these practices, with respect to the Indian requirements, can be done by- 1. assessing the governance landscape of the country; 2. understanding the scope of knowledge sharing and capacity building among different stakeholders of the sector; and 3. determining the intention to adopt and scale-up various financial instruments and mechanisms.

194 Climate Investment Funds. "Pilot Program for Climate Resilience (PPCR), Project Approval Request: Expansion of IFC-PPCR Strengthening Vulnerable Infrastructure Project" (Concept Note). Accessible: https://www.climateinvestmentfunds.org/sites/cif_enc/files/meeting-documents/cover_note_expansion_of_ifc-ppcr_strengthening_vulnerable_infrastructure_project_nepal.pdf

195 World Bank. "Pilot Program for Climate Resilience" (Program Approval Request). Accessible at: <https://pubdocs.worldbank.org/en/855821531744361472/4154-PPCRNP027B-Nepal-Cover-Page-and-Project-Documents.pdf>

Some examples from the Indian context that indicate the potential of replicability or applicability of learnings from these good practices, for strengthening the scope for private sector engagement, are listed below:

1. Regulations for structuring private sector investments towards resilience can be started by modifying technical requirements from project bidders and developers, when looking at public infrastructure construction. The existence of mandatory regulatory norms like Environmental Impact Assessment (EIA) for infrastructure projects, point out to how environmental concerns are already integrated in the policy landscape. Norms like these can be enhanced to include more specific climate and resilience aspects, especially in the highly vulnerable regions. There are examples of some private sector actors already taking a lead in developing their own norms for climate risk assessments and using those in their projects. For example, Mahindra Lifespaces has decided to take a 'nature-positive approach' to identify risks to their new residential infrastructure developments. This also included flood risk assessments, climate responsive design aspects, and preparedness plans for mitigating the identified risks.
2. In India encouraging a multi-stakeholder partnership has been gaining importance through PPP approach. PPP developed around Build-Operate-Transfer (BOT) models has existing examples in the Indian infrastructure segment, and the National Highway Authority of India (NHAI) is proposing to take the BOT route for new projects.¹⁹⁶ Information and knowledge sharing, as done in other countries can further play into this, ensuring private sector is equipped to make resilience central to the infrastructure development, and learnings from global good practices on enhancing meaningful private sector involvement for this aspect can be leveraged. The Karnataka Government worked with World Bank's PPIAF, to plan a PPP contract such that it included a design, build, operate (DBO) contract for privately operated water service in the North Karnataka cities. This improved water availability and reduced wastage, having a beneficial climate adaptation impact.¹⁹⁷
3. India already has successful experiences in deploying NbS, which has high replicability potential. Over the years, many NbS projects have been carried out in different subnational regions of the country, for example in Kolkata where wetlands were used to clean city's waste water; or management of natural water bodies and prevention of construction on floodplains in the city of Surat in Gujarat, was also encouraged through NbS.¹⁹⁸ Building awareness and capacity among stakeholders, especially private sector will allow better utilization of NbS/EbA strategies for resilient infrastructure.

196 Financial Express (March 2021). Public-Private Partnership: NHAI may take BOT route for new projects. Accessible at: <https://www.financialexpress.com/infrastructure/roadways/public-private-partnership-nhai-may-take-bot-route-for-new-projects/2222700/>

197 World Bank Blogs (2021). How do we link private sector participation and climate resilient infrastructure right now? Some ideas from PPIAF. Accessible at: <https://blogs.worldbank.org/ppps/how-do-we-link-private-sector-participation-and-climate-resilient-infrastructure-right-now>

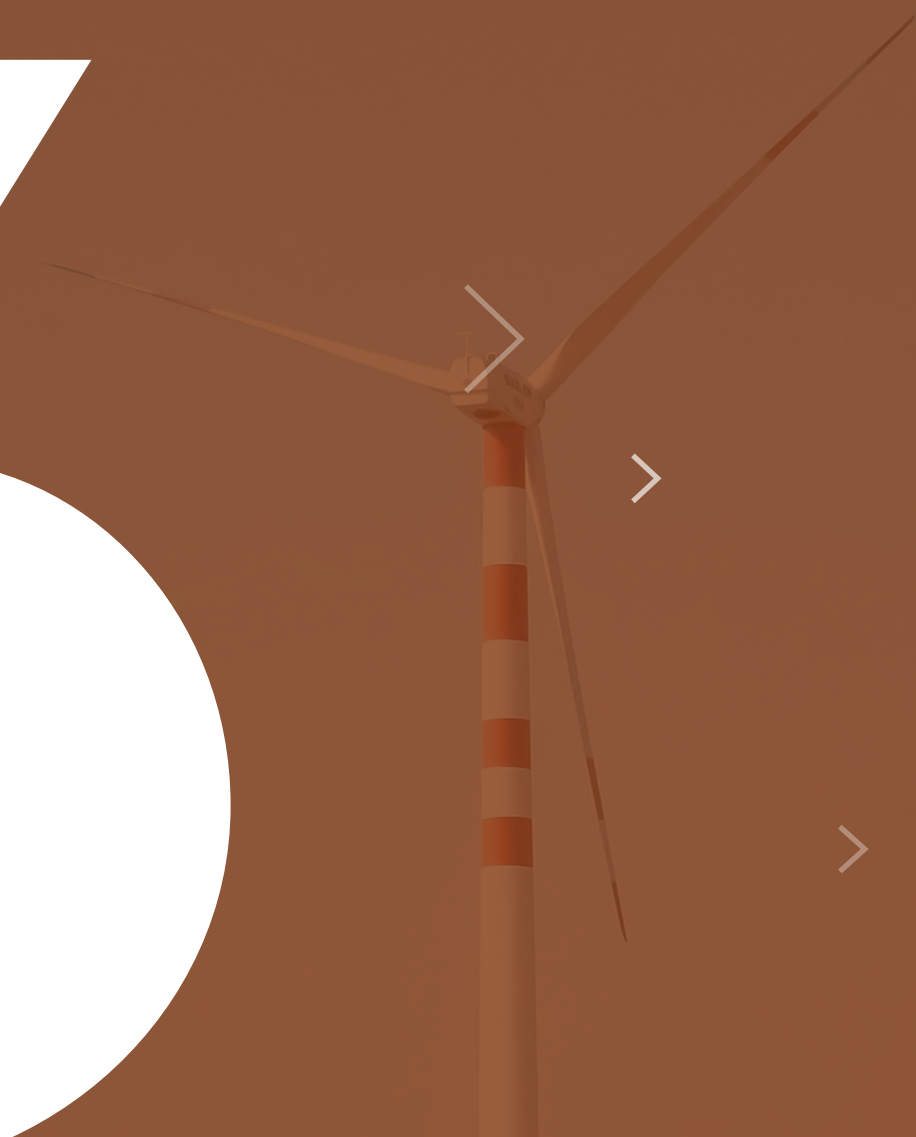
198 WRI (2020). Nature-based Solutions for reimagining the pathway to a sustainable future. Accessible at: <https://wri-india.org/blog/nature-based-solutions-reimagining-pathway-sustainable-future>

4. Financial barriers in the infrastructure sector, as highlighted in the previous chapters, need to be addressed at utmost priority. Replicating internationally developed financial instruments or mechanisms in the Indian market provides the perfect opportunity to catalyze private sector involvement in the resilient infrastructure. The instrument of resilience bonds for example can be further built on and explored for developing resilient infrastructure in India by mobilizing private finance, with the support of the public sector and international climate finance. The scope of increasing private sector participation in the resilient infrastructure sector can be through instruments like Viability Gap Funding mechanism, which is already present in the renewable energy space in India and can be scaled up for other resilient infrastructure projects.

The cross-cutting themes and inter-dependent complexities of these solutions make it challenging for a developing economy's government to effectively adopt them. This is where the international development organizations can step in to support policy-makers and private sector decision-makers, by demonstrating and piloting solutions. For example World Bank's financial and technical intervention through the Uttarakhand Disaster Recovery Project (UDRP) has enabled resilience to be integrated into the reconstruction of disaster affected houses. Using the approach of Owner Driven Construction of Houses (ODCH) methodology, which allows the beneficiaries to have a substantial role in the reconstruction process, has been successful. It has been developed as a good practice, where Nepal followed the same methodology when designing the house re-construction program after the 2015 earthquake.¹⁹⁹ International interventions like this can further be used to encourage private sector, supporting globally recognized best practices to be applied to the regional context.

Thus, India has the opportunity to learn from the international as well as local experiences and potential to promote resilient infrastructure strategies on a wider scale. In the next chapter, we provide recommendations for the way forward on addressing this issue, with help from international climate finance.

199 Global Facility for Disaster Reduction and Recovery. 2018. "Results in resilience: Gender Inclusion in Post-Disaster Housing in India- Helping women and girls build resilience" (Publication). The World Bank Group. Accessible at: <https://www.gfdrr.org/en/publication/results-resilience-gender-inclusion-post-disaster-housing-india>



CHAPTER SIX —————>

Recommendations for the Way Forward

Private sector participation is known to be a critical driver towards meeting climate goals. Private finance has been touted as the panacea for enabling ambitious climate actions, but there is very little of it existing on the ground in developing countries for sectors besides the energy sector. The fundamental issue with climate resilience interventions is that it's less about making profits, and more about mitigating risks. So, unless the private sector is able to understand the potential costs of these risks, it will not be motivated to invest in climate resilience of its own volition. Thus, mobilizing private finance for climate resilience requires additional drivers and catalysts, primarily in the form of risk mitigation instruments for incentivizing private climate investments and buy-in and support from domestic financial institutions. This requires a supportive governance and institutional framework in place, which allows for inter-agency and inter-state decision-making, as well as international cooperation for sharing resources and expertise.

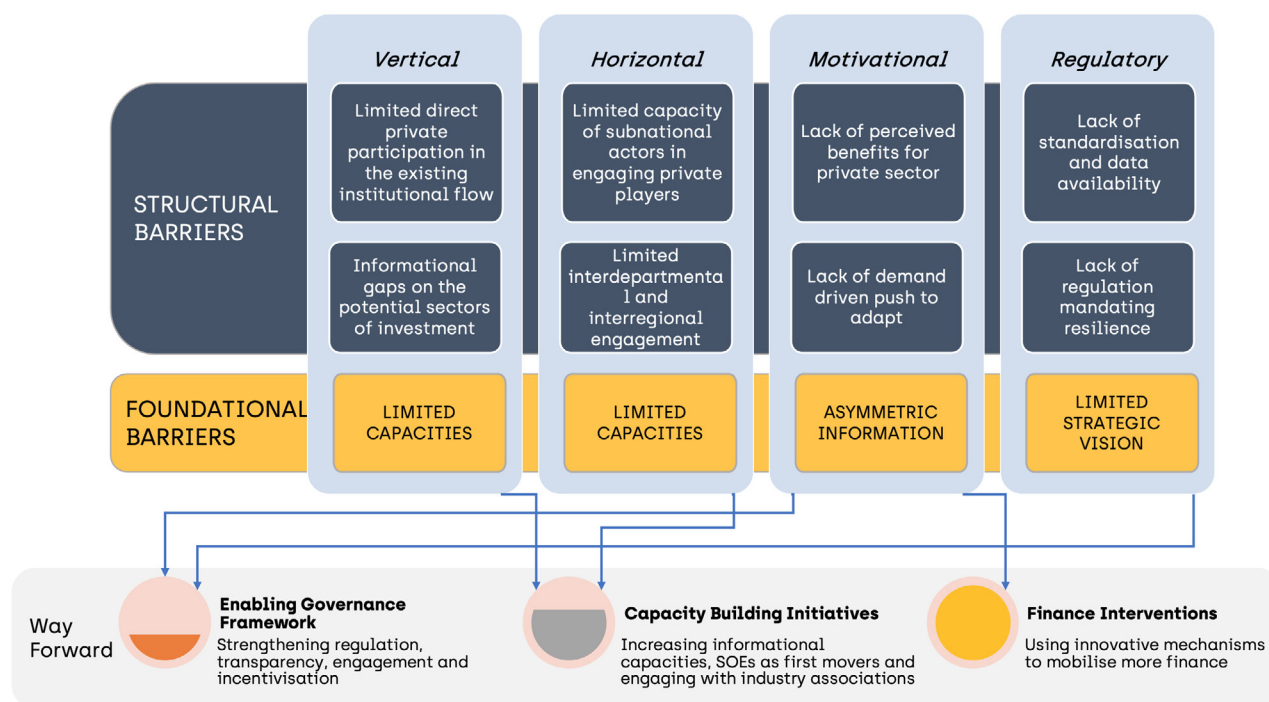
While the private sector has been instrumental in economy-wide scale up and adoption of mitigation measures to reduce GHG emissions, the presence of the private entities has remained notably limited in the domain of adaptation and resilience.

Many larger Indian companies, across a range of sectors, have started assessing the impacts of climate change on their business, but very few do so using climate models. Companies usually plan taking into account short-term risks and not future climate scenarios and long-term risks into consideration. If a company goes beyond this to implement actions for adaptation and building resilience, it's usually in the form of 'soft measures'. To be able to bring the private sector on board for transformative, 'hard measures' for resilient infrastructure, there is a need for tools to enable transparency and communicate the ground-reality, in terms of preparedness and impacts to the general public, as well as financial support and incentives, all of this under an enabling governance framework.

Among the barriers which have been explored in the earlier chapters, some of the common themes that implicitly run across most of these barriers discussed above is: lack of information, lack of capacity, lack of clear standardization and lack of cross-sectoral linkage in regulations. Whether it is about the limited information regarding risk assessment, at national or subnational levels; or it is in the form of lack of information around the benefits to private entities and businesses by undertaking adaptive action, or the capacity to frame bankable and effective projects, these foundational barriers underlie all other barriers. Lack of standardization or agreement on what constitutes resilient/green infrastructure is a particularly important foundational barrier. Related issues regarding lack of disclosures, reliable granular data further challenge the participation of private sector in building resilient infrastructure.

FIGURE 6.1

Moving from Barriers to Recommendation for Strengthening the Policy-Finance framework for Climate Resilient Infrastructure



In order to overcome this, several rounds of engagement with private sector must be undertaken along with thorough assessment of data requirements and disclosures to enable the use of a standardized taxonomy. As policymakers, regulators, and fiscal managers, public institutions have a key role in stimulating low investor appetite through public policies and mechanisms²⁰⁰. It should be noted, that adaptation is continued and long-term intervention, unlike many mitigation interventions, which depends on climate models and projections, thus requires flexibility in approach and solution development. To mobilize and keep the private sector meaningfully involved through this process, we have suggested a few actionable points, where support and engagement from international climate finance can help accelerate progress in mobilizing the private sector for developing resilient infrastructure.

200 Climate Policy Initiative (2018). "Understanding and Increasing Finance for Climate Adaptation in Developing Countries." https://www.international-climate-initiative.com/fileadmin/Dokumente/2019/20190225_Understanding-and-Increasing-Finance-for-Climate-Adaptation-in-Developing-Countries.pdf

6.1 Governance Framework

A strong and enabling governance framework acts as a means of mobilizing and ensuring increased private sector action towards resilient infrastructure. For this, a comprehensive and strategic plan, with an aim to address barriers faced by the private sector needs to be developed.

6.1.1 Regulations as a Driver

With climate change being one of the biggest negative economic externalities facing mankind, economic theory proposes two forms of action to tackle this externality. Policymakers can either adopt a regulatory-based approach (command and control measures) or an incentives-based approach (market-based mechanisms) to overcome the externality. As a result, in both cases, there is varying extent of involvement and oversight by the government. Investment in mitigation has worked successfully by using a combination of both command-and-control measures (for example mandating use of renewable energy under REC in India or European Energy Certificate System in Europe), while at the same time using market-based mechanisms to push towards low-carbon/energy efficient investments. The same approach has not been equally successful for deploying adaptive action at a wide scale, especially in developing countries like India. As the nature of action for adaptation and resilience, makes it vary across regions and communities, developing resilient infrastructure solutions therefore, depends significantly on the vulnerabilities of the region. This was reflected in our consultations with former policy makers in India, who argued, that owing to this nature of adaptive action, it was imperative to lead the way through well-thought out and applicable regulations.

Infrastructure is developed and owned by various levels of governments, such as at the municipal or state or national level; or its owned by public or private entities or by cooperatives. Since policies, laws, acts and rules that govern infrastructure development are formulated by different authorities at the national, regional and local level, and wide array of approvals is required by developers and at multiple stages; developing strong regulation for ensuring resilience is vital.²⁰¹ A much-needed pre-requisite for effective regulations, is a **robust institutional mechanism for enforcing** these, which in turn requires a clear understanding and development of an unambiguous taxonomy for sustainable financing/investments. In line with this, another point highlighted by experts was on the need for **consistent standards**, and including the area of resilient infrastructure in the components recognized as 'green', for sustainable or climate finance instruments and products.

Strengthening existing **regulations around incorporating resilience in all new infrastructure, or developing new regulation in the form of by-laws or region-specific regulation** to adapt to the local vulnerabilities are the very first step in ensuring infrastructural resilience.

201 UNDRR Working Paper (2020). Options for Addressing Infrastructure Resilience.

To further promote this understanding, in a few identified priority sectors facing extreme climate vulnerabilities, the nodal government agencies can be directed to modify conventional technical requirements for infrastructure project developments to include climate resilience components, and taking this even further, mandate feasibility studies which include climate risk assessments in the project design phase. This would increase the cost of such projects, and to ensure that it does not act as a disincentive for private sector actors, the government needs to compensate for this in some way, and some suggestions are included in the following sub-sections (6.1.2 and 6.3).

A largely missed opportunity in this sphere has been the **potential role that the Central Bank** can play. Over the past few years, the Reserve Bank of India (RBI) has been taking special notice of climate change issues. However, a missing piece of research is the impact climate change could have on large financial assets of banks and institutional investors, and how this could translate to non-performing assets, for each of the priority sectors. Regulations by the RBI could have a transformative impact on mobilizing finance for climate resilience, including from the private sector, as it could change the fundamental rules for an array of financial instruments. There is a role that international funders can play in supporting such research and developing this critical knowledge base.

6.1.2 Planning for Adequate Incentives to Drive Investments

Developing too many regulatory frameworks and relying on them to ensure investment in resilience will add to the already excess costs that resilient infrastructure bears over conventional infrastructure. It is important for governments to find the right balance between mandatory and voluntary frameworks induced by incentives, to enhance mobilisation of investment and interest in resilient infrastructure. Governments play a central role in setting the stage for investment in resilient critical infrastructure and a **‘carrot-and-stick’ approach is recommended**. In addition to regulation, **mechanisms providing positive and negative incentives** can ensure not just more mobilisation of investment but also adherence to minimum standards of both risk and resilience. Such policies must be adopted throughout the whole life cycle of the infrastructure project, from its design and operational phase to retrofitting interventions.²⁰²

These mechanisms **can include lower interest rates for projects which meet minimum criteria** of ensuring resilience in new infrastructure development. These projects could also attract **tax rebates or subsidies** in using green and resilient materials, and also be further enhanced by **insurance premium rebates, allocations from government bonds**, etc.

202 rrari , Mattia (2020). “Reflexive Governance for Infrastructure Resilience and Sustainability”. Accessible at: <https://doi.org/10.3390/su122310224>

Market-based instruments backed by the government, specially designed to support resilient infrastructure investments should also be explored.²⁰³

Similarly, negative incentives can ensure adherence to regulation. This can be achieved by effective transparency mechanisms. For example, transparency requirements could create reputational concerns upon developers in case of violation of EIA norms, or inadequate stakeholder consultations, and lead to the **negative listing** of an organization.

Using **performance based contracts for PPP models** for developing resilient infrastructure, as in the case of the water utilities in Northern Karnataka (See 5.4), can be deployed across a range of services and sectors by sub-national as well as the national government. This would provide the private sector with investment returns and be a way of addressing the horizontal barrier of limited engagement with the private sector, identified in Chapter 4.

6.1.3 Transparency through Robust Engagement Models

A prerequisite to make investments effective is by governments use their scarce resources to target economic, social, environmental, and climate priorities in the most efficient manner. According to the IMF, developing countries in Asia and the Pacific lose an average of 32% of their investments due to inefficient planning and development.²⁰⁴ Establishing accountability and ensuring transparency is the way to make regulation work.

This requires **planning and monitoring systems** based on a long-term infrastructure vision that includes an assessment of needs. Early planning, such as in the form of an infrastructure pipeline, as one for the National Infrastructure Pipeline in India, but also highlighting avenues of resilient infrastructure investment along with effective monitoring frameworks, can help decision-makers embed long-term effects climate into upcoming infrastructure projects.²⁰⁵ This first requires a rigorous process to appraise and select projects by assessing the economic, social, fiscal, environmental, and climate-related costs and benefits. This in turn requires strong institutional capacity for climate risk analysis, planning, and project implementation. Government ministries and departments must work together more closely, while making policies more effective through transparent monitoring and compliance. These mechanisms exist in the form of EIA in India, but their implementation/execution must be made more effective. **Disclosures of climate risk and measures taken to address these** are important ways of transitioning to improved transparency, which facilitates more effective engagement with the private sector.

203 Keele, S., Coenen, L. (June 2019) Policy for critical infrastructure resilience, Melbourne 2019. Workshop Summary. Arup and Resilience Shift, UK. Accessible at:

<https://www.resilienceshift.org/wp-content/uploads/2019/04/ResilienceShift-Role-of-Public-Policy-FINAL-1.pdf>

204 ADB Blog (2021). A Sustainable Recovery Depends on Quality Infrastructure Investment. Accessible at: <https://blogs.adb.org/blog/sustainable-recovery-depends-quality-infrastructure-investment>

205 ADB Blog (2021). A Sustainable Recovery Depends on Quality Infrastructure Investment.

As mentioned earlier, involvement of local governments is vital in developing sustainable and resilient infrastructure. National and subnational governments, along with respective institutional mechanisms, can integrate policy and planning to ensure holistic and more effective investments towards resilience.²⁰⁶

Planning needs to be complemented with **processes for ensuring accountability, transparency and engagement with all relevant parties**. The World Development Report of 2004 emphasises that accountability is established by setting clear end goals, defining performance benchmarks, providing the necessary resources to private entities or those responsible for achieving these goals and designing effective enforcement mechanisms that rewards good performance.

The effectiveness of regulation will depend on ensuring accountability and establishing transparency in monitoring processes. This would require creating the necessary mechanisms that ensure accountability of performance by project developers. This transparency is also necessary at the beginning of the projects, where it is imperative for the local/ regional governments to provide the necessary information for private entities to **carry out effective cost-benefit analysis**. At this stage, it is essential that project developers, be it only private entities or in PPP mode, engage with all relevant parties. This will involve end users which is often the civil society, stakeholders at different levels of the government and lastly local communities and experts to incorporate local successful practices of adaptation and resilience in the development of the project. These provisions too have been put in place under the existing EIA clearance processes, but often do not involve effective engagement with relevant parties and end up being a costly and minimally enforces component. Thus, **pre-project commitment to climate outcomes**, in terms of sustainability standards and disclosures, are better tools but require public backing for facilitating engagement and clear direction in the form of sector-wise regulations.

However, it should be noted that, mechanisms designed to mobilise increased investment in resilience must not only rely on regulation but also significantly on effective incentive mechanisms to drive investment.

6.2 Capacity Building Initiatives

Considering that resilient infrastructure cuts across all sectors and lack of capacity is a repeating refrain from these, capacity building interventions becomes key. This needs to be done for a range of stakeholders too, financiers, private investors, government officials. An important element of this is knowledge development and sharing, to facilitate effective decision-making.

206 ADB Blog (2021). A Sustainable Recovery Depends on Quality Infrastructure Investment.

6.2.1 Information Tools for the Private Sector

As highlighted earlier, the lack of information poses a significant barrier to investments. Good information forms the basis of responsive strategies, which is vital for integrating a climate lens. It is imperative that governments, especially local or regional governments, assign dedicated taskforces to provide information on the vulnerabilities, areas of intervention required, data on costs involved, etc. This will so that private entities in carrying out a thorough cost and benefit assessment and developing bankable projects. If the task of **collection of such information and sharing it to all relevant stakeholders** is left to the private sector, it is likely to not be carried out due to the high costs and duration involved. Even if it is carried out it may be limited in its scope. To fully capture the costs associated with vulnerabilities of the region and uncertainties associated with extreme climate events, **necessary data must be consolidated and made available by government bodies.**

This has been done in the USA under its EPA, where data portals are available to the public for specific climate concerns²⁰⁷:

- › infrastructure for multiple environmental, health, social, and economic benefits.
- › GIZ is an interactive, online information portal that provides communities with quick and easy access to EPA's Green Infrastructure tools and resources.
- › RAINE is a database that catalogs activities in more than 100 New England jurisdictions addressing climate change impacts. The database provides information at the state, local, or regional level, covering a wide-range of areas for adaptation planning, such as sea-level rise, extreme weather (e.g., precipitation, flooding, heat), and wildfires. It includes information such as web links, reports, plans, tools, specific practices, funding sources, and partnerships

In fact, it is already a goal of the Government of India to improve its governance and accountability by shifting to performance-based evaluation and data-based decision making.²⁰⁸ The report “Strategy for India @ 75” by NITI Aayog, lays a strong focus on improving governance. As a result it aims to “revamp its data systems and analysis so that all policy interventions and decision-making are based on evidence and real-time data”²⁰⁹. This will yield efficient and targeted delivery of the required investments. These **information portals can be developed as issue specific ones**, integrating resilient infrastructure aspects. The need for **providing verified high quality data which is reliable**, cannot be emphasized enough. For this, capacity of the government departments, especially the local and regional authorities, should be developed for providing adequate information around vulnerabilities, risk assessments, cost of inaction and elements of costs and estimation of benefits.

207 United States Environment Protection Agency. Tools for Climate Change Adaptation. Website, accessible at: <https://www.epa.gov/arc-x/tools-climate-change-adaptation>

208 NITI Aayog (2018). Strategy for New India @75. Accessible at: https://niti.gov.in/writereaddata/files/Strategy_for_New_India.pdf

209 NITI Aayog (2018). Strategy for New India @75.

This information needs to then be shared effectively across a multitude of key stakeholders from within the government, civil society, business, and industry networks at national and local levels. Further, the government, through industry specific Ministries or at sub-national level, can **frame and launch their own specific climate risk assessment tools**, to make this concept familiar to infrastructure project developers and stakeholders. On all these aspects, technical assistance from international climate finance can have a significant impact by supporting the endeavours through funding and expertise. Further financial incentives too can be linked for such projects, which have been highlighted in 6.3.

6.2.2 State-Operated Enterprises as First Movers

There is a large latent opportunity in leveraging SOEs to drive the climate agenda of a country. The SOEs **provides the national or sub-national government**, who are their controlling shareholder, with a major **channel to intervene in the economy directly or indirectly** to achieve the desired socio-economic objectives, as they have the ability to look beyond the short-term commercial interests and take decisions to maximize long-term economic gains. In contrast to most private sector companies, SOEs have the mandate, due to their state-ownership structure, which requires them to contribute towards the country's overall development and support the government in achieving its objectives. This enables them to **be a first mover to demonstrate the viability and benefits for newer solutions and models**, which are required in the area of resilient infrastructure, to the private sector actors.

Climate change poses some major challenges to the future operational capabilities of India's key SOEs, due to their large infrastructure and capital intensive operations. Extreme weather events are already putting some of the SOEs infrastructure and operations at high risk, causing losses.²¹⁰ Of the top 10 Indian companies by revenue in 2018, six were SOEs. Thus, with SOEs driving the climate actions of the corporate sector, there is a chance of making a larger impact on the overall economy's transition to and uptake of climate resilient infrastructure.

The private sector is gradually becoming aware of the physical risks and opportunities arising from a changing climate, and is in many cases proactively taking measures to assess their climate risks, mitigate their emissions and maintain their profitability in the face of adverse climate impacts. SOEs are owners of large scale critical infrastructure, harm to which can impact the country's development and welfare. For instance, NTPC (National Thermal Power Corporation) alone is responsible for around 25% of India's power generation capacity. To **adequately protect their critical national assets** from the adverse impacts of climate change and extreme weather events, it is essential for the companies to recognize and assess their climate risks and take appropriate measures to build their resilience in terms of infrastructure and operations.

210 TERI (2018). Climate Change Risks and Preparedness for Oil & Gas Sector in India

In India, the SOEs have a vast corpus of funds available from their own profits, which can also be used in part to advance the resilient infrastructure considerations and their deployment in the operations of these SOEs, besides various other climate initiatives aimed at reducing their adverse environmental impact. It is important to note that these companies have a high degree of autonomy to undertake large scale investments and new ventures. If directed by climate policies and supportive schemes from their relevant Ministries, they have a huge potential to make significant impact.

More stringent regulations can also be first applied to SOEs on a voluntary basis, **as a learning experience**. These can include measures such as **mandatory periodic climate risk assessments of assets**. Also, SOEs can be the **host of pilots and demonstration projects** with innovative support measures, such as climate insurance or financial risk management products, and incentives for risk reduction actions. Another area where SOEs can take a lead is in including Nature-based Solutions (NbS) as a part of their climate interventions, which will help bring this into the mainstream for the industry and economy as a whole.

6.2.3 Leveraging Industry Associations

There are a range of industry associations, cutting across sectors and regions, existing in India. These have the potential to allow for **dialogues between a range of stakeholders** and can form effective platforms to reach out to a majority of large private sector actors.

The capacity development of industry associations to understand climate impacts on their regions and sectors, is a way forward that should be done in parallel to other actions. The leading Indian industry associations, such as Federation of Indian Chambers of Commerce & Industry (FICCI), Confederation of Indian Industry (CII) and Associated Chambers of Commerce and Industry (ASSOCHAM) have already advanced in this area. Under their aegis, a wider range of associations can be reached out to and their engagement with international associations and research organizations facilitated. This will **enable consolidation of a range of private sector voices and concerns** as well as provide knowledge and capacity building opportunities for them.

Industry associations can also serve as the **platform for multi-stakeholder partnerships** between private sector, governments, scientific organizations and academia, to address specific sectoral issues for resilient infrastructure. This would help on **raising awareness** and **clarifying doubts on new innovative interventions** for building resilience, such as climate risk assessments, NbS and for understanding collaborative finance mechanisms. International climate funders can engage with key industries to States to drive and support such measures.

6.3 Finance Interventions

India should increasingly capitalise on the emerging global cooperation opportunities to ensure sustainable financing for long-term climate actions, chart green recovery pathways and frame a suitable response for climate emergencies. Resilient infrastructure in India is an enabling solution which would have long-term positive impacts for the country, its private sector, as well as global climate goals, providing several opportunities for innovative finance solutions and channels.

6.3.1 Leveraging National DFIs for Promoting Climate Resilient Infrastructure

In its budget presentation, in February 2021, the Government of India (GOI) announced its intent to set up a Development Finance Institution, the **National Bank for Financing Infrastructure and Development (NaBFID)**, with the aim of mobilizing the funding required for the **national infrastructure pipeline (NIP)**. The NIP, an initiative for developing high quality social and economic infrastructure across India, is key for the GOIs goal of driving economic growth, especially as a measure of COVID recovery. NaBFID has a planned capital base of INR 20,000 crore (~USD 3 billion) and a lending target of INR 5 lakh crore (~ USD 73 billion) in the first three years. For this, along with budget flows and private sector finance, international sources of finance will also be tapped into. The government of India has already started mobilizing funds for the implementation of the projects under the NIP, wherein the NIP specifically outlines the need to ensure that all new and existing infrastructure projects are climate and disaster resilient.

DFIs have traditionally played a critical role as a financier, mobiliser and intermediary to promote sectoral development. They can help **set the narrative for integrating green component and resilient infrastructure** that enables low carbon and climate resilient growth across the planned public infrastructure. This can be specifically supported by the flow of international finance, which can play a powerful and catalytical role by leveraging additional investments to unlock the green potential of the infrastructure sector in India. To promote a uniform approach to developing climate resilient infrastructure, NaBFID can take the lead and **promote climate risk assessment frameworks and resilience building measures** to the other DFIs focusing on infrastructure development in India. This would align with international climate finance objectives and would help in mobilize additional finance for infrastructure development in India. There is also the potential of **using NaBFID directly as an agent/channel to access international finance** from institutions such as GEF, GCF and AF, as well as bilateral and multilateral funds, for resilient infrastructure development.

International climate finance can use this DFI channel to **promote the use of suitable methodologies and best practices** in place globally, as a condition for the finance. To initiate the engagement, a sectoral approach can be taken to promote resilient infrastructure in the priority climate sectors.

The financial instruments that can be leveraged to direct financing to the DFI can include green bonds, result based finance or blended finance vehicles.

6.3.2 Mobilizing through Blended Finance Vehicles

According to Convergence, a global network for blended finance, ‘blended finance is a structuring approach, that uses catalytic capital from public or philanthropic sources to increase private sector investment for specific objectives, such as climate change and sustainable development’.²¹¹ Thus, a blended finance product can also be specifically designed for resilient infrastructure, since it forms an integral part of both sustainable development and climate aligned development goals. This has already been deployed for many relevant sectors, such as water and sanitation, energy and agriculture. It needs to be further explored for supporting critical infrastructure investments, both by the public and private sectors.

A finance instrument to be explored using this approach can be **green infrastructure or climate resilience bonds**. There are a few examples of these globally, but they haven’t been used at scale in India yet, due to the complexity of designing such a product. International technical assistance and public sector backing through a blended finance vehicle could be a way forward for pioneering this instrument with vast potential, in India. A well-designed blended finance project has the ability to attract private finance from a range of actors. The very structure of a blended finance vehicle and its process, would facilitate private sector collaboration.

A further area to explore would be **supporting sub-national resilient infrastructure interventions**, which is an under-funded area, **through blended finance projects**. As seen earlier, garnering private sector interest to support SAPCC led climate interventions has been a major challenge, with very few states having been able to successfully do so. Through a blended finance vehicle, international funders can support private sector actors at different scales of operations, to also explore the costs and benefits of adopting resilient infrastructure for their operations. It is also possible to include elements of carbon finance and create carbon assets under blended finance vehicles. This would help achieving mitigation as well as adaptation objectives from the infrastructure sector, while opening an additional finance stream for project implementers.

Another financing aspect that can be included in blended finance vehicles, is **insurance**. Infrastructure projects that have accounted for and address future climate risks, and are thus, less vulnerable to natural hazards, should be charged relatively lower premiums and provided better terms, which can be included as an incentive in the overall financing structure of such projects.

India’s experience with **PPP models** in the past can be built on, **using blended finance mechanisms** for attracting the private sector.

211 Convergence Website – Blended Finance. Available at: <https://www.convergence.finance/blended-finance>

Under such a scenario, the public sector partners or international funders can help catalyze investments by the private sector for climate resilience. An important pre-requisite herein would be to develop the public sector's understanding of what constitutes resilient infrastructure and the need for it, which will involve building the awareness of public officials, regulators, public finance institutions including banks, etc.

6.3.3 Incentivizing through Concessional and Conditional Debt

Mobilizing the private sector for investing in resilient infrastructure requires providing appropriate financial support and incentives. A major barrier is the perception of high risk and the additional costs for developing resilient infrastructure assets. To mitigate this **de-risking mechanisms** are required. International climate finance, in tandem with public finance, can help address this barrier by providing risk mitigation support in the **form of first loss guarantees in debt and equity investments, subsidized insurance premiums** for climate resilient assets, besides the traditional grants and concessional loans. For instance, to emphasize the Government's focus on climate resilient infrastructure as a critical issue, India's Priority Sector Lending norms for bank lending can be tweaked to favour allocations for it specifically, instead of infrastructure in general. Another measure is to **leverage the Viability Gap Funding (VGF) model**, which has been used by the Indian Government in sectors like power generation, for providing concessional debt for climate resilient infrastructure development in other priority sectors. This is especially critical in areas where there may not be clear commercial benefits from resilience activities in the near term. International climate finance can be channeled to help fill the finance gap assessed through VGF, and in this way can push for robust hard and soft infrastructure measures.

Besides such policy backed measures, **special incentives to enable the purchase of climate adaptation technologies and solutions, or investing in R&D** for these, can also be provided **using results-based finance instruments**. They can also leverage conditional measures such as **negative listing** for private entities that do not take climate risk assessments into account for infrastructure development, a requirement of periodic risk assessments and transparent reporting, etc. To initiate this, international funders can start with supporting some of the more established private sector companies, with strong fundamentals and a vast network of infrastructure assets.

