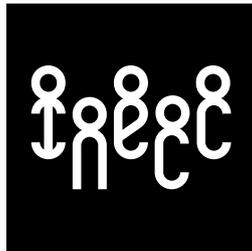


Climate Finance in India 2025



**Climate
Finance
in India
2025**



INECC
People's Voices
in Policy Choices

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Foreword

Climate finance in India has long been discussed in the abstract. Billions and trillions of dollars have been projected, pledged, and promised. But for the communities that live with the changing monsoon, the failing borewell, or the rising tide, these numbers remain distant. This report begins from their vantage point, from where finance either makes life more secure or leaves people more vulnerable.

For INECC, climate finance is not just about economic flows. It is about justice, about whether resources reach those who protect ecosystems, feed cities, and sustain the commons. It is about enabling local capacities and ensuring that finance works in service of life, not simply of growth.

Over the years, our network has seen how conversations around climate finance can easily get trapped in global jargon and institutional language. But India's realities are local, layered, and deeply human. The gap we wanted to fill through this report was not only informational but also moral — to bring back perspective and purpose to what “finance for climate” should mean.

This work began with a simple question: who benefits from climate finance, and who does not? We looked at the architecture of India's systems, from national missions and state action plans to local investments in adaptation. We examined where public money has gone, where private finance hesitates, and what this means for communities on the ground. What emerges is a story not of failure but of misalignment between what is urgent and what is funded, between what is needed and what is measured.

India's transition will not be defined only by the shift to clean energy. It will depend equally on how we adapt: how indigenous communities, farmers, fishers, and workers in informal economies rebuild their livelihoods amid uncertainty. Yet, as this report shows, only 10 percent of climate finance in India today supports adaptation. That gap is not just financial; it reflects a deeper imbalance in policy and perception.

At INECC, we see climate finance as part of a continuum of responsibility. It connects the local innovator piloting a green skill programme in Maharashtra to the policymaker negotiating adaptation clauses in Bonn or Belém. It connects gender justice to fiscal planning, local governance to global ambition. This report tries to hold these threads together — to see the system whole.

We are releasing this report at a moment when India's climate finance architecture is evolving rapidly, from new disclosure frameworks by the Reserve Bank and SEBI to a forthcoming national climate finance taxonomy. These developments mark progress, but they also raise questions about inclusion, transparency, and equity. Our analysis offers both caution and opportunity: a reminder that progress measured only in instruments and institutions can obscure the people those mechanisms are meant to serve.

In a sense, this publication is also part of INECC's broader journey. As a network, we have consistently argued that locally determined contributions — community-owned, ecosystem-specific actions — must be recognised and financed as legitimate climate responses. This report gives that argument new grounding, with evidence drawn from national and state-level finance landscapes.

I hope readers, whether from government, academia, civil society, or the financial world, will see this not just as another technical paper, but as a conversation starter. Climate finance in India cannot remain a top-down exercise of capital flows and reporting templates. It has to move closer to people, to the informal worker, the smallholder, the fisherwoman, the youth innovator whose realities define both the risks and the resilience that underpin our economy.

INECC is deeply grateful to all who contributed to this effort. Our collective aspiration is simple yet transformative: to democratise climate finance, to reorient it towards equity, and to ensure that it builds resilience where it matters most — from the bottom up.

Myron Mendes

Executive Director

Indian Network on Ethics and Climate Change (INECC)

List of Abbreviations

OECD	Organisation for Economic Co-operation and Development
SDG	Sustainable Development Goals
NDC	Nationally Determined Contribution (country-level climate commitments under the Paris Agreement)
GDP	Gross Domestic Product
MoEFCC	Ministry of Environment, Forest and Climate Change (Government of India)
UNFCCC	United Nations Framework Convention on Climate Change
IEA	International Energy Agency
MDB	Multilateral Development Bank
DST	Department of Science and Technology (Government of India)
NAPCC	National Action Plan on Climate Change
SAPCC	State Action Plan on Climate Change
NCEF	National Clean Energy Fund
NDRF	National Disaster Response Fund
CAMPA	Compensatory Afforestation Fund Management and Planning Authority
GCF	Green Climate Fund
SCCC	State Climate Change Cell (established under NAPCC/SAPCC framework in Indian states)
CCAP	Climate Change Action Plan (general term, often used by Indian states under SAPCC)
IREDA	Indian Renewable Energy Development Agency
NABARD	National Bank for Agriculture and Rural Development (India)
ICM	Indian Carbon Market
CCTS	Carbon Credit Trading Scheme
CDM	Clean Development Mechanism (under the Kyoto Protocol)
CER	Certified Emission Reduction (carbon credits under CDM)
EU-ETS	European Union Emissions Trading System

ICMGB	Inter-ministerial Committee on Global Warming and Border Issues (in India, sometimes shortened as Inter-Ministerial Committee on Climate Change/Global Warming)
REC	Renewable Energy Certificate
PAT	Perform, Achieve and Trade (energy efficiency trading scheme under India's National Mission on Enhanced Energy Efficiency)
CCS	Carbon Capture and Storage
CBAM	Carbon Border Adjustment Mechanism (EU mechanism)
NDMA	National Disaster Management Authority (India)
FC	Finance Commission (of India)

India's Challenge:

THE CRISIS

7TH MOST AFFECTED NATION GLOBALLY
COULD LOSE 3-10% GDP ANNUALLY BY 2100
167B LABOUR HOURS LOST TO HEAT (2021) =
USD 159B

THE GAP

NEEDED: USD 253-263B ANNUALLY (2026–2030)
AVAILABLE: USD 44B PER YEAR
SHORTFALL: USD 210B+ PER YEAR NEEDED

THE TRANSITION COST

7M+ COAL WORKERS NEED RESKILLING
USD 10.1 TRILLION NEEDED BY 2070 FOR NET-ZERO
CURRENT FOCUS: 90% MITIGATION, ONLY 10%
ADAPTATION

THE PATH FORWARD

SCALE BLENDED FINANCE MODELS
REMOVE BARRIERS TO PRIVATE
SECTOR INVESTMENT
STRENGTHEN STATE-LEVEL CAPACITY
CLOSE GENDER FINANCE GAP

Executive Summary

India's Climate Crisis: The Scale of the Challenge and the Cost of Inaction

India is in peril; the climate crisis is accelerating. Current action is too weak and too slow; to delay it is dangerous. The country is highly susceptible to the negative impacts of climate change due to its varied geo-climatic characteristics and complex socio-economic conditions. The negative impacts of climate change are already affecting India's economy and livelihoods, threatening the progress achieved in development and poverty reduction. In 2021, heat exposure caused an estimated loss of 167 billion potential labour hours, leading to income losses of around USD 159 billion, or 5.4% of the country's GDP (Climate Transparency Report 2022). Projections suggest that by 2040, India's national poverty rate could rise by 3.5% due to reduced agricultural productivity and increasing cereal prices, potentially driving an additional 50 million people into poverty compared to a scenario with no global warming (Picciariello et al. 2021).

India is in peril: the climate crisis is accelerating. Current action is too weak and too slow; to delay it is dangerous.

Coal remains one of the world's most prominent energy sources, significantly contributing to climate change, which disproportionately impacts vulnera-

ble populations. A transition from coal to renewable energy is urgently needed to mitigate these effects. India, as one of the world's largest emerging economies, stands at a crucial moment: it has the opportunity to mitigate climate change, and the private sector's leadership will be essential in driving future success. Given the strain on public resources due to global crises, the private sector has the potential to support economic recovery and foster a sustainable future.

The Financing Challenge

One of the major challenges faced by emerging economies like India is mobilising sufficient financial resources to meet their climate mitigation and adaptation goals. At COP26, India announced bold targets to contribute to global decarbonisation. According to the country's long-term low-emission development strategy, submitted to the UNFCCC in 2022, tens of billions of dollars will be needed by 2050 to achieve net-zero emissions by 2070. Additionally, based on updated Nationally Determined Contributions (NDCs), India's adaptation finance needs are projected at around USD 1 trillion by 2030. However, allocating public funding at this scale is challenging given the pressing social and economic priorities that require immediate attention.

This document provides an overview of India's current climate finance environment, identifying the estimated financial needs, necessary conditions, and macroeconomic policies required to meet national goals aligned with limiting global warming to 1.5°C and 2°C. Projections suggest that climate change could reduce India's Gross Domestic Product (GDP) by 3% to 10% annually by the end of the century (Kompas et al., 2018; RBI, 2023). Under a 'business as usual' scenario, per capita GDP losses are expected to

be 2.6%, 6.7%, and 16.9% by 2030, 2050, and 2100, respectively (Kahn, 2019). Climate change is set to impact various regions and sectors, including agriculture, health, infrastructure, and labour productivity. If temperatures exceed certain thresholds, climate impacts may become irreversible, posing a threat to ecological, social, and economic systems, which makes limiting warming to 1.5°C crucial for a low-carbon future.

Meeting this 1.5°C target requires investments ranging from 7% to 18% of India's 2019 GDP, with annual investments of USD 167 billion from 2016 to 2030—equivalent to around 8% of 2015 GDP—needed to fulfil India's Nationally Determined Contributions (NDCs) (MoEFCC, 2015). Achieving the 2°C target necessitates annual energy investments of 4% to 16% of 2019 GDP, while the 1.5°C goal will require between 7% and 18% of 2019 GDP from 2016 to 2050 (McCollum et al., 2018). A transition to a low-carbon economy will demand significant shifts in India's economic investment priorities and development goals.

According to India's updated Nationally Determined Contributions (NDCs), the country requires a massive amount of climate finance, estimated to be in the trillions of dollars by 2050, to achieve its ambitious sustainability targets. From 2026 to 2030, India will need between USD 253 and USD 263 billion annually in clean energy investments, which will further rise to USD 325–USD 355 billion per year between 2031 and 2035, to align with its climate and development goals (IEA-IFC, 2023). Other studies suggest that to reach net-zero emissions by 2070, the total required investment amounts to USD 10.1 trillion. However, current climate finance availability in India is only about USD 44 billion per year, highlighting a significant investment gap that must be addressed (Climate Policy Initiative, 2022).

A joint report by the International Finance Corporation (IFC) and the International Energy Agency (IEA) emphasises the need to scale up private finance in emerging markets. According to the report, investments in clean energy need to increase more than threefold from USD 770 billion in 2022 to USD 2.2–2.8 trillion annually by the early 2030s to help these economies achieve their climate and energy goals. Around 60% of this funding will need to come from the private sector. Therefore, attracting private sector investments into India's climate mitigation and adaptation goals is crucial. This requires creating an investment ecosystem with regulatory stability, bankable projects, and financial innovations.

Current State of Climate Finance

Between 2017 and 2019, India's climate finance increased by 150%, reaching USD 44 billion in 2020. However, funding remains insufficient and heavily skewed towards mitigation efforts (90%) rather than adaptation (10%) (CPI, 2022). Most climate finance stems from domestic commercial sources, followed by public funds, with private investments largely focused on renewable energy. Climate financing from Multilateral Development Banks (MDBs) grew from USD 1.9 billion in 2015 to USD 3.7 billion in 2022 (European Investment Bank, 2023).

Transitioning away from coal will incur short-term economic costs but may offer long-term benefits with the right policies. India's coal-dependent workforce—numbering over 7 million—faces job losses, and state revenues reliant on coal royalties will decline. A 'just transition' is essential to address social risks like job displacement, and workers will need to be compensated and reskilled for new employment opportunities. Communities may require alternative livelihoods and possible resettlement (Pai et al., 2020). India's energy transition has already resulted in the stranding of several carbon-intensive assets. In 2017–2018, 34 coal-based power projects—representing nearly 40 GW of capacity—were classified as 'stressed,' carrying outstanding debt of around INR1.74 lakh crore (approximately USD 23–26 billion) (Standing Committee on Energy, 2018; PRS Legislative Research; IISD, 2019). By 2023, 26 of these projects had been fully or partially resolved through acquisitions or debt restructurings, underscoring the financial risks embedded in India's coal portfolio.

Between 2006 and 2014, investments in coal-based energy exceeded USD 90 billion, with roughly half financed through public sources (Viswanathan and Garg, 2020).

The Path Forward: Policy and Financial Innovation

Effective policy coordination between central and state governments is critical to managing the energy transition while maintaining financial stability. Financial institutions must incorporate climate risks into decision-making processes to limit further investment in carbon-intensive assets. India's financial stakeholders, including banks and regulators, can facilitate this shift through green bonds and targeted subsidies. In terms of adaptation, India's 2020 costs were INR 29 trillion, rising to INR 86 trillion by 2030 (DEA, 2020).

In terms of adaptation, India's 2020 costs were INR 29 trillion, rising to INR 86 trillion by 2030 (DEA, 2020). However, the available green finance for adaptation in 2020 was only INR 370 billion per year, a small fraction of what is needed (CPI, 2022).

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Though some progress has been made in adaptive capacity investments, particularly in agriculture, water management, and

urban infrastructure, these efforts are insufficient to keep pace with India's growing adaptation needs. Aligning adaptation investments with Sustainable Development Goals (SDGs) could boost domestic adaptation finance. Private sector investment in adaptation remains minimal due to structural barriers, but government-led financial and policy incentives could help overcome these challenges.

India's transition to a resilient, low-carbon economy will require significant shifts in public and private investment towards clean energy and resilient infrastructure. Achieving the 1.5°C goal will depend on robust public and private sector cooperation, the implementation of targeted policies, and increased international climate finance to address mismatches between domestic savings, capital flows, and infrastructure needs.

India urgently needs investments in climate adaptation to maintain its economic growth and continue its development progress. Adaptation and resilience have become central pillars in India's strategy for addressing climate change (MoEFCC 2023). Although the government has made ongoing efforts to fund adaptation initiatives, current estimates suggest that the financial requirements at the national level are significant and are expected to grow over time (MoEFCC 2015; DEA 2020).

This report examines India's climate adaptation strategies, highlights the policy landscape, evaluates state-level adaptation funding needs and gaps, and discusses how these gaps can potentially be bridged through both public and private financial sources. Additionally, we will consider gender-responsive climate financing, just transition, and climate mitigation, with a focus on clean energy and low-carbon solutions.

Quick Facts:

VULNERABILITY: 7TH MOST AFFECTED COUNTRY BY EXTREME WEATHER (GERMANWATCH, 2021)

DISTRICT-LEVEL RISK: 75% OF INDIA'S DISTRICTS ARE EXTREME WEATHER HOTSPOTS

ADAPTATION COSTS: INR 29 TRILLION (2020) RISING TO INR 86 TRILLION (2030)

ADAPTATION FUNDING GAP: ONLY INR 370 BILLION/YEAR AVAILABLE VS. TRILLIONS NEEDED

KEY FINDINGS

New Regulatory Framework for Climate Risk (February 2024)

In February 2024, the Reserve Bank of India (RBI) introduced a draft Disclosure Framework on Climate-Related Financial Risks. This framework mandates that banks and regulated financial entities disclose how they are managing and mitigating climate risks. (RBI 2024) The framework focuses on four main pillars: governance, strategy, risk management, and metrics and targets, encouraging financial institutions to integrate climate-related risks into their operations and decision-making. While the RBI's draft framework is a proactive stance on climate risk, it also brings in implementation challenges for the REs. Data-related limitations (granularity, history, reliability), lack of standardised methodologies and resource constraints are few of the hurdles that entities may face in complying with the disclosure requirements. There are ongoing discussions on how to provide these entities with the necessary guidance and tools to comply with the framework's requirements.

India's Vulnerability: Districts at Risk

India is the 7th most affected country by extreme weather (Germanwatch, 2021). It is crucial to intensify climate action at both sub-national and district levels to counter the effects of increasingly severe events. According to the Council on Energy, Environment and Water (CEEW), three-quarters of India's districts are now hotspots for extreme weather events, with 40% experiencing a 'swapping trend'—where areas historically prone to floods are now facing more frequent droughts, and vice versa (Mohanty 2020). The Intergovernmental Panel on Climate Change (IPCC) also projects with high confidence that for each degree of temperature rise, precipitation could increase by 3%, leading to more intense cyclones and floods.

Assessing Vulnerability: The Common Framework

The Department of Science and Technology (DST) has developed a **Common Framework for Climate Vulnerability Assessment**, which aims to identify and assess the most vulnerable states and districts in India. This framework helps in understanding the level of exposure, sensitivity, and adaptive capacity of different regions to climate risks such as floods, droughts, and cyclones. The framework enables a standardised approach to vulnerability assessments, allowing for better comparison between regions and supporting the development of targeted adaptation projects. This assessment is crucial for directing resources to the most vulnerable areas and prioritising climate adaptation investments. Some of the most vulnerable states identified include Jharkhand, Assam, Bihar and Odisha, which face significant risks due to climate change.

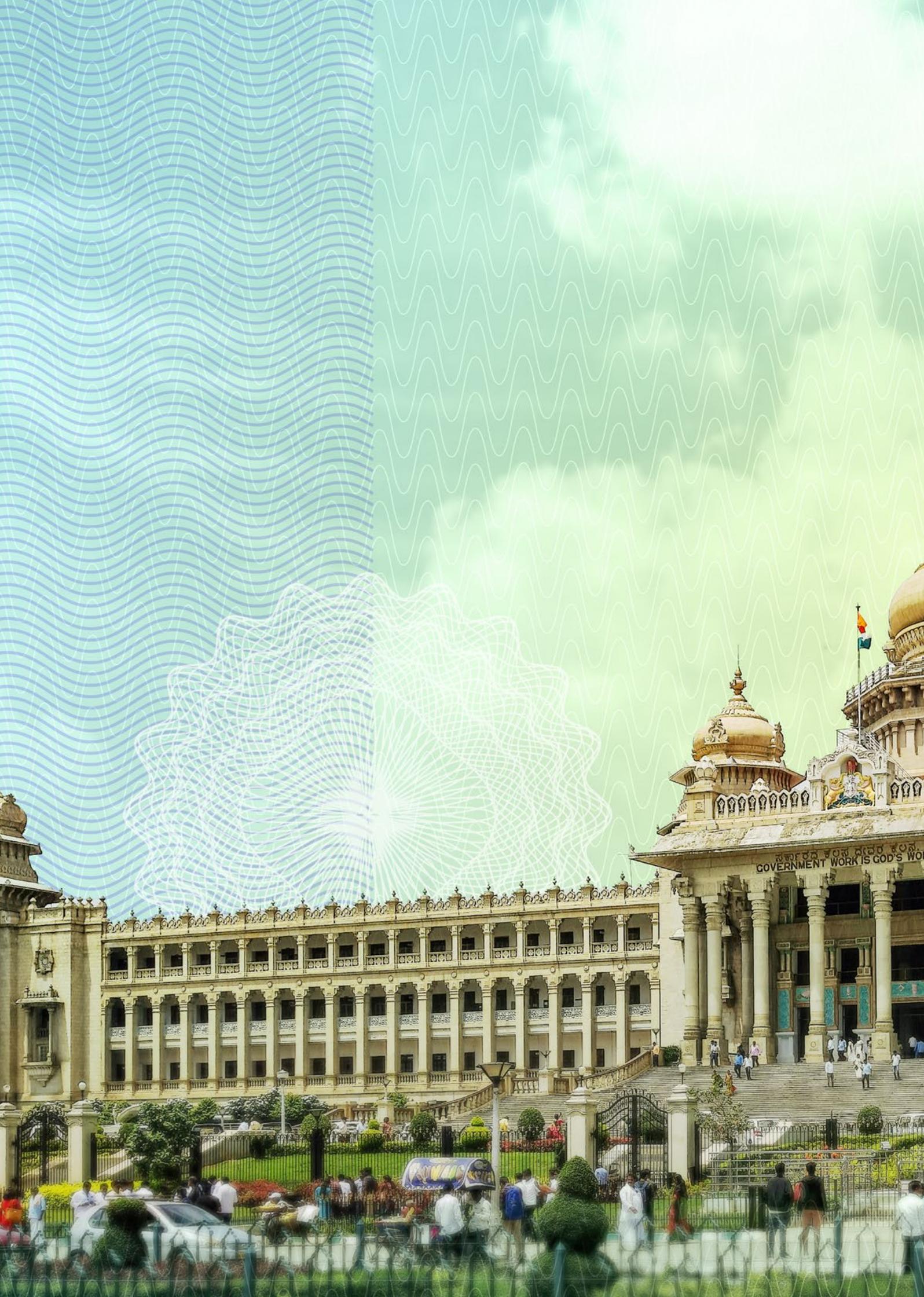
This framework plays a key role in India's **National Action Plan on Climate Change (NAPCC)** and supports the implementation of **State Action Plans on Climate Change (SAPCC)**, helping policymakers and stakeholders take informed decisions regarding climate adaptation and risk reduction initiatives. However, the challenge remains in ensuring that these investments are effectively tracked and aligned with regional vulnerabilities. The report proposes that adaptation interventions need to be integrated into broader fiscal policies, including India's Finance Commission deliberations, to ensure that states receive adequate funding based on their climate risks.

Tracking and Measuring Vulnerability

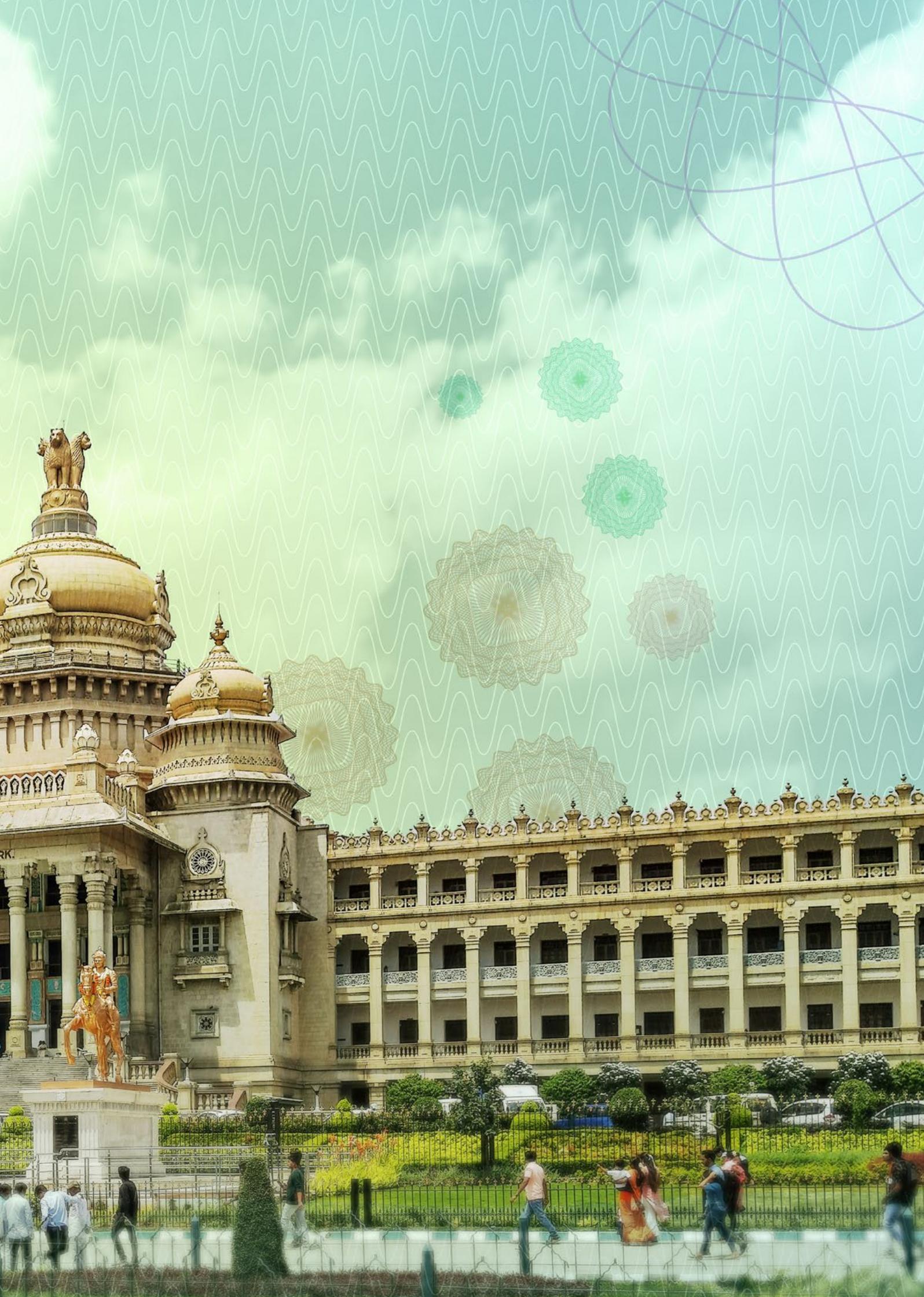
The **Climate Vulnerability Index (CVI)** developed by the **Council on Energy, Environment, and Water (CEEW)** primarily focuses on assessing and mapping climate risks across India's states and districts. It identifies areas most vulnerable to climate extremes by evaluating exposure, sensitivity, and adaptive capacity. **However, the CVI itself does not track funding for adaptation projects directly**, and is instead designed to inform adaptation investments by highlighting regions with the highest vulnerability.

India's Climate Finance Taxonomy: A New Framework

India is actively developing a Climate Finance Taxonomy to streamline and increase the flow of investments into climate-related activities. Finance Minister Nirmala Sitharaman, while presenting the **Union Budget for 2024-25** in July 2024 announced that the government would develop a 'climate finance taxonomy' to enhance the availability of capital for climate adaptation and mitigation and is framed around four key socio-economic groups i.e. 'Garib' (poor), 'Mahilayen' (women), 'Yuva' (youth) and 'Annadata' (farmer). This taxonomy will serve as a standardised framework to classify economic activities that align with the country's climate goals, including both **adaptation** and **mitigation** efforts. The primary goal is to improve transparency in climate investments and reduce the risk of **greenwashing**—where projects falsely claim to be environmentally sustainable. The taxonomy will guide investors, businesses, and financial institutions by clearly defining which activities are eligible for green financing, making it easier for both domestic and international capital to flow into projects that support India's green transition. This framework is crucial for mobilising the estimated **USD 10.1 trillion** required to **achieve India's net-zero targets by 2070**. So, climate finance taxonomy could, in theory, guide the new investments coming into the country towards more climate-friendly sectors like renewable energy, electric vehicles, and climate-resilient infrastructure. It would help investors, both domestic and international, identify which projects are truly green and deserve funding. However, adaptability is crucial for a country like India, where the socio-economic landscape is rapidly evolving.



ಸರ್ಕಾರದ ಕೆಲಸವು ದೇವರ ಕೆಲಸ
GOVERNMENT WORK IS GOD'S WORK



India's Climate Finance Architecture

INDIA HAS COMPREHENSIVE CLIMATE FINANCE ARCHITECTURE (NAPCC, SAPCCS, NAFCC, NCEF) BUT COORDINATION GAPS LIMIT EFFECTIVENESS

75% OF DISTRICTS ARE CLIMATE HOTSPOTS; VULNERABILITY ASSESSMENTS EXIST BUT FUNDING ALLOCATION REMAINS MISALIGNED

CARBON MARKET VALUED AT USD 1.2 BILLION TARGETS TOP-3 GLOBAL STATUS BY 2030

DATA GAPS AND INCONSISTENT METRICS CONSTRAIN PLANNING DESPITE NEW DISCLOSURE FRAMEWORKS

01 Introduction

The effects of climate change on communities, economies, and ecosystems are already widespread and are growing in intensity and frequency (IPCC 2022; GCA 2019). If current global emissions continue on their path, climate change could reduce the world's Gross Domestic Product (GDP) by 11-14% by the middle of the century (Guo et al. 2021). It is crucial to accelerate climate adaptation efforts to safeguard human, economic, social, and environmental well-being (GCA 2019). However, the UNEP's 2023 Adaptation Gap Report highlights that current global funding for adaptation is inadequate to effectively address these climate impacts. The gap in adaptation finance is expanding, with developing nations requiring an estimated USD 194 billion to USD 366 billion annually (UNEP 2023).

India is particularly at risk from the negative effects of climate change. The Germanwatch Global Climate Risk Index 2021 ranked India as the 7th most impacted country by weather-related losses and climate hazards (Eckstein et al. 2021). The economic and livelihood impacts of climate change are already evident, and the country's substantial need for adaptation investments is expected to rise as climate effects intensify (MoEFCC 2022).

These impacts also pose a threat to development progress and efforts to reduce poverty. By 2040, reduced agricultural productivity and increasing cereal prices could cause India's poverty rate to rise by approximately 3.5%, equivalent to 50 million more people falling into poverty compared to a scenario without warming (Picciariello et al. 2021). In 2021 alone, heat exposure in India led to the loss of an estimated 167 billion potential labour hours, resulting in an income loss of around USD 159 billion, which accounts for 5.4% of the country's GDP (Climate Transparency Report 2022). Indian districts that have experienced the fastest warming have seen 56% lower GDP growth compared to those that have warmed the least (Burke and Tanutama 2019).

India urgently needs to scale up adaptation measures to mitigate its climate vulnerability while promoting economic growth and development (MoF 2020). The country's strategy for climate adaptation and resilience is deeply rooted in socio-economic development, recognising that improving access to essential services like education, resilient infrastructure, and healthcare is vital for reducing vulnerability to climate change (MoEFCC 2022).

This report aims to evaluate India's approach to adaptation as a core element of its development strategy, identify its adaptation needs, and highlight the funding gaps based on existing literature, while exploring ways to close these gaps.

In this context, the report addresses the following research questions:

WHAT LEVEL OF INVESTMENT IS NECESSARY TO IMPLEMENT PLANNED ADAPTATION INITIATIVES AT NATIONAL AND STATE-LEVELS?

WHAT IS THE ESTIMATED FUNDING GAP AND WHAT ARE THE OBSTACLES TO CLOSING IT?

HOW CAN PUBLIC AND PRIVATE FINANCE HELP BRIDGE THIS GAP?

WHAT IS THE ROLE THAT CONCESSIONAL CLIMATE FINANCE PLAYS IN BRIDGING ADAPTATION FUNDING GAP?

1.1 CLIMATE RISK AND VULNERABILITY ASSESSMENTS

Climate Risk and Vulnerability Assessments (CRVAs) are crucial tools in understanding how different regions, sectors, and communities are exposed to the impacts of climate change. In India, CRVAs help policymakers, businesses, and communities assess the risks posed by extreme weather events, rising temperatures, and other climate impacts, and guide adaptation planning. Several databases and tools exist to facilitate these assessments, but there remain significant research gaps that need to be addressed to fully understand climate vulnerability at local and regional levels.

EXISTING DATABASES AND TOOLS IN INDIA

1. Climate Vulnerability Index (CVI)

Developed by the **Council on Energy, Environment and Water (CEEW)**, the Climate Vulnerability Index ranks Indian districts based on their vulnerability to extreme climate events such as floods, droughts, and cyclones. The index highlights that 75% of districts in India are hotspots for climate risks.

The CVI provides valuable data at the subnational level, helping states like **Odisha**, **Assam**, and **Bihar** identify the most at-risk areas for targeted adaptation interventions.

2. National Action Plan on Climate Change (NAPCC) and State Action Plans on Climate Change (SAPCCs)

The **State Action Plans on Climate Change (SAPCCs)**, developed by each state under the broader NAPCC framework, provide state-specific climate risk assessments. These plans include vulnerability analyses and outline adaptation strategies for sectors such as agriculture, water resources, and infrastructure.

For example, **Kerala** has focused heavily on flood risks, while **Rajasthan** targets water scarcity issues.

3. Indian Meteorological Department (IMD) and Disaster Management Authorities

The **IMD** provides climate data related to extreme weather events, including rainfall, drought forecasts, and heatwaves. States and national disaster management authorities use this data to assess and plan for climate risks.

Real-time early warning systems, particularly for cyclones and floods, have been developed in states like **Odisha** and **West Bengal**, which are frequently exposed to these risks.

4. National Disaster Management Authority (NDMA)

The NDMA provides national-level risk assessments for natural disasters like floods, droughts, and heatwaves. While these assessments focus on disaster preparedness, they are also increasingly integrating long-term climate risks to help guide adaptation planning.

5. International Data Platforms

India also draws on international climate vulnerability databases like the **Global Climate Risk Index (CRI)** by **Germanwatch**, which tracks climate-induced losses. The **IPCC** reports provide high-level data and projections, which are often used by Indian states to tailor local climate risk assessments.

RESEARCH GAPS IN CLIMATE RISK AND VULNERABILITY ASSESSMENTS

Despite the existence of several tools and databases, there are still significant research gaps that limit the effectiveness of CRVAs in India:

1. Lack of Localised Data

Many climate risk assessments focus on state or district levels, but they lack granular, hyper-local data that would allow for more precise adaptation measures. Vulnerability assessments often fail to capture differences in risks within districts, particularly in rural and marginalised communities.

For example, while Assam and West Bengal are identified as high-risk states for flooding, more detailed vulnerability mapping at the village or block level is needed to ensure that resources are allocated where they are most needed.

2. Sector-Specific Vulnerability Assessments

Existing assessments tend to be broad and do not delve deep into sector-specific risks. Sectors such as **agriculture**, **health**, and **infrastructure** require more detailed assessments to understand how climate change impacts them differently.

For example, **agriculture** in drought-prone regions like Rajasthan needs tailored assessments focusing on crop vulnerability, soil degradation, and water scarcity to guide adaptation strategies effectively.

3. Integrating Socioeconomic Vulnerabilities

Current assessments focus heavily on physical climate risks but often do not account for **socioeconomic vulnerabilities**, such as poverty, gender, and access to resources. Vulnerable groups such as **women**, **indigenous communities**, and **smallholder farmers** often face compounded risks due to limited adaptive capacity.

Incorporating data on **livelihoods**, **economic vulnerability**, and **access to essential services** would provide a more comprehensive understanding of climate risks, especially in highly vulnerable states like **Bihar** and **Chhattisgarh**.

4. Long-Term Data and Projections

While short-term climate risks are well documented, there is a need for **long-term climate projections** that assess risks over several decades. This would help states better understand how slow-onset impacts such as **rising temperatures** or **glacial melt** (in **Himachal Pradesh** and **Sikkim**) could affect water resources, agriculture, and infrastructure.

5. Data Integration Across Sectors and Scales

Currently, there is no **standardised framework** for integrating climate risk data across different sectors and administrative levels. States need a unified platform that consolidates data from agriculture, water, energy, and infrastructure, as well as district and national levels.

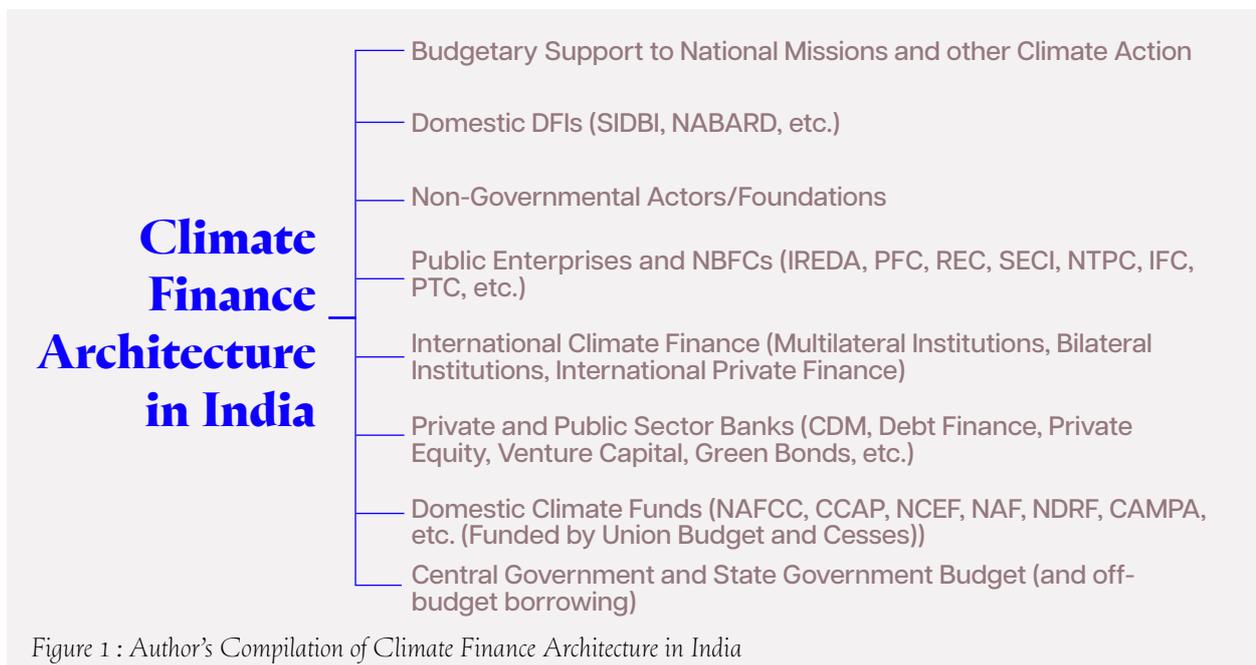
A comprehensive, **multi-sectoral climate risk database** could help streamline adaptation planning and ensure a cohesive response across government departments and private entities.

CONCLUSION

India has made significant progress in conducting climate risk and vulnerability assessments through various tools like the **Climate Vulnerability Index (CVI)** and state-level action plans. However, substantial research gaps remain, particularly in terms of **localised data, sector-specific vulnerabilities, and long-term projections**. Addressing these gaps will be critical for ensuring that adaptation investments are effectively targeted and that the most vulnerable communities are protected from the impacts of climate change.

1.2 CLIMATE FINANCE ARCHITECTURE IN INDIA

The climate finance framework in India involves a diverse array of institutions operating at multiple levels of governance. International multilateral and bilateral institutions contribute technical expertise and financial resources, while national ministries and agencies coordinate with these global funds to secure project financing. Indian development finance institutions (DFIs) and non-banking financial companies (NBFCs) collaborate with international organisations through government channels, further supporting banks and non-governmental organisations (NGOs) in driving climate initiatives.



The National Action Plan for Climate Change (NAPCC), launched in 2008, was a pivotal early government initiative aimed at formulating and implementing climate action strategies. It was structured around eight core missions, each overseen by a dedicated ministry, with the Ministry of Environment, Forest, and Climate Change (MoEFCC) acting as the lead coordinating agency. The respective ministries are responsible for determining strategies and interventions for each mission, guiding India's overall climate response.

State-level departments play an instrumental role in coordinating climate activities between Central and State governments. They provide technical and advisory support, organise State Steering Committee on Climate Change (SCCC) meetings, and help access climate finance from domestic and international sources.

In 2011, the Climate Change Finance Unit (CCFU) was established under the Ministry of Finance's Department of Economic Affairs to represent the ministry in both national and international climate finance discussions. The CCFU also oversees financial issues related to India's commitments under the United Nations Framework Convention on Climate Change (UNFCCC) and provides assistance to MoEFCC on climate finance matters.

Several funds have been created to channel finance towards climate initiatives, such as the National Clean Energy Fund (NCEF), the National Adaptation Fund for Climate Change (NAFCC), the National Disaster Response Fund (NDRF), and the Compensatory Afforestation Fund Management and Planning Authority (CAMPA). The NCEF, which originated from coal cess in 2010–11, funds clean energy initiatives, including research and projects under the NAPCC. The NAFCC, launched in 2015, focuses on financing climate adaptation in vulnerable states, filling gaps in existing schemes. States also pursue international climate finance from sources like the Green Climate Fund (GCF) and UNFCCC.

State-level departments play an instrumental role in coordinating climate activities between Central and State governments. They provide technical and advisory support, organise State Steering Committee on Climate Change (SCCC) meetings, and help access climate finance from domestic and international sources. Additionally, these departments are involved in project preparation, implementation, and capacity-building initiatives.

The Climate Change Action Programme (CCAP), introduced in 2014, has played a key role in advancing scientific research and building institutional capacity for climate action. With an initial allocation of USD 42 million for five years, CCAP supports climate research and domestic action plans at both national and state-levels. Between 2017–2021, the programme received USD 24.6 million for furthering these efforts.

Public Sector Undertakings (PSUs) like the Indian Renewable Energy Development Agency (IREDA), the National Thermal Power Corporation (NTPC), and the Solar Energy Corporation of India (SECI) have played vital roles in mobilising public funds towards renewable energy and climate mitigation projects. IREDA offers long-term financing for renewable and energy efficiency projects, while SECI supports the implementation of solar energy projects under the National Solar Mission. NABARD, as a key implementing agency, manages various adaptation funds, reinforcing its role in climate finance. Since the establishment of the NAPCC, the institutional framework for climate action has strengthened, with NABARD taking on a significant role in managing both domestic and international climate adaptation funds.

Moreover, India's efforts to engage with international climate finance mechanisms, along with the increasing participation of public and private sectors in climate initiatives, continue to evolve, further enhancing the country's capacity to tackle climate challenges.





The Adaptation Financing Crisis

**INDIA NEEDS USD 67 BILLION ANNUALLY
BY 2030; CURRENT INR 370 BILLION FALLS
DRASTICALLY SHORT**

**PRIVATE INVESTMENT HAMPERED BY
UNBANKABLE PROJECTS, HIGH RISKS, AND
FRAGMENTED POLICIES**

**STATE CAPACITY VARIES: GUJARAT,
ODISHA LEAD; UP, BIHAR LAG
SIGNIFICANTLY**

**INNOVATIVE MECHANISMS PROPOSED:
ADAPTATION TAX, CLIMATE-INCENTIVISED
BORROWING, ADAPTATION-SPECIFIC GREEN
BONDS**

02 India Needs to Focus on Adaptation Finance

2.1 INDIA'S APPROACH TO CLIMATE ADAPTATION

India's approach to climate adaptation is shaped by its geographical diversity, vulnerability to climate risks, and the need to safeguard its development progress against the impacts of climate change. The country has adopted a multi-pronged strategy to strengthen resilience at the national, state, and community levels, integrating adaptation into its broader development goals. This approach focuses on building institutional capacity, financing adaptation projects, and leveraging partnerships across public, private, and international sectors.

1. National Policy Frameworks for Adaptation

India's adaptation strategy is anchored in its **National Action Plan on Climate Change (NAPCC)**, launched in 2008. The NAPCC outlines eight national missions designed to address key areas such as agriculture, water, forests, energy efficiency, and urban resilience. These missions emphasise adaptation alongside mitigation, with a focus on protecting the most climate-vulnerable sectors and regions:

- The **National Mission for Sustainable Agriculture (NMSA)** promotes climate-resilient farming practices and water conservation to protect the agricultural sector, which is highly susceptible to changes in weather patterns.
- The **National Water Mission** aims to improve water use efficiency and ensure water security, especially in regions facing increasing drought risks, such as **Rajasthan** and **Maharashtra**.
- The **National Mission on Green India** focuses on afforestation and ecosystem restoration to enhance natural resilience against climate impacts, including desertification and flooding.

2. State-Level Climate Adaptation Plans

In line with the NAPCC, each state has developed its own **State Action Plan on Climate Change (SAPCC)**. These plans are tailored to the specific vulnerabilities and priorities of each state, reflecting India's diverse climate risks. For example:

- **Odisha** has prioritised disaster management and coastal resilience, given its frequent exposure to cyclones and storm surges. The state has successfully reduced cyclone-related casualties through its disaster early warning systems and resilient infrastructure.
- **Kerala**, in response to recurrent floods, focuses on flood control and water management. The state's **Rebuild Kerala Initiative** integrates climate adaptation measures to strengthen infrastructure and reduce flood risks.

3. Financing Climate Adaptation

India faces significant adaptation investment needs, particularly in vulnerable regions. Recognising this, the government has set up mechanisms to finance adaptation at various levels:

- The **National Adaptation Fund for Climate Change (NAFCC)**, established in 2015, provides financial assistance to state governments for implementing adaptation projects. However, the fund is limited, and states often face difficulties in securing adequate resources for large-scale adaptation efforts.
- India also leverages **international climate finance** through mechanisms like the **Green Climate Fund (GCF)** and the **Global Environment Facility (GEF)** to support adaptation projects in areas such as coastal protection, water conservation, and ecosystem restoration.

India's adaptation strategy is anchored in its National Action Plan on Climate Change (NAPCC), launched in 2008. The NAPCC outlines eight national missions designed to address key areas such as agriculture, water, forests, energy efficiency, and urban resilience.

4. Integration of Adaptation into Development Plans

India has integrated climate adaptation into its broader development policies, recognising that resilience-building efforts are key to sustainable growth. Key examples include:

- **Rural development programmes** like **Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)** are increasingly being used to support climate-resilient infrastructure, such as rainwater harvesting systems and drought-proofing measures.
- The **Smart Cities Mission**, aimed at promoting urban resilience, incorporates climate adaptation strategies to make Indian cities more resistant to floods, heatwaves, and other climate impacts.

5. Community-Based Adaptation

India emphasises **community-based adaptation (CBA)** approaches that empower local communities to build their own resilience. Through capacity-building programmes, rural communities are involved in projects like:

- **Watershed management** to combat droughts and soil degradation.
- **Participatory forest management** to protect ecosystems and livelihoods that depend on natural resources.

6. International Collaboration and Research

India collaborates with various international partners to strengthen its adaptation efforts:

- The **International Solar Alliance (ISA)**, co-founded by India, promotes solar energy adoption in vulnerable regions, reducing dependency on conventional energy sources that are susceptible to climate disruptions.
- India also engages with global institutions like the **United Nations Framework Convention on Climate Change (UNFCCC)** to share research and best practices in adaptation.

RESEARCH GAPS AND CHALLENGES

While India has made considerable progress in building climate resilience, challenges remain:

- **Financing gaps** continue to hinder the implementation of large-scale adaptation projects, especially in poorer, highly vulnerable states like **Bihar** and **Jharkhand**.
- There is a need for **better integration of adaptation data** into planning at the local and district levels, as many regions lack detailed, localised climate vulnerability assessments.
- **Capacity-building** at the state and local levels is essential to ensure effective implementation of adaptation measures. States need more technical expertise and institutional support to execute adaptation projects successfully.

CONCLUSION

India's approach to climate adaptation is holistic, spanning national and state-level policies, international collaborations, and community-driven projects. While the country has developed robust frameworks to address climate risks, challenges in financing, data integration, and local capacity remain. Continued efforts to scale up adaptation investments, particularly in vulnerable regions, will be critical to safeguarding India's economic and social development in the face of climate change.

2.2 RECENT ADAPTATION ACTION

Recent years have seen a surge in adaptation efforts in India, driven by growing recognition of the risks posed by climate change. The country is focusing on enhancing resilience across various sectors such as agriculture, infrastructure, and water management, with a strong emphasis on vulnerable regions. Several key actions were undertaken in 2023 and 2024 to scale up adaptation efforts at both the national and state-levels.

Scaling Up Infrastructure Resilience

India has made strides in building **climate-resilient infrastructure**, particularly in flood-prone areas. In 2024, the **Rebuild Kerala Initiative** continued its focus on reconstructing flood-resistant infrastructure following the devastating floods in recent years. The state invested in early warning systems and water management to better respond to future extreme weather events. Similarly, **Odisha**, prone to frequent cyclones, enhanced its coastal resilience programmes with the construction of cyclone shelters and embankments.

Locally Led Adaptation Projects

India has also emphasised **locally led adaptation** initiatives to empower communities at the grassroots level. Several states, including **Rajasthan** and **Maharashtra**, have implemented community-driven water conservation projects as part of their drought adaptation strategies. These projects promote traditional water harvesting techniques and modern irrigation systems, allowing rural communities to combat water scarcity more effectively.

Climate-Resilient Agriculture

In the agriculture sector, **climate-smart agriculture** practices are being promoted to help farmers adapt to shifting weather patterns. In 2023, India expanded programmes to introduce **drought-resistant crop varieties** and **precision farming technologies** that help farmers optimise water and input usage. These efforts are particularly important in states like **Gujarat** and **Punjab**, where agriculture forms a large part of the economy and is highly sensitive to climate variability.

Public-Private Partnerships in Adaptation

Public-private partnerships (PPPs) have become increasingly significant in scaling up adaptation investments. Private entities, particularly in the insurance and real estate sectors, are working alongside the government to build climate-resilient infrastructure and promote climate **risk insurance products**. For example, **ICICI Lombard** introduced weather-indexed insurance schemes aimed at protecting farmers from climate-induced losses.

How Can India Leverage Climate Finance for Adaptation and Resilience?

INTERNATIONAL AND DOMESTIC CLIMATE FINANCE

India has been actively engaging with international climate finance mechanisms, such as the **Green Climate Fund (GCF)**, to support adaptation projects. The government is also working on mobilising domestic finance for adaptation, with the **National Adaptation Fund for Climate Change (NAFCC)** providing funds for state-led adaptation projects. However, despite these efforts, India still faces a significant **adaptation finance gap**, as identified in the **2023 UNEP Adaptation Gap Report**, which underscores the urgent need to scale up both international and domestic funding.

India's recent adaptation actions reflect a multi-faceted approach that integrates infrastructure resilience, community involvement, agriculture adaptation, and public-private collaborations. While progress is being made, particularly in high-risk states like Kerala and Odisha, the country continues to face challenges related to financing and scaling these efforts to meet the growing risks posed by climate change.

While significant progress has been made in climate adaptation, certain sectors lag behind in their efforts, primarily due to funding constraints, lack of awareness, and institutional capacity gaps. These sectors include:

1. Health Sector

Vulnerability: India's health sector remains under-prepared for the impacts of climate change, particularly in terms of managing heat stress, vector-borne diseases (like malaria and dengue), and waterborne illnesses that are exacerbated by extreme weather events.

Challenges: Health systems in rural and remote areas lack the infrastructure and resources to cope with climate-induced health risks. There is a limited focus on integrating climate risks into public health planning, leaving vulnerable communities exposed during extreme weather events like heatwaves.

2. Urban Planning and Infrastructure

Vulnerability: Many Indian cities are lagging in integrating climate resilience into urban planning and infrastructure development. Rapid urbanisation, inadequate infrastructure, and unplanned urban sprawl increase the vulnerability of cities to flooding, heatwaves, and other climate risks.

Challenges: Despite initiatives like the **Smart Cities Mission**, many cities still lack robust climate resilience strategies, particularly in the areas of flood management, stormwater drainage systems, and heat mitigation. Urban slums are particularly at risk, as they lack access to basic services like sanitation and water.

3. Coastal and Fisheries Sectors

- **Vulnerability:** The coastal and fisheries sectors are highly vulnerable to rising sea levels, storm surges, and ocean acidification. However, adaptation measures in these sectors have been limited, particularly in terms of building resilience for small-scale fisheries.
- **Challenges:** Small-scale fishers often lack access to early warning systems and sustainable fishing practices that could protect their livelihoods from climate impacts. Coastal infrastructure development (ports, tourism facilities) also tends to overlook the risks of sea-level rise and coastal erosion.

4. Water Resources Management

- **Vulnerability:** While there have been significant efforts in drought-prone regions, overall **water resource management** remains inadequate in many parts of India. States like **Rajasthan** and **Maharashtra** face water scarcity issues, yet investment in climate-resilient water infrastructure and technologies is still lagging.
- **Challenges:** Fragmented policies, outdated irrigation infrastructure, and lack of coordination between water management authorities are major barriers to adaptation in this sector. Despite the clear need, many states struggle to implement integrated water resource management strategies to ensure sustainable water use.

5. Agriculture (Smallholder Farmers)

- **Vulnerability:** While large-scale agricultural projects are progressing, **smallholder farmers**, who constitute a significant portion of India's agricultural workforce, are struggling to adapt. Climate-smart agricultural techniques

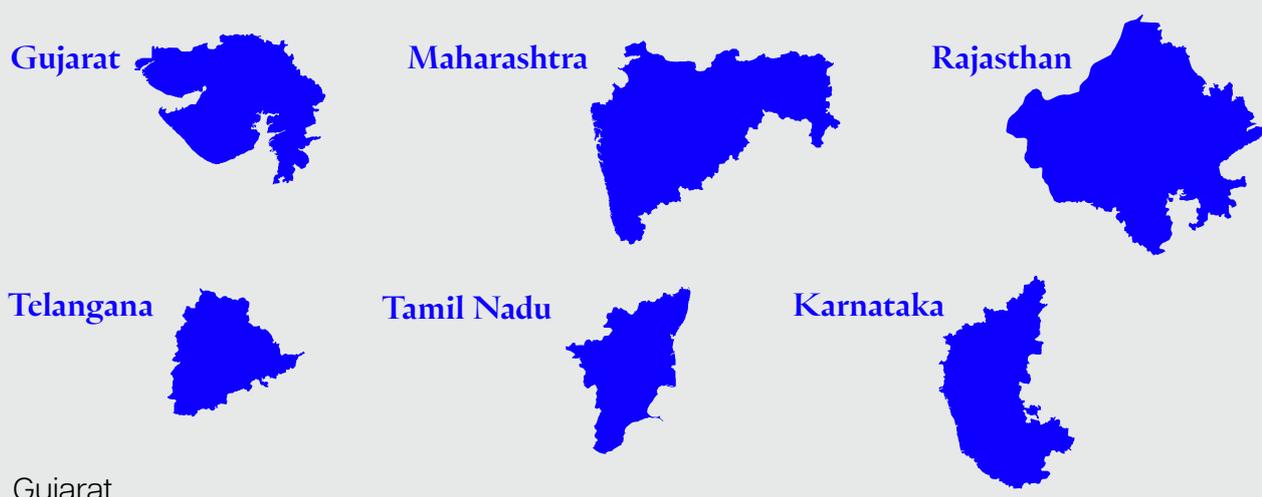
and resilient crop varieties are often inaccessible to small-scale farmers due to limited financial resources and a lack of government support.

- **Challenges:** Poor access to climate-resilient seeds, irrigation technology, and credit makes it difficult for smallholder farmers to adapt. Droughts, floods, and unpredictable monsoon patterns further exacerbate their vulnerability, threatening food security and livelihoods.

Although India is making strides in climate adaptation, sectors like health, urban planning, coastal fisheries, water management, and smallholder agriculture are still lagging behind. These sectors face challenges related to infrastructure deficits, lack of coordination, and insufficient funding, which need to be addressed to ensure comprehensive climate resilience across the country.

EXAMPLES OF BETTER WATER RESOURCE MANAGEMENT

Several Indian states have emerged as leaders in **water management**, demonstrating innovative approaches to address challenges like water scarcity, droughts, and inefficient irrigation practices. These states have implemented various policies, technologies, and community-driven programmes to better manage water resources:



Gujarat

- **Innovative Water Management Practices:** Gujarat has long been a pioneer in water conservation, particularly in areas facing severe drought. The state's **Sujalam Sufalam Yojana** is an ambitious water conservation project aimed at deepening lakes and ponds, desilting rivers, and ensuring groundwater recharge.
- **Efficient Irrigation:** Gujarat is also known for promoting **micro-irrigation** technologies like **drip and sprinkler irrigation** systems, which reduce water wastage and help in achieving more efficient water use in agriculture.
- **Narmada Canal Project:** The **Narmada Canal Project** has provided water to arid regions in Gujarat, supporting agriculture and drinking water supply, thus becoming a lifeline for the state.

Maharashtra

- **Jalyukt Shivar Abhiyan:** Maharashtra launched the **Jalyukt Shivar Abhiyan** to make villages water-sufficient by constructing small check dams, ponds, and wells to increase groundwater levels and improve water storage capacity. The programme has been credited with drought-proofing many areas of the state.

- **Water Conservation in Agriculture:** The state has also promoted **water-saving techniques in agriculture** and adopted **watershed management** practices to reduce water runoff, especially in the drought-prone Vidarbha and Marathwada regions.

Rajasthan

- **Traditional Water Harvesting:** Rajasthan is known for reviving traditional water harvesting techniques such as **Johads** (small earthen dams) and **Bawdis** (step wells) to conserve rainwater. The **Mukhya Mantri Jal Swavlamban Abhiyan** is a key initiative that focuses on making villages self-sufficient in water by constructing check dams and recharging groundwater.
- **Watershed Management:** The state has emphasised **watershed development** to ensure better water retention in dry areas and to combat desertification in regions like the Thar Desert.

Telangana

- **Mission Kakatiya:** Telangana's **Mission Kakatiya** is one of the most successful water restoration programmes in India. It aims to restore and rejuvenate thousands of tanks and reservoirs across the state, which are critical for irrigation and groundwater recharge.
- **Irrigation Projects:** The state has also invested heavily in large-scale irrigation projects like the **Kaleshwaram Lift Irrigation Project**, which provides water to previously dry regions.

Tamil Nadu

- **Rainwater Harvesting:** Tamil Nadu was one of the first states to make **rainwater harvesting** mandatory for buildings, helping to conserve water and recharge groundwater levels. This has become a model for other states in India.
- **Water Recycling:** Chennai, the capital city of Tamil Nadu, has adopted water recycling and desalination plants to meet the growing urban demand for water, especially in the face of water shortages during summer.

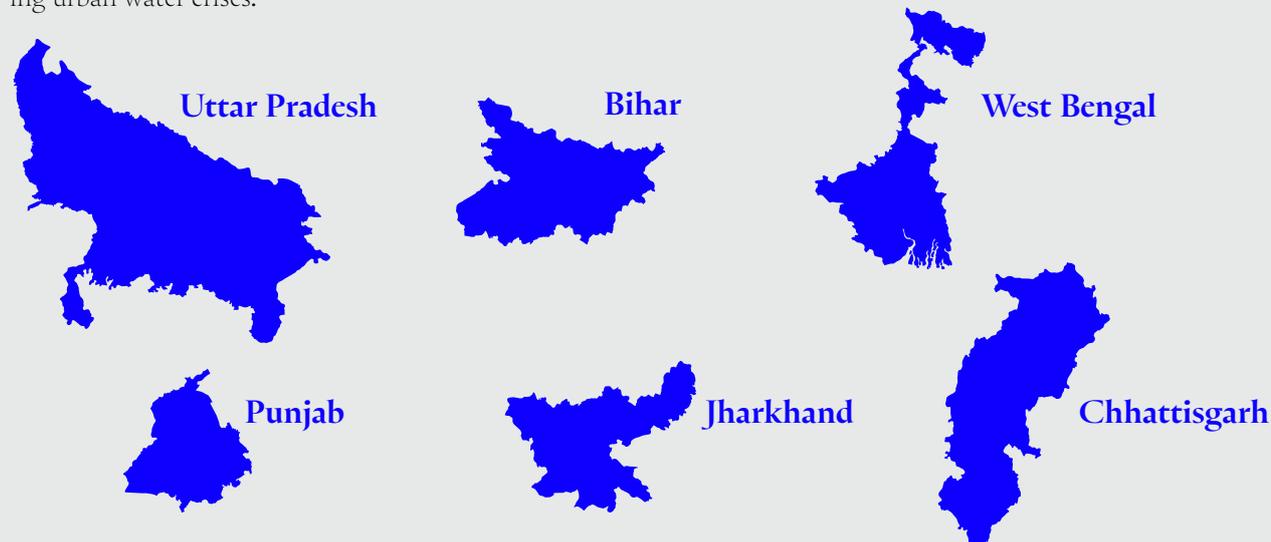
Karnataka

- **Kere (Lake) Revival Projects:** Karnataka has focused on restoring traditional water bodies like **Keres (lakes)** to improve groundwater levels and enhance water availability in rural and urban areas. Bengaluru, once known for its lakes, has been working to restore many of these water bodies.
- **Efficient Water Use:** Karnataka has promoted **drip irrigation** to reduce water usage in agriculture and tackle water scarcity in drought-prone regions like North Karnataka.

States like Gujarat, Maharashtra, Rajasthan, Telangana, Tamil Nadu, and Karnataka are leading the way in **water management** by implementing innovative policies, reviving traditional water conservation methods, and investing in large-scale irrigation projects. These states are proving that both **modern technologies** and **traditional practices** can be effectively integrated to tackle water challenges and ensure long-term sustainability.

UNDERSTANDING WEAKNESSES IN INDIA'S WATER RESOURCE MANAGEMENT FRAMEWORK

Several Indian states are lagging behind in **water management** efforts due to poor infrastructure, inefficient policies, and the lack of adequate governance frameworks. These states face severe water scarcity, inefficient water usage in agriculture, and growing urban water crises.



Uttar Pradesh

- **Challenges:** Uttar Pradesh, the most populous state in India, faces severe challenges in managing its water resources. The state has inefficient irrigation systems, with a high dependency on groundwater extraction, leading to **over-exploitation** and declining groundwater levels.
- **Water Pollution:** Industrial pollution, especially in the **Ganga basin**, further aggravates water issues. While there are efforts to clean up the Ganges, the state has not made significant progress in water conservation or irrigation efficiency.

Bihar

- **Challenges:** Bihar suffers from severe **flooding** in the north due to rivers like the Kosi, while simultaneously facing water scarcity in the south during the dry season. The state's water management policies are fragmented, and there is a lack of infrastructure to manage excess water and store it for dry periods.
- **Flood Management:** Flood control measures are outdated, and poor maintenance of embankments often exacerbates the flooding situation. Despite being one of the most water-rich states in terms of rainfall, Bihar lacks effective water storage and management systems.

West Bengal

- **Challenges:** Despite abundant rainfall, West Bengal faces severe water management issues due to **inefficient urban planning**, over-extraction of groundwater, and lack of investment in water infrastructure. Urban areas like **Kolkata** struggle with severe waterlogging during monsoons and water shortages during the dry season.
- **Flooding and Contamination:** The state also suffers from contamination issues, with high levels of **arsenic** in the groundwater, making safe drinking water a critical issue.

Punjab

- **Challenges:** Punjab, once the agricultural heartland of India, is facing a severe water crisis due to **over-reliance** on **groundwater** for irrigation. Years of intensive agriculture and water-**intensive** crops like rice have led to a rapid decline in groundwater levels.
- **Inefficient Irrigation:** Despite efforts to promote micro-irrigation, the adoption of water-efficient technologies has been slow. The state continues to use **inefficient flood irrigation** techniques, which waste significant amounts of water.

Jharkhand

- **Challenges:** Jharkhand, a state rich in natural resources, has inadequate water management systems. Despite significant rainfall, the state struggles with **water retention** due to deforestation, mining, and poor watershed management. Many rural areas suffer from water scarcity during the dry season, impacting agriculture and livelihoods.
- **Infrastructure Issues:** The state's irrigation infrastructure is underdeveloped, and there is a heavy reliance on **traditional methods** that are no longer effective in meeting water demand.

Chhattisgarh

- **Challenges:** Chhattisgarh has abundant rainfall, yet poor water management practices and deforestation have led to water shortages during the dry season. The state struggles with **poor infrastructure for water storage**, and rural communities often face water scarcity.
- **Watershed Management Issues:** The state's focus on industrial development, especially mining, has exacerbated water pollution and reduced the availability of clean water for local communities.

States like Uttar Pradesh, Bihar, Jharkhand, West Bengal, Punjab, and Chhattisgarh face significant challenges in water management. The lack of efficient water usage practices, inadequate infrastructure, and ineffective policies have worsened water scarcity and over-reliance on groundwater. These states need to adopt modern water management techniques, invest in infrastructure, and implement sustainable policies to ensure long-term water security.

STRATEGIES TO IMPROVE WATER RESOURCE MANAGEMENT

Improving water management in lagging states like **Uttar Pradesh, Bihar, Punjab, Jharkhand, Chhattisgarh, and West Bengal** requires a multi-faceted strategy that addresses both **structural issues** and **behavioural change**. Here are the key strategies needed to improve water management:

1. Adoption of Water-Efficient Technologies

Modern Irrigation Techniques: States must encourage farmers to shift from traditional, inefficient flood irrigation methods to more water-efficient systems like **drip and sprinkler irrigation**. This is especially crucial in **Punjab** and **Uttar Pradesh**, where over-reliance on groundwater for agriculture is depleting water reserves.

Precision Agriculture: Promoting the use of **precision agriculture technologies** that monitor soil moisture and optimise water usage based on real-time data can significantly reduce water wastage.

2. Groundwater Regulation and Monitoring

Groundwater Management Policies: A key reason for water management issues in states like **Punjab** and **Uttar Pradesh** is the over-extraction of groundwater. Introducing stricter groundwater regulations, such as permits for groundwater extraction, and implementing community-based groundwater management could help control overuse.

Monitoring Systems: States need to invest in **groundwater monitoring** systems to track water levels, especially in areas where over-extraction is rampant. Digital tools and **satellite-based systems** can help provide real-time data on groundwater levels.

3. Revitalisation of Traditional Water Harvesting Systems

Rainwater Harvesting: Reviving traditional rainwater harvesting techniques, like **Johads** and **Bawdis** (earthen dams and step wells), can help mitigate water shortages in states like **Rajasthan** and **Jharkhand**. These techniques should be integrated into modern water management plans to capture and store rainwater during the monsoon.

Urban Water Harvesting: Making **rainwater harvesting** mandatory in urban areas, especially in water-stressed states like **West Bengal**, can ensure sustainable water availability and reduce pressure on over-exploited groundwater sources.

4. Integrated Water Resource Management (IWRM)

Cross-Sectoral Coordination: Effective water management requires coordination across sectors like agriculture, urban development, and industry. **Integrated Water Resource Management (IWRM)**, which brings together multiple stakeholders—government, private sector, and communities—can ensure more holistic water governance. States like **Uttar Pradesh** and **Bihar** can adopt IWRM frameworks to manage water use sustainably across sectors.

Watershed Management: Improving **watershed management** practices is critical in states like **Jharkhand** and **Chhattisgarh** to prevent soil erosion, reduce runoff, and enhance groundwater recharge. Investments in watershed development programmes can also help improve water retention in rural areas.

5. Infrastructure Development

Upgrading Irrigation Systems: States like **Bihar** and **Jharkhand** need to invest in upgrading and maintaining irrigation infrastructure to prevent water leakage and inefficiency. Building check dams, percolation tanks, and small reservoirs can help store rainwater and prevent water scarcity during dry seasons.

Urban Drainage and Stormwater Management: In **West Bengal**, improving urban stormwater drainage systems is critical to address waterlogging during the monsoons. Investment in **green infrastructure**, such as permeable pavements and retention ponds, can help manage urban water more effectively.

6. Public Awareness and Community Involvement

Community-Led Water Management: Engaging local communities in water conservation efforts is crucial for sustainable water management. States like **Chhattisgarh** and **Jharkhand** can benefit from community-driven water management programmes that empower rural populations to monitor water usage and implement local solutions.

Education and Awareness: Water conservation awareness campaigns should be launched to encourage responsible water use among citizens, particularly in urban areas. Programmes can promote **water-saving technologies** in households and industries.

7. Financial Incentives and Policies

Subsidies for Water-Efficient Technologies: States need to offer **financial incentives** to farmers and industries to adopt water-efficient technologies. For example, **subsidies** for drip irrigation systems, rainwater harvesting units, or precision farming technologies can promote their widespread adoption.

Water Pricing Reforms: Introducing **rational water pricing** policies can encourage more efficient water use. In **Punjab** and **Uttar Pradesh**, for example, farmers could be incentivised to shift away from water-intensive crops like rice through differential water pricing.

8. Policy Reforms and Legal Frameworks

Legislative Support: States need robust **legal frameworks** to regulate water usage and enforce sustainable water management practices. These frameworks should include provisions for **penalties for illegal water extraction** and incentives for water conservation.

Coordination with Central Programmes: States should work closely with central government programmes like the **Atal Bhujal Yojana (ABHY)**, which focuses on sustainable groundwater management, and leverage central funds to improve water governance.

POLICY REFORMS TO IMPROVE WATER RESOURCE MANAGEMENT

Water-scarce states in India can benefit from a range of **policy reforms** that promote efficient water use, enhance conservation efforts, and ensure sustainable water management. These reforms should address structural inefficiencies, incentivise behavioural change, and provide a strong legal framework. Here are some key policy reforms that could help:

1. Groundwater Regulation and Sustainable Usage

Groundwater Management Policies: Over-extraction of groundwater is a major issue in water-scarce states like **Punjab** and **Uttar Pradesh**. Policy reforms should include the introduction of **groundwater permits** and **water withdrawal limits** for agricultural, industrial, and domestic use.

Groundwater Pricing: Rationalising water pricing by introducing tariffs on groundwater extraction can discourage overuse, particularly in agriculture. This can incentivise the adoption of **water-efficient practices like drip irrigation**.

2. Crop Diversification and Agricultural Reforms

Incentivising Crop Diversification: Water-intensive crops like paddy and sugarcane, heavily grown in states such as Punjab and Maharashtra, contribute to water stress. Policy reforms can promote crop diversification through financial incentives for growing **less water-intensive crops**, such as pulses, oilseeds, and millets. This would reduce water demand in agriculture, the largest consumer of water in India.

Promoting Climate-Resilient Farming: Encouraging farmers to adopt **climate-smart agricultural practices** and **water-efficient technologies** such as precision farming can improve water use efficiency and reduce the pressure on already stressed water resources.

3. Rainwater Harvesting and Water Storage Infrastructure

Mandating Rainwater Harvesting: Many states already have mandates for rainwater harvesting, but enforcement remains weak. Strengthening these mandates, particularly in urban areas, could ensure better **groundwater recharge** and provide supplementary water during dry periods. States like **Tamil Nadu** have had success with such policies, which can be replicated in other states.

Reviving Traditional Water Bodies: States should focus on restoring traditional water harvesting structures, such as **ponds, tanks, and lakes**, which can act as key sources of water for agriculture and drinking purposes during droughts. Programmes like **Mission Kakatiya** in Telangana serve as a model for other states.

4. Watershed Management and Ecosystem-Based Solutions

Integrated Watershed Management: Effective management of watersheds can ensure better water retention and recharge, particularly in drought-prone regions. States should adopt an **integrated water resources management (IWRM)** approach, which coordinates the development and management of water, land, and related resources to optimise water use and sustainability.

Forestation and Ecosystem Protection: Promoting **afforestation** and protecting **wetlands** can help in water retention and reducing runoff during monsoons. Forests and wetlands act as natural water storage systems, which can be crucial for water-scarce regions.

5. Water-Use Efficiency in Industry and Urban Areas

Water Efficiency Standards for Industries: Introducing mandatory **water efficiency standards** for industries, especially in water-intensive sectors like textiles and paper, can help reduce industrial water consumption. States could incentivise companies to adopt **recycling and reuse technologies** for industrial wastewater.

Urban Water Management Reforms: Urban areas in water-scarce states face increasing water demand. Cities should promote **water recycling** for non-drinking purposes, such as landscaping and industrial use. Additionally, investing in **smart water meters** and **leakage detection technologies** can ensure more efficient urban water use.

6. Legal and Institutional Reforms

Strengthening Water Rights and Governance: Reforms should aim to clarify **water rights** and improve the governance of water resources. This includes establishing **state-level water regulatory authorities** that oversee water allocations, ensure compliance with water laws, and resolve conflicts over water use.

Public-Private Partnerships (PPPs): States can encourage **public-private partnerships** to invest in water infrastructure projects, such as building desalination plants or constructing efficient irrigation systems. These partnerships can provide much-needed capital for improving water management in resource-scarce states.

7. Public Awareness and Behaviour Change Initiatives

Water Conservation Campaigns: Public awareness campaigns focused on promoting water conservation can encourage more responsible water use. These campaigns should target both rural and urban populations, promoting simple practices like reducing water waste in households, using water-saving devices, and efficient irrigation methods.

Training and Capacity Building: Strengthening the capacity of local water management institutions through training programmes can enhance their ability to manage water resources effectively. This includes empowering local communities to take part in water conservation efforts, such as **community-driven water management projects**.

CONCLUSION

A combination of **groundwater regulation, water-efficient technologies, agricultural reforms, and public awareness** is essential to improve water management in India's water-scarce states. By implementing these policy reforms, states can ensure long-term water sustainability, better resilience to climate variability, and more equitable water distribution across sectors.

2.3 POLICIES THAT DRIVE ADAPTATION INVESTMENT

India's climate adaptation strategy is shaped by a mix of national and state-level policies aimed at mitigating the impacts of climate change and enhancing the resilience of vulnerable communities. These policies guide the allocation of resources, foster public and private sector participation, and support the development of climate-resilient infrastructure. The key policies driving adaptation investments in India are discussed below:

National Action Plan on Climate Change (NAPCC)

Launched in 2008, the **National Action Plan on Climate Change (NAPCC)**¹ is India's overarching framework for climate action. It includes eight national missions, some of which focus on adaptation, such as the **National Water Mission**, **National Mission for Sustainable Agriculture**, and **National Mission on Himalayan Ecosystems**. These missions aim to promote sustainable water use, climate-resilient agricultural practices, and ecosystem conservation—directly influencing adaptation investment flows. The NAPCC has catalysed adaptation funding by setting clear goals for managing water resources, agricultural resilience, and rural livelihoods under changing climate conditions.

¹ Launched in 2008 by the Government of India, the NAPCC outlines India's strategy to address climate change through eight core "missions" focused on solar energy, energy efficiency, sustainable agriculture, and water conservation, among others.

State Action Plans on Climate Change (SAPCCs)

The **State Action Plans on Climate Change (SAPCCs)**² are designed to align state-level initiatives with national climate goals. Each state tailors its SAPCC to address local climate vulnerabilities, driving localised adaptation investments. For example, states like Odisha and Kerala, which are highly vulnerable to extreme weather events like cyclones and floods, have focused heavily on building climate-resilient infrastructure and improving disaster preparedness.

² Developed by individual Indian states in alignment with the National Action Plan on Climate Change (NAPCC), SAPCCs outline state-specific climate strategies, prioritising local vulnerabilities and integrating climate adaptation and mitigation into state-level planning. Source: MoEFCC – India Climate Portal

SAPCCs have become a vital tool for channeling both national and international climate finance to adaptation projects, ensuring that investments are directed towards high-risk areas.

National Adaptation Fund for Climate Change (NAFCC)

Established in 2015, the **National Adaptation Fund for Climate Change (NAFCC)**³ provides financial support to state governments for implementing adaptation projects. Managed by the **Ministry of Environment, Forest, and Climate Change (MoEFCC)**⁴, NAFCC helps states access grants for critical adaptation projects in sectors like agriculture, forestry, and water management.

³ Launched in 2015, NAFCC provides financial support to climate adaptation projects in sectors vulnerable to climate change, such as agriculture, water resources, and forestry. It is managed by the National Bank for Agriculture and Rural Development (NABARD).

NAFCC-funded projects have improved rural resilience by promoting sustainable farming practices and water resource management, demonstrating the importance of targeted financing for adaptation.

⁴ The nodal ministry of the Government of India responsible for planning, promoting, and coordinating environmental and climate-related policies and programmes, including oversight of national missions like NAPCC and climate finance instruments such as NAFCC.

Disaster Risk Reduction and Management Frameworks

The **National Disaster Management Authority (NDMA)**⁵ plays a crucial role in adaptation by fostering disaster risk reduction (DRR) strategies. The **National Disaster Management Plan (NDMP)**⁶, aligned with the **Sendai Framework for Disaster Risk Reduction**⁷, emphasises building resilient infrastructure, strengthening early warning systems, and improving community preparedness.

These policies have driven investments in climate-resilient infrastructure, particularly in states like Odisha, which has been praised for its cyclone management and disaster response systems. Such investments have led to reduced mortality and infrastructure damage during extreme weather events.

In its 15th Finance Commission report, specific provisions were made to support disaster risk reduction and climate adaptation efforts at the state-level, ensuring that states vulnerable to climate change receive additional financial support.

⁵ Established under the Disaster Management Act, 2005, NDMA is the apex body under the Ministry of Home Affairs responsible for formulating policies, plans, and guidelines for disaster risk reduction and climate resilience in India.

⁶ First released in 2016 and revised in 2019, NDMP is India's comprehensive framework for disaster risk reduction. It integrates climate change adaptation and aligns with the Sendai Framework, covering prevention, preparedness, response, and recovery strategies across sectors and levels of government.

⁷ A global agreement adopted by UN member states in 2015 to reduce disaster risk and losses in lives, livelihoods, and health. It emphasises understanding risk, strengthening governance, investing in resilience, and enhancing disaster preparedness and recovery.

Finance Commission's Role in Climate Resilience

The **Finance Commission of India** has also played a key role in encouraging adaptation investments by recommending grants for disaster management and resilience-building efforts. In its **15th Finance Commission report**, specific provisions were made to support disaster risk reduction and climate adaptation efforts at the state-level,

ensuring that states vulnerable to climate change receive additional financial support. This has incentivised states to focus more on resilience and adaptation by providing much-needed financial resources to implement climate action plans.

International and Multilateral Support: Green Climate Fund (GCF) and Bilateral Programmes

International climate finance mechanisms like the **Green Climate Fund (GCF)** and partnerships with organisations such as the **World Bank** and **UNDP** have further boosted India's adaptation investments. Many GCF-backed projects focus on enhancing the adaptive capacity of rural communities, improving agricultural productivity in the face of changing rainfall patterns, and developing infrastructure to cope with rising sea levels.

India's collaboration with international partners has enabled it to leverage global climate finance for adaptation projects, addressing climate vulnerabilities while aligning with national priorities.

India's policy framework for driving adaptation investments is robust, focusing on both national missions and state-level initiatives. Policies like the NAPCC and SAPCCs, supported by dedicated funds such as NAFCC and international financial mechanisms, play a critical role in mobilising resources for adaptation. These frameworks ensure that adaptation investments reach the most vulnerable communities and sectors, ultimately strengthening India's resilience to climate change.

2.4 CURRENT TRENDS IN ADAPTATION FINANCE

According to reports from the Climate Policy Initiative (CPI), India's adaptation investment needs are substantial, with many states facing significant funding gaps. CPI's 2024 Financing Adaptation in India report highlights that six states alone will require around **INR 444.7 billion (USD 5.5 billion)[§] annually between 2021 and 2030** to meet their adaptation goals. At the national level, the *Landscape of Green Finance in India 2024* estimates cumulative adaptation investment needs of **INR 85.6 trillion (around USD 1 trillion) by 2030**, averaging **USD 67 billion per year**. Critical areas for adaptation include agriculture, water resource management, and coastal protection, with the need for financing heightened by India's status as one of the most climate-vulnerable nations.

Scope	Time Period	Adaptation Investment Need	Approx. USD Equivalent
Six states (CPI "Financing Adaptation in India")	2021–2030 (annual)	INR 444.7 billion per year	~USD 5.5 billion per year
National estimate ("Landscape of Green Finance in India 2024")	2015–2030 (cumulative)	INR 85.6 trillion total (avg. ~INR 5,733 billion/year)	~USD 67 billion per year

Figure 2: Summary Table of India's Adaptation Investment Needs

Historically, adaptation finance in India has been heavily dependent on public funding through national schemes like the **National Adaptation Fund for Climate Change (NAFCC)** and international funds like the **Green Climate Fund (GCF)**. However, there is a growing push for private sector involvement, especially in sectors like sustainable agriculture, adaptive infrastructure, and disaster resilience. For example, climate-resilient agriculture has the potential to absorb 25% of these investments, underscoring the importance of focusing on adaptation solutions that can also generate returns.

Development finance institutions have played a key role in channelling adaptation finance towards vulnerable regions. Organisations like the **World Bank** and **UNDP** have provided concessional funding and blended finance facilities aimed at reducing risks for private investors. Recent initiatives, such as Goa's **Blended Finance Facility**, aim to mobilise funds for coastal protection and renewable energy adaptation projects, demonstrating how development finance can drive adaptation investment.

Despite the growing recognition of adaptation needs, India still faces a significant adaptation finance gap. The **CPI 2024 report** highlights that most state governments struggle to mobilise adequate finance, especially for sectors that do not offer immediate financial returns, such as ecosystem restoration and community-based adaptation initiatives. This has resulted in underinvestment in areas like disaster risk reduction and climate-resilient infrastructure.

Private sector participation in adaptation is growing, particularly in sectors such as climate-tech startups that focus on data analytics, adaptive infrastructure, and innovative water management solutions. The emergence of climate-focused venture capital has begun to fill some of the gaps, with investors exploring opportunities in adaptation-focused startups. This shift is particularly important as adaptation solutions, such as early warning systems and resilient infrastructure, become commercially viable.

While India has made progress in securing adaptation finance, significant funding gaps remain, particularly at the state-level. Leveraging both public and private finance will be critical to meeting India's adaptation needs. Efforts are underway to create more robust frameworks and blended finance models that can bridge the gap and ensure that resources are directed to the most vulnerable communities and sectors.

[§] USD equivalents are approximate, based on an exchange rate of INR 81–83 per USD (average 2021–2023).

Despite the growing recognition of adaptation needs, India still faces a significant adaptation finance gap. The CPI 2024 report highlights that most state governments struggle to mobilise adequate finance, especially for sectors that do not offer immediate financial returns, such as ecosystem restoration and community-based adaptation initiatives.

2.5 GAPS IN CURRENT INVESTMENT

According to global estimates, developing countries will require **USD 215 to 387 billion annually through 2030** to meet their climate adaptation needs, with the actual range of uncertainty extending from **USD 101 to 975 billion**. However, only about **USD 56 billion** currently flows into adaptation each year, leaving a large financing gap. India-specific data highlight the scale of the challenge at the national and subnational levels. The Reserve Bank of India estimates that the country will need around USD 1 trillion cumulatively by 2030 to adapt its industries to climate risks, while CPI's *Financing Adaptation in India* report finds that just six states alone require about **USD 5.5 billion annually between 2021 and 2030**.

One of the main challenges is the limited fiscal capacity of state governments, many of which face economic constraints and borrowing restrictions.

Despite this growing need, the majority of climate finance in India still flows into mitigation, particularly renewable energy, while adaptation initiatives, especially at the state and community levels, remain critically underfunded.

One of the main challenges is the limited fiscal capacity of state governments, many of which face economic constraints and borrowing restrictions. This has resulted in inadequate resources for critical adaptation projects, such as disaster risk reduction, resilient infrastructure, and sustainable water management. Additionally, private sector investment in adaptation remains limited, as it is often perceived as less commercially viable compared to mitigation investments.

Efforts are being made to address these gaps, including promoting blended finance models, leveraging public-private partnerships, and attracting international capital. However, substantial improvements are needed to fully meet India's adaptation investment goals and protect its most vulnerable regions from the growing impacts of climate change.

2.5.1 BARRIERS TO INCREASED INVESTMENT IN CLIMATE ADAPTATION

Despite the growing recognition of the need for climate adaptation investments, several barriers hinder the flow of finance into adaptation projects in India. These barriers include systemic, institutional, and financial challenges that limit the capacity to scale up adaptation investments.

Limited Private Sector Engagement

A major barrier to adaptation finance in India is the lack of private sector involvement. Adaptation projects are often seen as public goods, which provide broad societal benefits but lack clear financial returns for investors. Sectors such as disaster risk reduction, water management, and climate-resilient infrastructure are typically viewed as areas where government intervention is necessary, making it difficult to attract private capital.

Additionally, adaptation projects often lack bankable revenue models that would make them attractive to private investors. Unlike mitigation projects such as renewable energy, adaptation does not always have clear, quantifiable financial returns, which limits the engagement of private entities.

High Perceived Risks and Lack of Data

Another significant barrier is the high perceived risk associated with adaptation investments. Investors often lack adequate data to evaluate the risks and returns of adaptation projects, particularly in sectors like agriculture, rural development, and ecosystem restoration. The lack of comprehensive risk assessments and climate vulnerability data makes it difficult for investors to make informed decisions.

Moreover, many adaptation initiatives are implemented at a local or regional level, where the lack of technical expertise and financial infrastructure further discourages investment.

Fragmented Policy Framework

Although India has developed a number of national and state-level policies, the framework for adaptation finance remains fragmented. States are responsible for implementing many adaptation projects, but their capacity to mobilise and allocate resources effectively is limited by fiscal constraints and inconsistent policy implementation. State Action Plans on Climate Change (SAPCCs), while useful for planning, often lack the financial backing and coordination necessary for successful implementation.

The absence of a unified, standardised framework for tracking adaptation investments also creates challenges. Without such a framework, it is difficult to assess whether resources are being directed to the most vulnerable regions or sectors.

Insufficient Public Funding

Public funding for adaptation in India, while improving, remains inadequate compared to the scale of the challenge. The **National Adaptation Fund for Climate Change (NAFCC)** provides funding for state-led adaptation projects, but its resources are limited and unable to meet the vast needs across different regions and sectors. Many state governments face fiscal pressures and borrowing constraints, limiting their ability to finance adaptation measures.

Addressing these challenges will require creating better financial mechanisms, improving climate risk assessments, and developing more robust public-private partnerships to effectively channel resources into adaptation efforts.

Challenges in Blended Finance and Public-Private Partnerships

While blended finance and public-private partnerships are promoted as solutions to bridge the adaptation finance gap, their implementation faces several challenges. These include misalignment between public and private sector objectives, difficulties in structuring viable

financing models, and regulatory hurdles. Many adaptation projects lack the scale or commercial viability needed to attract blended finance.

Addressing these challenges will require creating better financial mechanisms, improving climate risk assessments, and developing more robust public-private partnerships to effectively channel resources into adaptation efforts.

Investment Limitations

**PERCEIVED LOW OR
UNCERTAIN RETURNS**

**HIGH PERCEIVED
RISKS**

**INSUFFICIENT DATA
AND METRICS**

**SMALL AND
FRAGMENTED
PROJECTS**

**LIMITED AWARENESS
AND EXPERTISE**

**REGULATORY AND
INSTITUTIONAL
BARRIERS**

**LIMITED ACCESS
TO FINANCE FOR
VULNERABLE
COMMUNITIES**

Strategies to Overcome Limitations

**DEVELOPMENT
OF INNOVATIVE
FINANCING
MECHANISMS**

**CREATION OF
REVENUE STREAMS**

**POLICY SUPPORT
AND INCENTIVES**

**IMPROVED DATA AND
METRICS**

CAPACITY BUILDING

2.5.2 INVESTORS AND THEIR LIMITATIONS IN INVESTING IN ADAPTATION

While there is increasing recognition of the need for adaptation finance, investors—particularly in the private sector—face several limitations that prevent them from significantly engaging in climate adaptation projects. These limitations are primarily related to financial returns, risks, regulatory barriers, and a lack of suitable frameworks for evaluating adaptation investments.

INVESTMENT LIMITATIONS

1. Perceived Low or Uncertain Returns

Lack of Revenue-Generating Models: Adaptation projects often involve public goods, such as flood defenses, drought-resistant agriculture, or ecosystem restoration. These projects typically do not generate direct revenue streams, making it difficult for investors to achieve traditional financial returns. Unlike mitigation projects (e.g., renewable energy) that can sell electricity or carbon credits, adaptation benefits are less tangible and harder to monetise.

Unquantified Benefits: The benefits of adaptation are often in the form of avoided losses or long-term resilience, which are challenging to quantify in financial terms. This uncertainty makes it difficult for investors to assess the return on investment (ROI) and compare adaptation projects with other investment opportunities.

2. High Perceived Risks

Climate and Project Risks: Adaptation projects may carry significant risks due to the uncertainties associated with climate impacts, technological effectiveness, and project implementation. Investors may be cautious about committing capital to projects where outcomes are uncertain or depend on variable climate patterns.

Regulatory and Policy Risks: Changes in government policies, regulatory frameworks, or lack of supportive legislation for adaptation initiatives can increase the risk profile of these investments. Investors may be wary of policy instability that could affect project viability.

3. Insufficient Data and Metrics

Lack of Standardised Metrics: There is a scarcity of standardised tools and metrics to measure the effectiveness and impact of adaptation projects. Without clear benchmarks, investors find it challenging to evaluate and compare opportunities, conduct due diligence, and monitor performance.

Data Gaps: Reliable data on local climate risks, vulnerabilities, and potential adaptation measures are often lacking, especially in developing regions. This data deficiency hampers risk assessment and decision-making processes for investors.

4. Small and Fragmented Projects

Scale Issues: Many adaptation projects are small-scale and localised, such as community-based initiatives or small infrastructure projects. Institutional investors and large funds typically prefer larger deals to justify transaction costs and meet investment thresholds, making small projects less attractive.

Aggregation Challenges: Combining multiple small projects into larger investment vehicles can be complex due to differing project timelines, stakeholders, and risk profiles. This fragmentation limits the ability to scale up investments in adaptation.

5. Limited Awareness and Expertise

Lack of Investor Awareness: Many investors are more familiar with mitigation projects and may lack awareness or understanding of adaptation opportunities. This knowledge gap can result in a preference for investments with clearer returns and established markets.

Technical Expertise Required: Adaptation projects often require specialised knowledge of climate science, local contexts, and adaptation strategies. Investors without this expertise may be hesitant to engage in such projects due to the perceived complexity.

6. Regulatory and Institutional Barriers

Regulatory Constraints: Financial regulations may limit the ability of institutional investors to allocate funds to adaptation projects that do not meet specific risk-return profiles or asset class definitions.

Inadequate Policy Incentives: The absence of strong policy incentives or subsidies for adaptation projects reduces their attractiveness compared to other investments that benefit from government support.

7. Limited Access to Finance for Vulnerable Communities

Creditworthiness Issues: Communities and regions most vulnerable to climate impacts often have limited financial capacity and creditworthiness. This makes it challenging for them to secure financing for adaptation projects, further limiting investment opportunities.

High Transaction Costs: The cost of due diligence, monitoring, and evaluation for projects in remote or underdeveloped areas can be prohibitive, discouraging investors from engaging in adaptation initiatives in these regions.

A large, stylized teal graphic at the bottom of the page. It features a large dollar sign '\$' on the left, followed by the number '1', and then the letters 'tr' in a serif font, suggesting the text '\$1 trillion'.

STRATEGIES TO OVERCOME INVESTMENT LIMITATIONS

1. Development of Innovative Financing Mechanisms

Instruments like blended finance, where public and philanthropic funds are used to de-risk projects and attract private capital, can make adaptation projects more appealing to investors.

2. Creation of Revenue Streams

Exploring models that generate income from adaptation projects, such as payment for ecosystem services or resilience bonds, can help provide returns to investors.

3. Policy Support and Incentives

Governments can introduce policies that provide tax incentives, guarantees, or subsidies for adaptation investments, reducing risk and enhancing returns for investors.

4. Improved Data and Metrics

Developing standardised frameworks for measuring adaptation outcomes and financial performance can enhance transparency and investor confidence.

5. Capacity Building:

Providing training and resources to investors on adaptation finance can increase their understanding and willingness to invest in these projects.

Investors face multiple limitations when considering investments in climate adaptation projects in India. Overcoming these barriers requires collaborative efforts between governments, financial institutions, and the private sector to create enabling environments, develop innovative financing solutions, and enhance the viability of adaptation investments. Addressing these challenges is essential to mobilise the necessary finance to build climate resilience and safeguard vulnerable communities against the impacts of climate change.

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FOR CLIMATE ADAPTATION

2.6 IMPROVING TRACKING OF CLIMATE RISKS AND ADAPTATION FINANCE

2.6.1. PROGRESS IN THE DISCLOSURE OF CLIMATE RISKS

The Reserve Bank of India (RBI) has taken a proactive role in advancing climate risk disclosure in the financial sector. In February 2024, the RBI released a draft Disclosure Framework on Climate-Related Financial Risks (RBI, 2024), mandating banks and financial institutions to disclose how they manage physical and transition risks related to climate change. The framework focuses on four key pillars: governance, strategy, risk management, and metrics and targets. This initiative is seen as a critical step towards integrating climate risks into the overall risk management framework of India's financial system.

The RBI's framework pushes financial institutions to quantify and report their climate-related risks, helping investors and stakeholders better assess the financial stability of banks in light of climate threats. However, while this initiative is aligned with international standards like the Task Force on Climate-Related Financial Disclosures (TCFD), challenges such as data availability and institutional capacity continue to limit its effectiveness.

The Securities and Exchange Board of India (SEBI) has also played a pivotal role in advancing climate risk disclosures, particularly for publicly listed companies. In 2021, SEBI introduced the Business Responsibility and Sustainability Reporting (BRSR) framework, which mandates the top 1,000 listed companies in India to disclose their environmental, social, and governance (ESG) metrics, including climate-related risks.

The BRSR framework is a step towards mainstreaming ESG disclosures, making it easier for investors to assess the resilience of companies to climate risks. It includes specific sections that require companies to disclose their greenhouse gas emissions, energy usage, and efforts towards mitigating physical climate risks. This framework has not only increased transparency but also encouraged businesses to adopt sustainability measures proactively.

While regulatory bodies have been instrumental in mandating climate risk disclosure, the private sector in India has also started to recognise the importance of transparent reporting on climate risks.

Major corporations, particularly in high-risk sectors such as energy, infrastructure, and agriculture, are increasingly adopting voluntary climate risk disclosures based on TCFD recommendations.

For example, Indian companies in the renewable energy and manufacturing sectors have been integrating climate risk assessments into their corporate strategies, recognising the long-term benefits of climate resilience. However, many small and medium-sized enterprises (SMEs) face challenges in adopting these frameworks due to a lack of resources and technical expertise in understanding and reporting climate-related risks.

Despite progress, the implementation of climate risk disclosure frameworks in India faces several challenges. One of the key issues is the **lack of comprehensive climate data** at the regional level, which makes it difficult for companies and financial institutions to accurately assess and disclose physical climate risks. Additionally, many

While regulatory bodies have been instrumental in mandating climate risk disclosure, the private sector in India has also started to recognise the importance of transparent reporting on climate risks.

organisations lack the technical capacity to integrate climate risks into their broader risk management systems, particularly in sectors that are not traditionally seen as high-risk for climate impacts.

Another challenge is the absence of **standardised metrics** for climate risk reporting across industries. While the RBI and SEBI frameworks provide a starting point, there is still a need for more consistent guidelines that can be applied uniformly across sectors, ensuring that investors and stakeholders have comparable data to evaluate

The alignment of Indian regulations with global frameworks like the TCFD will help drive better transparency, investor confidence, and sustainability in India's economic growth.

Looking ahead, climate risk disclosure in India is expected to expand further as both regulatory bodies and industry players recognise the critical importance of managing climate risks. The alignment of Indian regulations with global frameworks like the TCFD will help drive better transparency, investor confidence, and sustainability in India's economic growth. However, continued efforts are needed to address data gaps, build capacity, and develop more standardised reporting metrics to ensure that India can effectively manage and disclose climate risks at all levels.

2.6.2 PROGRESS IN DEFINING ADAPTATION FINANCE

Despite its importance, there is still little agreement on what qualifies as adaptation and adaptation finance and how it should be measured (UNFCCC, 2016).

One of the primary challenges in India is the absence of a **standardised framework** to assess and mobilise adaptation finance. While there is increasing momentum from both public and private actors, the lack of a unified system for measuring climate risks and assessing adaptation projects hinders efficient fund allocation. Additionally, states face borrowing constraints under new fiscal rules, which further limit their ability to invest in adaptation initiatives.

2.6.3 ADDRESSING GAPS IN DATA AVAILABILITY AND QUALITY

Gaps in data availability, especially related to long-term climate projections, agricultural vulnerabilities, and disaster risks, limit the effectiveness of adaptation policies and financial flows.

Recent efforts are being made to build more robust **green finance data infrastructure** to better track climate finance, but the lack of granular, standardised data remains a major obstacle. This issue is particularly pronounced in sectors like agriculture and water management, where climate risks are highly localised. Strengthening data collection mechanisms, improving transparency, and developing common methodologies for climate risk assessment will be key to addressing these gaps

2.7 APPROACHES TO DRIVE INVESTMENT IN CLIMATE ADAPTATION

2.7.1 THE ROLE OF THE PUBLIC SECTOR IN INCREASING ADAPTATION INVESTMENT

The public sector plays a pivotal role in driving adaptation investments in India, primarily by creating a supportive policy framework, mobilising resources, and implementing climate adaptation projects. Given India's high vulnerability to climate change, public financing is critical for strengthening resilience, especially in sectors like agriculture, water management, and disaster risk reduction.

While taxation and borrowing frameworks can create fiscal space for climate action, the effectiveness of these measures ultimately depends on how public sector investments are directed and prioritised.

STRENGTHENING PUBLIC SECTOR LEADERSHIP AND FINANCING MECHANISMS FOR CLIMATE ADAPTATION IN INDIA

Government-Led Initiatives and Frameworks

India has launched several national missions under the National Action Plan on Climate Change (NAPCC), which includes initiatives such as the National Mission for Sustainable Agriculture, the National Water Mission, and the National Mission on Green India. These missions are designed to promote climate adaptation at the state and national levels. However, the scale of required investments is vast, and public funding, though essential, is limited in scope. The National Adaptation Fund for Climate Change (NAFCC) has been a key tool in channeling public resources towards adaptation, but the gap between funding needs and available resources remains significant.

State-Level Adaptation Initiatives

States play a crucial role in implementing adaptation strategies, as climate risks vary regionally. For instance, states like Odisha and Kerala have taken proactive steps in enhancing climate resilience. Odisha's success in improving its cyclone management systems has been widely recognised, and Kerala has invested in flood resilience infrastructure. Despite these efforts, a 2024 report by the Climate Policy Initiative (CPI) revealed that six Indian states alone require an annual adaptation investment of USD 5.5 billion between 2021 and 2030 to address growing climate vulnerabilities.

Addressing Funding Gaps

One of the main challenges is the significant gap in financing adaptation. The public sector, though providing the majority of climate adaptation funding, cannot meet the rising needs alone. CPI's report highlights that public-private partnerships (PPPs) and blended finance mechanisms are increasingly being explored to fill these gaps. Blended finance involves combining concessional public funds with private investments, making adaptation projects more financially viable and scalable.

STRENGTHENING STATE CAPACITIES FOR GREEN BOND ISSUANCE IN INDIA

What are Green Bonds?

Green bonds are debt securities issued to raise capital for projects that have positive environmental outcomes. Historically, they have been used primarily for **mitigation** activities, such as investing in renewable energy, energy efficiency, and sustainable transportation. However, the **Green Bond Principles (GBP)** developed by the **International Capital Market Association (ICMA)** include both mitigation and adaptation projects as eligible categories for green bond financing.

Examples of Green Bonds in India

Although most green bonds in India have so far focused on renewable energy, there is growing interest in issuing bonds for adaptation. The **Securities and Exchange Board of India (SEBI)**, which regulates the issuance of green bonds, has indicated that adaptation projects can be included as long as they meet the required environmental criteria. For example, **Haryana** and **Punjab** could issue green bonds to finance projects for sustainable water management in agriculture, particularly in areas facing severe water stress due to climate change.

Green Bond Principles (GBP) developed by the International Capital Market Association (ICMA) include both mitigation and adaptation projects as eligible categories for green bond financing.

How Can States Use Green Bonds for Adaptation?

States can issue green bonds specifically earmarked for adaptation projects by following certain steps:

1. Identify Adaptation Projects

States need to identify and prioritise adaptation projects, such as building coastal defenses, improving irrigation systems for climate-resilient agriculture, or upgrading urban drainage to prevent flooding.

For example, **Odisha** could issue green bonds to finance the strengthening of its cyclone shelters and flood management systems, while Kerala might use them for flood-resilient infrastructure in vulnerable areas.

2. Develop a Green Bond Framework

States must develop a **green bond framework** aligned with internationally recognised guidelines, such as the **Green Bond Principles (GBP)** or the **Climate Bonds Initiative (CBI)** standards. This framework would outline how the proceeds from the bonds will be used for climate adaptation projects and ensure that the funds are properly allocated.

Uttarakhand, for instance, could develop a framework to issue green bonds for projects aimed at protecting its fragile mountainous regions from landslides and floods.

3. Monitoring and Reporting

States would need to put in place mechanisms for **monitoring and reporting** on how the funds are used. This involves periodic reporting to investors on the environmental impact of the adaptation projects, which builds transparency and credibility.

Green bonds issued by **Rajasthan** for drought resilience, for example, could report on improvements in water conservation or the reduction of agricultural losses due to droughts.

Challenges and Considerations

1. Awareness and Market Maturity

While green bonds have gained traction in India, the market is still relatively nascent for adaptation financing compared to mitigation. Issuers, investors, and regulators need to be educated about the potential for using green bonds to fund climate adaptation.

2. Adaptation Metrics

One of the challenges for states is demonstrating measurable benefits of adaptation projects, as opposed to mitigation projects where benefits like emissions reductions are easier to quantify. Developing clear metrics to assess the success of adaptation projects will be critical.

3. Investor Interest

States must ensure that the adaptation projects financed through green bonds are **financially attractive** to investors. Bonds must offer competitive returns, and states must highlight the long-term benefits of reducing climate risks for economic stability.

Conclusion

Issuing green bonds for adaptation offers Indian states an innovative way to finance climate resilience projects. By aligning with international standards, ensuring transparency in the use of proceeds, and clearly demonstrating the environmental and economic benefits of adaptation projects, states can attract investors to fund their long-term climate strategies. Given India's vulnerability to climate change, especially in states like Odisha, Kerala, and Rajasthan, green bonds represent a powerful tool for securing the financing needed for sustainable adaptation.

**SIX INDIAN STATES NEED AN
ANNUAL ADAPTATION INVESTMENT OF**

\$5.5 B

Can we propose a public sector fiscal tool?

ADAPTATION & RESILIENCE TAX

The **Adaptation and Resilience Tax** is a proposed financial mechanism aimed at generating dedicated funds to support climate adaptation and resilience-building projects. The idea behind this tax is to establish a sustainable revenue stream that can be specifically used for addressing the impacts of climate change, particularly in vulnerable areas. Unlike a **Carbon Tax**, which targets the reduction of greenhouse gas emissions by taxing carbon outputs, the Adaptation and Resilience Tax would focus on financing adaptation measures that protect communities, ecosystems, and economies from the adverse effects of climate change.

Key Features and Purpose

4. Targeted Revenue Generation

The tax would generate funds specifically for adaptation initiatives, such as improving infrastructure resilience (e.g., flood defenses, drought-proofing), supporting agriculture and water management, and enhancing disaster preparedness. It would allow governments to secure a dedicated pool of funds that cannot be diverted to other projects.

5. Complement to Existing Climate Finance

The Adaptation and Resilience Tax would complement existing mechanisms like the **National Adaptation Fund for Climate Change (NAFCC)** and international climate finance (e.g., from the **Green Climate Fund (GCF)**). Given the growing gap in adaptation finance needs in India and other developing countries, this tax could help fill part of the financing deficit.

6. Application and Coverage

The tax could be levied on industries or activities that are particularly vulnerable to climate impacts (e.g., agriculture, coastal real estate development) or those that benefit from adaptation measures (e.g., insurance companies). Alternatively, it could be a broader consumption tax where a small percentage of the general tax revenue is earmarked for adaptation purposes.

7. Conditional on Vulnerability and Need

The revenue generated from this tax could be allocated based on regional climate vulnerabilities, ensuring that more funds flow to highly climate-impacted states or sectors. States such as **Odisha**, which faces regular cyclones, or **Kerala**, prone to flooding, would benefit from this targeted approach.

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Rationale for the Tax

The reasoning behind proposing an Adaptation and Resilience Tax is driven by several factors:

- **Growing Climate Risks:** As climate change impacts become more severe, especially in developing nations like India, public spending on infrastructure and recovery from disasters will likely increase. Having a dedicated tax can provide a reliable source of funding to proactively manage these risks.
- **Public Finance Pressures:** Given that many states already face high fiscal deficits and borrowing constraints, as outlined by reports from the **Climate Policy Initiative (CPI)**, a dedicated tax ensures a steady inflow of resources without adding significant pressure to existing public finance systems.
- **Equitable Finance:** The tax can be structured to ensure that those most capable of paying contribute to building resilience for those most affected by climate change. This could also help address broader issues of **climate justice**, ensuring that the financial burden of adaptation does not disproportionately fall on vulnerable populations.

Challenges and Considerations

While the concept of an Adaptation and Resilience Tax holds promise, there are several challenges and considerations:

- **Public Acceptance:** Implementing new taxes is often politically sensitive, and there could be resistance from industries and taxpayers unless the benefits of the tax are clearly communicated.
- **Effective Allocation and Monitoring:** There would need to be robust governance and monitoring mechanisms in place to ensure that the tax revenue is used efficiently and transparently for adaptation and resilience projects.
- **Ensuring Fairness:** The tax should be designed in a way that does not disproportionately affect low-income individuals or small businesses, particularly those that may already be vulnerable to climate impacts.

Challenges at State-level

Implementing an Adaptation and Resilience Tax at the state-level in India requires a clear strategy, political will, and robust governance. Here's a step-by-step breakdown of how states could implement such a tax:

1. Identifying the Revenue Base

The first step for states is to identify the sectors or activities that would be taxed. The revenue base for the Adaptation and Resilience Tax could be broad, such as:

- **Sectors Benefiting from Resilience Measures:** Industries like insurance, real estate, or coastal tourism could be taxed as they directly benefit from climate adaptation projects like flood defenses or disaster preparedness.
- **High Carbon Emission Sectors:** While the focus is on adaptation, states could include industries that are heavily dependent on fossil fuels, encouraging them to contribute to resilience while transitioning to cleaner alternatives.
- **Consumption-Based Approach:** States could impose a small surcharge on general consumption items, like a percentage added to sales taxes, similar to environmental levies.

2. Designing the Tax Structure

The tax rate would need to be carefully designed to avoid overburdening businesses and consumers. States should consider:

- **Variable Rates:** Adjust the tax based on sectors, targeting those that have a higher climate risk footprint. For example, coastal real estate development or water-intensive industries could face higher rates.
- **Progressive Rates:** To avoid harming lower-income populations, a progressive tax structure could be implemented, where higher tax rates are imposed on larger corporations or wealthier individuals.
- **Incentives for Compliance:** States could introduce tax rebates or reductions for industries that demonstrate significant investments in their own adaptation measures.

3. Allocation of Revenue

One of the key elements in the success of an Adaptation and Resilience Tax is ensuring that the revenue collected is used effectively for adaptation projects:

- **Climate-Resilient Infrastructure:** States can allocate funds for building or upgrading infrastructure to withstand extreme weather events (e.g., flood control systems, drought-resistant agricultural practices).
- **Natural Resource Management:** Funds could be directed towards projects that enhance water conservation, reforestation, and land restoration in areas highly vulnerable to climate impacts.
- **Disaster Preparedness Programmes:** The tax revenue could support community-based disaster preparedness, early warning systems, and emergency response infrastructure.

4. Collaboration with Local Bodies

Implementation at the state-level would also require cooperation with local governments and municipalities, as they are directly involved in local adaptation measures:

- **Revenue Sharing Mechanism:** States could create a revenue-sharing model where a portion of the tax collected is transferred to local bodies to fund locally-driven adaptation projects, ensuring the most vulnerable communities receive necessary funds.
- **Capacity Building for Local Governments:** States can allocate part of the tax revenue to build the capacity of local governments to assess climate risks, develop adaptation plans, and implement climate-resilient projects.

5. Ensuring Public Support and Transparency

Public support is critical for the successful implementation of a new tax. States must:

- **Public Awareness Campaigns:** Engage the public with campaigns that explain the purpose and benefits of the tax, focusing on how the funds will directly contribute to protecting communities from climate change impacts.
- **Transparency in Allocation:** Set up monitoring and evaluation mechanisms to ensure the revenue collected is transparently allocated and that adaptation projects are effectively implemented. Regular reporting on how the tax revenue is spent will build public trust.

6. Pilot Projects and Gradual Implementation

Before rolling out the Adaptation and Resilience Tax across the state, it may be wise to:

- **Launch Pilot Programmes:** States could pilot the tax in regions with high climate vulnerability, such as coastal areas or flood-prone zones, to gauge its impact and adjust the tax structure accordingly.
- **Gradual Rollout:** Implement the tax gradually to allow sectors and consumers to adapt, beginning with smaller sectors or lower rates and scaling up over time.

7. Legal and Policy Framework

The implementation of such a tax would require clear legal backing:

- **Amendments to State Tax Laws:** States may need to introduce legislative amendments to existing state tax laws or introduce new laws that specifically allow for the collection and use of the Adaptation and Resilience Tax.
- **Coordination with National Policies:** Ensure that the state's tax policy aligns with national climate goals and the broader fiscal framework.

Possible Pathways for Indian States to an Adaptation and Resilience Tax



Framework for States to Assess and Estimate Their Climate Adaptation Investment Needs

States can calculate their **adaptation investment needs** by assessing the risks posed by climate change and determining the financial requirements for reducing vulnerability and increasing resilience. The following steps can guide this process:

1. Conducting a Climate Vulnerability Assessment

- **Assess regional vulnerabilities:** States need to first identify the specific **climate risks** (e.g., floods, droughts, heatwaves, or cyclones) they face and the sectors most affected (e.g., agriculture, water, infrastructure, and health). This requires gathering **regional climate data** and forecasting future impacts. Example: Kerala might focus on flood resilience, while Rajasthan would prioritise water scarcity and drought management.
- **Use standardised frameworks:** States can apply methodologies like the **Climate Vulnerability Index (CVI)**, which assesses exposure, sensitivity, and adaptive capacity. Many Indian states, including Odisha and Bihar, have already conducted detailed climate vulnerability assessments.

2. Identifying Adaptation Priorities

- **Sectoral analysis:** States should assess which sectors are most affected by climate change and prioritise investment needs accordingly. For example, agriculture in Rajasthan might need significant investment in drought-resistant crops, while coastal infrastructure in Tamil Nadu may require cyclone-proofing.
- **National and international guidelines:** States can align their priorities with national frameworks like the **National Action Plan on Climate Change (NAPCC)** and state-specific **State Action Plans on Climate Change (SAPCCs)**.

3. Estimating Costs for Adaptation Projects

- **Project identification:** States must outline specific adaptation projects, such as building flood defenses, improving irrigation systems, or restoring degraded ecosystems.

- **Cost estimation tools:** States can use frameworks developed by institutions such as the World Bank or the **United Nations Environment Programme (UNEP)** to estimate the costs of adaptation interventions.
- **Local context:** Cost estimates should be adapted to local conditions, as infrastructure costs or water management needs will vary greatly across regions.

4. Assessing Current Financial Resources

- **Evaluate existing budgets:** States should assess how much funding is already being allocated for adaptation through state budgets, central government support, and international climate finance mechanisms such as the **Green Climate Fund (GCF)**.
- **Gap analysis:** After estimating total investment needs, states should conduct a gap analysis to identify the shortfall between required funds and available resources. This will help in determining additional funding required from public and private sources.

5. Incorporating Climate-Incentivised Borrowing Ceilings

- **Link borrowing with climate risks:** Some states could implement a **climate-incentivised borrowing ceiling**, which allows them to borrow more based on their climate vulnerabilities. States like Odisha and Assam, which face higher climate risks, could benefit from additional borrowing capacity tied to specific adaptation needs.

6. Utilising Public-Private Partnerships (PPPs)

- **Blended finance mechanisms:** States can calculate investment needs for large-scale projects and explore funding through **public-private partnerships (PPPs)**. For example, Rajasthan has used PPPs for solar power development, which can serve as a model for water management or drought-proofing agriculture.

7. Tracking and Reporting

- **Develop monitoring systems:** Once investment needs are calculated, states should establish monitoring and evaluation systems to track how funds are used and ensure they are directed towards effective adaptation projects.

Examples of Successful Adaptation Investments



Odisha: The state has successfully leveraged funds for disaster risk reduction by improving cyclone management systems and building resilient infrastructure. Using vulnerability assessments and regional data, Odisha has clearly outlined its adaptation investment needs for coastal defenses and flood management.



Kerala: After severe flooding, Kerala's adaptation needs are focused on flood control and water management. By calculating the costs of flood resilience infrastructure, the state is better able to allocate resources and seek external finance.

Conclusion

The **Adaptation and Resilience Tax** represents a forward-thinking approach to ensuring sustainable financing for climate adaptation in India. By generating dedicated funds for resilience-building efforts, it could help fill the significant gap between adaptation needs and available finance, particularly for states and communities that are most vulnerable to climate change. However, careful planning, transparent governance, and public engagement will be crucial to its successful implementation.

Is There a Case for Introducing Climate-Incentivised Borrowing Ceilings?

CLIMATE-INCENTIVISED BORROWING CEILINGS FOR VULNERABLE STATES

Climate-incentivised borrowing ceilings are a proposed mechanism that would allow climate-vulnerable states to borrow beyond their typical fiscal limits, provided that the additional funds are used specifically for climate adaptation and resilience-building projects. This mechanism is designed to address the urgent need for increased adaptation investments in states that are disproportionately affected by climate change but may lack sufficient financial capacity under normal fiscal constraints.

How It Works

1. Linking Borrowing Limits to Climate Vulnerabilities

Currently, Indian states are subject to borrowing ceilings, typically set as a percentage of their **Gross State Domestic Product (GSDP)**, under the **Fiscal Responsibility and Budget Management (FRBM)** Act. These ceilings limit how much states can borrow to prevent fiscal profligacy and ensure long-term debt sustainability.

Climate-incentivised borrowing ceilings would adjust these limits based on the specific **climate risks and vulnerabilities** of each state. More vulnerable states—those exposed to frequent floods, droughts, cyclones, or rising sea levels—would be allowed to borrow **above their usual borrowing limits**, but only if the funds are earmarked for adaptation-related interventions, such as building resilient infrastructure, improving water management, or disaster preparedness.

2. Conditional Borrowing

This increased borrowing capacity is **conditional**, meaning states can only access additional funds if they commit to using them for projects that reduce climate vulnerabilities. This ensures that the borrowing does not contribute to general fiscal deficits but is instead targeted towards **climate adaptation** and resilience.

Projects such as strengthening coastal defenses, retrofitting infrastructure for extreme weather events, or investing in water conservation technologies would be eligible for funding under this mechanism.

3. Safeguarding Fiscal Discipline

While allowing more vulnerable states to borrow beyond the typical fiscal limits, the overall borrowing across states would still need to adhere to **FRBM norms**, ensuring that the increased borrowing does not lead to unsustainable debt levels. This means that only states with **proven climate investment needs** and **demonstrated capacity to implement adaptation projects** would qualify for this additional borrowing space.

Benefits of Climate-Incentivised Borrowing Ceilings

1. Increased Access to Finance for Vulnerable States

States that are highly exposed to climate risks, such as **Odisha, Assam, West Bengal, and Kerala**, would greatly benefit from this mechanism. These states face frequent natural disasters (e.g., cyclones, floods) that disrupt their economies and require significant adaptation investments to mitigate future impacts. With climate-incentivised borrowing ceilings, these states can access additional funds to build resilient infrastructure and enhance disaster management capabilities.

For instance, **Odisha** has made notable progress in improving its cyclone resilience systems but requires continued investment in infrastructure to protect its coastal areas. The ability to borrow beyond its fiscal limits would enable Odisha to scale up its climate adaptation efforts.

By providing financial incentives for states to invest in adaptation projects, this mechanism promotes a proactive approach to climate risk management.

2. Mitigating Economic Impacts of Climate Change

Vulnerable states often suffer significant economic losses due to climate impacts. Climate-incentivised borrowing allows them to **invest in preventive measures**, thereby reducing

the long-term damage to their economies. For example, states like **Kerala**, which experienced devastating floods in recent years, can use the funds to build flood defenses, reducing the future cost of disaster recovery.

This also helps safeguard the state's GSDP, as investing in adaptation can prevent the economic shocks that result from extreme weather events, allowing the state to maintain economic stability over time.

3. Encouraging Climate-Resilient Development

By providing financial incentives for states to invest in adaptation projects, this mechanism promotes a **proactive approach** to climate risk management. States are encouraged to integrate **climate resilience** into their long-term development planning, ensuring that future growth is sustainable and protected from climate risks.

Challenges and Considerations

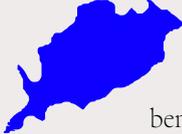
1. Capacity to Implement Adaptation Projects

Not all states may have the capacity to effectively manage and implement large-scale adaptation projects. States with limited governance capacity or technical expertise may struggle to deploy the borrowed funds efficiently, leading to concerns about the effectiveness of the increased borrowing limits. This would require **capacity-building efforts** and **technical assistance** to ensure that vulnerable states can implement projects that truly enhance climate resilience.

2. Monitoring and Accountability

To prevent misuse of the borrowed funds, robust **monitoring and evaluation mechanisms** must be in place. States would need to report on how the borrowed funds are used and demonstrate measurable progress in reducing climate risks. Transparency and accountability would be key to ensuring that the funds are used for their intended purposes.

States Already Benefitting or Positioned to Benefit



Odisha: With a long history of cyclones and coastal flooding, Odisha is one of the prime candidates for benefiting from climate-incentivised borrowing. The state has already made strides in disaster management and would greatly benefit from additional funds for coastal resilience infrastructure.



Kerala: After suffering from devastating floods in recent years, Kerala is focused on building flood-resistant infrastructure and improving water management systems. The state could use the additional borrowing capacity to invest in comprehensive flood control systems.



Assam: Prone to floods and landslides, Assam would be well-positioned to benefit from this mechanism, using the additional funds for river management and flood prevention projects.



West Bengal: Facing recurring cyclones like Cyclone Amphan, West Bengal would benefit from increased borrowing capacity to bolster its coastal defenses and disaster response systems.

Conclusion

Climate-incentivised borrowing ceilings offer a strategic solution for Indian states facing high climate vulnerabilities. By linking additional borrowing to climate adaptation investments, this mechanism not only addresses the financial gap for vulnerable states but also promotes sustainable development and economic resilience. While challenges remain, particularly in ensuring capacity and accountability, states like Odisha, Kerala, and Assam are poised to benefit significantly, allowing them to better protect their economies and populations from the growing impacts of climate change.

Indian states can issue **green bonds** for climate adaptation projects, although traditionally, green bonds have been more focused on **mitigation projects** like renewable energy. However, there's a growing recognition that **adaptation projects**, such as building flood defenses, improving water management, and developing climate-resilient infrastructure—are equally important and can be financed through green bonds.

2.7.2 THE ROLE OF THE PRIVATE SECTOR IN INCREASING ADAPTATION INVESTMENT

The private sector is becoming an increasingly important player in mobilising climate adaptation investments. While historically, adaptation finance has largely come from public sources, there is now a growing recognition of the role that businesses, financial institutions, and private investors can play in enhancing resilience to climate change.

For India, where the need for adaptation finance is vast, private sector involvement is critical for bridging the funding gap and scaling up efforts to protect communities and businesses from the growing risks of climate change.

WHICH SECTORS ARE LEADING CLIMATE ADAPTATION INVESTMENT?

Insurance and Financial Services

The insurance sector is one of the leading investors in climate adaptation, particularly through the development of weather-indexed insurance products. These products help protect farmers and vulnerable communities from climate risks such as droughts, floods, and other extreme weather events.

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Companies like ICICI Lombard and HDFC ERGO have launched crop insurance schemes aimed at covering agricultural losses due to climate extremes, offering a safety net to farmers.

Banks and financial institutions are also driving climate adaptation through green bonds and climate bonds. Although traditionally focused on mitigation, financial institutions are starting to channel investments into adaptation projects, including flood management and climate-resilient infrastructure.

Agriculture and Agri-Tech

The agricultural sector is one of the most vulnerable to climate change, and private companies involved in agri-tech and climate-smart agriculture are leading adaptation investments. For example, Mahindra and Tata Chemicals have developed climate-resilient seeds, drought-resistant crops, and precision farming technologies that help farmers adapt to changing weather patterns.

Private investment is also being funneled into irrigation systems and water management, with companies promoting efficient water use to tackle drought risks.

Real Estate and Infrastructure

The real estate and infrastructure sectors are investing heavily in climate-resilient infrastructure, particularly in flood-prone urban areas. Developers are increasingly incorporating flood-resistant designs, heat-tolerant materials, and sustainable building practices to withstand the effects of climate change.

Companies involved in urban planning are working on projects related to smart cities and green infrastructure, helping build resilience in rapidly urbanising areas such as Mumbai and Surat.

Renewable Energy

Although primarily focused on mitigation, the renewable energy sector contributes to climate adaptation by promoting decentralised energy systems and reducing dependence on vulnerable energy grids. Companies like Tata Power and Adani Green Energy are expanding their solar and wind energy portfolios, particularly in rural areas, enhancing energy resilience during extreme weather events.

Technology and Data Analytics

The technology sector is playing a growing role in providing tools for climate risk assessments and adaptation planning. Companies like Skymet and Climatic are offering weather forecasting services and data analytics platforms that enable farmers, businesses, and governments to make data-driven decisions to reduce their exposure to climate risks.

These platforms help predict extreme weather events and allow users to adapt in advance, reducing financial losses.

HOW PRIVATE INVESTMENT IS BEING MOBILISED

Public-private partnerships (PPPs) are emerging as a key mechanism for financing large-scale adaptation projects, particularly in infrastructure and urban planning.

Public-Private Partnerships (PPPs)

Public-private partnerships (PPPs) are emerging as a key mechanism for financing large-scale adaptation projects, particularly in infrastructure and urban planning:

Urban Climate Resilience: In cities like Surat, the private sector has partnered with local governments to improve urban resilience through flood management systems and sustainable water management projects. These collaborations leverage private sector capital and expertise in infrastructure development while ensuring that public adaptation needs are met.

Agriculture: In states like Rajasthan, PPPs have been instrumental in scaling up drought-resilient irrigation systems and promoting the use of climate-smart technologies in agriculture.

Corporate Social Responsibility (CSR) Initiatives

In India, Corporate Social Responsibility (CSR) has been an important driver of private sector engagement in climate adaptation. Under Indian law, large companies are required to allocate a portion of their profits towards CSR activities, and many companies are choosing to invest in climate adaptation projects, such as:

Water Conservation: Companies like ITC have funded large-scale water conservation programmes in drought-prone regions, helping improve the resilience of agricultural communities to climate change.

Reforestation and Ecosystem Restoration: Private companies are increasingly supporting ecosystem restoration projects that protect biodiversity and build natural defenses against climate impacts, such as floods and storms.

Many companies in sectors like FMCG, manufacturing, and telecommunications are channeling their Corporate Social Responsibility (CSR) funds into climate adaptation projects. For instance, ITC has heavily invested in water conservation and reforestation, especially in drought-prone areas like Telangana and Rajasthan.

These CSR projects, although focused on social good, are contributing significantly to building local resilience against climate impacts.

Blended Finance Models

Blended finance, which combines public and private capital to de-risk investments in climate adaptation, is becoming a key tool for scaling up private sector involvement:

Development finance institutions (DFIs) like the International Finance Corporation (IFC) are working with Indian banks and companies to channel private investment into sectors that are critical for adaptation, such as water management, urban infrastructure, and disaster preparedness.

These models help lower the risk for private investors by using public or concessional funds to cover part of the project cost, thereby incentivising private companies to invest in adaptation efforts.

Sector	PPPs	CSR	Blended Finance	Key Players
Insurance & Financial Services	●	●	●	ICICI Lombard, HDFC ERGO
Agriculture & Agri-Tech	●	●	●	Mahindra, Tata Chemicals
Real Estate & Infrastructure	●	●	●	Surat projects, Mumbai projects
Renewable Energy	●	●	●	Tata Power, Adani Green Energy
Technology & Data Analytics	●	●	●	Skymet, Climatic

● Primary mechanism ● Secondary mechanism

Figure 3: Table showing Investment by Sector & Mechanism

CONCLUSION

The private sectors investing most in climate adaptation in India include insurance, agriculture, real estate, infrastructure, and technology. These sectors are recognising the business opportunities and financial risks posed by climate change and are investing in innovative solutions to build resilience. As climate impacts intensify, the private sector's role in adaptation is expected to grow, complementing public efforts and helping bridge the adaptation finance gap.

2.7.3 THE IMPORTANCE OF CONCESSIONAL CLIMATE FINANCE

Concessional climate finance plays a critical role in supporting India's transition towards a low-carbon, climate-resilient economy. Concessional finance refers to funds provided on more generous terms than market loans, typically through lower interest rates, longer repayment periods, or both. These funds are essential for countries like India, where developmental needs and poverty alleviation efforts must be balanced with climate action imperatives.

One important step to bringing in private sector investments is de-risking projects, especially those involving new technologies or uncertain commercial viability. Innovative financial instruments can play a key role here, and one such instrument is **blended concessional finance**, which has emerged as an effective tool for mobilising private investment in climate-related sectors. Blended finance refers to combining concessional capital from donors or public sector institutions with private finance to support the development of private sector markets and help achieve Sustainable Development Goals (SDGs).

Blended concessional finance is particularly effective because it helps overcome critical market barriers by providing flexible financial structures that reduce investment risks. For example, it can take the form of **loans, equity, guarantees, or performance-based incentives** to mitigate risks and make projects more attractive to private investors. Success stories of blended finance in emerging markets include investments in climate-smart agriculture, green housing, and renewable energy.

In India, blended finance has been identified as a priority for sectors critical to climate mitigation and adaptation, including agriculture, water management, power, transport, infrastructure, and the circular economy. While the blended finance market in India is still in its early stages, the regulatory environment has been evolving. For instance, the **Reserve Bank of India (RBI)** joined the **Network for Greening the Financial System (NGFS)** in 2021, and in 2022, the **Securities and Exchange Board of India (SEBI)** established an advisory committee on environmental, social, and governance (ESG) issues in the securities market.

The **Climate Policy Initiative (2022)** reports that global climate finance has grown steadily over the past decade, with an annual average of USD 653 billion. However, recent years have seen a deceleration in the pace of investment growth. To meet internationally agreed-upon climate goals by 2030, it is estimated that global climate finance will need to increase by 590%. A key insight from the analysis is that debt remains the dominant form of climate finance globally, with low-cost debt comprising just 12% of total debt financing—a figure that has been decreasing since 2018. Furthermore, 99% of this debt is sourced from public institutions, underscoring the critical role of public financing in supporting global climate initiatives.

Innovative financial instruments can play a key role here, and one such instrument is blended concessional finance, which has emerged as an effective tool for mobilising private investment in climate-related sectors.

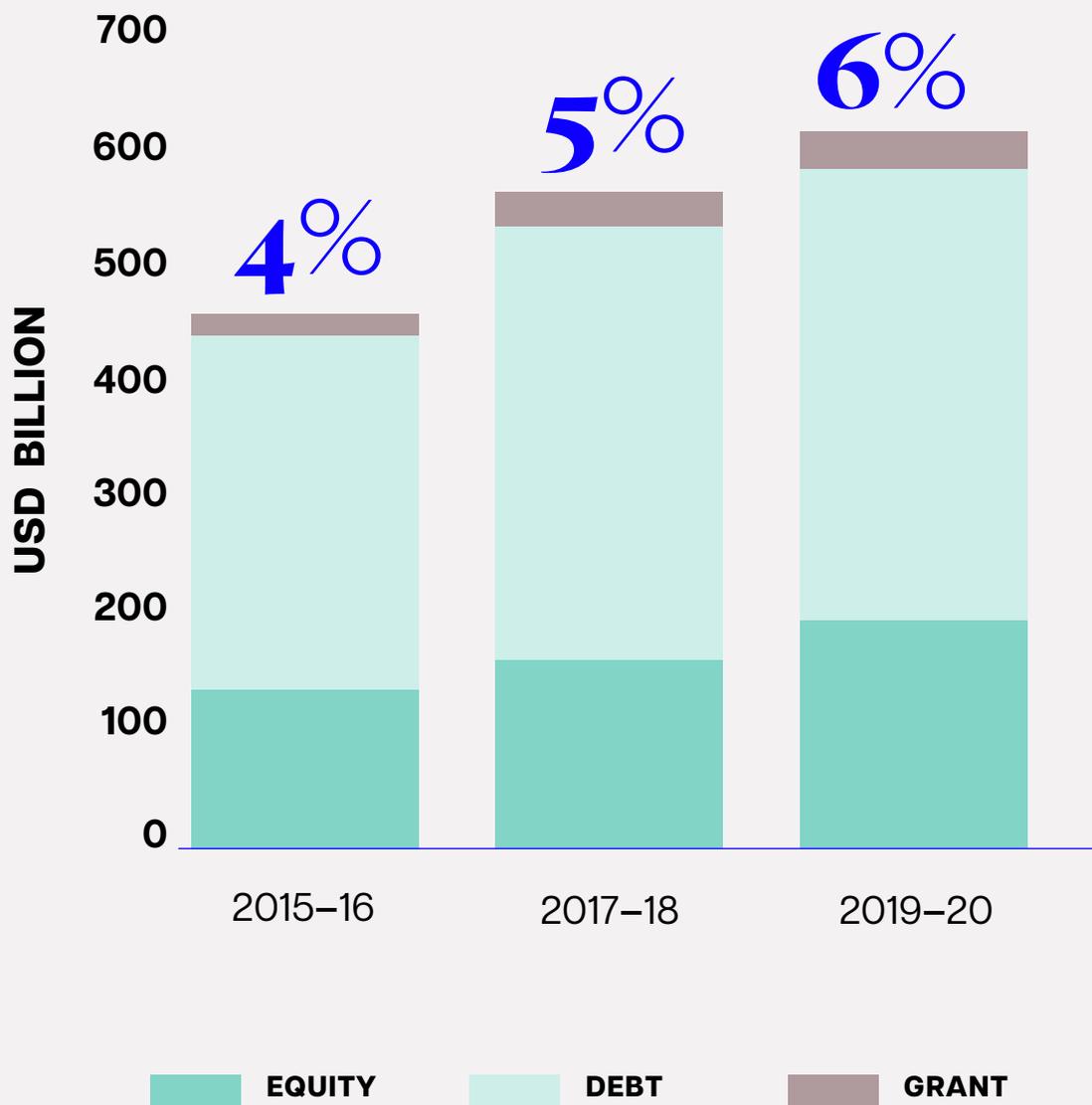


Figure 4: Instruments used for climate investments
Source: CPI

This trend has significant implications for India's climate finance landscape, where a large volume of capital is required to meet its sustainability and net-zero targets. The need for innovative financial solutions, including expanding access to concessional and low-cost debt, will be essential to bridge the significant investment gap. Engaging both public and private sectors to scale up climate finance through instruments like blended finance and green bonds could be vital to mobilise the necessary resources.

India's climate challenges are vast, with increasing vulnerabilities due to extreme weather events, rising sea levels, and temperature fluctuations. To mitigate these risks and to align with its Nationally Determined Contributions (NDCs) under the Paris Agreement, India requires significant financial resources. Estimates suggest that India needs over USD 2.5 trillion by 2030 to meet its climate action targets. While some of this can be raised through domestic and private sector investments, concessional finance is indispensable for filling the funding gaps, particularly in sectors that may not attract sufficient private capital due to perceived risks or low returns.

ROLE OF DOMESTIC CONCESSIONAL CLIMATE FINANCE

India has mobilised several domestic sources of concessional climate finance to support its climate goals. Key initiatives include:

1. **National Adaptation Fund for Climate Change (NAFCC):** Established in 2015 with an initial allocation of USD 50 million, the NAFCC was designed to finance climate adaptation activities in the most vulnerable states. It provides concessional funding to state governments to help implement adaptation projects. The fund plays a crucial role in bridging financing gaps where market-based mechanisms may be insufficient, particularly for projects aimed at protecting communities from climate impacts.
2. **National Clean Energy Fund (NCEF):** The NCEF, funded through a coal cess, was launched in 2010 to promote clean energy projects, including research and development. Over the years, this fund has provided concessional loans to clean energy developers, supporting the growth of India's renewable energy capacity, which is critical to reducing the country's reliance on coal. The concessional finance offered by NCEF has enabled investments in projects with high capital costs that might otherwise struggle to secure commercial financing.
3. **State Renewable Energy Funds:** Several states, such as Maharashtra and Gujarat, have established their own concessional financing mechanisms to support renewable energy development. These funds are instrumental in promoting decentralised renewable energy solutions, particularly in rural areas, where commercial investments are scarce. These state-led initiatives are also in alignment with broader national climate goals and provide additional concessional support at local levels.
4. **Public Sector Banks and Development Finance Institutions (DFIs):** Institutions such as the Indian Renewable Energy Development Agency (IREDA), the National Bank for Agriculture and Rural Development (NABARD), and the Small Industries Development Bank of India (SIDBI) provide concessional loans for climate-related projects. IREDA, for instance, plays a significant role in financing renewable energy projects at concessional rates, while NABARD channels concessional funding to agricultural and rural resilience initiatives, including sustainable farming and water management projects.

These (concessional financing mechanisms) funds are instrumental in promoting decentralised renewable energy solutions, particularly in rural areas, where commercial investments are scarce.

INTERNATIONAL CONCESSIONAL FINANCE MOBILISED FOR INDIA

In addition to domestic sources, India has benefited from international concessional finance, which has been instrumental in scaling up climate action. Some key channels include:

- 1. Green Climate Fund (GCF):** The GCF provides grants and concessional loans to help developing countries like India implement climate projects. India has received significant GCF funding for projects such as improving climate resilience in coastal communities and enhancing energy efficiency in the industrial sector. GCF financing often blends with domestic resources, enabling India to leverage international concessional support to meet its NDCs.
- 2. Multilateral Development Banks (MDBs):** Institutions like the World Bank, Asian Development Bank (ADB), and International Finance Corporation (IFC) provide concessional finance through climate-focussed programmes. The World Bank's concessional financing for India has focused on sectors like water resource management and renewable energy, helping the country to both mitigate and adapt to climate change.
- 3. Bilateral Development Agencies:** Several countries, including Germany (through KfW) and France (through AFD), provide concessional loans and grants to India for climate-related projects. These bilateral funds support a range of initiatives, from urban resilience projects to renewable energy infrastructure development, complementing India's domestic efforts.

GAPS IN CONCESSIONAL FINANCE

Despite these efforts, significant gaps remain:

- 1. Funding Gap:** India faces a massive financing gap in its climate journey. It is estimated that India needs around USD 10.1 trillion by 2070 to achieve its net-zero targets, but current financing sources, including concessional finance, fall short by USD 3.5 trillion. Much of the available concessional finance has been directed towards mitigation efforts, while adaptation projects, particularly in sectors like agriculture and water, remain underfunded.
- 2. Sectoral Imbalance:** A majority of concessional climate finance has been channelled into energy transition projects such as renewable energy and electric mobility. Sectors like agriculture, food systems, and heavy industries, which contribute significantly to emissions, have not received adequate concessional financing. These sectors, while crucial to India's decarbonisation, are perceived as high-risk, deterring private and concessional investments alike.
- 3. Adaptation vs. Mitigation:** While mitigation activities, especially in renewable energy, have received significant attention, adaptation efforts continue to be underfunded. Only about 10% of concessional finance has been allocated to adaptation projects, even though these are critical for building resilience in India's most climate-vulnerable regions. This imbalance highlights the need for a more strategic focus on adaptation finance.

THE WAY FORWARD

To bridge these gaps, India needs to further scale up concessional finance from both domestic and international sources. Some key strategies include:

- 1. Blended Finance Models:** Blended finance, which combines concessional finance with private capital, can help de-risk investments in high-risk sectors like agriculture and heavy industries. This approach has shown promise in attracting private capital into climate projects that offer lower returns..
- 2. Expanding Domestic Climate Funds:** India's domestic climate funds, such as NAFCC and NCEF, could be scaled up to meet the growing needs of adaptation projects. State-level climate funds can also play a critical role by providing concessional finance for region-specific adaptation efforts .
- 3. Leveraging International Finance:** India can continue to tap into international concessional finance by strengthening its engagement with MDBs and global climate funds. These institutions can provide concessional loans and grants that help finance large-scale adaptation and mitigation projects while keeping the costs low.

However, challenges remain, including regulatory hurdles like the lack of a clear green finance taxonomy and complexities around withholding taxes. Reforms addressing these issues, along with developing a cohesive framework for blended finance, could unlock more capital and foster the growth of the market. Moving forward, India will need to strengthen partnerships with development finance institutions (DFIs) and donors, build governance frameworks for transparency, and enhance capacity-building efforts across stakeholders to fully realise the potential of blended finance.

Concessional climate finance is a vital tool in India's climate finance strategy. Scaling its availability and directing it towards underfunded sectors will be critical in ensuring India can meet its climate goals while fostering inclusive and sustainable development.

**Concessional finance
provides lower interest
rates and longer
repayment periods,
essential for India's
climate transition.**

FUTURE RESEARCH DIRECTIONS IN THE INDIAN CONTEXT

In India, there is a growing need for more focused studies on the emerging trends within the framework of catalytic finance, particularly in defining and standardising its role across different sectors. A unified approach would allow concessional capital providers to assess the outcomes and effectiveness of their investments in a more coordinated way. This is especially relevant for India, where multiple public and private entities participate in climate finance initiatives.

A critical area for future research lies in exploring how concessional finance in India can effectively mobilise additional private capital, especially through blended finance models. Given India's vast developmental and infrastructure needs, it is essential to analyse how concessional finance can bridge the gap between public sector projects (such as sovereign lending) and private sector investments.

A critical area for future research lies in exploring how concessional finance in India can effectively mobilise additional private capital, especially through blended finance models. Given India's vast developmental and infrastructure needs, it is essential to analyse how concessional finance can bridge the gap between public sector projects (such as sovereign lending) and private sector investments.

Identifying how concessional finance can be strategically deployed to attract private investors—particularly in sectors like renewable energy, climate-resilient agriculture, and sustainable urban development—would be invaluable.

To advance this research, India needs improved methodologies for tracking and reporting concessional finance data. Developing transparent mechanisms to distinguish concessional finance flows between public and private investments would offer critical insights into which sectors can leverage the most private capital. Such data could help refine national climate policies and strategies for mobilising private investment.

Additionally, there is scope for deeper research into domestic concessional finance, particularly regarding how government-led investments in research and development (R&D) and policy-driven revenue mechanisms are supporting climate mitigation and adaptation efforts. Investigating how India's policy frameworks—such as tax incentives, subsidies, and government grants—are fostering climate innovation and enabling an environment conducive to private sector involvement could provide valuable insights. This research could also highlight how concessional finance is supporting India's efforts to meet its Nationally Determined Contributions (NDCs) under the Paris Agreement.

In summary, research that focuses on optimising concessional finance flows, both domestically and internationally, will be critical in helping India tackle the dual challenges of climate mitigation and sustainable development. By identifying how concessional finance can be better integrated into public-private partnerships and national policy frameworks, India can effectively scale up its climate finance ecosystem.





INDIAN RAILWAYS

दे भारत
EXPRESS



Scaling Mitigation Investment

USD 40-50 BILLION MOBILISED ANNUALLY VERSUS USD 170 BILLION NEEDED THROUGH 2030; 85% FROM DOMESTIC SOURCES

GREEN BONDS LEAD AT USD 7.5 BILLION; SOVEREIGN GREEN BONDS LAUNCHED 2023

CCTS 2023 ESTABLISHES COMPLIANCE MARKET; FACES CBAM PRESSURE AND TECHNOLOGY GAPS

CLEAN ENERGY DOMINATES; HEAVY INDUSTRY AND AGRICULTURE SEVERELY UNDERFUNDED

03 The State of Mitigation Finance in India

India is accelerating its investments in climate mitigation to align with its net-zero emissions target by 2070 and Paris Agreement commitments. These investments are crucial for transitioning to a low-carbon economy, primarily through renewable energy, energy efficiency, and sustainable transportation. The objective is to reduce emissions across key sectors like energy, transport, and industry, which together account for a large proportion of India's total emissions.

RATIONALE AND OBJECTIVE

The main objective is to decarbonise India's economy, addressing both current emissions and future sustainability. Investments are being targeted towards expanding renewable energy (especially solar), upgrading infrastructure, and developing green technologies to mitigate climate impacts. As part of its strategy, India aims to scale renewable energy capacity to 500 GW by 2030, highlighting the critical need for sustained and increased investments in the sector.

AMOUNT MOBILISED FOR MITIGATION FINANCE

India's tracked climate finance, according to recent reports, is estimated at around USD 40-USD 50 billion annually, with approximately 85% coming from domestic sources. However, this figure is well below the estimated requirement of USD 170 billion per year needed to meet India's climate goals through 2030. Green finance tools such as green bonds, blended finance, and public-private partnerships are increasingly seen as vital to closing this gap. Mobilisation of international capital, facilitated by organisations like the Green Climate Fund (GCF) and strategic partnerships such as those between the IFSCA and Climate Policy Initiative (CPI), plays a critical role in bridging this financing shortfall.

While progress is being made, the scale and speed of investment need to increase significantly to meet India's long-term climate goals, especially in high-emission sectors such as energy and transport.

3.1 APPROACH AND METHODOLOGY

To assess the current state of investing in climate mitigation in India, this report employs a mixed-method approach combining quantitative data analysis and qualitative case studies. The following methodologies guide this section:

Data Collection and Financial Tracking

The report relies on data from reputable sources like the Climate Policy Initiative (CPI), Green Climate Fund (GCF), and India's Ministry of Environment, Forest, and Climate Change (MoEFCC). This data tracks the amount of finance mobilised annually for climate mitigation, specifically focusing on investments in renewable energy, sustainable infrastructure, and green technologies.

Financial flows are tracked across public, private, and international sources, using CPI's Landscape of Green Finance reports, which provide insights into the funding gaps between available and required finance for India's climate goals.

Policy and Institutional Framework Analysis

The study also reviews India's key climate policies and frameworks, such as the National Action Plan on Climate Change (NAPCC) and various State Action Plans on Climate Change (SAPCCs), to evaluate how policies support investment in climate mitigation.

Additionally, the role of financial institutions, such as the International Financial Services Centres Authority (IFSCA), in mobilising sustainable finance is analysed.

This comprehensive approach ensures that the report provides an accurate, data-driven understanding of the financial landscape for climate mitigation in India while offering actionable insights for scaling investment.

Case Studies

To illustrate successful models and challenges, the report includes case studies from states like Gujarat and Rajasthan, where large-scale renewable energy projects have been implemented. These case studies helped contextualise the barriers and enablers of climate finance at the regional level.

This comprehensive approach ensures that the report provides an accurate, data-driven understanding of the financial landscape for climate mitigation in India while offering actionable insights for scaling investment.

3.2 DATA GAPS AND ASSUMPTIONS

Despite progress in tracking climate mitigation investments, several data gaps and assumptions remain that impact the accuracy and comprehensiveness of climate finance reporting in India.

1. Incomplete Data on Private Sector Investments

Gap: While public sector investments in climate mitigation are relatively well-documented, there is a significant lack of transparency regarding private sector contributions. Many companies do not report their climate investments comprehensively, particularly in sectors like energy, manufacturing, and transport. This leads to an underestimation of total climate finance mobilised.

Assumption: To fill this gap, the report assumes a conservative estimate of private sector involvement based on available case studies and partial data from key industries like renewable energy and electric mobility.

2. Lack of Granular, Region-Specific Data

Gap: There is limited region-specific data available on climate mitigation investments, especially at the state-level. While some states, like Gujarat and Tamil Nadu, report renewable energy capacity, the financial details of these investments are often not disaggregated by source or technology.

Assumption: For states where data is missing, national averages or estimates are applied, assuming similar growth rates in renewable energy deployment and investment trends.

3. Insufficient Tracking of International Climate Finance

Gap: Although India receives funds from international sources such as the Green Climate Fund (GCF), the tracking of how these funds are distributed across projects is inconsistent. This makes it difficult to assess the full impact of international financing on climate mitigation.

Assumption: The report assumes that international climate funds are distributed in line with national priorities outlined in India's Nationally Determined Contributions (NDCs) and State Action Plans on Climate Change (SAPCCs).

4. Limited Data on Cross-Sectoral Investments

Gap: Climate mitigation involves multiple sectors (e.g., energy, transport, industry), but there is limited data that tracks the integration of cross-sectoral investments, such as those that improve both energy efficiency and industrial decarbonisation.

Assumption: To address this gap, the report assumes that sectoral growth rates in energy efficiency and green technology are reflective of global trends, applying estimated financial needs for decarbonising key industries.

Addressing these data gaps will require improved transparency, better reporting mechanisms from private sector actors, and enhanced data collection at both national and state-levels. Until then, the assumptions made in this report provide a conservative yet practical approach to understanding climate mitigation finance in India.

3.3 FINDINGS

3.3.1 DOMESTIC SOURCES OF FINANCE

India's domestic sources of finance for climate mitigation are diverse, involving a mix of public, private, and institutional players. These sources play a crucial role in supporting the country's transition towards a low-carbon economy. Key domestic sources include:

1. Public Sector Investments

The Indian government remains a significant contributor to climate finance, particularly through initiatives like the National Clean Energy Fund (NCEF) and various state-led renewable energy programmes. Public sector entities such as the Indian Renewable Energy Development Agency (IREDA) and Power Finance Corporation (PFC) provide crucial funding for clean energy and infrastructure projects, especially in the solar and wind energy sectors.

State governments, especially in Gujarat, Tamil Nadu, and Maharashtra, have launched renewable energy projects, leveraging state-specific funds to increase capacity and invest in sustainable technologies. These states lead in deploying solar parks and wind energy facilities.

While India has made substantial progress in mobilising domestic finance for climate mitigation, a significant gap remains between current investments and the estimated USD 170 billion needed annually to meet climate targets by 2030.

2. Green Bonds

India has become one of the leading issuers of green bonds in the emerging markets, raising significant capital for renewable energy, sustainable transport, and green infrastructure projects. In recent years, green bonds issued by entities like State Bank of India (SBI), Indian Railway Finance Corporation, and NTPC Limited have contributed to large-scale renewable energy developments and efficient urban infrastructure.

As of 2021, India issued approximately USD 7.5 billion in green bonds, making it one of the largest issuers in Asia. These bonds fund projects that focus on reducing carbon emissions and building resilience against climate impacts.

3. Private Sector Contributions

The private sector is increasingly investing in climate mitigation through renewable energy projects, electric vehicles (EVs), and energy-efficient technologies. Companies like Adani Green Energy, Tata Power, and ReNew Power are major players in expanding India's solar and wind energy capacity.

Additionally, private banks and non-banking financial companies (NBFCs) are issuing green loans and sustainability-linked bonds, enabling companies to finance green projects, particularly in the energy and transportation sectors.

4. Institutional Investors

Domestic institutional investors, including Life Insurance Corporation of India (LIC), EPFO (Employees' Provident Fund Organisation), HDFC Life, and SBI Life Insurance, are gradually shifting towards climate-friendly investments. These institutions are exploring green bonds and sustainable infrastructure projects, although scaling up remains a challenge due to concerns over return rates and risk.

5. Public-Private Partnerships (PPPs)

Public-private partnerships are critical for financing large-scale mitigation projects. These partnerships help mobilise private capital while leveraging public sector support. Examples include the development of solar parks and energy-efficient urban infrastructure projects that combine government incentives with private investment to expand green capacity.

While India has made substantial progress in mobilising domestic finance for climate mitigation, a significant gap remains between current investments and the estimated USD 170 billion needed annually to meet climate targets by 2030. Scaling up both public and private sector efforts, improving access to green finance for small and medium enterprises, and expanding institutional investment in green technologies are essential to closing this gap.

BARRIERS HINDERING PRIVATE SECTOR INVESTMENT IN CLIMATE MITIGATION IN INDIA

Private investors in India face several challenges when investing in climate mitigation, despite the growing demand for green finance and the country's ambitious climate targets. These challenges include:

1. Perceived High Risk and Low Return

Private investors often perceive investments in climate mitigation projects, particularly in renewable energy and sustainable infrastructure, as high-risk due to market volatility, regulatory uncertainties, and policy shifts. The long-term nature of these investments, such as in solar or wind power, can also lead to concerns about low returns compared to other asset classes.

The unpredictability of regulatory frameworks, such as changing subsidy policies or tariff rates for renewable energy, creates further risk, making investors cautious about committing significant capital.

2. Lack of Access to Affordable Finance

Small and medium enterprises (SMEs) in India, which play a critical role in developing green technologies and services, often struggle to access affordable finance. High interest rates and limited availability of green loans create barriers for these enterprises to scale up sustainable projects.

In addition, the absence of de-risking mechanisms such as guarantees or insurance products for green projects further discourages private investors from entering the climate finance space.

3. Insufficient Data and Transparency

Private investors require clear, transparent, and standardised data on the performance and impact of green investments to make informed decisions. However, the availability of reliable and consistent data on green projects, such as emission reductions or financial returns, is limited in India. This lack of transparency and standardisation hampers the ability to assess the financial viability and impact of such projects.

4. Limited Market Development for Green Financial Products

The market for green bonds, green loans, and other sustainable financial products is still developing in India. Limited product offerings and a lack of financial instruments tailored to the needs of private investors make it challenging for them to participate effectively in climate mitigation projects.

Furthermore, the absence of robust green certification and verification standards makes it difficult to differentiate genuinely sustainable investments from those that engage in greenwashing, reducing investor confidence.

5. Regulatory and Policy Uncertainty

Frequent changes in policies, particularly related to tariffs, subsidies, and renewable energy targets, create uncertainty. Investors seek policy stability and long-term commitments to feel secure in their investments, but the current landscape often involves unpredictable changes in regulatory frameworks.

Additionally, insufficient government support in the form of incentives or tax breaks for private green investments can reduce investor appetite for participating in climate-related projects.

6. Integration and Coordination Issues

Fragmented coordination between different government agencies and financial institutions makes it difficult for investors to navigate the regulatory landscape. A lack of cohesive policies across central and state governments can lead to confusion and create barriers for private sector involvement.

Moreover, integrating climate considerations into existing financial systems and institutions remains a challenge, preventing the seamless flow of capital into climate mitigation initiatives.

To improve data transparency in climate finance and projects, India needs to implement several strategic measures aimed at enhancing the availability, reliability, and standardisation of information. These improvements are crucial for building investor confidence, ensuring effective policy implementation, and tracking progress towards climate goals.

STRENGTHENING TRANSPARENCY AND DATA INFRASTRUCTURE TO ACCELERATE CLIMATE FINANCE IN INDIA

Addressing these challenges requires a comprehensive policy approach, including improving regulatory frameworks, enhancing access to affordable finance through risk-sharing mechanisms, and developing a standardised framework for reporting and verifying green investments. By creating a more stable and transparent environment, India can encourage greater private sector participation in its climate mitigation efforts.

To improve data transparency in climate finance and projects, India needs to implement several strategic measures aimed at enhancing the availability, reliability, and standardisation of information. These improvements are crucial for building investor confidence, ensuring effective policy implementation, and tracking progress towards climate goals.

HERE ARE SOME KEY ACTIONS:

1. Establishing a Unified Climate Finance Reporting Framework

India can develop a centralised reporting platform where all entities involved in climate finance, including government bodies, private companies, and international organisations, report their investments and project impacts. This platform would standardise data collection and reporting processes, ensuring consistency and comparability across sectors and regions.

The government could collaborate with international organisations such as the Green Climate Fund (GCF) and Climate Policy Initiative (CPI) to adopt best practices and align with global standards, making Indian climate data more credible and accessible.

2. Mandating Data Disclosure for Private Sector and Green Bonds

To enhance transparency, India can enforce mandatory disclosure requirements for private sector companies and entities issuing green bonds. These requirements would include detailed information on project impacts, such as greenhouse gas emissions reductions, financial performance, and social benefits.

Incorporating ESG (Environmental, Social, and Governance) reporting standards into the regulatory framework for listed companies would further ensure that private investments in climate projects are tracked and verified against consistent criteria.

3. Developing Real-Time Monitoring Systems

India could invest in digital and satellite-based monitoring technologies to provide real-time data on emissions, renewable energy output, and other climate metrics. For instance, satellite-based systems can track deforestation rates, air quality, and land use changes, providing accurate data that can be integrated into national climate databases.

The deployment of Internet of Things (IoT) devices in renewable energy plants and urban infrastructure could also provide continuous monitoring of climate performance, helping both public and private stakeholders verify their project outcomes.

4. Enhancing Collaboration Between Government Agencies and the Private Sector

Improving data transparency requires stronger coordination between government agencies, private companies, and financial institutions. Establishing a public-private partnership (PPP) model for climate data collection and analysis can streamline efforts and ensure that all parties have access to reliable and updated information.

Collaborative platforms where private firms and state governments can share data and insights related to climate investments, emissions reductions, and sustainability metrics will enhance the overall transparency and efficacy of climate finance flows.

5. Implementing Third-Party Verification and Certification Systems

To avoid greenwashing and ensure data integrity, India could introduce independent verification systems for climate projects. Third-party auditors would assess the accuracy of reported data, particularly in the private sector and for green bonds, to verify that projects meet the set environmental and social criteria.

Certification programmes for green projects can also be developed in partnership with international standards bodies, ensuring that the data aligns with global best practices and increases investor confidence.

CONCLUSION

Improving data transparency in India's climate finance landscape is essential for scaling investments and ensuring effective climate action. By implementing standardised reporting frameworks, enforcing mandatory disclosures, leveraging technology for real-time monitoring, and fostering collaboration across sectors, India can build a more transparent and reliable climate finance ecosystem.

3.3.2 INTERNATIONAL SOURCES OF FINANCE

International finance is crucial for India to meet its climate mitigation and adaptation targets, especially given the vast funding gap. International climate finance comes primarily from multilateral development banks (MDBs), such as the World Bank, Asian Development Bank (ADB), and Green Climate Fund (GCF). These institutions provide concessional loans, grants, and technical assistance to support renewable energy projects, sustainable infrastructure development, and energy efficiency programmes across the country.

India's foreign direct investment (FDI) in green projects has also seen growth, although it still constitutes a small percentage of total FDI inflows. The landscape of international finance in India is diversified, with some funding channelled through public sources, like development aid and other official flows, while private international investments focus mainly on sectors with established market maturity, such as solar and wind energy.

India's inclusion in JPMorgan's Government Bond Index-Emerging Markets (GBI-EM) has significantly increased foreign capital inflows into the country, which will positively impact the financing of climate mitigation projects. The inclusion, which began in June 2024 and will be phased in over 10 months, is expected to bring in up to USD 24 billion in inflows over this period. This influx will help reduce borrowing costs, improve bond yields, and provide a reliable source of foreign capital for green initiatives.

HOW THESE FUNDS REACH MARGINALISED COMMUNITIES

International funds are not only supporting large-scale green energy and infrastructure projects but also increasingly targeting adaptation and resilience projects that benefit marginalised communities. For example, India accesses the Green Climate Fund (GCF) and other global initiatives to support smallholder farmers, women-led enterprises, and rural infrastructure development. These funds are channelled to provide affordable clean energy solutions, improve water management, and promote climate-resilient agriculture practices.

TARGETING MARGINALISED COMMUNITIES

Efforts to ensure that international finance reaches marginalised communities include initiatives that prioritise adaptation and decentralised renewable energy systems. For example, funds from the GCF and World Bank have supported solar mini-grids and decentralised energy projects in rural areas, specifically targeting regions where access to grid electricity is limited. Such projects are essential for improving the livelihoods of women and marginalised communities who are disproportionately affected by climate change.

Programmes like those from NABARD (National Bank for Agriculture and Rural Development) use international funds to improve water management systems and agricultural practices in vulnerable areas, benefiting smallholder farmers and poor communities. However, challenges remain in ensuring that these funds reach the most marginalised, as intermediary institutions often lack capacity and transparency.

For greater impact, international donors and development banks need to further integrate gender and equity considerations into their climate finance strategies to ensure that funds are effectively channelled to projects that empower marginalised groups and promote sustainable, inclusive development.

Additionally, international development banks like the Asian Development Bank (ADB) and World Bank play crucial roles by supporting state-level projects aimed at building resilience in communities vulnerable to climate impacts. The focus is increasingly on integrating gender-responsive finance and targeting disadvantaged groups to ensure the benefits of international investments are equitably distributed.

Overall, while international sources are significantly enhancing India's capacity to finance climate projects, efforts are being made to direct these resources in ways that prioritise the needs of marginalised communities, ensuring an inclusive and just transition to a low-carbon economy.

INTERNATIONAL FINANCE CONSTITUTES ONLY



**OF INDIA'S TOTAL
CLIMATE FUNDING DESPITE
MASSIVE NEEDS.**

3.4 GREEN FINANCE INSTRUMENTS

Green finance refers to the financial activities aimed at supporting sustainable development through investments in environmentally beneficial projects. It is crucial in India's transition to a low-carbon economy, particularly as the country seeks to achieve its net-zero emissions target by 2070 and fulfil its commitments under the Paris Agreement. Green finance instruments mobilise capital for clean energy, energy efficiency, sustainable infrastructure, and climate adaptation projects, making it an essential tool for decarbonising the economy and building climate resilience.

WHY IS GREEN FINANCE NEEDED IN INDIA?

India's ambitious renewable energy targets (such as installing 500 GW of renewable energy capacity by 2030) and its need to transform high-emission sectors (like transport and heavy industry) require substantial financial investments. Current estimates suggest India needs around USD 170 billion annually to meet its climate goals, but the country is only mobilising a fraction of this amount. Therefore, leveraging green finance is critical to bridging this gap, reducing emissions, and promoting sustainable economic growth.

Green finance instruments in India have mobilised billions of dollars for sustainable projects; however, the country needs to scale these efforts further to meet its growing financial requirements.

TYPES OF GREEN FINANCE INSTRUMENTS IN INDIA

1. Green Bonds

Green bonds are a prominent tool in India's green finance landscape. These are debt instruments specifically used to finance projects that have positive environmental benefits. India's sovereign green bond framework, launched in 2023, outlines eligible projects such as renewable energy, clean transportation, and water management. This framework has attracted both domestic and international investors by adhering to international standards, such as those set by the International Capital Market Association (ICMA). Major issuers include the State Bank of India (SBI), NTPC, and Indian Railway Finance Corporation, contributing to financing projects like solar parks and electrification of railway networks.

2. Sustainability-Linked Bonds (SLBs)

These bonds are outcome-based instruments tied to specific sustainability performance indicators. SLBs differ from traditional green bonds because they do not limit the use of proceeds to green projects but link the bond's financial terms to the achievement of specific sustainability targets, such as reducing emissions by a particular percentage. This flexibility allows corporations to align their business models with broader climate goals.

3. Transition Bonds

With a focus on decarbonising hard-to-abate sectors like steel, cement, and transportation, transition bonds are gaining attention in India. These bonds finance projects that may not be entirely green initially but are essential for transitioning high-emission sectors towards cleaner technologies, such as carbon capture and storage (CCS) and green hydrogen production.

**\$ 7.5
BILLION**
**IN GREEN BONDS WAS ISSUED BY INDIA AS OF 2021,
LEADING ASIA IN ISSUANCE.**

4. Blended Finance Instruments

Blended finance combines public, private, and philanthropic funds to reduce the risks associated with climate investments, making it easier for private investors to engage in green projects. The International Finance Corporation (IFC) and other multilateral banks are supporting India through such mechanisms, particularly in the renewable energy sector.

5. Sovereign Green Bonds (SGBs)

India's introduction of sovereign green bonds in 2023 marks a significant milestone in mobilising green finance. These bonds finance green infrastructure projects like clean energy and sustainable urban development. By guaranteeing returns independently of project performance, these bonds provide security to investors, attracting global ESG funds and increasing investment inflows.

IMPACT AND FUTURE DIRECTIONS

Green finance instruments in India have mobilised billions of dollars for sustainable projects; however, the country needs to scale these efforts further to meet its growing financial requirements. The development of a comprehensive green finance taxonomy in 2024 and the expansion of green bond frameworks are positive steps towards enhancing transparency and attracting more investments. Strengthening regulatory mechanisms and building a pipeline of eligible green projects will be crucial for maximising the potential of these instruments.

3.5. DRIVING INDIA'S 2025 CLIMATE MITIGATION AGENDA

India's approach to climate mitigation in 2024 is guided by its commitment to achieve net-zero emissions by 2070 and its updated Nationally Determined Contributions (NDCs) under the Paris Agreement. The focus is on reducing emissions intensity, expanding renewable energy capacity, and enhancing carbon sinks. Significant efforts include ramping up solar and wind energy infrastructure, with a target of 500 GW of non-fossil fuel capacity by 2030.

The government is also investing in decarbonising transport by promoting electric vehicles (EVs) and expanding public transport options. Programmes like the electrification of India's railway network and initiatives to deploy electric buses in cities such as Mumbai highlight a comprehensive strategy aimed at reducing emissions from urban mobility.

To support these efforts, India leverages both domestic and international green finance. International initiatives like the Global Energy Alliance for People and Planet (GEAPP) are working with Indian stakeholders to provide funding and technical support for scaling renewable energy projects, ensuring the country's pathway towards sustainable development is both inclusive and impactful.

3.5.1 ENHANCING TRANSPARENCY TO SCALE CLEAN ENERGY FINANCE

Clean energy initiatives, including the promotion of renewable energy and electric vehicles (EVs), are central to India's climate mitigation strategy. These efforts aim to reduce greenhouse gas emissions, transition to a low-carbon economy, and address energy poverty, particularly in vulnerable states and communities. Rural and underdeveloped regions in India are disproportionately impacted by climate change, and integrating clean energy solutions such as solar power and EV infrastructure not only mitigates these impacts but also promotes economic development and resilience.

SPOTLIGHT ON VULNERABLE STATES AND COMMUNITIES

1. Bihar and Jharkhand

These states face significant energy poverty, with many rural populations lacking access to reliable electricity. Solar energy projects and microgrid solutions are being implemented to provide sustainable and affordable energy access to isolated and impoverished areas. Additionally, the introduction of electric two-wheelers and e-rickshaws, which are more affordable and accessible to low-income groups, reduces dependence on fossil fuels and provides clean transportation options.

2. Odisha

Odisha, frequently affected by cyclones and flooding, focuses on renewable energy to build resilience. The state has implemented programmes to install solar-powered water pumps and off-grid solar systems in remote coastal communities, providing essential services while reducing emissions. Furthermore, Odisha is investing in solar-powered charging stations for electric vehicles, ensuring that rural

and coastal areas have access to clean transportation even during power outages caused by extreme weather. These initiatives also create green jobs, improving local economic conditions and supporting small businesses.

3. Rajasthan

As a drought-prone state with significant solar potential, Rajasthan is expanding its solar capacity to provide affordable clean energy. Many of these projects target smallholder farmers and rural households, enabling them to access solar-powered irrigation systems and decentralised energy solutions, thereby supporting sustainable agricultural practices. Additionally, the state is integrating EV infrastructure, targeting electric tractors and two-wheelers for farmers and rural residents, providing them with low-emission and cost-effective alternatives.

By targeting marginalised communities, these initiatives aim to achieve equitable climate mitigation that supports sustainable development across India.

FOCUS ON MARGINALISED COMMUNITIES

Investing in clean energy and EV infrastructure for vulnerable communities in these states not only mitigates climate change but also enhances livelihoods

and living standards. Special funding mechanisms, such as subsidies for solar installations, green microfinance, and incentives for purchasing EVs, are necessary to make these solutions accessible to economically disadvantaged groups. By targeting marginalised communities, these initiatives aim to achieve equitable climate mitigation that supports sustainable development across India.

3.5.2 DRIVING THE SHIFT TO SUSTAINABLE AND LOW-CARBON MOBILITY

Clean transportation is a critical component of India's climate mitigation strategy, aiming to reduce greenhouse gas emissions from one of the country's largest polluting sectors. The transportation sector accounts for a significant share of India's total carbon emissions, driven by a rapid increase in vehicle ownership and urbanisation. To address these challenges, India is focusing on promoting sustainable transportation options, including electric vehicles (EVs), public transit systems, and alternative fuels.

KEY INITIATIVES AND FOCUS AREAS

1. Promotion of Electric Vehicles (EVs)

The Indian government has implemented policies such as the Faster Adoption and Manufacturing of Electric Vehicles (FAME) scheme, which provides financial incentives for EV purchases. This initiative encourages the adoption of electric two-wheelers, three-wheelers, and buses, making clean transportation more accessible to the masses.

States like Delhi and Maharashtra are leading in EV deployment, with aggressive targets for increasing the number of electric buses and establishing extensive charging infrastructure to support the transition to electric mobility.

2. Investment in Public Transit Systems

Expanding and improving public transit systems is essential for reducing the reliance on personal vehicles and lowering emissions. Initiatives include investing in metro rail projects, BRT (Bus Rapid Transit) systems, and clean buses, particularly in densely populated urban areas. For instance, cities like Mumbai and Bengaluru are expanding their metro networks to provide efficient and low-emission public transport options.

The integration of electric buses into public transit fleets is a key strategy for reducing urban air pollution and greenhouse gas emissions. Several states are piloting electric bus services, aiming to replace older diesel fleets with cleaner alternatives.

3. Alternative Fuels

Promoting the use of alternative fuels such as compressed natural gas (CNG) and biofuels is also part of India's clean transportation strategy. CNG is increasingly being adopted for public transportation vehicles, while biofuels derived from agricultural waste are being explored as a sustainable option for the transport sector.

The government is investing in research and development of bio-fuel technologies to ensure a stable supply and create market opportunities for rural farmers, thus supporting both climate goals and local economies.

Clean transportation is essential for India to achieve its climate mitigation goals. By promoting electric vehicles, investing in public transit, and developing alternative fuel options, India can significantly reduce emissions in the transportation sector.

4. Infrastructure Development

A robust charging infrastructure for electric vehicles is crucial for promoting their adoption. The government is working to expand the network of charging stations across urban and rural areas, making it easier for users to transition to EVs.

Additionally, policies encouraging the development of dedicated lanes for bicycles and electric scooters in urban areas aim to promote non-motorised transport, reducing congestion and emissions in cities.

FOCUS ON VULNERABLE COMMUNITIES

Clean transportation initiatives also target vulnerable communities, aiming to enhance mobility and accessibility. Programmes that provide subsidies for electric two-wheelers and e-rickshaws help low-income individuals reduce transportation costs while contributing to cleaner air and reduced carbon emissions. Additionally, improving public transit options ensures that marginalised populations have access to reliable and affordable transportation, enhancing their economic opportunities.

CONCLUSION

Clean transportation is essential for India to achieve its climate mitigation goals. By promoting electric vehicles, investing in public transit, and developing alternative fuel options, India can significantly reduce emissions in the transportation sector. These initiatives not only contribute to environmental sustainability but also enhance the quality of life for millions, particularly in vulnerable communities, by providing cleaner, more efficient, and accessible transportation solutions.

3.5.3 DRIVING INDIA'S ENERGY EFFICIENCY TRANSITION

Energy efficiency is a critical component of India's climate mitigation strategy, aimed at reducing energy consumption while maintaining productivity and economic growth. This focus is essential for lowering greenhouse gas emissions, minimising energy costs, and enhancing energy security, particularly as India transitions to a more sustainable energy landscape.

In 2024, India took a significant step by joining the **International Energy Efficiency Hub**, a global platform that fosters collaboration and shares best practices in energy efficiency among member countries. This membership will provide India access to a vast network of experts and innovative solutions, enhancing its domestic energy efficiency initiatives. The Bureau of Energy Efficiency (BEE) has been designated as the implementing agency to align India's participation with its national energy efficiency goals.

Key initiatives in energy efficiency include the **Perform, Achieve and Trade (PAT)** scheme, which targets specific industries to reduce energy consumption through market-based mechanisms. This programme incentivises companies to adopt energy-saving technologies and practices, thus fostering a culture of efficiency.

Moreover, the government's focus on **energy-efficient appliances**, backed by the **BEE's star labeling program**, promotes the adoption of technologies that consume less power, further reducing overall energy demand.

As India continues to emphasise energy efficiency, it is crucial to recognise its potential benefits for vulnerable communities, particularly in rural areas where energy access is limited. By promoting energy-efficient solutions, India can enhance the resilience of these communities, enabling them to thrive despite the challenges posed by climate change.

Building on experience from the Clean Development Mechanism, India has issued 278 million carbon credits representing 17% of global voluntary carbon market supply, and now transitions to a compliance-based domestic market that could mobilise billions in climate finance while navigating international trade pressures from CBAM.

3.6 THE SCOPE OF INDIA'S CARBON MARKET FOR CLIMATE MITIGATION

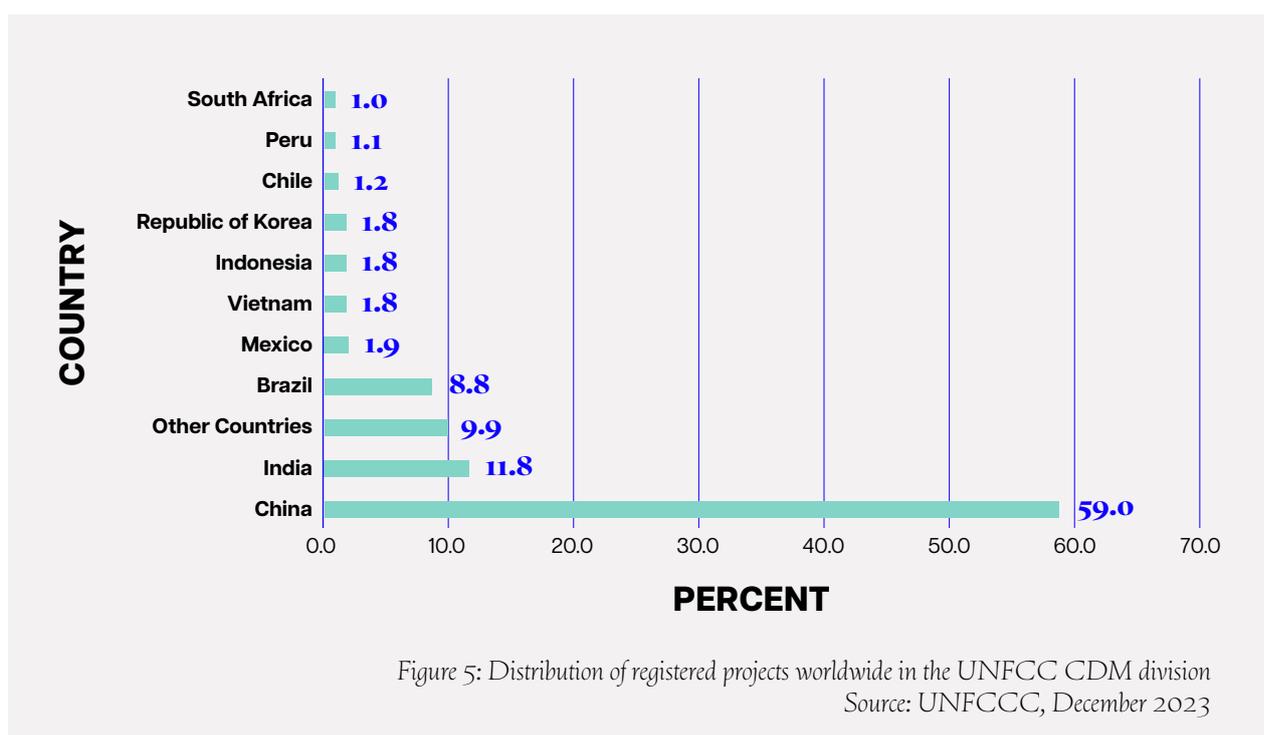
India is making significant strides in establishing a carbon market as a vital tool for climate mitigation. The **Indian Carbon Market (ICM)**, formalised under the **Carbon Credit Trading Scheme (CCTS) 2023**, aims to play a pivotal role in driving the country's decarbonisation efforts. The market seeks to set emission reduction targets in alignment with India's Nationally Determined Contributions (NDCs) and ultimately help achieve net-zero emissions by 2070.

Evolution of the Carbon Market in India

India's journey in carbon trading began with its active participation in the **Clean Development Mechanism (CDM)** under the Kyoto Protocol. CDM enabled Indian industries to earn **Certified Emission Reductions (CERs)** by implementing clean technology projects, particularly in sectors like renewable energy. Over 1,450 Indian projects were registered under global carbon crediting programmes, including **Verra** and **Gold Standard**, positioning India as a significant player in the voluntary carbon market.

Building on this experience, India has introduced the **Carbon Credit Trading Scheme (CCTS) 2023**, which is part of its broader plan to develop a full-fledged domestic **Indian Carbon Market (ICM)**. The ICM aims to regulate carbon emissions through a **cap-and-trade** system, incentivising industries to reduce emissions while enabling non-compliant industries to purchase carbon credits. India's vision is for the ICM to be one of the world's top three carbon markets by 2030.

Developed countries can meet part of their emission reduction targets by purchasing Certified Emission Reductions (CERs) from mitigation projects in developing nations, with each CER representing a reduction of one tonne of CO₂. By December 2023, over 7,800 CDM projects were registered globally, and India, along with China, accounted for more than 70% of these. India alone contributed 22% of the projects, managed by the National CDM Authority (NCDMA) under the Ministry of Environment, Forest, and Climate Change (MoEFCC). (IIHS 2024)



KEY ASPECTS OF INDIA'S CARBON MARKET

- 1. Evolution of the Market:** India's carbon market is expected to evolve from its current offset-based approach, built largely around project-level carbon credits, to a more comprehensive compliance market, similar to the **European Union Emission Trading System (EU-ETS)**. The market is designed to incentivise industries to reduce greenhouse gas (GHG) emissions by issuing carbon credit certificates to entities that exceed their targets. Those failing to meet targets can purchase credits from compliant entities, thus fostering an emissions trading ecosystem. The **Bureau of Energy Efficiency (BEE)** will be responsible for overseeing this system, ensuring accurate measurement, reporting, and verification of emissions data.
- 2. Project-Based Approach:** India's experience with carbon markets has primarily revolved around the **Clean Development Mechanism (CDM)** and the voluntary carbon markets. The country has emerged as one of the largest generators of carbon credits through renewable energy projects, with more than 1,451 projects registered under leading global carbon registries, **Verra** and **Gold Standard**. These credits, representing 10% of India's annual GHG emissions, have earned substantial revenues from international buyers, positioning India as a key player in the global voluntary carbon market.
- 3. Potential for Growth:** The ICM is designed to scale rapidly in the coming years, with aspirations to become one of the top three carbon markets globally by 2030. A well-regulated carbon market in India could mobilise billions in climate finance, helping to reduce emissions across sectors like renewable energy, heavy industries, and transport. The **Indian Carbon Market Governing Board (ICMGB)** will play a critical role in shaping the market and ensuring it evolves to meet the demands of a growing economy while achieving emissions intensity reduction.

CURRENT MARKET PERFORMANCE AND ACHIEVEMENTS

India has also become a key player in the voluntary carbon market (VCM), issuing 278 million carbon credits between 2010 and 2022, representing 17% of the global carbon credit supply. Despite the decline of the CDM market in 2012 due to reduced demand for CERs and a price collapse, the VCM in India has flourished. The Indian carbon market is expected to avoid 295 million tonnes of CO₂ emissions by 2030 across several sectors under a well-regulated carbon market system.

As of mid-2023, India's voluntary carbon market was valued at just over USD 1.2 billion, with ~1,450 projects listed across the Verra and Gold Standard registries. India is among the world's largest suppliers of offsets; CSE's review notes that Indian projects account for roughly one-fifth of all credits issued under these two programmes. Project types are concentrated in renewable energy, clean cooking/energy access, afforestation/reforestation, and agricultural practices.

India's carbon market offers an immense opportunity to meet both its Nationally Determined Contribution (NDC) targets and its broader developmental goals. Between 2013 and 2020, an analysis of 500 CDM projects revealed that India generated 90 million CERs, equivalent to reducing 90 million tonnes of CO₂ emissions. Similarly, the first two cycles of the PAT scheme contributed to cutting down approximately 100 million tonnes of CO₂, although this was not an explicit goal of the program.

To solidify its carbon market, the Indian government has taken decisive steps. In May 2023, the Ministry of Environment, Forest, and Climate Change (MoEFCC) issued a notification on developing the Indian Carbon Market (ICM), with the Bureau of Energy Efficiency (BEE) and the Ministry of Power overseeing the

initiative. The Ministry of Power also introduced the Carbon Credit Trading Scheme, 2023, to facilitate a robust cap-and-trade mechanism, which aims to incentivise decarbonisation while fostering sustainable development.

With a well-designed carbon market, India has the potential to address the dual challenges of decarbonisation and development, offering significant contributions towards global climate mitigation goals.

NAVIGATING CHALLENGES AND SEIZING OPPORTUNITIES

Key Challenges Facing India's Carbon Market

- 1. Technology Gaps and Import Dependencies:** Despite the potential of the carbon market, India faces significant challenges, particularly in sectors like renewable energy, which rely heavily on imports. For instance, while India has set a goal to generate 500 GW of electricity from renewable sources by 2030, its solar manufacturing capacity remains underdeveloped, particularly for critical components like polysilicon. Furthermore, the carbon market can drive investments in other clean technologies like **green hydrogen, offshore wind, and carbon capture and storage (CCS)**, areas where India still lags behind.
- 2. Market Stability Concerns:** Price stability will be a critical factor for the success of India's carbon market. Experiences from markets like the EU-ETS have shown that price volatility can undermine investment confidence. India's market must establish mechanisms to ensure stable pricing and transparency in transactions. Additionally, there is a need for clear guidelines on integrating existing schemes, such as **Renewable Energy Certificates (RECs)** and **Perform, Achieve, Trade (PAT)** certificates, into the broader carbon market structure.

STRATEGIC PATHWAYS TO STRENGTHEN INDIA'S CARBON MARKET

To strengthen its carbon pricing strategies, India can implement a series of market-based mechanisms and policy reforms that align with both its developmental priorities and climate goals:

- **Broadening Market Participation:** Expanding participation across more sectors, including agriculture, mining, and transport, can significantly increase the reach and efficiency of India's carbon market. Currently, the market's focus is on energy and industry, but sectors like forestry and agriculture have immense potential to generate carbon credits through afforestation and climate-smart practices.
- **Dynamic Pricing Mechanisms:** Introducing dynamic pricing, where the carbon price adjusts based on demand and supply, can prevent market volatility and ensure that prices reflect the true cost of carbon. This approach has been successful in the **EU Emission Trading System (EU-ETS)**, which uses a combination of cap-and-trade and a carbon price floor to maintain stability.
- **Revenue Recycling:** Revenues generated from carbon pricing mechanisms could be reinvested into sectors that are difficult to decarbonise, such as heavy industries and transport. By creating incentives for these sectors to adopt cleaner technologies, India can accelerate its transition towards a low-carbon economy. Revenue recycling can also be used to fund social programmes that help communities and industries affected by carbon pricing.

- **Linking to International Carbon Markets:** Integrating India's carbon market with international markets could enhance liquidity and increase access to advanced technologies. India could explore the opportunity to link with global platforms like the Carbon Offsetting and Reduction Scheme for International Aviation (CORSA), which allows countries to trade carbon credits internationally.

THE CBAM CHALLENGE: NAVIGATING EU'S CARBON BORDER RULES

Understanding CBAM's Impact on India

The **Carbon Border Adjustment Mechanism (CBAM)**, introduced by the European Union, is designed to impose a carbon price on imports from countries that do not have equivalent carbon pricing mechanisms. CBAM is particularly relevant for India, which exports carbon-intensive products like steel, cement, and aluminum to the EU.

- 1. Impact on Exports:** CBAM could increase the cost of exporting to the EU, particularly for energy-intensive sectors. Indian exporters may face tariffs unless the carbon intensity of their products is reduced. This could pressure Indian industries to decarbonise rapidly and align their practices with international carbon pricing standards.
- 2. Incentive for Domestic Carbon Market Growth:** CBAM may act as a catalyst for the rapid evolution of India's carbon market. To avoid paying tariffs, Indian exporters might seek to purchase domestic carbon credits to offset their emissions, thus driving demand within the ICM. Additionally, CBAM could push the Indian government to accelerate its carbon pricing reforms to ensure competitiveness in the global market.
- 3. Opportunity for International Collaboration:** CBAM could encourage India to engage in deeper collaboration with the EU and other major economies on climate policy and carbon market integration. By developing a robust carbon pricing mechanism that meets international standards, India can avoid potential trade barriers while attracting foreign investments in clean technology.

COMPLIANCE CHALLENGES AND STRATEGIC RESPONSES

The **Carbon Border Adjustment Mechanism (CBAM)**, introduced by the European Union, presents both a challenge and an opportunity for India. As a major exporter of energy-intensive products to the EU, such as steel and cement, Indian industries could face higher costs under CBAM due to the country's carbon-intensive production processes. However, CBAM can also serve as a catalyst for India to accelerate its carbon pricing and clean technology adoption.

Key challenges for India's compliance with CBAM include:

1. Carbon Intensity in Key Sectors

India's exports to the EU, especially in energy-intensive sectors such as steel, cement, and aluminum, have a high carbon intensity due to the country's reliance on coal. CBAM⁹ compliance would require Indian manufacturers to significantly reduce their carbon footprint, which is challenging given the current state of energy infrastructure. Shifting to cleaner energy sources, such as renewable energy or green hydrogen, is essential but involves high upfront costs and long-term investment.

⁹ Introduced by the EU in 2023, CBAM aims to equalise the carbon cost of imported goods with domestic production by requiring importers to report embedded emissions (from Oct 2023) and purchase carbon certificates (from 2026) for carbon-intensive imports like steel, cement, and aluminium.

2. Lack of Domestic Carbon Pricing Mechanisms

Currently, India does not have an equivalent carbon pricing system to match the EU's stringent standards. The Indian Carbon Market (ICM)¹⁰ is still in its nascent stages, and while mechanisms like the Carbon Credit Trading Scheme (CCTS) 2023¹¹ have been introduced, they are not yet fully operational or comprehensive. The absence of a well-established carbon pricing system makes it difficult for Indian industries to align with CBAM's requirements.

3. Cost Competitiveness

Complying with CBAM could reduce India's cost competitiveness in the EU market. Indian companies that export carbon-intensive products would either need to reduce emissions significantly or purchase carbon credits to offset their emissions. Both options increase operational costs, which could make Indian exports less competitive compared to producers from countries with lower carbon emissions or more advanced carbon pricing systems.

4. Technology and Investment Needs

India still lags in adopting advanced technologies like carbon capture and storage (CCS)¹², offshore wind, and green hydrogen, which are crucial for reducing emissions in hard-to-abate sectors. Furthermore, the domestic manufacturing capacity for clean technologies is limited. For example, India's solar industry depends heavily on imports for key components, making it harder for industries to transition rapidly to cleaner alternatives.

5. Administrative and Regulatory Complexity

Aligning with CBAM will require Indian companies to meet stringent reporting and verification standards for carbon emissions. This is a challenge, particularly for small and medium-sized enterprises (SMEs) that may lack the expertise and resources to implement complex emissions tracking and reporting mechanisms. The Indian government will need to create supportive policies and capacity-building initiatives to help industries adapt to these requirements.

6. Global Trade Relations and Policy Uncertainty

CBAM's introduction could potentially lead to trade tensions between India and the EU, especially if it is perceived as a protectionist measure. India may view CBAM as a non-tariff barrier to trade, which could complicate negotiations on climate and trade agreements. Additionally, there is uncertainty regarding how CBAM will interact with existing international climate agreements, such as the Paris Agreement, and how it will affect India's export markets beyond the EU.

7. Access to Climate Finance

Transitioning to low-carbon technologies requires significant investment, and many Indian companies may not have sufficient access to affordable climate finance. While international climate funds and concessional finance could help bridge this gap, the availability and flow of such resources have been limited. India needs more robust financing mechanisms to support industries in adopting cleaner technologies and improving their compliance with global carbon standards.

¹⁰ Established through an amendment to the Energy Conservation Act and notified in early 2023, the ICM builds on existing mechanisms like the PAT and REC schemes. It introduces a dual-market structure, comprising a compliance market (transition from PAT) and a voluntary offset market, with phased implementation from 2025–2026. The institutional framework includes entities such as the Bureau of Energy Efficiency, the Ministry of Environment, Forest and Climate Change, the Ministry of Power, and the National Steering Committee for the Indian Carbon Market.

¹¹ Notified on 28 June 2023 by the Ministry of Power under the Energy Conservation (Amendment) Act, 2022, the CCTS introduces a compliance-and-offset mechanism to enable emissions trading across nine energy-intensive industrial sectors, replacing the earlier PAT (Perform, Achieve, Trade) scheme.

¹² A process that captures CO₂ emissions from industrial and energy sources, transports them (often via pipelines), and injects them into deep geological formations for long-term isolation. CCS is seen as essential for reducing emissions from hard-to-abate sectors like cement and steel, though it remains expensive, technically complex, and is criticised for potentially prolonging fossil fuel reliance.

PATH FORWARD: TURNING CBAM PRESSURE INTO OPPORTUNITY

India's compliance with CBAM poses significant challenges, primarily due to the high carbon intensity of its industrial exports, the lack of a mature carbon pricing mechanism, and the substantial financial and technological investments required. To overcome these challenges, India will need to accelerate the development of its domestic carbon market, invest in clean technology, and secure international climate finance. Additionally, a clearer alignment between India's carbon policies and global standards is crucial to maintaining competitiveness in international markets, especially in the face of evolving regulations like CBAM.





Bridging the Gender Finance Gap

**WOMEN DISPROPORTIONATELY IMPACTED
BUT LACK ACCESS TO FINANCE AND
DECISION-MAKING POWER**

**GENDER INTEGRATION INCONSISTENT
DESPITE GCF MANDATES AND SEBI BRSR
FRAMEWORK**

**CRITICAL DATA GAPS: NO TRACKING OF
FINANCE REACHING WOMEN-LED PROJECTS**

**REQUIRES TARGETED FUNDS, CAPACITY
BUILDING, AND WOMEN'S LEADERSHIP IN
GOVERNANCE**

04 Gender and Climate Finance

Gender and climate finance are deeply interconnected, particularly when considering the impacts of climate change on vulnerable populations. Women, especially in developing countries like India, often bear the brunt of climate-related disasters due to existing social, economic, and political inequalities. Access to climate finance can empower women to build resilience and contribute to adaptation and mitigation efforts. Integrating **gender equity** into climate finance frameworks is essential for a just transition to a low-carbon economy that leaves no one behind.

DISPROPORTIONATE IMPACT OF CLIMATE CHANGE ON WOMEN

Women are often more vulnerable to the effects of climate change, particularly in rural and agricultural communities where they are responsible for managing household water, food, and energy needs. As climate change exacerbates water scarcity, crop failures, and natural disasters, women face increased burdens.

- **Agriculture:** In India, women constitute a large portion of the agricultural workforce, particularly in subsistence farming. Climate impacts like erratic rainfall and drought disproportionately affect women farmers, reducing crop yields and income security.
- **Health and Livelihoods:** Climate-induced health risks, such as heat stress, waterborne diseases, and displacement, also affect women more severely, as they are often primary caregivers and have limited access to healthcare and financial resources.

GENDER-INCLUSIVE CLIMATE FINANCE

Incorporating gender considerations into climate finance is critical for ensuring that women can access the financial resources needed to adapt to and mitigate climate change. Gender-responsive climate finance focuses on funding projects that not only address climate resilience but also empower women economically and socially. This can include:

- **Access to Credit:** Providing women with better access to credit, particularly for climate-smart agriculture, renewable energy, and water conservation technologies, can enhance their capacity to adapt to climate impacts.
- **Training and Capacity Building:** Investments in training programmes that promote climate-resilient agricultural practices and renewable energy entrepreneurship for women can strengthen their economic independence and resilience.

JUST TRANSITION AND GENDER EQUITY

A just transition refers to the process of shifting to a sustainable economy in a way that is fair and inclusive, ensuring that workers and communities, particularly vulnerable groups, are not left behind. A gender-just transition ensures that women are actively involved in climate decision-making and that climate finance is directed towards initiatives that address gender-specific vulnerabilities.

- **Women's Leadership:** Women's involvement in climate finance decision-making processes can lead to more comprehensive solutions. For example, supporting women-led cooperatives in renewable energy or water management can amplify their role in the green economy.
- **Job Creation:** Climate finance that supports the development of green jobs must consider the barriers women face in accessing these opportunities, such as unequal access to education and training. Ensuring that new job opportunities created by climate investments are accessible to women is key to achieving a just transition.

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GENDER-SENSITIVE INVESTMENT MECHANISMS

Gender-sensitive investment mechanisms in climate finance can ensure that funds are directed towards projects that address the unique challenges faced by women in the face of climate change. This includes:

- **Targeted Funds for Women-Led Projects:** Allocating a percentage of climate finance to women-led adaptation and mitigation projects can help bridge the gender gap in climate action. For instance, women-led reforestation projects or renewable energy initiatives can deliver both environmental and social benefits.
- **Monitoring and Evaluation:** Climate finance projects should include gender-disaggregated data in their monitoring and evaluation processes to track the impacts of investments on women and ensure that they are benefitting equitably.

INTERNATIONAL INITIATIVES SUPPORTING GENDER AND CLIMATE FINANCE

Several global frameworks support gender-sensitive climate finance, including:

- The Green Climate Fund (GCF) mandates the integration of gender considerations in its projects, ensuring that women benefit from climate finance and that gender-responsive actions are taken at all stages of project implementation.
- The UN Framework Convention on Climate Change (UNFCCC) promotes gender equality in climate action through the Gender Action Plan, which aims to enhance the participation of women in climate policy and finance initiatives.

CONCLUSION

Integrating gender into climate finance is critical to achieving a just transition. Women are disproportionately affected by climate change, yet they also play a key role in driving solutions. Ensuring that climate finance mechanisms are gender-responsive not only enhances the resilience of women but also strengthens the overall effectiveness of climate adaptation and mitigation efforts. By focusing on gender equity, climate finance can help build inclusive, sustainable societies that are better prepared to face the challenges of a changing climate.

4.1 THE IMPORTANCE OF GENDER-RESPONSIVE CLIMATE FINANCING

Gender-responsive climate finance is increasingly recognised as essential in addressing both climate change and gender equity challenges in India. Women, particularly in rural and marginalised communities, are disproportionately impacted by climate change due to their roles in agriculture, water collection, and caregiving. By integrating gender considerations into climate finance, India can ensure that climate action is inclusive and effective.

Recent discussions have emphasised the importance of empowering women through access to financial resources, especially in sectors like **renewable energy** and **sustainable agriculture**. For example, women-led businesses often face challenges in accessing climate finance. Targeting climate finance towards **women-led projects** can enhance their capacity to implement climate-resilient practices. Reports from 2023 have called for improved **data tracking** of gender-specific impacts and better access to credit for women entrepreneurs, particularly in the context of India's National Action Plan on Climate Change (NAPCC).

India can lead by adopting **gender-disaggregated data** in climate finance and expanding access to green jobs for women, particularly in sectors like **solar energy** and **water management**. International initiatives, such as those from the **UNEP Finance Initiative**, encourage investments that focus on women-led businesses, which not only address climate resilience but also promote gender equity and economic inclusion.

These efforts will not only benefit women but also strengthen India's overall climate resilience by ensuring diverse perspectives and inclusive participation in climate action.

Targeting climate finance towards women-led projects can enhance their capacity to implement climate-resilient practices.

4.2 EFFORTS TO INTEGRATE GENDER CONSIDERATIONS IN EXISTING CLIMATE FUNDS

In recent years, India has made efforts to integrate gender considerations into existing climate funds, recognising the disproportionate impact of climate change on women. Internationally, frameworks like the **Green Climate Fund (GCF)**, **Climate Investment Funds (CIFs)**, and the **Global Environment Facility (GEF)** have increasingly emphasised gender inclusion. India has been proactive in aligning with these frameworks by incorporating gender-responsive strategies in climate action plans such as the **National Action Plan on Climate Change (NAPCC)**.

One prominent example is India's integration of gender-specific criteria in projects funded through the **National Adaptation Fund for Climate Change (NAFCC)**. These projects aim to support women in rural areas, particularly in agriculture and water management, by providing access to climate-resilient technologies and financial resources. Additionally, the UNDP and other international agencies have been working with India to enhance women's participation in climate-related decision-making and project implementation, ensuring that women are not only beneficiaries but also key drivers of climate action.

Several Indian states have made notable efforts to integrate gender considerations into their climate action plans and financing mechanisms. **Kerala** and **Odisha** have emerged as leaders in this area. Kerala, through its **State Action Plan on Climate Change (SAPCC)**, has integrated gender into various climate adaptation projects, especially in agriculture and water management, sectors where women play a critical role.

For example, Kerala's programmes focus on enhancing women's capacity to lead climate-resilient farming initiatives and provide better access to climate finance for women-led projects in rural areas.

Similarly, **Odisha** has incorporated gender-responsive budgeting into its climate resilience strategies, particularly in disaster management. Given Odisha's vulnerability to cyclones and floods, the state's policies ensure that women, who are often more affected by these disasters, are active participants in decision-making processes related to disaster preparedness and response. Odisha's programmes have also improved women's access to credit and technology, enabling them to build more resilient livelihoods in the face of climate change.

These examples highlight how states can adopt gender-responsive frameworks, linking climate finance with gender equity, to ensure that women are not just passive recipients but active participants in climate action.

While progress has been made, there is a growing recognition that more comprehensive gender mainstreaming is required in climate finance. This includes setting up mechanisms to ensure equitable access to funds, promoting women-led adaptation and mitigation projects, and tracking gender-disaggregated data to assess the impact of climate investments on women's livelihoods and resilience. These efforts align with broader international objectives to ensure that climate finance is both inclusive and effective in addressing the vulnerabilities of women to climate change.

Kerala, through its State Action Plan on Climate Change (SAPCC), has integrated gender into various climate adaptation projects, especially in agriculture and water management, sectors where women play a critical role.

While progress has been made, there is a growing recognition that more comprehensive gender mainstreaming is required in climate finance.

4.3 CHALLENGES IN IMPLEMENTING GENDER MANDATES IN EXISTING CLIMATE FUNDS/POLICIES

India faces several **challenges in implementing gender mandates** in existing climate funds and policies, despite growing recognition of the need for gender-responsive climate action. Some key challenges include:

1. Limited Access to Climate Finance for Women:

Many climate finance mechanisms still lack gender-specific provisions, making it difficult for women, especially those in rural areas, to access the funds necessary for climate adaptation projects. Women's limited access to credit and financial resources exacerbates their vulnerability to climate impacts.

2. Inconsistent Gender Mainstreaming: While India's **State Action Plans on Climate Change (SAPCCs)** and the **National Action Plan on Climate Change (NAPCC)** emphasise gender equity, the incorporation of gender into actual climate projects remains inconsistent. Many climate policies fail to address the specific vulnerabilities faced by women, leading to gaps in implementation.

3. Data and Monitoring Gaps: One of the primary obstacles is the lack of **gender-disaggregated data** in climate finance projects. Without proper tracking mechanisms, it is difficult to assess whether climate funds are truly benefiting women, particularly in sectors like agriculture and water management, where women are disproportionately affected.

4. Cultural and Institutional Barriers: Deep-rooted cultural norms and institutional biases can limit women's participation in climate decision-making processes. This hampers the effectiveness of gender mandates, as women are often underrepresented in leadership roles within climate finance initiatives.

Efforts are ongoing to address these challenges, but overcoming these barriers will require stronger institutional frameworks, better data collection, and targeted financial instruments that prioritise gender inclusion in climate action.

One of the primary obstacles is the lack of gender-disaggregated data in climate finance projects. Without proper tracking mechanisms, it is difficult to assess whether climate funds are truly benefiting women, particularly in sectors like agriculture and water management, where women are disproportionately affected.

4.4 CONCLUSION AND RECOMMENDATIONS

CONCLUSION

The need to address climate change is increasingly urgent, requiring a comprehensive strategy that integrates both mitigation and adaptation measures. The findings of this report highlight the significance of reducing greenhouse gas emissions while simultaneously enhancing resilience to inevitable climate impacts.

Mitigation

Mitigation remains a central pillar of climate action. It involves the adoption of low-carbon technologies, the transition to renewable energy sources, and the implementation of sustainable land-use practices. These measures aim to decarbonise key sectors such as energy, transportation, and industry, ultimately reducing the concentration of greenhouse gases in the atmosphere. Investing in green technologies and infrastructure also supports economic growth and job creation, contributing to a more sustainable and equitable society. Effective mitigation policies are essential to achieving global climate targets, such as those set by the Paris Agreement, and to keeping global temperature rise below critical thresholds.

Adaptation

Adaptation, on the other hand, is necessary to cope with the climate impacts already being experienced and those anticipated in the future. It emphasises the importance of building resilience within communities, economies, and ecosystems. This includes developing climate-resilient infrastructure, improving water management systems, and advancing agricultural practices that are adaptive to changing weather patterns. Adaptation strategies must be inclusive, ensuring that vulnerable populations, including those in developing regions, have the resources and support needed to withstand the consequences of climate change. By integrating adaptation into planning and policy frameworks, governments and organisations can minimise risks, protect assets, and ensure a sustainable quality of life for all.

Synergies

The synergy between **mitigation** and **adaptation** is crucial for comprehensive climate action. While mitigation efforts work to limit future changes, adaptation ensures societies are prepared for the impacts that are already occurring or are likely to occur. Achieving a balance between these strategies requires international cooperation, innovative policy frameworks, and sustained investment in green finance and technology.

In conclusion, addressing climate change effectively demands a holistic approach that leverages both mitigation and adaptation strategies. By integrating these two approaches, we can create a resilient, low-carbon future that not only mitigates risks but also enhances long-term sustainability and prosperity for communities worldwide.

RECOMMENDATIONS

To ensure effective and equitable climate action, the following recommendations are proposed, focusing on integrating both mitigation and adaptation strategies while emphasising support for vulnerable groups and promoting a just transition:

1. Develop Inclusive Climate Policies with a Just Transition Focus

Governments should prioritise the development of climate policies that consider the needs of poor communities, women, and other vulnerable groups. This includes creating job opportunities in renewable energy sectors, providing skills training, and ensuring that those transitioning from carbon-intensive industries receive adequate support and reskilling programmes. The goal is to promote a fair and just transition that leaves no one behind while ensuring economic and social stability.

2. Enhance Access to Green Finance for Marginalised Communities

Financial institutions and development agencies must ensure that green finance mechanisms, such as microfinance for clean energy solutions and grants for climate-resilient agricultural practices, are accessible to poor communities and women-led enterprises. Special funding schemes should be designed to support small-scale farmers, low-income households, and women entrepreneurs, empowering them to adopt sustainable practices and enhance their resilience to climate impacts.

3. Promote Gender-Responsive Climate Action

Climate policies and programmes should be gender-responsive, recognising the critical role women play in building climate resilience and ensuring sustainable livelihoods. Governments and organisations should provide women with leadership opportunities in climate governance and decision-making processes. Tailored support programmes, such as access to resources and capacity-building initiatives, should be made available to empower women as key agents of change in the transition towards a low-carbon economy.

4. Build Climate-Resilient Infrastructure with a Focus on Vulnerable Populations

Infrastructure development must prioritise the needs of communities most at risk from climate impacts, including poor and marginalised populations. Governments should invest in projects that not only enhance overall resilience but also specifically protect vulnerable groups, such as building flood-resistant housing for low-income areas and creating early warning systems accessible to remote communities. Ensuring these communities have access to adaptive resources is vital for achieving a just and inclusive transition.

5. Empower Local Communities Through Participatory Planning

Effective adaptation strategies should involve local communities in the decision-making process. Participatory planning ensures that climate action measures are culturally appropriate and meet the specific needs of marginalised groups, including indigenous populations. This approach enhances ownership, fosters local leadership, and ensures that the benefits of climate action are shared equitably, promoting social inclusion and justice.

6. Integrate Social Safeguards into Green Investments

Governments and investors should integrate social safeguards into green projects, ensuring that investments contribute to poverty alleviation and do not disproportionately affect marginalised communities. For instance, large-scale renewable energy projects should involve fair compensation and relocation plans for affected communities, safeguarding their rights and livelihoods. This aligns with the principles of a just transition by promoting socially responsible development.

7. Targeted Capacity Building for Vulnerable Groups

Capacity-building programmes should be designed specifically for poor communities, women, and other vulnerable groups to equip them with the skills and knowledge needed for climate-resilient livelihoods. Governments and NGOs should work together to provide training in sustainable agriculture, renewable energy, and other green sectors, enhancing economic opportunities for these populations while building resilience to climate change.

8. Strengthen International Support for a Just Transition

Developed countries and international organisations must enhance financial and technical support to developing nations, with a focus on just transition frameworks. This includes facilitating access to climate funds, sharing technology, and providing technical assistance tailored to the needs of vulnerable populations. Ensuring that international cooperation promotes equity and inclusivity will help bridge development gaps and foster sustainable, resilient communities.

9. Establish Monitoring Mechanisms to Ensure Equitable Outcomes

Governments should set up transparent monitoring and evaluation systems that specifically track the impacts of climate policies on poor communities, women, and other vulnerable groups. By assessing the effectiveness of programmes and making necessary adjustments, governments can ensure that the benefits of climate action are distributed equitably and that all communities are supported in the transition.

Implementing these recommendations will foster an inclusive and just approach to climate action, ensuring that vulnerable groups and marginalised communities are empowered and protected as part of the global transition towards a sustainable, low-carbon future.

Epilogue

Why this report now – and why for INECC

We are at an inflection point. Climate finance in India is expanding, but so too are the inequalities in who accesses it. There is growing sophistication in frameworks and instruments – green bonds, taxonomies, disclosure norms – yet the conversation remains distant from the lived experience of those who must adapt first and fastest.

This is precisely why INECC chose to commission and curate *Climate Finance in India 2025*. For decades, our network has worked at the intersection of ethics, ecology, and economy. We have seen how local initiatives thrive when there is predictable, fair, and accessible finance and how they falter when finance is gated by complexity.

The timing of this report reflects both urgency and possibility. India's climate finance narrative is being rewritten from the Reserve Bank's new risk disclosure frameworks to the promise of a national climate finance taxonomy. COP30 in Belém will once again test whether commitments to the Global South are matched by real resources. Within this shifting terrain, INECC's role is to bring local intelligence to national and global tables to show that resilience is not an abstraction but a set of daily decisions shaped by access to finance, technology, and trust.

This report also signals a shift within INECC itself. We are moving beyond critique towards construction – developing tools, dialogues, and partnerships that bridge the distance between climate policy and people's priorities. Our climate finance guidebooks, local case studies, and state-level engagements in Maharashtra, Chhattisgarh, and Kerala are part of this continuum. The report stands as both a knowledge product and an invitation to reimagine climate finance as a social contract grounded in justice.

From an ethical perspective, climate finance is not only about how much money flows, but where, for whom, and to what end. It asks whether finance reinforces old hierarchies or redistributes power. Whether it strengthens the capacity of local institutions or locks them into dependency. These are questions we cannot postpone if we are to ensure a just transition in India.

The work ahead will require imagination as much as information. It will call for partnerships between government, civil society, academia, and private finance. Not as parallel actors but as co-creators. It will also require a shift in language: from “beneficiaries” to “stakeholders,” from “projects” to “pathways,” from “aid” to “agency.”

As INECC continues its engagement across states and regions, we are committed to translating the insights from this report into action through policy dialogues, capacity building, and advocacy that centre the voices of those least represented in finance rooms.

This publication closes with a simple premise: finance must follow justice. If climate finance in India can become truly inclusive – transparent, gender-responsive, and locally accountable – it will not only meet emission or adaptation targets but also renew the social and ecological contracts that sustain our democracy.

That is the larger perspective this report belongs to – a future where finance is not the privilege of the powerful but the right of every community striving to adapt, innovate, and thrive in a changing climate.

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About the Indian Network on Ethics and Climate Change (INECC)

The Indian Network on Ethics and Climate Change (INECC) is a national network that has, since 1996, brought together individuals and organisations committed to linking climate change to the lives and livelihoods of the poor and the marginalised. Registered formally as a not-for-profit society in March 2010, INECC has consistently worked to make climate discourse in India more inclusive, ethical, and grounded in justice.

INECC's members span civil society organisations, practitioners, researchers, and educators across the country. What connects them is a shared belief that communities are not just victims of climate change but are active agents of change. From early dialogues on climate justice to today's engagement in climate finance, just transition, and green skill development, the network has evolved with one constant purpose: to ensure that policy reflects people's realities.

For over two decades, INECC has played a catalytic role in building awareness and action on climate issues at local, national, and international levels. Its work ranges from facilitating community-based adaptation and resilience projects to being part of national and state-level discussions on India's climate policy processes including the National and State Action Plans, NDCs, and finance frameworks. INECC has contributed to global dialogues through its participation in successive UNFCCC Conferences of the Parties (COPs) and through partnerships with regional and global platforms across the Global South.

Today, INECC's work spans four interconnected domains:

- **Access to Climate Finance:** enabling community-level and decentralised solutions to be recognised, supported, and financed.
- **Green Skills and Livelihoods:** building pathways for youth, women, and local entrepreneurs to engage in climate-resilient economies.
- **Just Transition and Resilience:** supporting communities to move towards low-carbon futures without leaving anyone behind.
- **Communication and Advocacy:** translating complex climate policy into accessible, people-centred narratives that build understanding and agency.

The network continues to be guided by its founding vision that ethics and justice must remain at the heart of climate action, and that true sustainability emerges from equity, participation, and local ownership.

For more information, visit www.inecc.net

Colophon

Climate Finance in India 2025
Developed by the Indian Network on Ethics and Climate Change (INECC)

PRODUCTION TEAM

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Design and Layout: Charlene Sequeira

TECHNICAL SPECIFICATIONS

Typefaces: Oculi Display and Articulat CF Design

Software: Adobe Creative Suite

Format: Digital PDF

Pages: 112

CITATION

Recommended citation: Yadav, S. (2025). Climate Finance in India 2025. Indian Network on Ethics and Climate Change. India.

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