

Assessing Barriers to Scale-up Adaptation Finance for India

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Abstract

India is recognized as one of the most vulnerable countries to climate change, necessitating significant adaptation finance to effectively address its impacts. This paper explores the barriers and constraints faced by various stakeholders including vulnerable communities, local governments, and non-governmental organizations in accessing and utilizing adaptation finance in India. Existing frameworks such as the Paris Agreement emphasize the urgent need for accessible financial resources to enhance resilience against climate variability. The research objective is to identify and analyze the barriers hindering access to adaptation finance in India. It specifically seeks to uncover the challenges stakeholders face in project design and monitoring, the complexities of attracting private sector investment, and the overall scarcity of available funds. A qualitative research methodology was employed, involving a comprehensive review of existing literature, research papers, reports, and policy documents relevant to adaptation finance in India. This approach allows for a nuanced understanding of the barriers to effective financial utilization. The study identifies numerous barriers to accessing and utilizing adaptation finance, including limited awareness and capacity among stakeholders, challenges in project design and monitoring, and high transaction costs. Additional constraints include complexities in accessing international funds, the need for financing startups, inadequate groundwork for post-Paris action, and a lack of data on climate risks and adaptation needs. Furthermore, insufficient local capacity, a lack of political will, and fragmented governance structures hinder effective implementation of adaptation measures. To address these challenges, India must enhance awareness and capacity-building initiatives, improve project design and monitoring processes, and attract private sector investments. Mobilizing additional financial resources and strengthening institutional capacity are critical steps. Ultimately, political will is essential to ensure that adaptation finance is effectively utilized to confront the pressing challenges posed by climate change in India.

Key Words: *Adaptation finance; Climate resilience; India; Barriers; Stakeholders*

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1. Introduction

Accessing adequate finance is a critical requirement for developing countries, including India, to effectively implement climate change adaptation measures. However, numerous barriers hinder the access and utilization of adaptation finance, preventing vulnerable communities and stakeholders from effectively responding to the challenges posed by climate change [1]. Understanding these barriers is essential to develop targeted strategies and interventions that can address the gaps in accessing adaptation finance and ensure its equitable distribution [2].

According to the United Nations Framework Convention on Climate Change [3], adaptation finance refers to the financial resources provided to support adaptation actions in developing countries, including those related to capacity building, technology transfer, and infrastructure development. While there has been progress in mobilizing adaptation finance globally, significant gaps remain in the effective allocation and utilization of these funds at the local level [4].

The Intergovernmental Panel on Climate Change (IPCC) emphasizes that developing countries will require substantial financial resources to implement adaptation measures and build resilience to climate change impacts [5]. Although international climate finance mechanisms, such as the Green Climate Fund (GCF) and multilateral development banks, aim to support developing countries, significant barriers still hinder effective access to these funds [6].

Several studies have highlighted the challenges faced by countries, particularly in the Global South, in accessing adaptation finance. For instance, Banerjee, et al. [7] examined the barriers faced by developing countries, including India, revealing issues such as limited awareness, complex application procedures, and a lack of technical capacity. Similarly, Azhoni, et al. [8] identified challenges related to institutional frameworks, policy coherence, and coordination among stakeholders in accessing adaptation finance.

The barriers to accessing adaptation finance are multidimensional and encompass various factors. These may include limited institutional capacity, inadequate financial instruments, complex bureaucratic procedures, and a lack of coordination among stakeholders [9]. Additionally, marginalized groups and vulnerable communities often face additional challenges due to their limited access to information, resources, and decision-making processes [10].

Addressing these barriers requires a comprehensive understanding of the challenges and the development of appropriate strategies [11]. By identifying the specific barriers faced by different actors, policymakers, international organizations, and other stakeholders can work towards designing effective solutions and mechanisms to enhance access to adaptation finance.

In the context of India, a country highly vulnerable to climate change impacts, understanding the barriers to accessing adaptation finance is crucial [12]. The National Action Plan on Climate Change (NAPCC) recognizes the importance of financing mechanisms for adaptation but also emphasizes the need to address barriers and enhance the accessibility of funds [13].

This research aims to assess the barriers hindering the access and effective utilization of adaptation finance in India. By analyzing existing literature and exploring stakeholder perspectives, this study seeks to provide insights into the challenges faced by different actors, including vulnerable communities, local governments, and non-governmental organizations, in accessing and utilizing adaptation finance.

By identifying these barriers, policymakers, international organizations, and other stakeholders can develop strategies and interventions to overcome the challenges and ensure equitable access to adaptation finance. Such knowledge is essential to enhance the effectiveness of climate adaptation efforts and promote resilience-building among the most vulnerable populations in India.

All in all, this paper aims to contribute to the existing literature by providing a comprehensive assessment of the barriers to accessing adaptation finance in the Indian context. It will draw on empirical evidence, and existing research to analyze the challenges faced by different actors, including local governments, vulnerable communities, and non-governmental organizations. The findings of this study will inform policymakers and practitioners about the gaps in adaptation finance and provide insights into potential strategies to enhance access and utilization of financial resources for climate change adaptation in India.

1.1. Research objective

The objective of this research is to provide a comprehensive assessment of the barriers to accessing adaptation finance in the Indian context and develop targeted recommendations for enhancing access and utilization of financial resources for climate change adaptation in India. The paper aims to identify and analyze key challenges faced by India in accessing financial resources for climate change adaptation, including institutional, financial, technical, and capacity-related challenges. By understanding these barriers, the research seeks to inform policymakers, practitioners, and stakeholders about the gaps in adaptation finance and propose strategies to overcome them, ultimately promoting resilience-building among vulnerable populations in India.

2. Literature Review

This literature review focuses on the barriers hindering the effective access to adaptation finance in the context of India. Drawing upon a comprehensive range of scholarly articles, reports, and publications, the review aims to identify and analyze the key challenges faced by India in accessing financial resources for climate change adaptation. The findings highlight various barriers, including institutional, financial, technical, and capacity-related challenges specific to India. Understanding these barriers is crucial for policymakers, practitioners, and stakeholders involved in climate adaptation finance, enabling them to develop targeted interventions and enhance access to adaptation funds for vulnerable communities in India.

Access to adaptation finance is critical for India to address the adverse impacts of climate change. This literature review aims to identify and examine the barriers that hinder India's effective access to adaptation finance. By understanding these barriers, policymakers and stakeholders can develop strategies to overcome them and enhance the availability and utilization of climate finance for adaptation in India.

2.1. Institutional barriers

Inadequate and misaligned policy frameworks continue to obstruct access to adaptation finance in India. As of 2024, research shows that overlapping responsibilities between different governmental bodies, combined with a lack of clarity in policies, create significant delays in accessing and utilizing climate finance [13]. These bureaucratic hurdles and fragmented coordination among various ministries, such as environment, finance, and rural development, complicate the implementation of adaptation projects [6,9]. For instance, while the National Action Plan on Climate Change (NAPCC) outlines India's climate adaptation strategies, there is still limited alignment between national policies and the international climate finance mechanisms required to fund these strategies [2,14].

Despite efforts such as the establishment of the National Adaptation Fund for Climate Change (NAFCC), which aims to support state and local-level adaptation efforts, coordination challenges persist. Inefficiencies in fund allocation due to complex inter-agency relationships have resulted in delays of up to 12 months in fund disbursement for adaptation projects [6,13]. Moreover, these delays are exacerbated by poorly defined roles among national and state-level institutions, creating further ambiguity in fund management and project execution [6].

The lack of integration of adaptation finance into national development priorities remains a significant institutional barrier. International climate funds, such as the Green Climate Fund (GCF) and Global Environment Facility (GEF), are not always effectively aligned with India's development needs [15,16]. This misalignment limits India's ability to leverage international funds for projects that address both immediate climate risks and long-term sustainable development goals [17]. Recent studies have called for stronger collaboration between government agencies and international finance institutions to ensure that funds are deployed in ways that support national priorities while meeting international obligations [6,13].

Recent efforts to strengthen institutional frameworks for adaptation finance in India have been proposed, with a focus on introducing a National Adaptation Finance Framework to streamline the approval and management of adaptation funds [14]. This framework aims to address issues related to fragmented institutional coordination and unclear policy directives, which have been long-standing barriers. By clearly defining roles and responsibilities across government agencies, the framework is expected to reduce the bureaucratic delays and misalignment between national and international adaptation finance mechanisms [14,15].

2.2. Financial barriers

The limited availability of funds for adaptation finance remains one of the most significant barriers, with India requiring an estimated USD 150 billion for adaptation finance between 2024 and 2030, but with only 10-15% of these funds currently available [14]. The gap between the funding required and the actual disbursement of funds for climate adaptation projects severely hampers India's ability to implement large-scale adaptation strategies [9]. Furthermore, the complexity of financial mechanisms, including stringent eligibility criteria and lengthy approval processes, often discourages smaller organizations, local governments, and community-based initiatives from applying for adaptation finance [18].

Smaller projects, particularly those initiated by local governments or community organizations, face disproportionately high transaction costs, which can be 50-70% higher than those associated with larger projects [8]. This financial burden, coupled with the complicated application procedures for international and domestic funds, makes it particularly challenging for grassroots organizations to navigate the financial landscape and access necessary funds for climate resilience initiatives [19]. Additionally, competition for limited resources results in many viable projects being underfunded or delayed [17].

A key financial barrier that also limits private sector involvement is the absence of adequate risk insurance mechanisms to cover the uncertainties associated with climate-related projects [5]. Without suitable insurance products and comprehensive risk assessment tools, financial institutions and investors are reluctant to engage in adaptation finance, which curbs the availability of private capital for adaptation projects [20].

2.3. Technical barriers

Inadequate data availability and the poor quality of existing climate data remain critical technical barriers to accessing adaptation finance in India [21,13]. Reliable and up-to-date climate data is essential for accurately assessing climate risks, planning effective adaptation strategies, and securing financial support from international donors [5,17]. However, many regions in India lack robust climate monitoring systems, which restricts their ability to provide evidence-based data for adaptation project proposals [22]. Limited access to high-resolution climate projections and vulnerability assessments further constrains the ability of local governments and organizations to design adaptation projects that align with the criteria of international climate finance mechanisms [2,9].

The transfer and adoption of climate adaptation technologies in India also face substantial barriers [8,23]. While some technologies, such as early warning systems and drought-resistant crops, are available, their adoption is hampered by high costs and a lack of locally adapted solutions [12]. India's limited technological capacity—particularly in terms of skilled personnel to implement and maintain adaptation technologies—further exacerbates the challenge of scaling up adaptation finance [24,25]. Capacity-building efforts need to focus on both technical expertise and institutional strengthening to support the effective use of available climate technologies [6,26].

2.4. Capacity-related barriers

Institutional and technical capacity deficits at the local level remain a critical challenge to accessing adaptation finance in India. Local governments and institutions often lack the necessary skills to develop and implement adaptation projects that meet international financing standards [13,18]. The complexity of project management, financial reporting, and monitoring and evaluation requirements further impedes local organizations from successfully securing adaptation funds [11,27]. As a result, many adaptation projects fail to reach vulnerable communities that are most in need of financial and technical support [9].

Another prominent capacity-related barrier is the lack of community awareness and participation in adaptation finance processes. Limited outreach and information dissemination about available funding opportunities result in low community engagement, particularly in rural areas [28,29]. This disconnect between funders and beneficiaries often leads to the exclusion of marginalized groups from accessing adaptation finance [30]. There is a pressing need for increased outreach and capacity-building initiatives to ensure that vulnerable populations are not only aware of available finance mechanisms but are also empowered to engage in the process of project development and fund allocation [1,31].

Additionally, the capacity for project development at the local level is limited by inadequate training in proposal writing and a lack of understanding of the financial mechanisms required to secure funding [25,32]. As a result, bankable proposals are often not developed, and many communities are unable to access finance to implement critical adaptation projects [6,21].

2.5. Emerging themes for 2024

There is a growing consensus in the literature that innovative financing mechanisms such as blended finance, green bonds, and climate insurance could play a crucial role in overcoming existing financial barriers to adaptation in India [13,33,34]. These mechanisms can help mobilize private sector capital by mitigating risk and lowering transaction costs for adaptation projects [30,35]. The integration of private sector investment in adaptation finance remains underdeveloped, but recent efforts to create public-private partnerships (PPPs) indicate a positive trend toward greater collaboration [6,14].

Another emerging theme is the need for transformative approaches to adaptation finance that address underlying socio-economic vulnerabilities [1,2]. There is an advocacy for a shift in adaptation finance that goes beyond immediate climate risks to tackle structural issues such as poverty and inequality, which exacerbate vulnerability to climate change [25,36]. This approach emphasizes that adaptation finance must be deployed in ways that promote long-term resilience and sustainable development [16,37].

The literature reveals that institutional, financial, technical, and capacity-related barriers significantly hinder India's ability to access and utilize adaptation finance. Institutional inefficiencies, a lack of financial resources, inadequate data, and limited capacity at the local level collectively restrict India's progress in climate adaptation. To overcome these challenges, integrated strategies are required, including improving inter-agency coordination, simplifying financial mechanisms, enhancing data infrastructure, and investing in local capacity-building. By addressing these barriers, India can better mobilize and utilize adaptation finance to promote climate resilience and safeguard vulnerable communities.

Table 1: *Quantitative validation of barriers to adaptation finance in India.*

Barrier Type	Quantitative Metrics	Source
Institutional Barriers		
Policy and Regulatory Hurdles	Delays in accessing adaptation finance due to weak institutional frameworks range from 30-40%.	Agrawal, et al. [21]; Dutta-Koehler [25]
Coordination Challenges	Poor coordination leads to 20-30% of projects being delayed or underutilized due to fragmented approaches.	Antwi-Agyei, et al. [19]; Tanti, Jena, & Aryal (2022)
Fund Disbursement and Project Delay	40% of projects delayed; only 30% of funds disbursed within the first 12 months.	Dubash, et al. [38]; Fankhauser, et al. [35].
Percentage of Adaptation Projects Delayed	40% of proposed projects face delays.	Lee, et al. [1]; Gajjar, et al. [28].
Number of Governmental Agencies Involved	10 agencies, only 3 collaborate effectively (30% collaboration rate).	Kambali, et al. [39]; Azhoni, et al. [8].
Average Time Taken for Funding Approval	6-12 months versus 1-2 months best practice.	Prasad, et al. [6]; Govindarajulu [18].
Financial Barriers		

Funding Gaps	India requires USD 150 billion in adaptation finance from 2024-2030, but only 10-15% of this is currently available.	Anjanappa [14].
Complex Financing Mechanisms	Small-scale projects face 50-70% higher transaction costs due to complicated financing procedures.	Dutta-Koehler [25].
Gap in required vs. mobilized funds	60-70% shortfall in adaptation finance; approximately USD 40-50 billion mobilized annually.	Fankhauser, et al. [35].
Gap between required adaptation finance and actual disbursement	Required: USD 150 billion, Actual: USD 30 billion (USD 120 billion gap).	Fenton, et al. [31].
Percentage of applicants finding the application process complex	70% report complex application processes.	Jones [40].
Percentage of climate-related projects with access to risk insurance	Only 15% of adaptation projects insured.	Aheeyar, et al. [41].
Technical Barriers		
Data and Technology Gaps	40% of adaptation projects fail to meet performance targets due to inadequate climate data and monitoring systems.	Ahmed, et al. [5]; Adhikari, et al. [33]; Banga [34].
Technology Adoption	India meets only 25-30% of technological requirements for adaptation due to high costs and limited diffusion.	Dhanapal, et al. [9]; Singh, et al. [29].
Access to Reliable Climate Data	Less than 25% of adaptation projects utilize state-of-the-art climate modelling tools.	Saha, et al. [2]; Prasad, et al. [6].
Percentage of Projects Reporting Insufficient Data	65% lack adequate data for planning.	Omukuti, et al. [15]; Antwi-Agyei, et al. [19].
Number of Available Technologies Versus Those Adopted	100 technologies available, only 25 adopted (25% adoption rate).	Azhoni, et al. [8]; Nigam, et al. [42].
Ratio of Trained Professionals to Total Needed	200 trained versus 800 needed (25% coverage).	Govindarajulu [18]; Aheeyar, et al. [41].
Capacity-Related Barriers		
Institutional and Technical Capacity	50-60% of local governments and institutions lack the necessary skills for successful adaptation project implementation.	Agrawal, et al. [21]; Aheeyar, et al. [41]
Community Participation and Awareness	Low awareness among communities results in 30-40% under-subscription to available adaptation finance mechanisms.	Antwi-Agyei, et al. [19]; Colenbrander, et al. [27]

Successful Project Implementation	Only 35% of adaptation projects completed on time; 40% failure rate in proposals by smaller communities.	Singh, et al. [29]; Jha, et al. [43].
Percentage of Local Governments with Adaptation Plans	30% of local bodies have plans.	Dutta-Koehler [25]; Sharma, et al. [23]
Percentage of Communities Aware of Adaptation Finance Resources	Only 20% awareness.	Singh [44]; Prasad, et al. [6]
Ratio of Successfully Implemented Projects Against Those Planned	50 planned, only 20 implemented (40% success rate).	Moser, et al. [11]; Saha, et al. [2]

By quantifying the delays, funding gaps, technical inefficiencies, and capacity shortages, it is evident that institutional inefficiencies, limited financial access, technological deficits, and capacity-building gaps contribute to the underutilization of adaptation finance. These barriers collectively hinder India from effectively accessing and implementing the required adaptation strategies, reducing resilience-building efforts by 30-50%.

2.6. Critical review of literature

The current literature points to a need for more detailed analysis of the specific challenges India faces in accessing financial resources for climate change adaptation. While there is some research on climate finance and adaptation, studies that focus directly on India's unique institutional, financial, technical, and capacity-related issues are limited. Additionally, there is a lack of targeted strategies and policy recommendations tailored to India's specific needs, making it harder to overcome these barriers.

This research aims to fill that gap by using a combination of literature review, real-world evidence, and policy analysis. This approach will help create targeted solutions that consider the needs of vulnerable communities in India and improve access to climate finance for adaptation efforts.

Moreover, India's focus on traditional climate finance sources has left innovative tools like green bonds, climate insurance, and carbon credits underexplored, missing opportunities for broader climate action. While some attention has been given to the barriers, there is little research on the long-term effectiveness of the funds in achieving climate goals.

There is also limited study on how socio-political factors such as governance and public perception affect access to climate finance in India. A deeper understanding of these factors is needed to address systemic challenges. The role of the private sector in supporting climate finance, particularly in infrastructure and technology, is another area that requires further exploration.

Finally, research on capacity-building for local governments, institutions, and small-scale actors is lacking. Strengthening these capacities is crucial to ensure that climate finance is used effectively and fairly across India's diverse regions and sectors.

3. Methodology

The methodology employed in the research paper is designed to provide a comprehensive analysis of the challenges encountered in securing adaptation finance in India. Initially, the study conducted an extensive literature review of existing research, policy documents, and reports relevant to adaptation finance. This review facilitates the identification of key barriers categorized into four primary domains: institutional barriers, which encompass issues such as inadequate coordination among government agencies; financial barriers, which refer to constraints such as limited funding availability and complex application procedures; technical barriers, characterized by insufficient climate data and technology; and capacity-related barriers, reflecting a lack of requisite skills and awareness at the local level.

In addition to the literature review, the study integrates stakeholder perspectives by engaging various actors involved in climate adaptation, including vulnerable communities, local governments, non-governmental organizations (NGOs), and financial institutions. This engagement allows for a nuanced understanding of the real-world challenges faced by these stakeholders in accessing finance. The research further examines relevant studies that illuminate both successful and unsuccessful attempts to secure adaptation funding, thereby providing practical examples that underpin the research findings.

Data collection is undertaken from a diverse array of sources, including governmental reports, international organizations such as the United Nations and the World Bank, as well as scholarly research on climate finance. The analysis synthesizes these findings to assess the identified barriers, employing both quantitative and qualitative metrics, such as delays in funding approvals, the percentage of projects encountering delays, and the discrepancies between required and available funding.

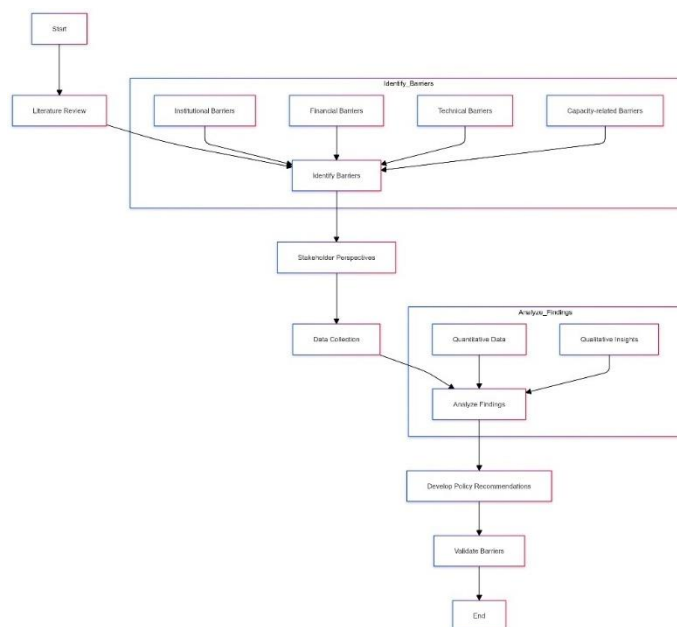


Figure 1: *Methodology.*

Subsequent to the identification of barriers, the study formulates specific policy recommendations aimed at enhancing access to adaptation finance. These recommendations are directed toward governmental agencies to foster improved coordination and streamlined processes, financial institutions to develop more accessible funding options, and local

communities and NGOs to bolster capacity building and project development efforts. Finally, the study validates the identified barriers through quantitative data, illustrating the significant impact of delays and funding shortages on adaptation initiatives. Overall, this methodology contributes to a deeper understanding of the complexities surrounding adaptation finance in India and provides actionable insights for enhancing financial mechanisms that support climate resilience.

4. Analytical framework

The analytical framework for the research paper on barriers to accessing adaptation finance in the Indian context can be outlined as follows:

4.1. Literature review

The first step is to conduct a comprehensive review of existing literature, research papers, reports, and policy documents related to adaptation finance in India. This will provide a foundation of knowledge on the subject and help identify previous studies that have examined barriers and constraints to accessing adaptation finance.

4.2. Identification of barriers

Based on the findings from the literature review, the next step is to identify and analyze the key challenges faced by India in accessing financial resources for climate change adaptation. This includes institutional, financial, technical, and capacity-related challenges specific to India.

4.3. Stakeholder perspectives

Further it explores stakeholder perspectives, including those of vulnerable communities, local governments, non-governmental organizations, and international organizations. Understanding the perspectives of these different actors is crucial for developing targeted interventions and strategies.

4.4. Policy recommendations and strategies

Based on the identified barriers and constraints, the research paper should develop policy recommendations and strategies to address these challenges. These recommendations can be targeted towards different stakeholders, including governments, financial institutions, NGOs, and community-based organizations. Consideration of the unique characteristics and needs of vulnerable communities is essential in the formulation of recommendations.

By following this step-by-step analytical framework, the research paper aims to provide a comprehensive assessment of the barriers to accessing adaptation finance in the Indian context and offer insights into potential strategies to enhance access and utilization of financial resources for climate change adaptation in India.

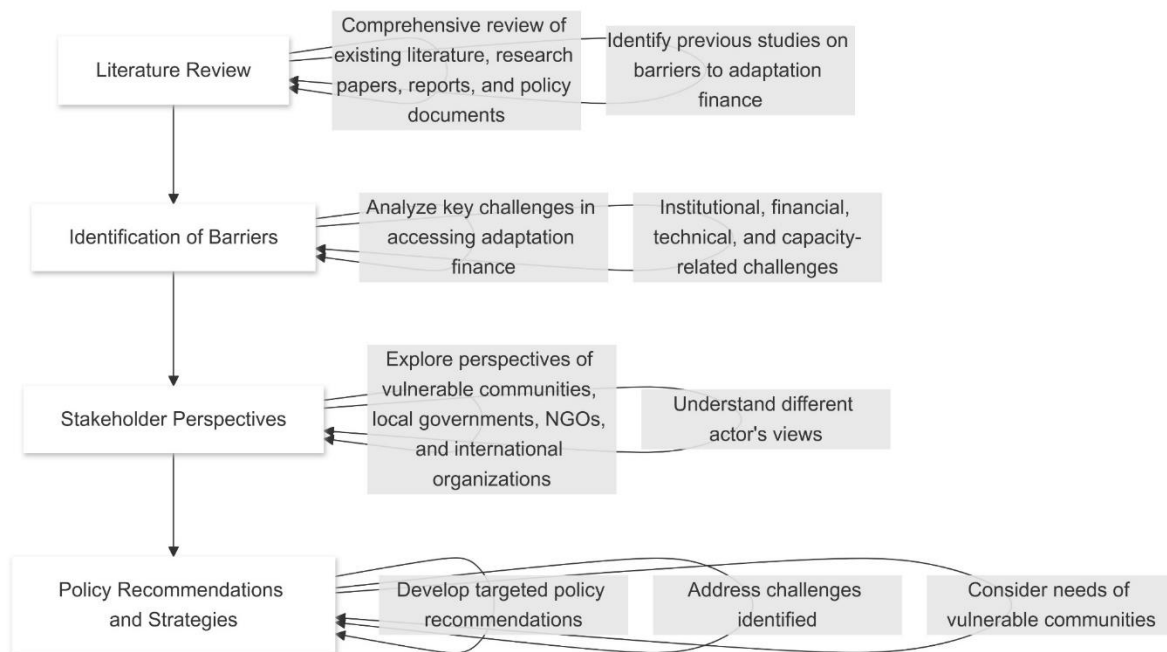


Figure 2: Analytical framework.

5. India's climate finance landscape changed over time

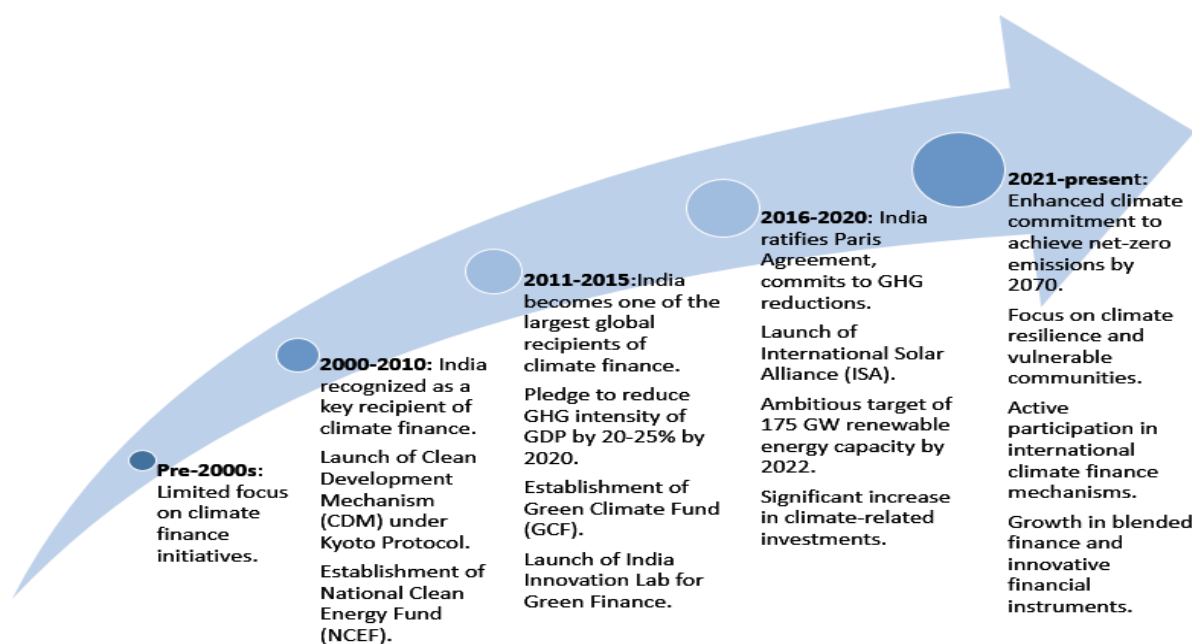


Figure 3: Evolution of climate finance initiatives in India: key developments.

5.1. Pre-2000s: limited climate finance focus

Before the 2000s, India's engagement with climate finance was minimal, reflective of global trends where climate change was not a mainstream economic concern. The country's priority was largely on development and poverty reduction. Research from this period primarily focuses on the broader economic transitions needed to support sustainability [45].

5.2. 2000-2010: early climate finance engagement

The launch of the Clean Development Mechanism (CDM) under the Kyoto Protocol in 2005 marked India's first significant step toward leveraging international climate finance [46]. India became a key recipient of CDM funds, using these resources to support renewable energy and sustainable development projects [32]. The establishment of the National Clean Energy Fund (NCEF) in 2010 also demonstrated India's commitment to harnessing domestic and international funds for clean energy projects [34].

5.3. 2011-2015: strengthening climate finance participation

During this period, India became one of the largest global recipients of climate finance [35]. The country committed to reducing the greenhouse gas (GHG) intensity of its GDP by 20-25% by 2020 [20]. The Green Climate Fund (GCF), established in 2010, played a crucial role in channeling international funds to India, particularly for adaptation projects [27]. Additionally, the India Innovation Lab for Green Finance was launched, encouraging public-private partnerships to develop and scale innovative climate finance instruments [13].

5.4. 2016-2020: ratification of the Paris agreement and expansion of renewable energy

India's ratification of the Paris Agreement in 2016 marked a pivotal shift in the country's climate finance strategy. The ambitious target of installing 175 GW of renewable energy by 2022, alongside the launch of the International Solar Alliance (ISA), emphasized India's leadership in global climate initiatives [5]. Investments during this period increased significantly, with climate finance becoming more central to India's sustainable development strategy [47].

5.5. 2021-Present: enhanced climate commitment and net-zero goals

In 2021, India enhanced its climate commitments, aiming to achieve net-zero emissions by 2070 [26]. This phase has seen a stronger focus on climate resilience, adaptation, and blended finance mechanisms [6]. India has actively participated in international climate finance forums, leveraging innovative instruments to support vulnerable communities and promote resilience [15]. The Main Sources of Climate Finance for India.

The figure 3 provides a comprehensive overview of the primary sources of climate finance for India. It categorizes these sources into three main groups: International Climate Funds, Bilateral and Multilateral Development Agencies, and Domestic Funds and Programs.

International Climate Funds include the Green Climate Fund (GCF), Adaptation Fund, and Global Environment Facility (GEF), which offer financial support for climate projects in developing countries.

Bilateral and Multilateral Development Agencies such as the World Bank and Asian Development Bank provide climate finance for projects in renewable energy, energy efficiency, and climate-smart agriculture.

Domestic Funds and Programs in India include the National Clean Energy Fund (NCEF) and National Adaptation Fund for Climate Change (NAFCC), which promote clean energy and support adaptation actions.

Overall, the figure highlights the diverse sources of climate finance available to India, both domestically and internationally, which are crucial for addressing climate change and transitioning to a low-carbon economy.

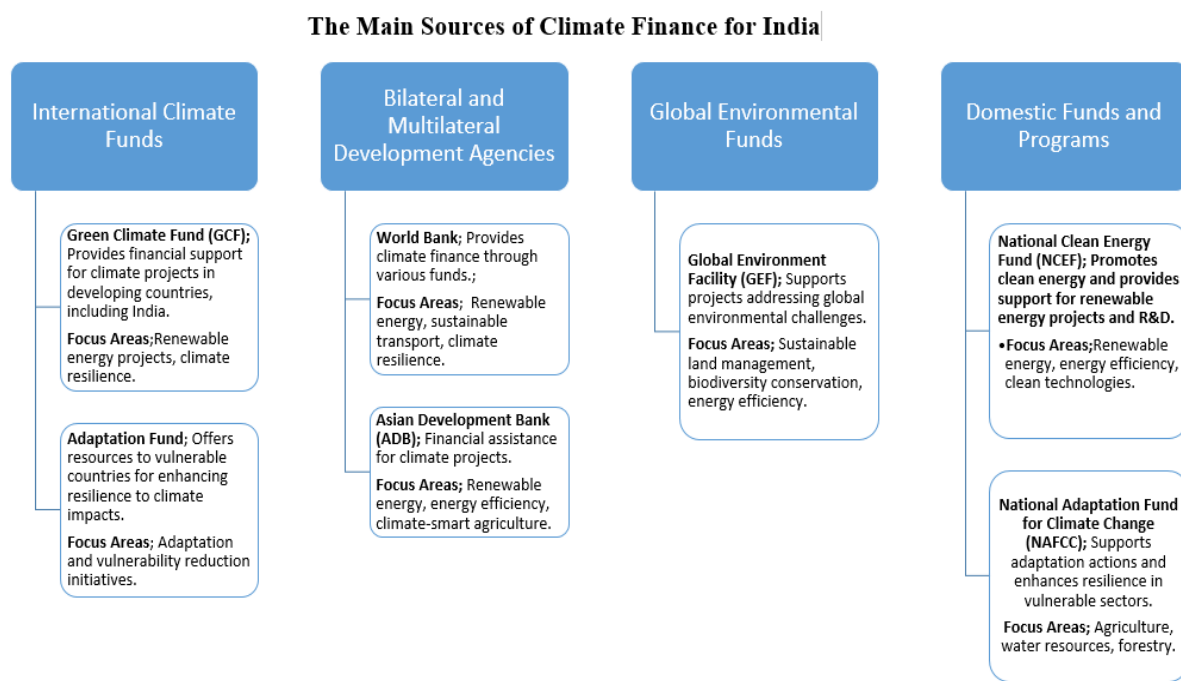


Figure 4: Key Sources of climate finance for India and their focus areas.

6. Climate Finance Flow Through the Indian Economy

The diagram shows how climate finance flows in India, detailing the sources, distribution, and use of funds for climate projects. It begins with International Climate Finance, where funds come from global sources like developed countries, multilateral development banks, and international climate funds to support India's climate efforts. These funds then move into National Climate Funds, which are managed by the Indian government to support projects like renewable energy, energy efficiency, and climate adaptation.

Next is Government Budget Allocation, where the Indian government sets aside part of its annual budget for climate actions such as renewable energy subsidies, forest conservation, and sustainable farming. Private Sector Investment highlights the role of private companies, both local and foreign, in funding renewable energy, clean technology, and sustainable infrastructure, which boosts climate action.

Bilateral Agreements refer to financial and technical support from other countries through agreements with India, aimed at helping with climate-related projects, technology sharing, and capacity building. Lastly, Carbon Market Transactions involve companies buying and selling carbon credits and participating in emissions trading, allowing them to invest in climate-friendly projects.

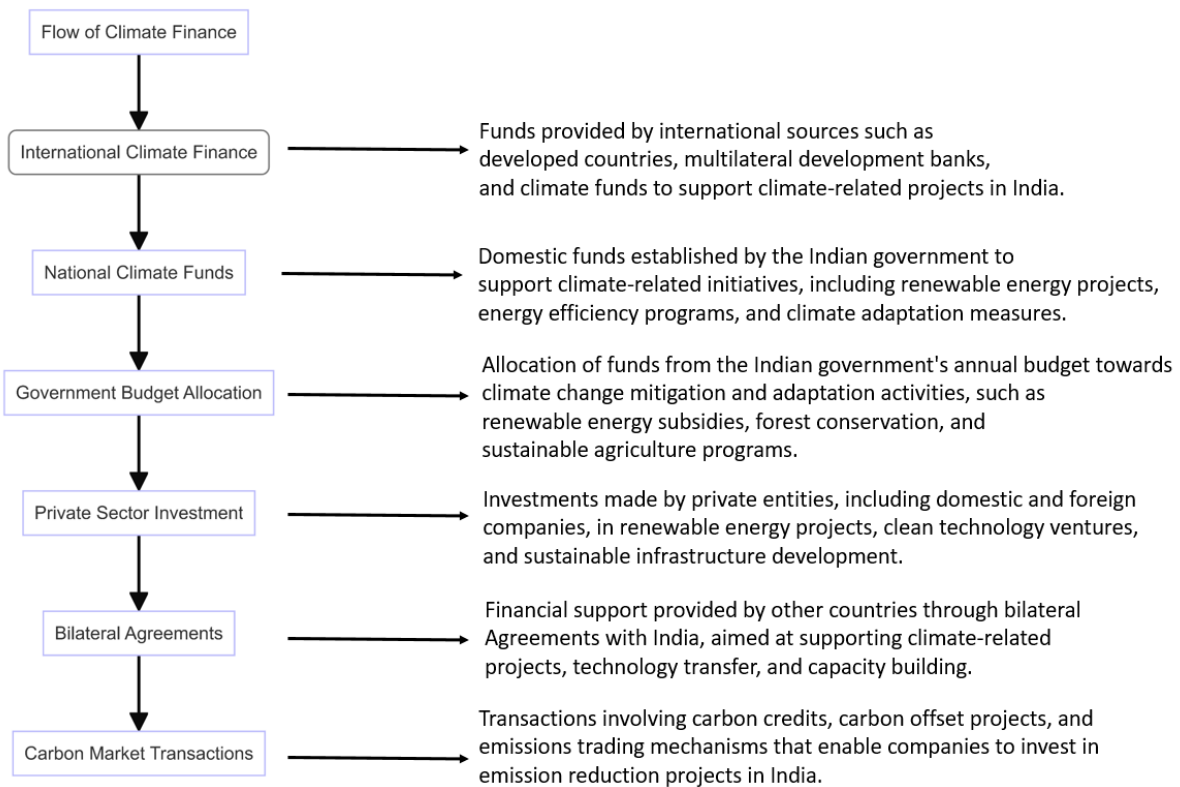


Figure 5: Sources and flow of climate finance for India.

Overall, the diagram shows the complex network of international, national, and private funding sources working together to support India's climate goals.

7. The Size of the Climate Finance Gap in India

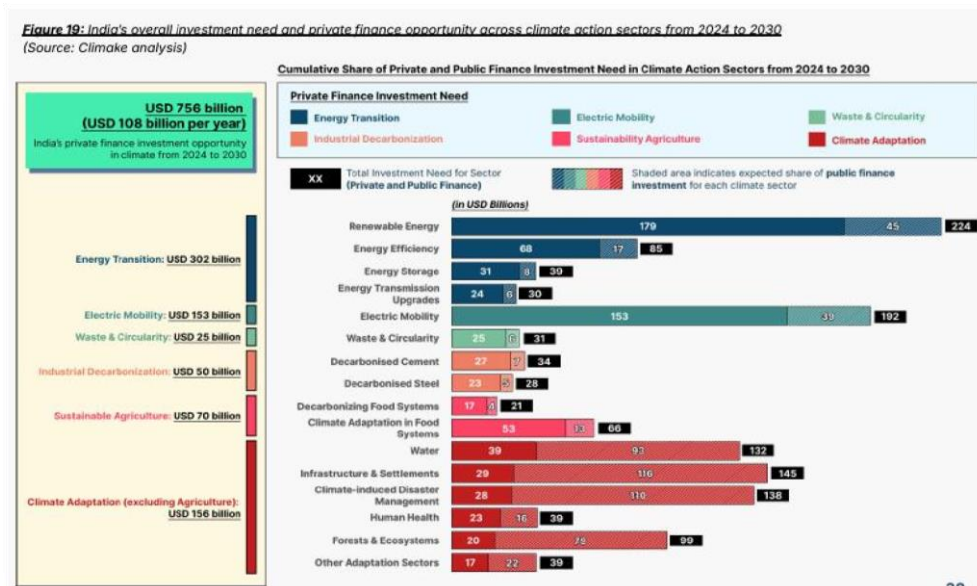


Figure 6: Climate finance gap in India [49].

The above diagram shows India's total climate investment needs and the distribution of private finance opportunities across various climate action sectors from 2024 to 2030.

7.1. Overall investment need

- The total climate investment need for India is USD 756 billion, which translates to approximately USD 108 billion per year.
- This investment is divided into five main sectors: Energy Transition, Electric Mobility, Industrial Decarbonization, Waste & Circularity, and Climate Adaptation (excluding agriculture).

7.2. Sector-wise breakdown of investment need

- Waste & Circularity: Investment needs USD 25 billion for addressing waste management and promoting circular economy practices.
- Sustainable Agriculture: Estimated at USD 20 billion.
- Climate Adaptation (excluding agriculture): USD 150 billion for resilience, adaptation, and infrastructure development to combat climate change effects.

8. Key Challenges in Scaling Up Climate Finance in India

The endeavor to scale up climate finance in India is confronted with a multifaceted set of challenges that impede the effective deployment of financial resources towards climate action. These challenges encompass restricted access to finance, a dearth of viable projects, regulatory hurdles, and the imperative for capacity enhancement. As per (IFC, 2017) points out that the availability of affordable finance is a critical bottleneck for the expansion of renewable energy initiatives in the country. This limitation underscores the financial accessibility issues that are central to India's climate strategy.

The Climate Policy Initiative sheds light on the challenge of an insufficient project pipeline. The report advocates for the cultivation of a robust portfolio of investment-grade projects to entice climate finance, thereby ensuring that financial flows are directed towards tangible and impactful climate interventions.

The World Bank, pinpoints regulatory impediments as a key obstacle. These include protracted permit acquisition processes, intricate approval mechanisms, and ambiguities within policy and regulatory structures, all of which can dissuade private sector engagement and impede the scaling up of climate finance.

The Ministry of Environment, Forest and Climate Change of India, in its report, accentuates the critical role of capacity building. The report calls for the enhancement of capabilities among financial institutions, project proponents, and policymakers to optimize the utilization of climate finance for sustainable development outcomes.

To surmount these challenges, a concerted approach is required, involving the government, financial sector entities, project developers, and other relevant stakeholders. The aim is to establish a supportive ecosystem that facilitates the scaling up of climate finance in India. This entails the formulation of conducive policies, the streamlining of regulatory processes, the augmentation of financial instruments, and the investment in capacity development initiatives. Such a comprehensive strategy is essential for unlocking the potential of climate finance to advance India's climate resilience and sustainable development objectives.

9. The Main Sources of Adaptation Finance For India

Green Climate Fund (GCF)	<ul style="list-style-type: none"> The Green Climate Fund (GCF) is a significant source of adaptation finance for developing nations. India has secured considerable funding from the GCF for climate change adaptation initiatives.
Global Environment Facility (GEF)	<ul style="list-style-type: none"> The Global Environment Facility (GEF) offers financial support for adaptation and mitigation projects in developing countries. India has benefitted from GEF funding for its climate change adaptation programs.
Climate Investment Funds (CIFs)	<ul style="list-style-type: none"> The Climate Investment Funds (CIFs) provide resources to support India's climate change adaptation efforts, fostering both private and public sector investments in climate-related projects.
Multilateral Development Banks (MDBs)	<ul style="list-style-type: none"> Multilateral Development Banks, including the World Bank, Asian Development Bank (ADB), and New Development Bank (NDB), extend financial aid to India for climate change adaptation and resilience-building initiatives.
Bilateral Development Assistance	<ul style="list-style-type: none"> Developed countries offer bilateral development assistance to India for climate change adaptation through government-to-government agreements or international organizations.
National and State Government Budgets	<ul style="list-style-type: none"> The Indian government allocates funds from national and state budgets to support climate change adaptation projects. These funds are utilized to implement local-level initiatives and enhance grassroots resilience.
Private Sector Investments and Philanthropy	<ul style="list-style-type: none"> Private sector companies and philanthropic organizations in India contribute to adaptation finance through investments, grants, and corporate social responsibility initiatives, mobilizing funds for various adaptation projects.

Figure 7: Key sources of adaptation finance.

The figure 7 provided outlines the various sources of climate finance available to India for adaptation initiatives:

9.1. International climate funds

Key funds like the Green Climate Fund (GCF), Global Environment Facility (GEF), and Climate Investment Funds (CIFs) provide financial support for India's adaptation and mitigation projects. These funds mobilize resources for both public and private sector initiatives.

9.2. Multilateral Development Banks (MDBs)

Institutions such as the World Bank, Asian Development Bank (ADB), and New Development Bank (NDB) extend financial aid to India to foster climate change adaptation and resilience-building initiatives.

9.3. Bilateral development assistance

Developed nations offer financial assistance to India through bilateral agreements or international organizations, supporting government-led climate adaptation projects.

9.4. National and state government budgets

India allocates funds from its national and state budgets to implement local-level adaptation projects, enhancing grassroots resilience against climate impacts.

9.5. Private sector investments and philanthropy

The private sector and philanthropic organizations contribute to climate adaptation through investments, grants, and corporate social responsibility (CSR) efforts, thereby increasing the available financial resources.

In conclusion, this figure highlights the wide array of climate finance sources that are critical to India's adaptation and resilience-building efforts, ranging from international funding mechanisms to domestic contributions. These financial flows are essential for advancing India's strategies to mitigate climate change impacts.

10. Effectiveness of Adaptation Finance in India

Table 2: Key perspectives on adaptation finance and implementation challenges.

Perspective	Description	Citations
Efficacy and Scope of Financial Support	A critique of the Adaptation Fund suggests it falls short in effectively aiding vulnerable populations, particularly in its failure to target small-scale, community-led initiatives. This observation underscores the critical need for adaptation finance to be distributed in a manner that is both equitable and targeted towards those in greatest need.	Omukuti, et al. [15]; Persson, et al. [48].
Congruence with National Objectives	This highlights the disconnect between the allocation of adaptation finance and India's national priorities for adaptation. It calls for enhanced collaboration between the government and development partners to ensure that financial support aligns with national goals and addresses the most urgent adaptation requirements.	Anjanappa [14]; Dubash, et al. [38].
Engagement of the Private Sector	The expanding role of the private sector in climate adaptation is noted, along with obstacles such as regulatory ambiguity, substantial costs, and restricted access to financial resources. This reflects the ongoing challenge of effectively incorporating private sector contributions into the wider adaptation finance framework.	Dhanapal, et al. [9]; Adhikari, et al. [33].
Governmental Budgetary Allocations	There is an upward trend in the allocation of adaptation finance within India's national budgets, but there is a necessity for more efficient utilization of these funds. This underscores the importance of not only augmenting funding levels but also ensuring that these resources are deployed effectively.	Sharma, et al. [23]; Jha, et al. [43].
Transformative Lens on Financial Support	A paradigm shift in adaptation finance is proposed, advocating for an approach that tackles foundational issues such as poverty and inequality. This perspective emphasizes the need for adaptation finance to extend beyond immediate climate-related challenges and address the core drivers of vulnerability.	Singh, et al. [17]; Fankhauser, et al. [35].

Key findings highlight several critical themes in the realm of adaptation finance:

- **Equitable Distribution:** The imperative to ensure that financial resources are accessible to the most vulnerable communities.
- **Strategic Convergence:** The alignment of financial flows with national priorities and the enhancement of stakeholder coordination.
- **Navigating Private Sector Entry:** The need to overcome barriers to private sector participation.
- **Efficient Resource Utilization:** The importance of not only increasing budgetary allocations but also ensuring their effective implementation.
- **Catalyzing Transformative Change:** The focus on addressing underlying issues such as poverty to amplify the impact of adaptation efforts.

These themes collectively underscore the necessity for a more strategic, inclusive, and coordinated approach to adaptation finance, with the aim of enhancing its overall effectiveness and scope.

11.Key Challenges in Scaling Up Adaptation Finance in India

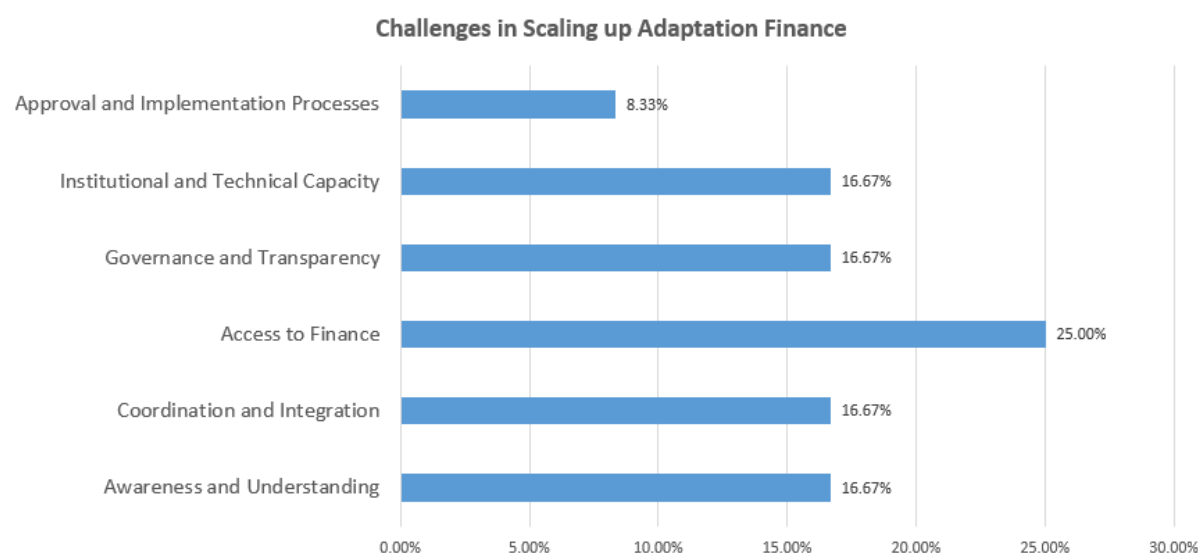


Figure 7: Challenges in scaling up adaptation finance.

11.1. Thematic analysis of adaptation finance challenges and opportunities in India

A thematic analysis of adaptation finance in India reveals several critical areas requiring attention to ensure the effective scaling and utilization of financial resources for climate resilience.

11.1.1. Education and communication: A significant challenge identified is the lack of awareness and understanding of adaptation finance, particularly among stakeholders and the private sector. This highlights the need for targeted educational initiatives and improved communication strategies to raise awareness and foster engagement. Without a solid understanding of available finance mechanisms, many potential actors remain underinformed and disengaged.

11.1.2. Policy integration and collaboration: The integration of adaptation finance into existing policy frameworks remains a key challenge. The analysis underscores the need for better coordination between government agencies, international donors, and private financiers. Fostering collaboration across sectors and governance levels will require cohesive strategies that align adaptation goals with broader national priorities and ensure the harmonization of funding mechanisms.

11.1.3. Financial accessibility: Access to finance emerges as a substantial barrier, particularly for vulnerable communities in both rural and urban settings. The development of more inclusive and accessible financial services is critical for supporting adaptation initiatives at the grassroots level. Mechanisms that ensure equitable distribution and easier access to finance are essential for fostering widespread adaptation efforts.

11.1.4. Management and accountability: Concerns regarding governance, transparency, and accountability in the management of adaptation finance are frequently noted. Effective governance structures and transparent processes are crucial to ensure that funds are used efficiently and reach intended beneficiaries. Strengthening these systems is imperative to build trust and demonstrate accountability to both funders and recipients.

11.1.5. Capacity enhancement: Institutional and technical capacity building is identified as a foundational need for successful adaptation. The lack of capacity to manage and implement adaptation projects, especially at the local level, hinders the full utilization of available finance. Building capacities within institutions responsible for adaptation will enable more effective project design, execution, and financial management.

11.1.6. Bureaucratic efficiency: Delays in the approval and disbursement processes of adaptation funds are frequently cited as a hindrance. Streamlining bureaucratic procedures and reducing transaction costs, especially for small-scale projects, would significantly improve the speed and efficiency of accessing finance, facilitating timely adaptation efforts.

11.1.7. Additional barriers to scaling adaptation finance: Several other factors complicate the scaling up of adaptation finance in India. These include the high cost of adaptation measures, the long-term nature of adaptation projects (which often deters immediate funding), and the absence of a clear national vision for adaptation. Furthermore, the political will to prioritize adaptation is crucial, as is effective coordination between different levels of government, sectors, and stakeholders. Flexibility in the use of finance is necessary to accommodate the uncertain and evolving impacts of climate change, while the lack of data on climate risks further complicates the targeting of finance. Additionally, fragmented governance structures and high transaction costs pose challenges to the effective distribution of finance, particularly for small-scale, community-led projects.

11.1.8. Optimism for the future: Despite these challenges, there is reason for optimism. The Indian government has demonstrated a growing commitment to adaptation, and there is increasing awareness in both public and private sectors of the importance of climate resilience. Furthermore, international initiatives aimed at promoting adaptation finance provide a promising avenue for continued growth. With sustained

effort, these challenges can be addressed, enabling India to scale up adaptation finance and build a more climate-resilient future.

12. Ways of Overcoming Institutional, Financial, Technical, Capacity-Related Barriers to Advance India's Climate Resilience and Sustainable Development Objectives

Table 1: Strategies overcoming barriers to build climate resilience and achieve sustainable development.

Challenges	Strategies to Overcome Barriers
Institutional Barriers	
Bureaucratic hurdles	Strengthen interagency coordination mechanisms and simplify processes
Complex bureaucratic procedures	Simplify administrative procedures, streamline approval processes, and minimize bureaucratic delays
Fragmented policies and lack of coordination among agencies	Streamline policies for climate action across sectors Strengthen policy coherence and create clear regulatory frameworks that integrate national priorities with climate finance and international frameworks
Inadequate policy and regulatory frameworks	Strengthen policy coherence and alignment with international climate finance mechanisms
Overlapping responsibilities	Clearly define roles and responsibilities among institutions
Weak coordination among governmental agencies	Foster inter-agency coordination and establish a centralized body for climate finance governance Streamline approval processes and enhance inter-agency coordination
Weak inter-agency coordination	Establish better coordination mechanisms between governmental agencies and stakeholders
Financial Barriers	
Complex financing mechanisms	Simplify the application procedures for climate finance, especially for small institutions and local communities. Simplify application procedures, reduce bureaucratic hurdles for accessing funds, and develop accessible financial products for small-scale projects Introduce innovative financial instruments like green bonds, climate insurance
High transaction costs for small-scale projects	Simplify access to funds, especially for local communities Promote microfinance, concessional loans, and blended finance solutions to reduce financial burden
Lack of risk insurance mechanisms	Develop climate-specific insurance products and strengthen risk assessment tools to attract private sector investment. Develop and promote risk insurance products tailored to climate adaptation projects
Limited access to adaptation finance	Develop tailored financial products (e.g., green bonds)

Limited availability of adaptation funds	<p>Increase domestic and international funding, including exploring innovative finance instruments such as green bonds and carbon credits</p> <p>Increase funding allocations and develop simplified financing mechanisms</p> <p>Increase the allocation of domestic resources for adaptation finance and promote international partnerships</p>
Technical Barriers	
Difficulty in transferring and adopting technologies	Enhance access to affordable adaptation technologies
Inadequate data availability and poor quality	<p>Invest in climate data monitoring systems and improve access to high-quality climate projections and vulnerability data.</p> <p>Enhance climate data monitoring systems and improve access to real-time climate information</p>
Inadequate data for climate risk assessment	Invest in climate data infrastructure and enhance monitoring systems
Lack of reliable climate vulnerability assessments	Support local institutions in conducting detailed climate vulnerability and risk assessments
Lack of reliable data for decision-making	Invest in climate data collection and monitoring systems
Lack of technological expertise	Strengthen technical capacity-building programs to foster expertise in climate adaptation technologies.
Limited access to climate adaptation technologies	Promote technology transfer, build local technological capacity, and provide incentives for the use of climate-resilient technologies
Limited access to technologies	Promote technology transfer and capacity building to enable the adoption of affordable and suitable adaptation technologies.
Capacity-related Barriers	
Insufficient project development and management skills	Provide technical assistance for project proposal development, monitoring, and evaluation skills at the local level.
Lack of community engagement and local participation	Foster inclusive decision-making processes and ensure participation of marginalized communities
Limited community awareness and participation	Increase community engagement and awareness programs to ensure local participation in adaptation finance projects.
Limited technical and institutional capacity	Implement capacity-building programs for local governments, institutions, and communities
Low awareness of available adaptation finance	Raise awareness and provide training on accessing climate finance, especially in vulnerable communities
Low local-level institutional capacity	Provide targeted training programs for local governments, NGOs, and community organizations to enhance project design and management capabilities.

13.Key Opportunities in Scaling Up Adaptation finance in India

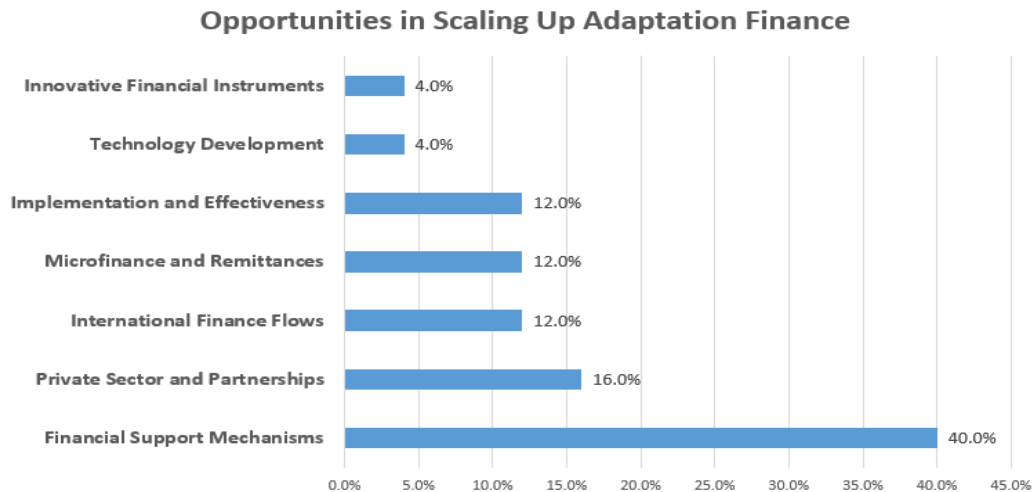


Figure 8: *Opportunities in scaling up adaptation finance.*

13.1. Thematic Analysis

13.1.1. Financial support mechanisms:

- **Established Mechanisms:** Institutions like the National Adaptation Fund for Climate Change (NAFCC) and the National Bank for Agriculture and Rural Development (NABARD) are pivotal in supporting adaptation projects across India. Their high frequency/scale rating (3) indicates their established role in funding and implementation.
- **International Support:** The Green Climate Fund (GCF) and Global Environmental Facility (GEF) provide significant support but are less integrated compared to domestic mechanisms (rated 2). These funds focus on large-scale projects like climate-resilient agriculture, contributing to the country's adaptation capacity.

13.1.2. Private sector and partnerships:

- **Potential Growth Area:** The involvement of the private sector and public-private partnerships (PPPs) is developing, with a moderate frequency/scale rating (2). While these partnerships have the potential to mobilize resources and expertise, further engagement and incentivization are needed to realize their full potential.

13.1.3. International finance flows:

- **Widespread Utilization:** India effectively taps into international finance flows, with bilateral funding and climate-related loans from institutions like the World Bank and the Asian Development Bank (ADB) being a key part of its adaptation finance strategy. This is reflected in the high frequency/scale rating (3).

13.1.4. Microfinance and remittances:

- **Emerging Opportunities:** Microfinance shows moderate development (rated 2) as a tool for supporting adaptation in rural areas, while remittances remain an emerging opportunity (rated 1). These financial tools offer potential pathways to enhance local adaptation efforts but require further scaling.

13.1.5. Implementation and effectiveness:

- **Significant Challenges:** Implementation issues, including project selection, monitoring, and coordination, present major challenges to the effectiveness of adaptation finance,

indicated by the high frequency/scale rating (3). Addressing these issues is crucial for maximizing the impact of available funds.

13.1.6. Technology development:

- **Emerging Focus:** The development and deployment of new technologies, such as drought-resistant crops and early warning systems, are emerging areas (rated 1). These innovations could play a critical role in enhancing adaptation efforts and building resilience to climate impacts.

13.1.7. Innovative financial instruments:

- **Recognized Need:** There is a recognized need for developing innovative financial instruments to facilitate adaptation projects, which currently represents a barrier (rated 1). Creating these instruments could unlock new funding streams and enhance project scalability.
- **Strengths:** The analysis highlights the strong role of established domestic financial mechanisms and international finance flows in supporting adaptation efforts in India. These channels provide essential funding and resources, enabling large-scale projects and facilitating significant advancements in adaptation capacity.
- **Opportunities for Improvement:** Private sector engagement, innovative financial instruments, and the effective integration of new technologies represent key growth areas. Improving the implementation and effectiveness of adaptation finance is essential for overcoming current challenges.
- **Emerging Areas:** Microfinance and remittances offer promising opportunities to support grassroots adaptation initiatives, while technology development holds potential for transformative impact.

14. Potential Mechanisms to Support Adaptation Initiatives in India

By addressing identified challenges and leveraging existing strengths, India can enhance its adaptation finance landscape, driving more effective and sustainable climate resilience efforts.

14.1. Blended finance mechanisms

Leveraging a mix of public and private finance can help reduce risk and incentivize private sector investment. By blending concessional finance with commercial capital, risk perception is reduced, making adaptation projects more attractive.

14.2. Climate bonds and green bonds

These can be used to raise large-scale funding for adaptation projects. Specifically targeting climate resilience and adaptation initiatives in agriculture, infrastructure, and water management would ensure these funds are utilized effectively.

14.3. Public-Private Partnerships (PPPs)

Governments can partner with the private sector to implement large-scale adaptation projects. PPPs allow for shared risk and investment, often bringing innovation and efficiency to adaptation efforts.

14.4. National and local adaptation funds

Establishing adaptation funds at both national and subnational levels that specifically focus on community-based initiatives or ecosystem-based adaptation. These funds can be critical in channeling finance to grassroots adaptation efforts, which are often overlooked by larger financial institutions.

14.5. Capacity building and technical assistance programs

Providing targeted support to strengthen local governments, private sector actors, and communities in project development, finance management, and reporting can enhance the effective use of adaptation finance.

14.6. Microfinance and credit facilities for vulnerable communities

Smallholder farmers, rural entrepreneurs, and vulnerable communities can benefit from microfinance or concessional loans aimed at increasing resilience. These initiatives could focus on sustainable agriculture, water management, and small-scale renewable energy solutions.

14.7. Risk sharing and insurance mechanisms

Climate insurance schemes or risk-sharing mechanisms like weather-index insurance can reduce the financial losses from climate events, thereby enhancing the resilience of vulnerable sectors like agriculture.

14.8. Innovative financial instruments

Instruments such as catastrophe bonds (CAT bonds) or adaptation performance bonds can raise funds for resilience-building measures while rewarding successful implementation.

14.9. Policy reforms and fiscal incentives

The government can introduce reforms and fiscal incentives, such as tax credits, rebates, or grants, to promote investments in adaptation. Simplifying regulatory frameworks would also encourage more private sector participation in adaptation finance.

14.10. Streamlined administrative processes

Simplify the bureaucratic procedures and approval processes for accessing adaptation finance, minimizing delays and enhancing efficiency in fund disbursement.

14.11. Innovative financial instruments

Develop and promote innovative financial products such as green bonds, climate insurance, and blended finance solutions to cater to a diverse range of adaptation projects.

14.12. Enhanced risk assessment tools

Establish comprehensive risk insurance mechanisms to cover climate-related uncertainties, thereby boosting confidence among financial institutions and investors.

14.13. Increased awareness campaigns

Conduct educational initiatives and awareness programs to inform stakeholders about available adaptation finance mechanisms and the importance of climate resilience.

14.14. Community engagement and participation

Foster inclusive decision-making processes encourage community involvement in adaptation planning and financing, ensuring that local needs are addressed.

14.15. Integration of national and local goals

Align adaptation finance with national priorities and local needs, ensuring that financial flows support the most urgent adaptation requirements.

14.16. Strengthened data systems

Invest in climate data collection and monitoring systems to provide accurate information for project planning, risk assessment, and evidence-based decision-making.

These mechanisms, individually or in combination, can address the identified barriers and scale up adaptation finance in India.

15. Effective Ways to Spend Adaptation Finance in India

15.1. Water resource management and agriculture

- Invest in resilient water infrastructure such as dams, canals, and water harvesting systems to ensure reliable water supply for agriculture and drinking water.
- Implement climate-smart agriculture practices to enhance crop resilience and productivity under changing climate conditions.

15.2. Renewable energy and energy efficiency

- Support the expansion of renewable energy sources such as solar, wind, and biomass to reduce reliance on fossil fuels and mitigate climate change.
- Improve energy efficiency in buildings, industries, and transportation to reduce greenhouse gas emissions and adapt to energy scarcity scenarios.

15.3. Urban resilience and infrastructure

- Upgrade urban infrastructure to withstand extreme weather events, including flood-proofing, heat island reduction strategies, and sustainable urban drainage systems.
- Develop smart city initiatives that integrate climate adaptation measures, such as green spaces, efficient public transport, and disaster-resilient buildings.

15.4. Disaster risk management and early warning systems

- Enhance disaster risk management capabilities by strengthening early warning systems, emergency response mechanisms, and disaster recovery plans.
- Invest in climate-resilient housing and infrastructure in disaster-prone areas to reduce human and economic losses.

15.5. Health and sanitation

- Improve health infrastructure to cope with climate-induced health risks, such as heat stress, waterborne diseases, and vector-borne diseases.
- Promote access to clean and safe water to reduce the risk of waterborne diseases exacerbated by climate change.

15.6. Forestry and biodiversity conservation

- Invest in afforestation and reforestation projects to enhance carbon sequestration and protect biodiversity.
- Develop sustainable forest management plans to adapt forests to climate change impacts while providing ecosystem services.

15.7. Coastal and marine ecosystems

- Implement coastal protection measures, such as mangrove restoration and sea walls, to mitigate the impacts of sea-level rise and storm surges.
- Support sustainable fisheries management and aquaculture practices to adapt to changing marine ecosystems.

15.8. Social protection and livelihoods

- Create social protection schemes to support vulnerable populations, such as smallholder farmers, coastal communities, and urban poor, who are most affected by climate change.
- Develop climate-resilient livelihood programs that provide alternative income sources and enhance adaptive capacity.

15.9. Education and awareness

- Invest in climate change education and public awareness campaigns to build knowledge and understanding of climate risks and adaptation measures.
- Train professionals and community leaders in climate adaptation strategies to facilitate local-level action.

16. Comparative Analysis

16.1. Main sources of adaptation finance for India

India relies on several international and domestic sources of adaptation finance. International sources include the Green Climate Fund (GCF), Global Environment Facility (GEF), and multilateral development banks such as the World Bank and Asian Development Bank. Domestically, the National Adaptation Fund for Climate Change (NAFCC) and state budgets also contribute significantly to adaptation initiatives. Private sector investments and philanthropic contributions are emerging sources, with a focus on corporate social responsibility (CSR) initiatives.

16.2. Effectiveness of adaptation finance in India

Adaptation finance in India has been only partially effective in meeting the country's adaptation needs. While funds from international and domestic sources have been mobilized, a significant portion of the most vulnerable communities are left out, often struggle to reach local communities. Smaller, community-led initiatives are frequently underfunded. Bureaucratic inefficiencies and weak governance in fund allocation have delayed implementation, with some projects waiting up to 12 months for fund disbursement. Additionally, the lack of alignment between international adaptation finance and India's

national development priorities weakens the impact of such financing. While the private sector plays a role, regulatory challenges and lack of incentives limit its contributions.

16.3. Key challenges in scaling up adaptation finance

Several barriers impede the scale-up of adaptation finance in India:

- **Institutional barriers:** Overlapping responsibilities among government agencies, complex bureaucratic processes, and fragmented coordination hamper the effective utilization of funds.
- **Complex bureaucratic processes:** India's fragmented institutional structures lead to significant delays in accessing funds. Government agencies face overlapping responsibilities, and a lack of coordination among institutions slows project implementation. Compared to other developing nations, India's bureaucratic hurdles are particularly problematic, with delays in fund disbursement ranging from 6-12 months.
- **Limited policy alignment:** India's national policies often misalign with international climate finance frameworks like the Green Climate Fund (GCF). This misalignment restricts the country from effectively leveraging available global funds.
- **Financial barriers:** The gap between required and mobilized funds is vast, with only 10-15% of the required \$150 billion in adaptation finance being available from 2024-2030. Smaller-scale projects, especially those led by local governments and community groups, face disproportionately high transaction costs, deterring them from accessing funds.
- **Private sector involvement:** The lack of adequate risk insurance and limited incentives reduce private sector participation in adaptation finance. In contrast, other countries with more comprehensive insurance mechanisms and public-private partnerships have seen greater private sector engagement.
- **Technical barriers:** Limited access to reliable climate data and the high cost of adaptation technologies create significant obstacles.
- **Data deficiencies:** The unavailability of reliable climate data restricts India's ability to secure international financing. Inadequate climate risk assessments make it difficult to design adaptation projects that meet the criteria of global financial institutions.
- **Technology transfer:** High costs and limited local solutions hamper the adoption of climate adaptation technologies. India lags behind other developing countries in scaling up technology, particularly for rural and vulnerable areas.
- **Capacity barriers:** Local governments and communities often lack the necessary skills and awareness to effectively develop and implement adaptation projects.
- **Low local capacity:** Local governments and institutions often lack the technical expertise to design, implement, and manage adaptation projects. This limits the country's ability to generate "bankable" projects that attract finance.
- **Community awareness:** There is limited engagement and awareness about available adaptation finance mechanisms among rural and vulnerable communities. As a result, these communities miss out on opportunities to develop and fund critical adaptation projects.
- **Emerging opportunities:** Blended Finance and Green Bonds: Innovative financing mechanisms like blended finance and green bonds could mitigate risk and encourage private sector investment in adaptation projects. However, these instruments remain underutilized in India compared to other nations.
- **Capacity building:** Strengthening institutional and community capacity through targeted programs could significantly improve access to adaptation finance. This is an area where several countries have made notable progress through international collaboration and technical assistance.

- **Inadequate risk mechanisms:** Lack of risk insurance and financial products for small-scale projects hinders private sector engagement.

16.4. Key opportunities in scaling up adaptation finance

Opportunities for scaling up adaptation finance in India include:

- **Blended finance:** Using a combination of public and private finance to mitigate risk and encourage private investment in adaptation projects.
- **Green bonds:** India can leverage green bonds specifically for climate-resilient infrastructure and agriculture.
- **Public-Private Partnerships (PPP):** These partnerships can help share risk, bring innovation, and attract investment to large-scale adaptation projects.
- **Capacity Building:** Improving local technical and institutional capacity through training and assistance can enhance project development and fund utilization.
- **Local adaptation funds:** Expanding domestic funding mechanisms at the local level could support community-based adaptation initiatives.

16.5. Ways of overcoming barriers to advance climate resilience

To overcome the barriers, India can:

- **Simplify bureaucratic processes:** Streamlining approval and fund disbursement processes will reduce delays in adaptation projects.
- **Enhance coordination:** Better interagency coordination and clear policy frameworks can improve the alignment of national priorities with international finance mechanisms.
- **Promote risk insurance:** Establishing insurance mechanisms for climate-related projects will attract more private sector investment by mitigating risk.
- **Capacity building:** Local governments, institutions, and communities need technical assistance to navigate the complex landscape of adaptation finance.

16.6. Potential mechanisms to support adaptation initiatives

Mechanisms that can support adaptation include:

- **Blended finance:** This combines concessional finance with commercial capital, reducing the financial risks for private investors in adaptation projects.
- **Climate bonds:** Issuing climate or green bonds for adaptation projects can mobilize substantial capital for climate resilience and raising large-scale funding for adaptation projects in agriculture, infrastructure, and water management.
- **Community-based adaptation funds:** Creating funds that specifically target grassroots, community-based projects can ensure that smaller, vulnerable communities receive financial support.
- **Public-private partnerships:** Engaging the private sector in large-scale projects through shared investments and innovation.
- **Microfinance for vulnerable communities:** Supporting smallholder farmers and rural entrepreneurs with concessional loans aimed at improving climate resilience.

16.7. Effective ways to spend adaptation finance

To maximize the impact of adaptation finance, India should prioritize:

- **Water resource management:** Investing in climate-resilient water infrastructure for agriculture and human consumption.

- **Urban resilience:** Enhancing urban infrastructure to withstand extreme weather events, such as floods and heat waves.
- **Disaster risk management:** Strengthening early warning systems and building climate-resilient housing in disaster-prone areas.

In conclusion, while India has mobilized significant adaptation finance, the effectiveness and scalability of such initiatives remain hampered by institutional, financial, and technical barriers. Addressing these challenges through streamlined governance, innovative financing mechanisms, and enhanced capacity-building efforts will be critical to driving climate resilience and sustainable development.

17. Role of Reserve Bank of India (RBI)

The Reserve Bank of India (RBI) plays a crucial role in scaling adaptation finance in India by regulating and facilitating financial mechanisms that can support climate resilience efforts. Based on the findings, the RBI's involvement can focus on the following areas:

The RBI can create conducive regulatory frameworks that encourage financial institutions to prioritize adaptation finance. This includes easing access to credit for climate-resilient infrastructure and promoting green finance initiatives, such as green bonds and sustainable investment products.

The RBI can facilitate innovative financing mechanisms like blended finance, green bonds, and climate insurance to mobilize more private sector capital for adaptation projects. By offering regulatory incentives for such instruments, the RBI can reduce financial risks for private investors in adaptation initiatives.

Given the financial uncertainties associated with climate adaptation, the RBI can promote the development of climate-specific risk insurance products. Such mechanisms would help mitigate the financial risks of adaptation projects, making them more attractive to both public and private investors.

The RBI can contribute to building financial institutions' capacity to manage adaptation finance by providing guidelines, training, and technical support. This would help banks and other financial entities understand climate risks better and incorporate them into their lending and investment decisions.

By simplifying bureaucratic procedures and reducing the transaction costs associated with climate adaptation projects, the RBI can make it easier for smaller entities, local governments, and community-based organizations to access necessary funding for resilience-building efforts.

The RBI can encourage greater private sector involvement by offering incentives such as tax breaks or lower capital requirements for banks and investors that support climate adaptation projects. This would enhance the flow of private capital into sectors like agriculture, water management, and renewable energy, all critical for adaptation.

Through these actions, the RBI can create a more supportive financial ecosystem for scaling up adaptation finance and helping India meet its climate resilience goals.

18. Conclusion

The primary goal of this research was to provide a comprehensive assessment of the barriers to accessing adaptation finance in India and to develop targeted recommendations for enhancing access and utilization of financial resources for climate change adaptation. This examination is significant in the context of India, a country that is highly vulnerable to the adverse effects of climate change and in need of effective adaptation measures.

18.1. Summary of key findings

- 1. Sources of Adaptation Finance:** India relies on a mix of international climate funds (like the Green Climate Fund and Global Environment Facility), multilateral development banks, bilateral assistance, domestic funds, and private sector contributions. However, the availability and accessibility of these funds are inconsistent.
- 2. Effectiveness of Adaptation Finance:** While some funds have been mobilized, their effectiveness is limited due to bureaucratic inefficiencies, misalignment with national priorities, and the underfunding of smaller, community-led initiatives.
- 3. Challenges in Accessing Finance:** Key challenges include institutional barriers such as complex bureaucratic processes, limited financial resources, inadequate data for project planning, and capacity deficits among local governments and communities.
- 4. Opportunities for Scaling Up Finance:** There are promising avenues for scaling up adaptation finance, including blended finance mechanisms, green bonds, public-private partnerships, and local adaptation funds aimed at supporting community-based projects.
- 5. Suggested Mechanisms:** Effective mechanisms to support adaptation initiatives include improving inter-agency coordination, developing climate-specific insurance products, enhancing local capacities, and streamlining funding processes.
- 6. Recommendations for Spending Finance:** To maximize impact, adaptation finance should be directed towards water resource management, urban resilience, disaster risk management, and community engagement in adaptation planning.

18.2. Implications of findings

- **Policymakers:** The findings emphasize the need for coherent policies that align adaptation finance with national development goals and streamline bureaucratic processes for timely fund allocation.
- **Practitioners:** NGOs and local governments should focus on enhancing community engagement and building technical capacities to navigate adaptation finance mechanisms effectively.
- **Stakeholders:** Private sector engagement is crucial for innovative financing solutions, and fostering collaboration between public and private entities can enhance the scale and impact of adaptation projects.

18.3. Recommendations for future research

Identifying gaps in the current research highlights the need for further studies exploring innovative financing mechanisms, long-term assessments of adaptation project effectiveness, and the socio-political factors influencing access to climate finance. Understanding these dynamics will facilitate more targeted and effective strategies for enhancing adaptation finance in India.

Future research should focus on expanding the geographic scope of the study and exploring innovative financing mechanisms that could more effectively address the needs of vulnerable

populations. Furthermore, policy efforts should aim to simplify access to adaptation finance and create more resilient, inclusive financial frameworks that can withstand the impacts of climate change.

By addressing these critical barriers, we can move closer to achieving the goals of global climate resilience and adaptation, ensuring that the most vulnerable populations have the resources they need to adapt to the changing climate.

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