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# A strategic approach towards sustainable development: Scaling climate finance mechanisms for climate change in India

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## Abstract

*Climate change poses a significant threat to the global community, particularly impacting vulnerable populations in developing countries. This paper provides an in-depth examination of climate finance, illustrating its definition, sources, instruments, and implications for developing countries. The paper also highlights key climate finance funds that serve as vital mechanisms for channeling financial resources to projects aimed at reducing emissions, enhancing resilience, and promoting sustainable development in developing countries. The study emphasizes the importance of a strategic approach to secure the necessary funding for India's ambitious transition outlined in its Long-Term Low Emission Development Strategy submitted at COP27. It suggests four pillars of India's climate finance strategy: private sector engagement, international partnerships, diverse financial instruments, and innovation finance. By outlining these pillars, the paper aims to assist Indian policymakers and stakeholders develop a strong and efficient climate finance strategy to achieve their climate objectives while promoting sustainable development.*

**Keywords:** Climate Finance, Sustainable Development, Climate Change, Four Strategic Pillars.

**JEL Classification:** Q56; Q58

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## **1. Introduction**

Climate change presents a critical threat globally, with developing countries such as India bearing a disproportionate burden despite their minimal contributions to global emissions (Mattoo & Subramanian, 2012). The diverse and expansive geography of India makes it particularly susceptible to climate change, leading to severe weather events, agricultural challenges, water shortages, and rising sea levels (Baraj et al., 2024; Hussain et al., 2024). These effects jeopardize not only the environment but also the nation's socio-economic stability, hindering sustainable development and worsening existing inequalities. To combat climate change, significant financial resources are necessary for both mitigation and adaptation strategies (Laukkonen et al., 2009; Locatelli et al., 2016). As a developing economy, India faces the dual challenge of pursuing economic growth while building climate resilience. Increasing climate finance is essential for India to achieve its climate objectives, foster sustainable development, and strengthen the resilience of its communities against climate impacts.

Climate finance refers to funding from local, national, or international sources—whether public, private, or alternative—intended to support actions aimed at mitigating and



adapting to climate change.<sup>1</sup> International agreements such as the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, and the Paris Agreement emphasize the necessity of financial aid from wealthier nations to those less financially endowed and more susceptible to climate impacts. These agreements acknowledge the significant disparities in each country's contributions to climate change and their capacity to address its effects (Mahmood, 2024). Mitigation efforts require substantial investments to significantly reduce emissions, while adaptation strategies demand extensive resources to manage the adverse consequences of a changing climate (Kong'ani, 2024; Lal, 2024). The Kyoto Protocol, though influential, was largely replaced by the Paris Agreement, which introduced more comprehensive financial commitments, including mechanisms such as the Green Climate Fund to support developing nations (Al Faruque, 2024). Recent analyses highlight the need for greater financial commitments to meet global climate targets and reduce vulnerabilities in low-income nations (Kipkemboi et al., 2024). The principle of "common but differentiated responsibilities and respective capabilities," as outlined in the Convention, requires developed countries to provide financial resources to help developing countries achieve the objectives of the UNFCCC. The Paris Agreement reinforces this obligation and encourages voluntary contributions from other countries. Developed nations should lead the effort in mobilizing climate finance from diverse sources, instruments, and channels, recognizing the crucial role of public funding, and supporting strategies driven by the needs and priorities of developing countries. This mobilization should represent progress beyond previous efforts.

Governments and stakeholders need to assess the financial needs of developing countries and understand how to mobilize these resources effectively, aiming to balance adaptation and mitigation efforts. The Paris Agreement guides efforts to align financial flows with pathways toward low greenhouse gas emissions and climate-resilient development. The Agreement also emphasizes transparency and predictability of financial support, with progress assessed as part of the global stocktake. The concept of just transitions seeks to balance countries' development needs, providing access to clean and affordable energy while meeting commitments to reduce global greenhouse gas emissions. Climate finance is crucial for India's energy transition. According to the UNFCCC, climate finance includes local, national, or transnational funding from various sources to support actions addressing climate change.

The principle of 'common but differentiated responsibility' (CBDR) in international climate policy recognizes that all countries share responsibility for addressing climate change, but their responsibilities differ due to the historical contributions of industrialized nations. This principle is embedded in the UNFCCC's legal framework and recognized in agreements like the Kyoto Protocol and the Paris Agreement. In 2009, at COP15, industrialized countries pledged \$100 billion annually by 2020 to support least developed and developing countries.<sup>2</sup> Due to slow progress, this goal's timeline was extended to 2025 at COP21.

India, as a developing country, plays a unique role in advocating for climate finance in international forums while addressing its internal financing challenges. As a representative voice for the Global South, India emphasizes the need for just transitions and highlights the additional responsibilities of developed countries in supporting developing nations. At COP26,

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<sup>1</sup> <https://unfccc.int/topics/introduction-to-climate-finance>

<sup>2</sup> <https://www.oecd.org/en/topics/sub-issues/climate-finance-and-the-usd-100-billion-goal.html>

India underscored the importance of climate finance and low-cost climate technologies for implementing climate actions amid global net zero commitments.

The G20 Sustainable Finance Working Group (SFWG), established in 2016, focuses on mobilizing finance to ensure global growth and stability, promoting transitions to greener, more resilient, and inclusive societies. The SFWG's 2023 work plan prioritizes mechanisms for mobilizing resources for climate finance, enabling finance for Sustainable Development Goals, and building the ecosystem for sustainable development financing.

The economic slowdown post-COVID-19 has pushed developing countries to explore alternative climate funding sources. These include multilateral development banks like the World Bank and Asian Development Bank, bilateral assistance from developed countries through grants and concessional loans, domestic financing through government concessions and private sector investments, and carbon markets where companies can trade carbon credits to meet emissions reduction targets. India is also developing its Carbon Credit Trading Scheme alongside its current energy-saving market mechanism.

This study analyzes the current landscape of climate finance in India, assessing the effectiveness of existing mechanisms in mobilizing resources for mitigation and adaptation efforts. By exploring the interplay between international agreements, national policies, and financial instruments, the study seeks to identify key gaps in climate finance accessibility and propose strategic solutions. A core objective is to evaluate India's role in global climate finance negotiations and its alignment with the principles of equity and sustainability. The study also introduces a strategic framework based on four pillars—private sector engagement, international partnerships, diverse financial instruments, and innovation finance—to guide policymakers in optimizing financial flows for climate action. Ultimately, the study contributes to the broader discourse on climate finance by providing a comprehensive roadmap for India's transition toward a low-carbon and climate-resilient economy, ensuring economic growth while addressing climate vulnerabilities.

## **2. Sources of Climate Finance**

### *2.1. Multilateral Development Banks*

Multilateral development banks (MDBs) play a key role in channeling financial resources toward climate action (Choi & Laxton, 2023; Culpeper et al., 2016; Delina, 2017). Institutions like the World Bank, the Asian Development Bank, and the African Development Bank provide loans and grants to support climate mitigation and adaptation efforts. MDBs offer not only funding but also technical expertise, capacity building, and policy support, helping countries develop and implement effective climate strategies (Mhlanga, 2024). For instance, the World Bank's Climate Investment Funds (CIF) have supported numerous renewable energy projects and resilience-building programs globally.

### *2.2. Bilateral Assistance*

Bilateral assistance from developed to developing countries is a vital source of climate finance (Ha et al., 2016; K. Michaelowa & Namhata, 2022). Structured through direct agreements, this assistance supports specific climate projects or broader environmental goals with grants, concessional loans, and technical aid. Technology transfer agreements also enable developing countries to access advanced technologies and practices essential for effective climate action

(Pandey et al., 2022; Popp, 2011). Bilateral arrangements foster international cooperation and ensure financial support aligns with recipient countries' national priorities.

### *2.3. Domestic Financing*

Domestic financing mechanisms are crucial for mobilizing internal resources for climate action (Adhikari & Safae Chalkasra, 2023; Pickering et al., 2015). Governments can implement policies and offer incentives such as tax breaks, subsidies, and low-interest loans to stimulate investment in renewable energy and energy efficiency. Private sector involvement, through venture capital, private equity, and impact investing, supports the development and scaling of innovative technologies and sustainable infrastructure projects. For example, India's Renewable Energy Investment Promotion initiatives have attracted significant private sector investment in solar and wind energy sectors (Chaudhary et al., 2015; Kumar. J & Majid, 2020).

### *2.4. Carbon Markets*

Carbon markets are a market-based approach to controlling greenhouse gas emissions, providing economic incentives for reducing emissions (Lederer, 2012; Sovacool, 2011). These markets allow entities to trade carbon credits, representing the right to emit a certain amount of CO<sub>2</sub> or other greenhouse gases. International frameworks like the Kyoto Protocol and the Paris Agreement guide carbon trading, fostering the development of international and domestic carbon markets (Betteheim & Origny, 2002; A. Michaelowa et al., 2019). Countries like India are developing their carbon trading schemes, integrating them with existing market mechanisms to enhance effectiveness (Bansal et al., 2023; Tanveer et al., 2024). By setting a price on carbon, these markets encourage companies to invest in cleaner technologies and adopt sustainable practices, contributing to global emissions reduction efforts.

## **3. Fundamental Instruments of Climate Finance**

Climate finance encompasses a diverse array of financial instruments tailored to address specific challenges and needs associated with climate-related projects (Belianska et al., 2022). These instruments play a crucial role in mobilizing resources for initiatives aimed at mitigating and adapting to climate change. Below are key instruments commonly used in climate finance:

### *3.1. Green Bonds*

Green Bonds are specialized financial instruments issued to raise capital specifically for projects that contribute to environmental sustainability (Agliardi & Agliardi, 2019; Bhutta et al., 2022). These projects typically include renewable energy generation (such as solar and wind farms), energy efficiency improvements in buildings and industries, sustainable water and waste management systems, and initiatives to protect biodiversity and natural ecosystems. Investors in green bonds are attracted not only by financial returns but also by the opportunity to support environmentally beneficial projects (Flammer, 2021; Tang & Zhang, 2020).

### *3.2. Debt Swaps*

Debt Swaps involve the conversion or restructuring of debt obligations, usually foreign currency debt held by developing countries, into funding for climate-related projects (Essers et al., 2021). This mechanism allows countries to redirect financial resources towards climate change adaptation and mitigation efforts without increasing their overall debt burden. Debt swaps are often facilitated by international financial institutions or through agreements between creditor nations and private investors, aiming to align financial flows with sustainable development priorities (Haughton & Keane, 2021; Lukšić et al., 2022).

### *3.3. Guarantees*

Guarantees play a critical role in de-risking investments in climate projects (Matthäus & Mehling, 2020; Steckel & Jakob, 2018). By providing assurance that financial obligations related to climate initiatives will be met, guarantees attract private sector investment and facilitate access to financing for projects with uncertain returns or higher perceived risks. Guarantees can be structured in various forms, including partial credit guarantees, performance guarantees, or political risk guarantees, depending on the specific needs of the project and the risk profile perceived by investors (Honohan, 2010; Lu et al., 2019).

### *3.4. Concessional Loans*

Concessional Loans offer favorable terms to borrower countries, including lower interest rates, extended repayment periods, and flexible terms compared to market-rate loans (Stecher, 2018). These loans are often provided by international financial institutions, bilateral donors, or development banks to support climate actions that contribute to sustainable development goals. Concessional loans are particularly valuable for financing infrastructure projects, technology adoption, and capacity-building initiatives aimed at reducing greenhouse gas emissions and enhancing climate resilience in vulnerable communities (Anjanappa, 2024).

### *3.5. Grants and Donations*

Grants and Donations are essential sources of funding for climate-related activities that may not generate financial returns but are critical for achieving environmental and social benefits (Jaiwant et al., 2024; Robin, 2022). These funds are typically provided by governments, philanthropic organizations, international agencies, and private sector entities to support a wide range of initiatives. Examples include research and development of clean technologies, community-based adaptation projects, disaster risk reduction programs, and education and awareness campaigns on climate change mitigation strategies. Grants and donations enable the initiation of innovative projects and pilot initiatives that contribute to long-term sustainability and resilience-building efforts.

## **4. Prominent Climate Finance Funds**

Various multilateral and financial institutions manage funds dedicated to climate finance, supporting a wide range of projects aimed at mitigating climate change and enhancing resilience. Some key examples are:

### *4.1. Green Climate Fund (GCF)*

The Green Climate Fund (GCF) stands as the world's largest climate-focused fund, created to support those directly impacted by climate change<sup>3</sup>. Its primary goal is to aid developing countries in their efforts to reduce greenhouse gas emissions. The GCF invests in a variety of sectors, including renewable energy projects like wind and solar power, efficient water management systems, and sustainable agricultural practices that enhance climate resilience.

### *4.2. Special Climate Change Fund (SCCF)*

The Special Climate Change Fund (SCCF) was established to focus on projects that foster adaptation to climate change, develop new technologies, and build capacity<sup>4</sup>. It addresses multiple sectors such as energy, industry, transportation, forestry, agriculture, and waste

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<sup>3</sup> <https://www.killerstartups.com/avaana-capital-closes-135-million-fund/>

<sup>4</sup> <https://climatefundupdate.org/the-funds/special-climate-change-fund/>

management. Additionally, the SCCF promotes economic diversification to help countries reduce their dependence on sectors that are highly susceptible to climate change.

#### *4.3. Least Developed Countries Fund (LDCF)*

The Least Developed Countries Fund (LDCF) is dedicated to supporting the most vulnerable nations in enhancing their climate resilience<sup>5</sup>. Under the guidance of the UNFCCC, the LDCF finances the development and implementation of National Adaptation Programs of Action (NAPAs), which prioritize immediate and critical adaptation needs in these countries (Sovacool et al., 2017).

#### *4.4. UN-REDD Programme*

The UN-REDD Programme is a collaborative effort among various UN agencies, initiated to combat deforestation and forest degradation in developing countries (Dulal et al., 2012; Miah, 2021). Established in 2008, it aims to reduce emissions through sustainable forest management practices and by enhancing forest carbon stocks. The program supports efforts to preserve forests, which are vital for carbon sequestration and biodiversity.

#### *4.5. The City Climate Gap Fund*

The City Climate Gap Fund, launched by the World Bank, addresses the substantial shortfall in climate finance for urban areas, particularly in developing nations<sup>6</sup>. This fund provides crucial technical assistance, capacity building, and support for project preparation, enabling cities to develop and implement effective climate mitigation and adaptation strategies. By focusing on urban areas, the Gap Fund helps cities transition towards sustainable development pathways.

Thus, climate change stands as one of the most pressing challenges of our time, threatening both the future and the health of the planet (Kjellstrom & McMichael, 2013; McMichael & Lindgren, 2011). The climate crisis is primarily driven by human activities, such as the excessive burning of fossil fuels, deforestation, and overfishing. Urban areas, home to more than half of the global population, are significant contributors, accounting for over 70% of global CO<sub>2</sub> emissions (Crippa et al., 2021). Over the past five decades, these activities have continually damaged the atmosphere, oceans, and earth's surface. Rapid and often unplanned urban growth, especially in developing countries, further exacerbates the issue, leading to increased GHG emissions and exposing citizens to greater risks like floods and heatwaves. Without decisive action, the lives of all living beings will remain in jeopardy.

The United Cities and Local Governments Asia-Pacific (UCLG ASPAC), as the largest regional section of UCLG, has consistently advocated for addressing climate change (ESCAP UN, 2022). UCLG ASPAC recognizes that collective efforts from local governments and cities, supported by national governments, can significantly contribute to global climate change mitigation and adaptation.

Local governments and cities are at the forefront of building resilience and adapting to climate change. Effective climate action requires cooperation and integration among all

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<sup>5</sup> <https://prepp.in/news/e-492-least-developed-countries-fund-ldcf-environment-notes>

<sup>6</sup> <https://www.citygapfund.org/wp-content/uploads/2024/09/city-climate-finance-gap-fund-annual-report-2022.pdf>

stakeholders. The necessary tools to secure the future and protect the planet are available; it is now imperative to use them effectively.

### **5. Climate Finance Landscape in India**

India's ambitious energy transition will be costly, involving the expansion of renewable energy installations, infrastructure modernization, and improvements in energy efficiency across various sectors (Charles Rajesh Kumar & Majid, 2024; Sen et al., 2016). Achieving these goals necessitates substantial capital investment in solar, wind, hydro, and other clean energy technologies. India's original Nationally Determined Contribution (NDC) estimated that climate action would require USD 2.5 trillion from 2015-2030, which translates to roughly USD 170 billion annually (Chaturvedi et al., 2024; Hazra, 2023). To significantly advance its climate transition and achieve net-zero emissions by 2070, India will need cumulative investments of USD 10.1 trillion, highlighting the urgent need for innovative financial solutions (Adikarla, 2024). Sector-specific financial institutions (FIs) in India will play a crucial role in facilitating the flow of green finance essential for the low-carbon transition.

Despite these challenges, India has made significant strides in attracting green finance. According to Climate Policy Initiative (CPI) estimates for 2019-20, India raised a total of USD 44 billion, a 150% increase from 2017-18. Although this progress is commendable, it is still insufficient. Current investments cover only about 25% of the total needed across sectors to meet the country's NDCs. While climate-related foreign direct investment (FDI) has risen substantially, reaching USD 1.2 billion in FY2020, this represents only about 3% of total FDI for that year<sup>7</sup>.

To bridge the climate finance gap, India must tap into the rapidly growing global green capital pool from sovereign wealth funds, global pensions, private equity, and infrastructure funds. This can be achieved by addressing investment barriers in transition projects, fostering a sustainable finance ecosystem, and diversifying funding sources.

Mobilizing substantial capital from traditional sources presents multiple challenges. One major obstacle is the perceived risk associated with low-carbon projects, especially in emerging economies. Investors often see such projects as uncertain and potentially low-yield, which creates a reluctance to commit large sums of capital.

Furthermore, the capital-intensive nature of these projects, along with long gestation periods and changing regulatory frameworks, can lead to a misalignment between investor expectations and project timelines. CPI analysis indicates that the high costs of capital and risk-adjusted return on capital, which can be up to seven times higher in developing economies compared to developed ones, have impeded the flow of global capital to these regions. Balancing viable returns on investment within reasonable timeframes requires innovative financial structures and risk mitigation mechanisms.

### **6. India's Climate Finance Strategy**

In November 2022, India submitted its Long-Term Low Emission Development Strategy (LT-LEDS) to the UNFCCC at COP27, signifying a significant shift that will require trillions of

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<sup>7</sup> <https://carboncopy.info/looking-inward-can-india-pave-its-own-path-to-self-reliant-climate-finance/>

dollars in investment. However, India currently lacks a comprehensive strategy for mobilizing the necessary climate finance. Key pillars for consideration are:

#### *6.1. Mobilizing Private Sector Capital*

India must prioritize attracting private-sector investment over public financing. Despite commitments from Western governments to support vulnerable countries, India contends that developed nations bear greater responsibility due to their historical emissions. Nonetheless, India must also mobilize private sector resources. Major corporations and financial firms globally view the climate transition as a significant economic opportunity (Larsen & Dupuy, 2023). Companies like Shell, BP, Reliance, Adani, and Tata are investing in clean technologies. India can attract private capital by highlighting the climate transition as an opportunity to leapfrog to advanced technologies, akin to its telecommunications revolution. Policies in key subsectors, such as the National Green Hydrogen Mission, can help mitigate risks and encourage early transitions.

#### *6.2. Leveraging International Institutions and Partnerships*

Multilateral institutions and international development banks (MDBs) such as the World Bank, IFC, and ADB need to prioritize affordable climate finance for countries like India. Proposals from Germany, the United States, and other G7 nations aim to reform the World Bank to better address climate challenges (Alba et al., 2023; Kastrop et al., 2022). India's G20 presidency presents an opportunity to advocate for MDB reforms. MDBs can lower project finance costs and enhance the creditworthiness of green projects. Aligning policy and regulation will be essential for smoother implementation. India should also engage with financial networks like the Network of Central Banks and Supervisors for Greening the Financial System (NGFS) to manage risks and reduce capital costs for low-carbon investments.

#### *6.3. Utilizing a Blend of Financial Instruments*

India must employ a mix of financial instruments—equity, debt, bonds, grants, philanthropic capital, and blended finance—to make the climate transition affordable. Innovative climate finance, such as pooled investment funds, credit guarantees, and green bonds, can unlock private investment and reduce dependence on debt. While India's initial green bond issuance is a positive step, it is insufficient. States and cities should also independently access bond markets. Blended finance, leveraging development finance or philanthropic capital to attract private investment, must be part of the strategy. Addressing barriers like limited bankable green projects, lack of standardized global policies, and the absence of a global climate finance marketplace will be critical.

#### *6.4. Funding Climate-Focused R&D and Innovation*

Investing in climate-focused research and development (R&D) is crucial. India must not only consume but also develop technologies for a just transition. Technologies like electric vehicles, renewable energy, carbon capture, and smart agriculture need to be tailored to the Indian market. Startups should play a significant role, leveraging India's dynamic ecosystem. Currently, India's climate tech venture capital funding lags behind other regions. Enhancing climate tech VC funding and increasing R&D spending is essential. Collaborative research with global partners will help strengthen India's R&D ecosystem.

By focusing on these pillars, India can effectively mobilize the capital and resources required for its ambitious climate transition. India's LT-LEDS framework includes core elements such as increasing the contribution of renewable energy, expanding biofuel usage,



boosting electric vehicle adoption, enhancing energy efficiency through the Perform, Achieve and Trade scheme, tripling nuclear capacity, and developing green hydrogen manufacturing<sup>8</sup>. As technologies become more affordable and the optimal paths to net-zero in various sectors become clearer, additional components of India's net-zero strategy will emerge.

To implement the LT-LEDS, India requires a comprehensive climate finance strategy grounded in the four pillars mentioned above. These pillars should support the financing of each element outlined in the LT-LEDS document and any new components that arise as the net-zero strategy evolves.

A fragmented approach to climate finance will result in a slower climate transition and a missed opportunity for India to become a green superpower. Conversely, a holistic strategy will enable India to secure affordable, timely capital for the necessary projects, technologies, and enterprises to accelerate its climate transition.

## **7. Conclusion**

India stands at a critical juncture in its quest for sustainable development in the face of global climate challenges. The ambitious targets set forth in its Long-Term Low Emission Development Strategy (LT-LEDS) underscore the pressing need for a robust climate finance strategy. To achieve its objectives of bolstering resilience, cutting emissions, and promoting sustainable growth, India must adopt a strategic approach built on four essential pillars.

Firstly, mobilizing private sector capital is paramount. By encouraging investment in clean technologies and creating a conducive policy environment, India can attract substantial funding from private enterprises. Secondly, forging partnerships with international institutions and multilateral development banks will provide vital financial backing and technical know-how. Thirdly, leveraging a diverse range of financial tools such as green bonds, guarantees, and concessional loans will be crucial for financing India's climate transition efficiently. Lastly, prioritizing investments in climate-oriented research and development will spur innovation and adaptation of technologies tailored to India's specific needs.

An integrated climate finance strategy based on these pillars will not only enable India to meet its climate goals but also position it as a global leader in sustainable development. By aligning financial resources with low-carbon pathways and enhancing resilience, India can tackle climate change challenges while advancing economic prosperity and social equity for its people. Through collaborative efforts and strategic alliances, India has the opportunity to pave the way towards a cleaner, more sustainable future.

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<sup>8</sup> <https://ddpinitiative.org/wp-content/uploads/pdf/ndc-lts.pdf>

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