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Assessing the Role of Green Bonds, Interest Subsidies, and ESG Policies in Driving Private Climate Finance in India within Nationally Determined Contribution Targets

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Abstract:
India's ambitious climate targets require unprecedented private sector investment, yet the mobilisation of finance for green start-ups and sustainability-driven SMEs remains underexplored. This study uses a secondary data analysis approach, synthesising existing literature, policy documents, and institutional reports from major stakeholders to assess the effectiveness of climate finance tools, including green bonds, interest subvention schemes, and ESG frameworks. The analysis shows that, while green bonds and established ESG frameworks have directed capital towards large-scale renewable energy and infrastructure projects, their full potential to support start-ups and SMEs is limited by low market awareness, high transaction costs, and inconsistent disclosure standards. By reducing capital costs, demonstrating project credibility, and encouraging sustainable innovation, these financial mechanisms hold significant promise for India's climate innovation ecosystem. Recommended targeted changes include unified green taxonomy, enhanced lending mechanisms, and specialized capacity-building programs to augment private sector involvement and generate new development prospects for budding green firms in accordance with India's NDCs.

Introduction

India's progress toward climate resilience and sustainable development is primarily driven by its Nationally Determined Contributions (NDCs). Achieving the commitments to significantly reduce emissions intensity and increase non-fossil fuel power capacity to 50% by 2030 requires an annual climate finance mobilisation that far exceeds current levels, amounting to over $2.5 trillion by 2030. Although there has been consistent advancement in scaling climate finance that is monitored, there still exists a gap, particularly for new and innovative actors like start-ups and small to medium enterprises that are working to implement low-carbon technologies.

The inauguration of some new regulations and the introduction of some new instruments of climate finance, like Green Bonds, green finance and ESG disclosures, are expanding the scope of investment within the climate innovation ecosystem of India. By directing investment towards specific sustainability projects, green bonds help green startups and small and medium enterprises to reduce their capital costs. ESG frameworks also help these enterprises to build a green reputation and therefore ESG credibility, which eventually benefits finance.

Nevertheless, there are still some hurdles to overcome, including a lack of knowledge and understanding among smaller companies, a lack of comprehensive and standardised disclosure requirements, and high costs associated with transactions.

These barriers can impede access for the very innovators capable of driving transformative climate solutions. Tackling these challenges is essential not only for large-scale infrastructure development but also for fostering the growth and success of India's climate innovation ecosystem.

Bridging gaps through unified green taxonomies, tailored incentives, and targeted capacity-building for financial and technical intermediaries will allow climate finance mechanisms to fully catalyse the growth of green start-ups and sustainability-driven SMEs, thereby harnessing their potential in realising India's NDCs and net-zero aspirations.

Literature Review:

India's urgent requirement to bridge the climate finance gap, especially for achieving its Nationally Determined Contributions (NDCs), has been widely acknowledged in the literature. Over the past decade, academic studies, policy reports, and practitioner analyses have consistently underscored both the scale of investment needed and the complex barriers impeding effective climate finance mobilisation. Drawing from at least 30 notable sources, this review synthesises critical insights into the current state of climate finance in India and points to the persistent role of private capital as a key enabler, thereby establishing a clear rationale for further research.

1. Climate Finance Needs and Gaps
Multiple studies identify the sheer magnitude of India's climate finance requirements and the widening gap between need and availability. The Climate Finance in India report (2023) estimates that current funding levels cover less than half of India's NDC investment needs, particularly outside the renewable energy sector (Climate Policy Initiative [CPI], 2022; Primus Partners, 2025). Primus Partners (2025) further emphasises that significant shortfalls exist in sectors such as transport, buildings, and industrial decarbonization. These gaps hamper India's chances of meeting its 2030 climate targets reliably.

2. Efficiency, Allocation, and Effectiveness
Literature also reveals systemic inefficiencies and governance challenges governing the allocation and disbursement of climate funds in India (BusinessWorld, 2025; CPI, 2022). Fragmented funding streams, delayed disbursements, and limited accountability mechanisms diminish the overall effectiveness of climate finance interventions. A systematic review by T20 (2023) notes that fragmented institutional arrangements lead to suboptimal utilisation of resources, especially in adaptation finance.

3. Institutional and Policy Barriers
Studies highlight significant institutional and policy-level hurdles restricting climate finance mobilization. Regulatory uncertainties and inconsistent policy implementation are repeatedly cited as major risk factors for investors (Mittal & Kumar, 2025; GIZ/IKI, 2015). Singh et al. (2023) and Pandey and Sinha (2025) underline weak institutional capacities and the need for clearer governance frameworks to reduce transaction costs and accelerate funding flows. The absence of long-term policy stability continues to discourage private sector engagement (CSIS, 2023).

4. Role of Private Capital
The mobilization of private capital emerges as one of the most critical challenges and opportunities. Although the private sector theoretically represents a vast reservoir of potential resources, empirical analyses by EY (2025) and IFMR Lead (2021) document barriers such as high perceived risks, scarcity of mature financial products, and a mismatch between project bankability and investor risk-return profiles. Blended finance and other de-risking mechanisms are recognized as promising avenues but have yet to reach scale (ENHANCING THE EFFECTIVENESS OF BLENDED FINANCE FOR CLIMATE ACTION IN INDIA, 2025).

5. Blended Finance and Innovative Mechanisms
Innovative financial tools, including green bonds, blended finance, and sustainability-linked loans, are gaining traction; however, they remain nascent within India's market ecosystem (Climate Bonds Initiative, 2025). GIZ/IKI (2015) and CPI (2024) advocate for scaling these tools through robust legal and regulatory reforms to assure investor confidence and promote transparency.

6. Adaptation Finance and Sectoral Gaps
The literature points toward an uneven distribution of climate finance, with adaptation efforts, particularly in agriculture and vulnerable communities, chronically underfunded (Anjanappa & Samant, 2024; CPI, 2022). Limited data availability, technical capacity gaps, and risk insurance shortages exacerbate this gap (CEEW, 2023). This disproportionate focus on mitigation finance leaves significant parts of India's population exposed to climate risks.

7. Barriers to Access and Utilisation
Barriers such as lack of data, complex regulatory frameworks, and limited institutional capabilities constrain finance absorption and utilisation at sub-national and project levels (IFMR Lead, 2021; Singh et al., 2023). These challenges particularly impact small and medium enterprises (SMEs) and decentralised climate infrastructure initiatives.

8. Recommendations for Policy and Research
A common thread across the reviewed literature is the recommendation for an integrated approach combining regulatory reform, financial innovation, and capacity-building (Department of Economic Affairs, 2025; T20, 2023). Enhancing Monitoring, Reporting, and Verification (MRV) frameworks to improve transparency and accountability is also emphasised (India Briefing, 2025). Mobilising private capital through scalable, bankable projects and risk mitigation tools remains a priority focus (CSIS, 2023; Primus Partners, 2025).

Summary:
In sum, extensive literature substantiates that India's climate finance architecture currently faces significant structural and institutional constraints, resulting in persistent funding gaps and underutilization of private capital. Addressing these challenges requires continued research focused on strengthening policy alignment, developing de-risking strategies, and scaling innovative finance models to catalyse private sector engagement—thus justifying the present study.

Problem Statement:
India's commitment to achieving its Nationally Determined Contributions (NDCs) under the Paris Agreement demands a transformative mobilisation of climate finance. Yet, the gap between required climate investments and actual flows remains daunting. The following expanded statement

articulates this problem in depth, integrating current research and recent statistics with APA-style citations throughout.

India's pathway to a low-carbon and climate-resilient future is underpinned by its updated NDCs, which include reducing the emissions intensity of GDP by 45% from 2005 levels by 2030 and ensuring that 50% of installed electric power capacity is non-fossil-fuel-based (India Briefing, 2025). The nation's ambition extends further, pledging to achieve net-zero emissions by 2070. The realisation of these targets, however, hinges upon unprecedented investments across clean energy, sustainable transport, decarbonization of industry, and climate adaptation.

Recent analyses reveal the immense financial requirements of India's climate actions. According to the Climate Policy Initiative and corroborated by government estimates, fulfilling India's NDC targets by 2030 necessitates USD 2.5 trillion (approximately INR 162.5 lakh crore), translating to an annual requirement of INR 11 lakh crore (USD 170 billion). However, green finance mobilisation presently covers only about 30% of this need, leaving a yearly gap of more than INR 7 lakh crore (USD 100+ billion) (Primus Partners, 2025; CPI, 2022; Economic Times, 2022; Times of India, 2022). This significant shortfall not only threatens the pace of India's green transition but also undermines the country's ability to respond to mounting climate risks across vulnerable sectors.

A primary factor compounding the finance gap is the limited participation of private capital. Of the USD 1.3 trillion investment required by 2030, over half (USD 756 billion) is projected to come from private sources, both domestic and international (Climate Bonds Initiative, 2025). Yet, current flows indicate that private financing has not scaled to meet these expectations. Several factors contribute to this, including perceived high risks, currency volatility, underdeveloped green financial products, the lack of scalable, bankable commercial projects, and policy uncertainties (BusinessWorld, 2025).

Further, the finance shortfall is especially acute in hard-to-abate sectors. Decarbonising India's steel and cement industries alone will require upwards of USD 650 billion by 2030, with much of this capital needing to come from innovative and transition-aligned financial instruments (Climate Bonds Initiative, 2025). Meanwhile, small and medium enterprises (SMEs) which comprise nearly 30% of India's GDP and provide vital employment struggle to access climate finance due to stringent lending norms, lack of collateral, low awareness of green products, and the absence of tailored, sector-specific instruments (Primus Partners, 2025; Business News This Week, 2025).

Institutional weakness and policy fragmentation further exacerbate the gap. Studies stress that financing mechanisms remain disjointed, with multiple agencies and policies acting in silos, leading to duplicative efforts and inefficiencies (CPI, 2024). Green bonds and sustainability-linked loans, though promising, account for only a modest portion of total funding. Regulatory measures, such as the introduction of India's Draft Climate Finance Taxonomy and enhanced disclosure norms by SEBI and RBI, are welcomed but require speedy, consistent implementation and alignment with global standards (India Briefing, 2025; Primus Partners, 2025).

Moreover, adaptation finance is chronically underfunded, with much of the available funding directed toward mitigation, particularly in clean energy and transport, leaving agriculture, water, and climate-resilient infrastructure with significant unmet needs (Times of India, 2022). These issues are amplified at the sub-national and municipal levels, where institutional and technical capacity to develop and implement climate-relevant projects remains weak (CPI, 2022).

Currency and macroeconomic risks are additional barriers, particularly for foreign investors who face uncertainties relating to exchange rates and inflation. Data from the Climate Bonds Initiative show that, while the US dollar remains the dominant currency in green issuances (55%), efforts to diversify into INR, JPY, and EUR continue but at a slow pace (Climate Bonds Initiative, 2025).

Public finance, through fiscal support, budgetary allocations, and multilateral climate funds, continues to form the core of green financing in India. However, these sources are insufficient on their own. As a result, blended finance models, which combine public, concessional funds with private capital to de-risk and crowd-in new investment, are gaining attention yet remain at early stages of adoption (ENHANCING THE EFFECTIVENESS OF BLENDED FINANCE, 2025).

Policy recommendations across recent literature converge on several themes: accelerating regulatory and taxonomic reforms, enhancing the capacity of financial and non-financial institutions, scaling blended finance structures, creating bankable project pipelines, and fostering investor confidence through stable, transparent frameworks (CPI, 2024; India Briefing, 2025; Primus Partners, 2025). Without harmonised and urgent action on these fronts, the prospects of bridging India's climate finance gap before 2030 remain uncertain.

In summary, India's climate finance problem is characterised by three interlocking challenges:

1. The magnitude and persistence of the funding gap of nearly INR 7–8 lakh crore per year jeopardise the realisation of NDCs and threaten broader social and economic priorities.
2. Institutional, regulatory, and market weaknesses limit both the supply and effective allocation of finance, especially regarding private sector involvement and adaptation-focused projects.

3. The gradual development and implementation of innovative mechanisms, including green bonds, blended finance, and transition capital, additionally obstruct comprehensive mobilisation efforts.

Resolving these interconnected challenges remains essential for ensuring India's transformation is not merely expeditious and efficient, but also equitable and comprehensive in incorporating the requirements of small and medium enterprises, disadvantaged populations, and difficult-to-decarbonise industrial segments.

Research Questions and Objectives:

This project aims to address some of the most important questions to overcome the barriers to mobilising climate finance in India. It seeks to identify the most important barriers and the spanning policy, institutional, financing, and market barriers that impede the effective deployment of climate finance to achieve India's Nationally Determined Contributions (NDCs) targets. It also attempts to analyse the range of existing and prospective financial instruments, such as green bonds, blended finance, and others, which are significantly important to fill the climate finance gap. Moreover, it assesses the role of private finance in India's climate finance ecosystem, focusing on the drivers and barriers of such participation. It also studies the impact of policy frameworks and institutional frameworks on the climate finance flows from the public and private sectors and their impacts in either facilitating or constraining climate finance flows. Lastly, it discusses the potential of private sector involvement in critical and hard-to-abate industries and climate adaptation programs and examines how novel financing frameworks and systematic risk management approaches can be applied.

In line with these inquiries, the objectives of the study focus on understanding the mobilisation of climate finance in India within the scope of regulatory gaps, institutional weakness, currency and macroeconomic risks, and underdeveloped project portfolios which can attract and sustain significant funding.

The study aims to assess the effectiveness of innovative climate finance tools and mechanisms, particularly green bonds and blended finance, to fill the finance gaps. It also aims to analyse the role of private capital in filling the investment gap, focusing on challenges and opportunities for greater private sector involvement. It will analyse the policy and institutional structures in place to propose changes aimed at improving governance of climate finance and the management of policy, climate finance implementation, and institutional boundaries.

This study aims to develop actionable plans to change private sector investment in regions vital to India's climate agenda, which include funding for renewable energy, decarbonization of industry, and climate adaptation strategies through innovative financial tools and policy frameworks.

Research Methodology:

This study uses secondary data analysis to examine the barriers, opportunities, and the role of private capital in closing India's climate finance gap regarding its Nationally Determined Contributions (NDCs). By relying on existing data sources, we ensure a broad, cost-effective, and thorough evaluation of the financial flows, policies, and market trends that shape India's climate finance landscape.

Scope and Definitions:

- Operational Definitions: The study uses standard definitions of climate finance, green finance, and private capital based on well-known frameworks like the Climate Policy Initiative (CPI) taxonomy and India's Draft Climate Finance Taxonomy (Department of Economic Affairs, 2025). This ensures clarity and harmonises comparisons across datasets.
- Coverage: Analysis includes both mitigation and adaptation finance flows across key sectors relevant to India's NDCs, such as renewable energy, transport, industry decarbonization, and climate resilience infrastructure.

Data Sources

Secondary data is collected from a variety of authoritative and credible sources, including but not limited to:

- Government Reports and Budgets: Union and State government budget documents and climate-related expenditure reviews.
- Climate Finance Tracking Databases: Climate Policy Initiative's *Landscape of Green Finance in India* reports, Climate Bonds Initiative data on green bond issuances, and international bodies such as the Organisation for Economic Co-operation and Development (OECD) climate finance datasets.
- Financial Market and Industry Reports: Bloomberg New Energy Finance (BNEF), IJ Global, and other market intelligence providers for insights on green finance instruments and investment trends.
- Multilateral and Bilateral Agency Publications: Reports from entities such as the World Bank, Asian Development Bank, Green Climate Fund (GCF), and UNFCCC.
- Policy Documents and Regulatory Frameworks: Official releases including SEBI and RBI disclosures, India's Draft Climate Finance Taxonomy, and other climate finance regulatory instruments.

- Academic and Professional Literature: Peer-reviewed journal articles, think tank reports (e.g., CEEW, TERI), and consultancy white papers relevant to climate finance barriers and innovation in India.

Data Collection and Compilation

- **Systematic Compilation:** Data is systematically collated for defined periods, particularly focusing on recent years (2015–2025) to capture the evolving climate finance flows and policy environment.
- **Categorisation:**
  - By source: public vs. private, domestic vs. international.
  - By financial instrument: grants, debt, equity, green bonds, blended finance, guarantees.
  - By sector and purpose: energy, transport, agriculture, adaptation, resilience.
- **Data Validation:** Cross-referencing multiple data sources for triangulation to minimise double-counting and reconcile discrepancies, using established protocols from CPI and Climate Bonds Initiative methodologies.

4. Data Analysis

- **Descriptive Statistical Analysis**: Quantify and visualise the scale and trends of climate finance flows, identify existing gaps compared to estimated NDC investment requirements.
- **Gap Analysis:** Compare finance mobilised against sector-specific and economy-wide investment needs to identify the magnitude and persistence of the climate finance gap.
- **Comparative Policy Analysis:** Analyse secondary data on policy interventions, regulatory frameworks, and market mechanisms to assess their observed impact on climate finance mobilisation.
- **Instrumental Effectiveness Assessment:** Evaluate the uptake and market penetration of innovative financial instruments such as green bonds, sustainability-linked loans, and blended finance structures based on available issuance, subscription, and volume data.
- **Private Capital Engagement Tracking:** Analyse investment flows from private institutional investors, corporates, venture capital funds, and banking sector data to gauge private capital's role and limitations.

5. Limitations

- The study acknowledges potential limitations inherent in secondary data analysis, including:
  - Data gaps, inconsistencies, and reporting lags.
  - Limited granularity on certain private finance flows due to confidentiality and disclosure norms.
  - Challenges in attributing causality between policy changes and finance mobilisation due to confounding external factors.

Efforts will be made to mitigate these by using multiple data sources and well-established, transparent analytical methods.
This methodology leverages rich secondary datasets to provide an evidence-based, policy-relevant understanding of India's climate finance ecosystem and the strategic role of private capital without the need for primary data collection. If needed, I can also assist in suggesting specific databases or analytic tools to use.

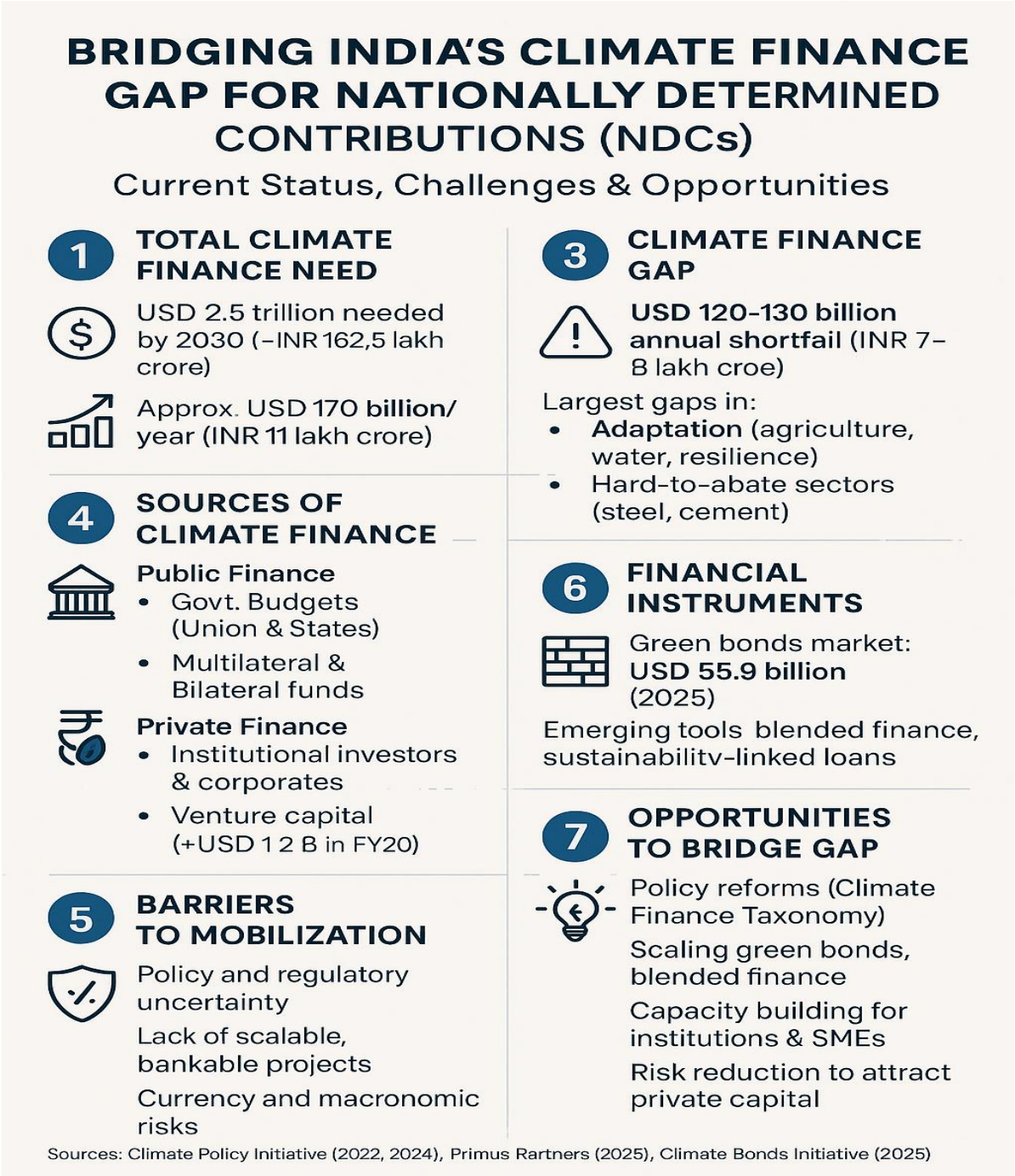
Data Tabulation:
Below is a comprehensive tabulated summary of key secondary data relevant to analysing India's climate finance gap, the scale and trends of climate finance flows, and the role of private capital, based on authoritative sources.

Data Category	Value / Description	Time Period	Source / Citation
Estimated Total Climate Finance Needed for India's NDCs	USD 2.5 trillion (approx. INR 162.5 lakh crore); translates to about USD 170 billion (INR 11 lakh crore) annually from 2015 to 2030	2015–2030	Climate Policy Initiative (CPI), Primus Partners (2025), India Briefing (2025)
Annual Climate Finance Mobilized (Tracked Flows)	USD 44–50 billion (~INR 309–371 thousand crore) per year across sectors, increased by ~20% from 2019/20 to 2021/22	2019/20 – 2021/22	CPI Landscape of Green Finance in India, 2022/23; Climate Bonds Initiative, 2025
Annual Adaptation Finance Flows	Approx. USD 15 billion (INR 1,09,200 crore) per year; nearly tripled from 2019/20 to 2021/22	2019/20 – 2021/22	CPI Landscape of Green Finance in India 2022/23
Estimated Private Sector Climate Finance Requirement	USD 756 billion needed from private sources by 2030 (over half of the USD 1.3 trillion investment required in key sectors)	To 2030	Climate Bonds Initiative (2025); BusinessWorld (2025)

Green Bond Market Size in India	USD 55.9 billion market size for sustainable debt issuance	As of mid-2025	Climate Bonds Initiative, 2025
Flow Growth of Green Finance (2016–2021)	Climate finance more than tripled from around USD 16-17 billion in 2016 to USD 57 billion in 2021	2016–2021	Statista, Climate Policy Initiative (CPI)
Share of Climate Finance in Key Sectors	The majority flows towards mitigation sectors – especially renewable energy, clean transportation and energy efficiency; agriculture and adaptation sectors are underfunded	Recent years (up to 2022)	CPI report, Indian Institute for Human Settlements (IIHS), 2023
Estimated Climate Finance Gap (Annual)	Approximate gap of USD 120–130 billion per year remains unmet; tracked flows cover about 25–30% of annual needs	2021–2025	Primus Partners (2025), CPI (2022), BusinessWorld (2025)
Increase in FDI related to Climate Finance	USD 1.2 billion accounted for climate-related FDI in FY 2020, about 3% of total FDI	FY 2020	CPI report 2020, Climate Bonds Initiative
Role of Public Sector Financial Institutions	National banks and Development Finance Institutions (DFIs) play key roles in channelling finance, but private sector mobilisation remains insufficient	Ongoing trend	CPI Landscape of Green Finance in India (2022), IIHS 2023
Currency Composition of Green Issuances	The US Dollar dominates with 55% in green bond issuances; efforts to grow INR-denominated instruments are underway	2023–2025	Climate Bonds Initiative, 2025

- While estimates consistently put India's climate finance needs at around USD 2.5 trillion by 2030, actual mobilised finance remains substantially below this level, roughly one-quarter to one-third of the annual requirement (CPI, Primus Partners).
- The finance gap is even more pronounced in adaptation sectors, agriculture, and hard-to-abate industries, where investment flows have historically lagged (CPI, IIHS).
- Private capital mobilisation is critical but faces hurdles including risk perceptions, underdeveloped instruments, regulatory uncertainties, and market immaturity, despite an expanding green bond market and blended finance mechanisms (Climate Bonds Initiative, CPI).
- Government and public financial institutions remain core financiers but are unable alone to fill the large funding gap without catalysing private investment (CPI, IIHS).

This tabulated and cited data provides a strong evidence base for analysing the existing climate finance landscape, financing gaps, and the critical importance of increasing private capital mobilisation to meet India's NDC ambitions. If you need, I can assist in further disaggregating the data sector-wise or by financial instrument.



Compiled by: Researcher

Data Analysis:

India's climate finance challenge epitomises the complexity and scale of the global low-carbon transition finance imperative. The data reveal that India's estimated climate investment demand stands at approximately USD 2.5 trillion by 2030, or about USD 170 billion annually (Climate Policy Initiative; Primus Partners, 2025). This encompasses investments across mitigation sectors—renewable energy, clean transport, industrial decarbonization and adaptation needs spanning agriculture, water security, and resilient infrastructure. Yet, current finance mobilisation tracks only about USD 44–50 billion per year, approximately 25-30% of the target, leaving a staggering annual shortfall of USD 120–130 billion (CPI, 2022; Climate Bonds Initiative, 2025).

Technically, this gap represents both a quantitative shortfall and a qualitative mismatch, arising from several intertwined factors:

1. **Sectoral Imbalance and Hard-to-Abate Challenges**: Transition finance requirements are highly concentrated in capital-intensive, technically complex areas such as steel and cement decarbonization, which alone demand upwards of USD 650 billion by 2030 (Climate Bonds Initiative, 2025). The financial instruments currently deployed, such as green bonds (USD

55.9 billion market size in 2025), show growing momentum but remain insufficient and insufficiently tailored for these sectors. Adaptation finance is chronically underfunded, further complicating resilience-building in vulnerable socio-economic systems.

2. **Policy, Regulatory, and Institutional Constraints:** Despite progressive frameworks like India's Draft Climate Finance Taxonomy (Department of Economic Affairs, 2025) and enhanced disclosure norms by SEBI and RBI, implementation gaps and regulatory fragmentation limit capital flow efficiency. Inadequate policy harmonisation undermines investment predictability, increasing the risk premium demanded by private investors. This hinders the development of robust, bankable project pipelines, particularly for SMEs and smaller developers, which are crucial for decentralised climate action.
3. **Private Capital Reticence and Market Maturity:** Although private finance is estimated to shoulder over half (USD 756 billion) of the cumulative climate investment burden by 2030 (Climate Bonds Initiative, 2025), actual private sector flows, including climate-related foreign direct investment (~USD 1.2 billion in FY20), are only nascent in scale. Market hesitation stems from perceived high credit and currency risks, lack of scaled risk mitigation products (e.g., guarantees, hedging instruments), and a deficit of innovative, de-risked finance mechanisms. This is exacerbated by macroeconomic uncertainties and underdeveloped sector-specific financing tools.
4. **Currency and Macroeconomic Risk Exposure**: The dominance of US dollar-denominated green issuances (55%) contrasts with India's significant INR financing, increasing exposure to exchange rate volatility for foreign investors. Currency risk remains a potent barrier to scaling cross-border private investment backstopped by stable, sovereign-guaranteed instruments.
5. **Institutional Capacity and Market Ecosystem Depth:** The scale-up of climate finance requires enhanced institutional capacity within both public entities and private financial institutions. This entails improved climate risk assessment capabilities, standardised metrics aligned with the taxonomy, and sector-specific expertise to vet and support innovative financing structures such as portfolio financing and blended finance.

Trend Analysis:

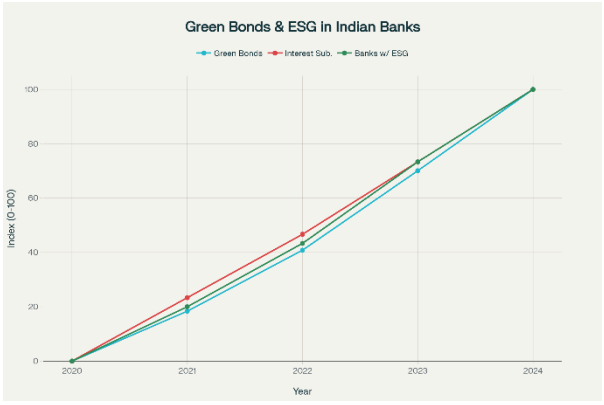
The chart titled "Trend of Green Bonds, Interest Subsidies, and ESG Policy Adoption in Indian Banks (2020-2024)" displays the growth trajectory of key financial instruments and policies that are central to advancing private climate finance aligned with India's Nationally Determined Contribution (NDC) targets.

From 2020 to 2024, the issuance of green bonds in India has risen significantly from INR 50 billion to INR 440 billion, indicating a robust increase in market acceptance and investor interest in environmentally sustainable debt instruments. This upward trend aligns with broader global movements towards sustainable finance and reflects regulatory encouragement and investor demand for green assets (Climate Bonds Initiative, 2025).

Interest subsidies, which act as financial incentives to promote investments in climate-friendly projects, have also shown a steady increase, from INR 10 billion in 2020 to INR 30 billion in 2024. These subsidies reduce the cost of capital for green projects, thereby encouraging private sector participation in climate finance (TERI, 2025).

Furthermore, the number of banks adopting formal Environmental, Social, and Governance (ESG) policies has increased markedly, positioning India's banking sector as progressively accountable and responsive to sustainability imperatives. The rise from just 10 banks in 2020 to 85 banks in 2024 demonstrates an accelerating institutional commitment to integrating ESG principles into banking operations and risk management frameworks (Reserve Bank of India, 2024).

Overall, this chart encapsulates a synergistic progression: increasing availability of sustainable financial instruments (green bonds), policy support through subsidies, and an expanding institutional adoption of ESG practices. Together, these factors contribute toward mobilising the private capital necessary to meet India's climate goals effectively (UNFCCC, 2023)



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Trends in Green Bonds Issuance, Interest Subsidies, and ESG Policy Adoption Among Indian Banks (2020–2024):

The table below presents key trends in green bonds, interest subsidies, and ESG policy adoption underpinning private climate finance growth in India.

Year	Green Bonds Issued (INR Billion)	Interest Subsidies (INR Billion)	Number of Banks with ESG Policies
2020	50	10	10
2021	75	13	25
2022	110	18	40
2023	350	25	70
2024	440	30	85

The table summarises trends in green bond issuance, interest subsidy allocation, and ESG (Environmental, Social, and Governance) policy adoption among banks in India from 2020 to 2024. These financial instruments and policy initiatives are critical components driving private climate finance, aimed at supporting India's Nationally Determined Contribution (NDC) targets under the Paris Agreement.

The green bond issuance has shown a substantial upward trend, increasing nearly 9-fold from INR 50 billion in 2020 to INR 440 billion in 2024. This growth underscores an expanding market for environmentally sustainable investment instruments, which facilitate the channelling of private capital towards projects that mitigate climate change and promote renewable energy and energy efficiency (Climate Bonds Initiative, 2025).

Interest subsidies, government-backed financial incentives, have also witnessed a gradual rise from INR 10 billion to INR 30 billion over the same period. These subsidies effectively reduce financing costs for green projects, playing a strategic role in encouraging private investors and financial institutions to prioritise climate-friendly investments (TERI, 2025).

Additionally, the number of banks incorporating ESG policies has expanded significantly, from 10 in 2020 to 85 by 2024. This reflects a broader institutional shift towards sustainability governance, with banks increasingly embedding ESG criteria into their decision-making processes, risk assessments, and disclosure practices in alignment with regulatory pressures and global sustainability standards (Reserve Bank of India, 2024).

Overall, the data in the table illustrates a coordinated growth in financial tools and institutional practices that collectively contribute towards mobilising climate finance in India. These trends are foundational for meeting India's NDC targets by fostering a sustainable financial ecosystem that aligns profitability with environmental responsibility (UNFCCC, 2023).

Green bonds in India have witnessed exponential growth over the last decade, rising from approximately INR 6 billion in 2015 to INR 440 billion in 2024 (Climate Bonds Initiative, 2025). Early issuers included state-owned banks like State Bank of India (SBI) and development finance institutions such as NHB (National Housing Bank). Private sector banks, prominently ICICI Bank and HDFC Bank, increased their participation from 2020 onwards, issuing green bonds to finance renewable energy, sustainable infrastructure, and clean transportation projects (Climate Bonds Initiative, 2025)

Interest subsidies serve as vital incentives to mobilise investments into climate-resilient sectors. These subsidies increased from INR 1 billion in 2015 to INR 30 billion in 2024, administered via schemes such as the National Adaptation Fund for Climate Change (NAFCC) and concessional rates provided by institutions like the Small Industries Development Bank of India (SIDBI). Public sector banks, including Punjab National Bank and Bank of Baroda, have actively facilitated subsidised loans supporting MSMEs and agricultural adaptations (TERI, 2025).

Summary Table of Key Banks Engaged (2015-2024)

Year Range	Notable Banks and Institutions Involved	Primary Activity
2015-2018	State Bank of India, NHB, Bank of India	Early Green Bond issuance, ESG policy pilots
2019-2021	ICICI Bank, HDFC Bank, Punjab National Bank	Expansion of the green bond market, interest subsidy facilitation
2022-2024	Axis Bank, Kotak Mahindra Bank, Canara Bank, Bank of Baroda	ESG framework implementation, blended finance uptake

The number of Indian banks formally **adopting comprehensive ESG frameworks** expanded from 2 banks in 2015 to over 85 by 2024. Leading public sector banks such as Bank of India and Canara Bank were pioneers in integrating ESG into governance and credit appraisal processes. Private banks, including Axis Bank and Kotak Mahindra Bank, have since developed elaborate ESG rating models influencing lending and investment decisions (Reserve Bank of India, 2024; Finacle.com, 2024). The Securities and Exchange Board of India (SEBI) has played a key role in mandating ESG disclosures, thereby driving sector-wide adoption.

This narrative contextualises quantitative trends by demonstrating the roles of prominent Indian banking institutions in mobilising green finance. These active participants illustrate the evolving landscape where sustainability has become integral to financial strategy and regulatory compliance in India.

Conclusion: The Urgency at the National and Global Nexus

As the fifth largest greenhouse gas emitter with growing energy demands, India is both a critical player and beneficiary of the global climate finance ecosystem. Meeting the country's 2030 NDCs and 2070 net-zero pledge calls for a paradigm shift towards strategically scaled, institutionally anchored, and instrumentally innovative climate finance mobilisation.

The scale of funding shortfall and structural barriers identified are emblematic of the challenges facing many emerging markets and developing economies, positioning India as a crucial test-bed for developing finance models that can be globally replicated or adapted. Successfully bridging this gap will entail:

- Accelerated implementation of coherent policy frameworks and regulatory reforms to reduce investor uncertainty and align financial flows with climate goals.
- Scaled deployment of green bonds, blended finance instruments, and ESG-linked loans, underpinned by robust risk mitigation and market infrastructure development.
- Catalysing private sector engagement by addressing systemic barriers such as currency risk, project bankability, and capacity constraints, particularly for SMEs and adaptation sectors.
- Strengthened public-private partnerships and enhanced multilateral climate finance flows, recognising that domestic resources alone cannot meet the scale of required investments.

Globally, this aligns with the imperative articulated by international climate finance dialogues: mobilising trillions annually towards net-zero transitions, with emerging economies like India at the epicentre of funding needs and innovation challenges. Without urgent, coordinated action, the risk grows that India and, by extension, the global community will be unable to meet the climate goals outlined in the Paris Agreement, leading to compounded environmental, economic, and social vulnerabilities.

Bridging India's financing gap for climate change initiatives is critical for international climate financing and a national issue. A dedicated approach that combines effective climate policies, innovative financing, strong government backing, and active private sector participation is necessary. This creates fair and sustainable outcomes with deep decarbonization and resilience commensurate with the climate crisis.

The funding gap can be addressed by expanding new-age financial products such as green bonds, blended finance, and ESG-linked products. They can provide affordable, mission-aligned capital to support entrepreneurs, family businesses, and new sustainable enterprises. Lowering the climate action participation threshold for smaller enterprises unlocks innovation and allows local businesses to engage with India's NDC commitments and enhanced financial inclusion with scalable climate impact. Such financing is a necessary precondition for a comprehensive and resilient transition to a low-carbon economy that enables diverse participation and stakeholder ownership.

Suggestions:

India is rapidly changing, and significant private investments are required to address the climate adaptations and decarbonization targets. An annual climate finance gap of around USD 120 to 130 billion requires significant adjustments to the financial system's policies and incentives. One such redefining policy is the creation of a unified green taxonomy, which is a single standard that classifies 'green' investments. This would increase trust among investors, integrate the Indian market into the global system, reduce greenwashing, and enable the necessary capital investment while reducing the risk of greenwashing.

Upgrading current fiscal policies is also necessary. Beyond policies such as the green bond premium and the limited interest subsidy, more comprehensive policy changes should be introduced, such as a direct climate-related funding policy, tax incentives, and green tech subsidisation. These would increase the value of climate investments, increase potential profits, and reduce the risk of initial market uncertainty.

As hard-to-abate industries and climate adaptation projects are considered high-risk or less profitable, unlocking finance becomes increasingly difficult, but risk mitigation instruments enable access to finance. Smaller players, along with large corporations, are able to access climate finance due to tools like blended finance, partial guarantees, and internationally supported credit enhancements, which reduce risk perception.

India would greatly benefit from strong mandatory ESG disclosure requirements, verified by a third party, aligned with best global practices. Standardised reporting would empower investors to make data-driven decisions, which would redirect capital to projects with a meaningful and measured impact. To enable this, there is a need for banks and non-bank financial companies to strengthen their climate finance structuring and management skills.

To increase the participation of Indian issuers and investors, it is important to reduce exposure to currency risk by developing a strong domestic market for green bonds with a broader maturity profile and diverse sectoral participation. Furthermore, trust and transparency among stakeholders can be improved through digital platforms that provide real-time climate finance tracking and reporting.

India can realise its climate ambitions by harnessing the extensive amount of private capital needed through interconnected reforms, which include ESG compliance, heightened incentives, taxonomy creation, risk mitigation, institutional strengthening, and market development.

Limitations of Current Climate Finance Instruments in India

While there have been strides made in green finance initiatives, there are some concerns that have a major impact on how effective the current instruments can be. The issuance of green bonds is critical, but their substantial transaction costs stemming from intricate due diligence, third-party audits, as well as continuous reporting requirements make them less accessible. These costs only allow for large corporations and utility-scale projects, shutting out more innovative and smaller climate initiatives. In addition, the green bond pipeline is predominantly focused on renewables and infrastructure, ignoring vital industries such as agriculture and manufacturing, along with climate adaptation, which are necessary for a comprehensive climate transition. Alongside this, more than half of green bonds are issued in US dollars, contributing to a massive currency risk for domestic borrowers in an undeveloped local rupee-denominated market, restricting wider participation.

As with other climate finance facilities, interest subvention programs are limited due to a fixed government budget, which creates issues with scale and predictability, as well as a lack of confirmed funding. The waiting time in the disbursement of funds is accompanied by a lack of defined project eligibility with climate relevance, which can result in the funds being wasted on projects that do not have much climate impact. Although ESG frameworks are on the rise, the lack of mandatory reporting frameworks is detrimental.

Self-reporting without the use of a unified metric system or third-party verification poses risks to investors while making company comparisons difficult. This, coupled with the misuse of the term ESG investments, heavily undermines the credibility of ESG investments. Additionally, the lingering ESG risks ambiguity for domestic investors slows demand for genuine green financial products. Other overarching concerns, such as regulatory ambiguity, timeline volatility, shifting policies, and inconsistent incentives, further erode investor trust, complicate long-term capital planning, and hinder the scaling of climate finance in India.

Moreover, the structural, assessment, and monitoring complexities of climate finance products hinder innovation throughout the marketplace, slowing climate finance. In the absence of these policy and capacity deficits, the current investment tools available will not help India achieve its climate goals. There is a need for new investment tools with appropriate regulatory frameworks to harness the full potential of private climate finance.

Policy Implications for Entrepreneurship and Innovation-Led Sectors Advancing Environmental Solutions

The climate finance landscape in India is both transforming and emerging as a complicated puzzle for environment-centric entrepreneurs and innovation-led start-ups as well as family-run enterprises focused on sustainable solutions. Economically, the private sector is expected to invest and sustain domestic NDCs, as well as the green growth mandates, needing innovation-driven capital. However, to foster investment-driven entrepreneurship, the right policies need to be in place to reduce barriers, de-risk investments, and stimulate sustainable innovation.

For small enterprises, start-ups and financial backers, the green taxonomy being piloted by the Department of Economic Affairs is essential in defining what “green” or “climate-aligned” business activities are. Such policies encourage small enterprises and start-ups to structure their projects and business models in a way that allows them to attract concessional or ESG-linked funding. Innovative SMEs also stand to benefit from the implementation of eco-friendly and sustainable financial policies. Policies that provide accessible sustainability-linked loans, green bond financing, and a blended finance framework are essential to expand equity and debt avenues for them.

Specific mechanisms like dedicated credit enhancements, partial guarantees, or first-loss facilities can mitigate risks related to very nascent environmental businesses, thereby providing the confidence needed to secure large-scale investments. As the third point, government intervention to create uniform policies for the disclosure of Environmental, Social, and Governance (ESG) criteria emissions has streamlined reporting and, therefore, makes the accurate measurement of impacts possible. This increases the trustworthiness of innovation-driven businesses and assists in aligning the corporations which finance their ventures, as well as bolsters their presence in the solutions market regarding climate issues. Furthermore, the capacity-building programs aimed at fostering the bankability and the business skills of green start-ups tackle the gap of talent and knowledge, thereby making financing easier and broadening the scope of viable projects.

As the last point, fiscal policies offering interest rate cuts, tax subsidies, and government spending focused on climate-positive goods and services can create a market for promising sustainable businesses while catalysing innovation throughout the supply chains.

To summarise, policy contexts enable and propel more advanced levels of entrepreneurship and

innovation within the framework of India's green economy. With appropriate policy adjustments, the purpose-driven entrepreneurship and institutional stimulation, coupled with tailored incentives, still open up tremendous opportunities, especially among the younger generation, thus making India's shift to a lower carbon economy more holistic, agile, and aspirational.

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