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Climate Finance Mobilization by Private Sector in India

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ABSTRACT
This study tries to signify the role of climate finance in India .With the rising importance of meeting the sustainable Development Goals and meeting the emission reduction targets in accordance with the Paris Agreement it becomes imminent to look into need to mobilize climate finance and bring about the Structural Reforms with regards to the Climate Finance Taxonomy. Various studies have been concluded which highlight the effort of both the Public Sector and the Private Sector in order to incentivize Climate Finance, but various gaps still pertain which need to be addressed to enable the Emerging Nation to transition towards a low-carbon Economy(Siriman et al., 2025). The current study explores the potential of the Private Sector being a major contributor towards the mobilization of Green Investment and Green Bonds. The Private Sector has spearheaded the initiative by incorporating the ESG framework and advancing on Adaptation and Mitigation funding requirements(Chauhan & Bhardwa, 2025). The paper tries to estimate the role of Private Sector in the Viability Gap Funding across various Sectors and extrapolate Green Bonds as a major Green Finance option in the coming years.

METHODOLOGY
The study is based on the various reports from leading Institutions findings like the World Bank CIFs, GCF, ADB, NABARD, RBI, SEBI , Bank of America Green Bonds Report , CFI , published findings on Climate Finance .The study is truly based on estimates and conclusions of the reports. The data for graphical extrapolation were derived from secondary sources and not easily accessible due to the nascent nature of standardized reporting in the Indian sustainable finance market.

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I. INTRODUCTION

India's vulnerability to climate change poses a significant threat to its developmental trajectory, with projections indicating that climate change is already impeding economic progress and endangering livelihoods (Chakravarty et al., 2024). The nation's commitment to the United Nations Sustainable Development Goals necessitates a fundamental shift towards sustainable practices and a substantial mobilization of financial resources (Basheer et al., 2022). Green finance, encompassing financial investments that yield environmental benefits, has emerged as a critical enabler in steering India towards a more sustainable and resilient future (Yadav et al., 2024). To achieve its climate goals, India requires sufficient and timely investments (Chakravarty et al., 2024). The government has actively fostered this transition by promoting diverse instruments such as green bonds and climate-resilient initiatives, which are essential for bridging the current funding gap (Lokesha, 2024). These mechanisms play a pivotal role in directing capital toward renewable energy, smart infrastructure, and waste management, effectively operationalizing the integration of environmental risk analysis into broader economic decision-making (Maganur, 2025), (.C et al., 2025). However, scaling these initiatives remains contingent upon overcoming persistent structural barriers, including regulatory inconsistencies, nascent market infrastructure, and pervasive information asymmetries that impede investor confidence (Ali, 2025; Li et al., 2025). Addressing these challenges requires a robust institutional framework that harmonizes policy incentives with standardized reporting mechanisms to enhance market transparency (Kaswan et al., 2025).

Furthermore, the proliferation of green bond issuances and sustainable debt instruments reflects a burgeoning investor awareness and the efficacy of proactive regulatory measures, such as those introduced by the Reserve Bank of India and the Securities and Exchange Board of India (Himanshi, 2025),(Kumar et al., 2026). Specifically, the integration of sustainability criteria into priority sector lending norms and the implementation of mandatory Business Responsibility and Sustainability Reporting frameworks underscore a concerted effort to institutionalize climate risk management within the national financial architecture (Hridhya et al., 2025). Despite these regulatory advancements, realizing the national objective of net-zero emissions by 2070 necessitates an annual investment of approximately 2.5% of GDP through 2030, highlighting the urgent requirement for accelerated capital mobilization (Ahmed & Kaur, 2025). To bridge this financing deficit, it is essential to catalyze private sector participation by leveraging blended finance models and fintech innovations that mitigate systemic risks and enhance the bankability of green projects (Shah et al., 2023; Siriman et al., 2025). Furthermore, the strategic deployment of Sovereign Green Bonds serves as a foundational lever to crowd

in institutional capital while signalling long-term commitment to global climate objectives (Dash, 2025; Kumar, 2025). Beyond sovereign issuances, strengthening institutional capacity and technical expertise remains essential for scaling climate finance, particularly in streamlining the assessment of complex, climate-related projects (Digitemie & Ekemezie, 2024). A primary obstacle remains the current absence of a national green taxonomy, which complicates efforts to standardize definitions and prevent greenwashing across the sector (Mittal & Jain, 2026; Ozili, 2022). Establishing a clear, science-based taxonomy is critical to guiding capital flows toward high-impact sustainable activities while ensuring that financial institutions can effectively measure, assess, and report on their environmental exposures (Sachs et al., 2023), (SOUNDARRAJAN & Vivek, 2016).

These specialized entities can accelerate the transition by linking fiscal incentives—such as production-linked tax credits and accelerated depreciation schemes—to clear, measurable outcomes like achieving a 30 percent solar energy coverage in new power-sector investments by 2030 (Zhang et al., 2026). Moreover, fostering household-level adoption requires localized fiscal strategies, such as providing renewable solutions at pro-rata rates through municipal bodies, which can be sustained by reallocating tax revenues generated from the industrial sector (Shahbaz et al., 2020). Such bottom-up initiatives effectively bridge the gap between national climate goals and grassroots implementation, ensuring that the transition remains socially inclusive across diverse regional contexts (Destek et al., 2023; Ordonez et al., 2023). Addressing the monumental funding gap—estimated at $10.1 trillion to reach net-zero by 2070—will ultimately require bridging the deficit between conventional capital and the diverse financial instruments necessary for large-scale, sustainable infrastructure (Kushawaha, 2025). To bridge this substantial investment chasm, India must urgently address structural bottlenecks such as underdeveloped debt markets and the inadequate enforcement of Renewable Purchase Obligations (PERWEZ & Safiuddin, 2025). Simultaneously, leveraging international climate finance and bilateral partnerships is critical to securing the necessary capital inflows to fulfil the projected USD 6.5 trillion financing requirement for the 2047 transition (Jadhav & Neharkar, 2026). Consequently, the mobilization of these resources hinges on the successful scaling of renewable capacity to a projected 6,150–6,700 GW, necessitating a synchronized advancement of both public fiscal support and private investment frameworks (Jadhav & Neharkar, 2026). This necessitates the establishment of specialized financial vehicles capable of de-risking early-stage technological deployment, thereby facilitating the technological and financial transfers essential for deep decarbonization (Shukla et al., 2015). Furthermore, the evolution of India's green sovereign bond market presents a viable avenue to mobilize additional capital, provided that the regulatory framework incorporates granular metrics for measuring social co-benefits alongside environmental impact (Kumar & Tandon, 2023). Beyond sovereign instruments, scaling clean energy investments by domestic insurers and pension funds remains vital, provided that structural impediments within these institutions are addressed to facilitate the deployment of long-term capital (Srivastava, 2023).

Additionally, creating credit enhancement facilities to provide local currency guarantees will be crucial in lowering the overall cost of capital and fostering confidence among domestic and international project bond investors (Aydos et al., 2022). Furthermore, the expansion of green bond pathways offers a transparent mechanism to deepen capital markets, facilitating increased liquidity for energy efficiency and sustainable transportation initiatives (Qiu et al., 2023).

The concept of sustainable development, which entails meeting present needs without jeopardizing the ability of future generations to meet their own needs, forms the bedrock of this paradigm shift (Yadav et al., 2024). The financial sector, particularly the banking sector, assumes a pivotal role in advancing sustainable development by channelling investments towards environmentally sound projects and promoting responsible financial practices (Solanki & Rana, 2019). Green banking, an increasingly prominent approach, integrates environmental considerations into banking operations, fostering a transition towards a low-carbon economy and fostering sustainability across diverse industries(Đokić et al., 2022).

The Indian government has demonstrated a strong commitment to promoting sustainable development through various policy initiatives and regulatory frameworks(Ali, 2025). However, to fully realize the potential of green finance, it is imperative to address existing barriers and strengthen the enabling environment (Park & Kim, 2020).

India's progress in attaining its climate goals is increasingly driven by the efficient allocation of green finance(Siriman et al., 2025). Identifying and measuring the sources of green finance can increase the transparency of government climate change action plans and boost confidence among domestic and foreign investors (Chakravarty et al., 2024). To achieve green growth, more than 45% of green finance will come from the private sector due to India's fiscal constraints (Sreenu & Mishra, 2023).

GREEN FINANCE AND ITS RELEVANCE

The Sustainable Development Goals, a set of 17 interlinked global goals adopted by the United Nations in 2015, provide a comprehensive framework for addressing the world's most pressing challenges, encompassing poverty, inequality, climate change, and environmental degradation. Green finance plays a crucial role in achieving these goals, particularly those related to climate action, clean energy, sustainable cities and communities, and responsible consumption and production (Yadav et al., 2024). By channelling investments towards projects that mitigate climate change, promote resource efficiency, and enhance environmental sustainability, green finance acts as a catalyst for transformative change across various sectors. Green finance is essential for supporting environmentally beneficial projects that promote sustainable economic growth (Sreenu & Mishra, 2023). These initiatives tackle important issues like pollution reduction and renewable energy development (Sreenu & Mishra, 2023).

Green innovation and green finance are crucial to sustainable development, particularly in quickly expanding Asian nations that must balance economic expansion with environmental concerns. Green finance encourages environmentally friendly investments by lowering investor and stakeholder information asymmetries, boosting efficiency, valuing natural assets, and encouraging sustainable lifestyles to promote high-quality economic growth (Sreenu & Mishra, 2023). The financial sector plays a crucial role in advancing sustainable development by funding activities conducive to sustainable development (Guo et al., 2020). Furthermore, green finance empowers stakeholders, such as businesses, to oversee the entire investment process and guarantees that the investment endeavour upholds green values (Sreenu & Mishra, 2023).

Innovative financial structures such as blended finance and green bonds are being developed to increase private sector investment in projects that support the SDGs(Tolliver et al., 2019). The development of sustainable finance has gone through a number of stages throughout the course of the last few decades. The classification has expanded from purely "economic" to encompass "economic, social, and environmental" factors, which is where it all began. This demonstrates a change in priority from economic objectives first to all three being equal, and ultimately to giving social and environmental concerns precedence (Schoenmaker, 2017).

II. LITERATURE REVIEW

This section synthesizes current academic discourse surrounding the integration of financial systems with environmental objectives, highlighting the transition toward prioritizing non-financial externalities in capital allocation (Fu et al., 2023).

Recent empirical studies demonstrate that the strategic alignment of financial instruments with Environmental, Social, and Governance criteria serves as a critical bridge between economic expansion and the preservation of natural capital (Çıtak & Hoş, 2024).

Specifically, the integration of ESG indicators has become fundamental for risk assessment, ensuring that ecological and social impacts are systematically evaluated alongside traditional financial metrics(Landi et al., 2022). Moreover, such frameworks facilitate the flow of capital toward renewable energy and green infrastructure projects (Goyal & Panwar, 2025).

Moreover, institutional frameworks—including specialized climate funds and evolving carbon markets—have emerged as essential mechanisms for mobilizing the large-scale investment necessary for low-carbon transitions (Jitendra, 2026).

These instruments effectively mitigate market failures linked to environmental externalities, shifting the focus from short-term financial gains to long-term sustainable outcomes (Udeh et al., 2024). Furthermore, the proliferation of sustainability-linked loans and green bonds has enabled a more precise alignment between corporate borrowing terms and verifiable environmental performance targets (Al-Afeef et al., 2024). By leveraging these diverse instruments, emerging economies can effectively navigate the transition toward a more resilient financial architecture that reconciles global development imperatives with the urgent necessity of climate change mitigation (Fu et al., 2024; Štreimikienė et al., 2023).

In this context, the role of regulatory oversight remains paramount, as it ensures that financial institutions systematically internalize the environmental, social, and governance risks associated with their lending portfolios (Svoboda, 2023; Yunus & Nanda, 2024). Furthermore, the establishment of standardized reporting requirements is essential for preventing "greenwashing" and ensuring that capital flows genuinely contribute to measurable environmental dividends(Liu et al., 2026). This regulatory harmonization is particularly critical for developing economies, where high costs of capital and perceived investment risks frequently trigger a climate investment trap that hinders the deployment of sustainable infrastructure (Ameli et al., 2021).

CHALLENGES AND OPPORTUNITIES IN PROMOTING GREEN FINANCE IN INDIA

India has demonstrated a growing commitment to increasing green finance flows for both mitigation and adaptation, with domestic capital playing a significant role (Chakravarty et al., 2024). To fully realize the

potential of green finance in India, it is essential to address several challenges and capitalize on emerging opportunities. A key challenge lies in the limited availability of data and reporting on private sector adaptation finance, making it difficult to assess the current level of investment and attract further participation (Chakravarty et al., 2024). There is an opportunity to increase private sector investment in sustainable projects and promote the SDGs by creating innovative financial instruments like blended finance and green bonds.

Enhancements in data collection procedures are partly responsible for the rise in total finance flows for adaptation(Chakravarty et al., 2024). It is essential to keep in mind that these numbers could not accurately reflect the state of adaptation finance because they do not account for private sector adaptation investment (Chakravarty et al., 2024). There is a need for increased awareness and capacity building among financial institutions, businesses, and investors regarding green finance concepts, instruments, and best practices. Further issues include inconsistent laws, a lack of openness, and a lack of clearly defined categorization standards.

Collaboration and partnerships between government, financial institutions, businesses, and civil society organizations are essential to overcome these challenges and unlock the full potential of green finance in India(Himanshi, 2025). By creating uniform standards and definitions, the Indian government can give investors trust and promote more investment in environmentally friendly projects (Himanshi, 2025). By eliminating these obstacles, India can hasten its transition to a more sustainable and resilient economy while also advancing the accomplishment of its Sustainable Development Goals.

India needs to significantly increase its green finance to enable a low-carbon transition (Chakravarty et al., 2024). According to estimates, developing nations would need between USD 2.5 and 3 trillion annually to reach the SDGs (Zahid, 2019). The current levels of green finance in India are insufficient to meet the country's climate goals and sustainable development needs (Chakravarty et al., 2024). India needs an estimated INR 11 trillion per year to meet its Nationally Determined Contributions by 2030; however, only about 30% of this amount is now funded by tracked green finance for mitigation (Chakravarty et al., 2024). India would need to invest at least INR 85.6 trillion, or INR 5,733 billion per year, between 2015 and 2030 in order to adapt to climate change (Chakravarty et al., 2024).

Recent data shows a substantial rise in adaptation flows, with government budgetary expenditure being a major contributor (Chakravarty et al., 2024). There is potential for additional growth in private sector involvement, particularly in areas like sustainable agriculture(Makkar et al., 2023). By de-risking investments and aligning incentives, USAID is pioneering innovative strategies that channel resources into critical sectors such as agriculture, water, and renewable energy (Giglio et al., 2021). More than half of the publications in the database came from developing nations, demonstrating their significant influence on the fields of green finance and its contribution to the achievement of sustainable development goals (Yadav et al., 2024).

Despite the Indian government's ambitious efforts, sustainability goals are still not being met, and a number of obstacles impede the efficient implementation of green banking practices. One of the main obstacles is a lack of knowledge and communication among stakeholders, which is made worse by a lack of confidence and a bad image of banks' green activities (Sharma & Choubey, 2021). It is necessary to educate financial organizations, enterprises, and investors on the ideas, tools, and best practices of green finance.

Green finance interventions can lead to improved environmental quality protection, financial effectiveness and finance structure, playing a vital role in economic growth (Sreenu & Mishra, 2023). Green finance and firm innovation have a positive correlation, which means it plays a crucial role in the transition to improved and sustainable financing methods for manufacturing (Sreenu & Mishra, 2023). The transition to a "decarbonized" economy will require significant new capital investment, especially in the form of green finance to support the reduction of greenhouse gas emissions and help corporations adapt to the impacts of climate change (Cheberyako et al., 2021). This transition is of utmost importance, especially given the growing awareness of the environmental and social consequences associated with conventional financing approaches.

The Indian financial system needs to be reoriented to support the green economy by encouraging private sector investment in renewable energy and green infrastructure (Yadav et al., 2024). It can integrate the financial development and environmental protection and combine them organically (Wang et al., 2021).

GREEN FINANCE LANDSCAPE IN INDIA

India has witnessed a gradual increase in green finance flows in recent years, driven by international commitments like the Paris Agreement and government initiatives like SEBI mandates, alongside growing investor awareness(Rajitha & Vijayakumar, 2026; Soundaravalli, 2026) These include investments in renewable energy projects, energy efficiency initiatives, green buildings, and sustainable transportation systems(Chakravarty et al., 2024; Vennila & S, 2024) Estimates indicate that India's adaptation investment needs are substantial and likely to increase in the future (Chakravarty et al., 2024).

Green finance in India still confronts numerous obstacles, though. These include things like a regulatory deficiencies in standards, data gaps, low investor awareness, high costs, and limited access to

financial products(Kaushik, 2025; SOUNDARRAJAN & Vivek, 2016) To fully realize the potential of green finance, it is imperative to address these barriers and create an enabling environment for sustainable investments(Singh, 2024). The Indian renewable energy sector has seen a considerable influx of foreign capital.

Green finance instruments encompass a range of financial products and mechanisms designed to channel investments towards environmentally sustainable projects. These include green bonds, sustainability-linked loans, green funds, and carbon finance instruments(Simionescu & Gavurová, 2023; Sohail et al., 2024) Green bonds, which are fixed-income securities used to fund projects with environmental benefits, have gained traction in India, with issuances from both public and private sector entities. Green bonds are used to fund environmental projects, such as alternative energy, water treatment, and pollution control (Anderson, 2016).

The global renewable energy market was valued at 928.0 billion USD in 2017 and is expected to reach a valuation of 1512.3 billion USD by 2025, registering a compounded annual growth rate of 6.1% from 2018 to 2025 (Liu et al., 2023). Globally, banks, governments, and bond markets are the primary sources of funding for investments in environmentally friendly infrastructure and the transition to clean energy (Bolton et al., 2020).

India's green finance landscape has witnessed significant progress in recent years, driven by government policy support (Chakravarty et al., 2024).

The nation has implemented various initiatives to promote green finance, including the issuance of green bonds and the development of green financial instruments(Chakravarty et al., 2024).

Despite this progress, significant challenges remain in scaling up green finance in India. These include: a lack of awareness regarding green instruments, regulatory gaps, policy inconsistencies, and a lack of standardized metrics(Jaura, 2023). Further, a significant portion of the green finance in India comes from the private sector(Sreenu & Mishra, 2023), and due to this fiscal constraint, it is important for India to manage the flow of finance.

To achieve its sustainable development goals and transition to a low-carbon economy, India needs to overcome these challenges and create a more conducive environment for green finance. This can be achieved through measures such as providing financial incentives and ensuring uniformity of standards (Chakravarty et al., 2024). The uncertainty of the policies and short-termism in the financial system are significant barriers to investment (Sreenu & Mishra, 2023).

Financial institutions can play a crucial role in promoting sustainable practices (Chowdhury et al., 2025). For instance, several fintech companies are integrating green financial systems with the aim of using technology to lower CO2 emissions and promote the efficient use of resources (Sreenu & Mishra, 2023).

POLICY RECOMMENDATIONS FOR ENHANCING GREEN FINANCE IN INDIA

To further strengthen the green finance ecosystem in India and accelerate the transition towards a sustainable economy, the following policy recommendations are crucial:

1. Raising Awareness and Capacity Building: Conduct awareness programs and training initiatives to educate stakeholders, including financial institutions, businesses, and consumers, about the benefits of green finance and sustainable investments(Ozili, 2022).
1. Developing Innovative Financial Instruments: Encourage the development and adoption of innovative financial instruments, such as green bonds, green loans, and green insurance products, to attract a wider range of investors and finance green projects(Ozili, 2022).
1. Strengthening Regulatory Frameworks: Establish clear and consistent regulatory frameworks for green finance, including standards for green bonds, guidelines for environmental risk assessment, and incentives for sustainable investments(Ozili, 2022).
1. Promoting Public-Private Partnerships: Foster collaboration between the public and private sectors to leverage their respective strengths and resources to finance green projects and promote sustainable development initiatives (Chakravarty et al., 2024).

The Indian government has recognized the importance of green finance in achieving its sustainable development goals and has implemented several policies to promote it (Chakravarty et al., 2024). These policies include incentives for renewable energy projects and tax incentives to stimulate investments in green technologies(Chakravarty et al., 2024; Goswami, 2025) Government spending on EVs has significantly increased, facilitating India’s target for EVs to reach a substantial share in new vehicle sales by 2030 (Chakravarty et al., 2024).

Ultimately, these sustainability initiatives are crucial as they promote environmentally conscious practices, cut down on paper usage, and streamline banking procedures, as environmentally friendly management occasionally takes a back seat to other banking activities (Chowdhury et al., 2025; Govindaraj, 2021). This calls for improved strategic planning by the government to expand the effectiveness of green finance and promote sustainable growth(Sreenu & Mishra, 2023).

Moreover, a comprehensive system for measuring, reporting and verifying is not yet in place to monitor financial characteristics. Numerous green banking policies exist in the country. In order to help India

reach its sustainable development goals and move toward a low-carbon economy, these obstacles must be overcome and a more favourable climate for green finance must be created (Chakravarty et al., 2024).

India's commitment to the Sustainable Development Goals necessitates a fundamental shift in financial paradigms, with green finance emerging as a critical enabler for environmentally sustainable and socially responsible development (Mahesh et al., 2022).

To attract green finance, SEBI has put in place disclosure norms for the issuance and listing of green bonds (SEBI Puts in Place Disclosure Norm for Green Bonds, 2017). These norms aim to enhance transparency and provide investors with the necessary information to evaluate the environmental impact of their investments. Here's what the SEBI guidelines entail:

1. **Disclosure of Environmental Objectives:** Issuers of green bonds must disclose the environmental objectives of the issue in the offer documents(Ramakrishnan et al., 2023).
2. **Tracking of Proceeds:** Issuers need to provide details of the systems and procedures employed for tracking the proceeds of the issue, including investments made and earmarked for eligible projects in the offer documents(Ramakrishnan et al., 2023).
3. **Use of Proceeds:** Issuers must disclose the use of proceeds and a list of projects to which green bond proceeds have been allocated in the annual report and periodical filings made to the stock exchanges(Ramakrishnan et al., 2023).
4. **Third-Party Review:** Issuers can appoint an independent third-party reviewer, certifier, or validator for reviewing, certifying, and validating the pre-issuance and post-issuance process, including project evaluation and selection criteria(Ramakrishnan et al., 2023).

These disclosure requirements are designed to standardize definitions and classifications, which helps attract finance flow in mitigation and adaptation sectors, building investor confidence and mobilizing finance (Chakravarty et al., 2024). Additionally, SEBI has introduced new sustainability reporting requirements for the top 1,000 listed entities in India by market capitalization, making reporting mandatory from 2022-23 onwards (Chakravarty et al., 2024). This move will encourage companies to prioritize environmental concerns (Chakravarty et al., 2024).

India's pursuit of high-calibre economic growth necessitates a strategic integration of eco-friendly techniques, wherein green finance plays a pivotal role in funding projects aligned with sustainable development goals (Sreenu & Mishra, 2023).

Despite the nascent stage of green finance in India, its significance in the modern financial market is gaining substantial recognition, catalysing the development of innovative financial instruments and market-based incentives to accelerate its proliferation (Chakravarty et al., 2024; "International Journal of Recent Technology and Engineering (IJRTE)," 2019).

Green bonds, characterized by their utilization of proceeds for environmentally friendly projects, are gaining traction as established financial instruments within sustainability-focused investment portfolios (Reboredo & Ugolini, 2019).

Stock exchanges are also encouraging this market by creating specific green bond market segments (Reboredo, 2018).

The Indian landscape of green finance is multifaceted, encompassing operating, investing, and financing activities that steer funds towards environmentally beneficial projects, thereby offering a comprehensive outlook for sustainable development (Sreenu & Mishra, 2023). Government policies have a crucial role in this transition by creating a favourable regulatory environment and helping mobilize capital for green projects(Chakravarty et al., 2024).

Financial investments channelled towards environmentally friendly projects and policies, including sustainable development initiatives, are the core of green finance, which is imperative for fostering a sustainable economy (Xu et al., 2020).

Green finance instruments, such as green bonds and green funds, serve as indispensable vehicles for directing financial resources towards environmentally sustainable projects, thus addressing climate change and promoting ecological conservation (Anderson, 2016).

Notably, India has emerged as the second-largest issuer of green bonds among Asian emerging markets as of February 2023, indicative of its growing prominence in the global green finance arena (Chakravarty et al., 2024).

Green finance instruments can facilitate the accumulation of resources for climate change adaptation and infrastructure projects in areas such as renewable energy generation, energy effectiveness, clean water, and low-carbon transport (Shaydurova et al., 2018).

Government initiatives, exemplified by schemes promoting solar rooftop energy, underscore India's commitment to fostering renewable energy adoption and augmenting the green finance landscape(Chakravarty et al., 2024). Furthermore, the issuance of green bonds by entities such as the EXIM Bank of India demonstrates

the country's proactive stance in leveraging financial instruments to support environmentally sustainable projects (Rawat & ., 2020).

Nevertheless, India faces challenges in effectively channelling investments into climate action, emphasizing the imperative for expanding the spectrum of financial instruments and mitigating risks associated with existing ones (Chakravarty et al., 2024). Coordinated efforts to scale up green finance necessitate the creation of market-based incentives, innovative financial products, and de-risking mechanisms to attract investments in sustainable initiatives (Chakravarty et al., 2024).

India's augmented climate commitments, including reducing carbon intensity and increasing renewable energy capacity, underscore the criticality of robust financial backing and timely policy interventions to facilitate the transition towards a low-carbon economy (Chakravarty et al., 2024). Also, as South Asian countries are becoming world leaders in green finance strategy implementation, authorities should facilitate the development of green recovery and services and strengthen banking institutions' ability to provide green loans (Zhang, 2023).

Green finance could be essential in realizing the Paris Climate Agreement goals and requires comprehensive probing in extant literature (Li et al., 2023). As of 2022, the Indian government is working with development banks and financial institutions to mobilize green finance through interventions that direct capital to green initiatives (Chakravarty et al., 2024).

Financial instruments like green bonds are a step in this direction and have gained significant traction (Li et al., 2023). Green finance has gained traction since the 2015 Paris Agreement and is now seen as an important tool for addressing environmental damage and climate change (Yadav et al., 2024). With the country's economic recovery picking up pace in the aftermath of the pandemic, it is important to keep up the momentum witnessed for green finance growth (Chakravarty et al., 2024). In light of the country's climate goals, it is important to identify the funding gaps and take appropriate steps to bridge them(Chakravarty et al., 2024).

III. RESEARCH GAP

Although there has been extensive scholarly investigation into the role of green finance in fostering ecological preservation and economic development, a critical research gap persists regarding its granular impact across specific industries and regional contexts. Further inquiry is required to elucidate the opportunities and systemic challenges associated with leveraging green finance to advance the Sustainable Development Goals within diverse geographic and socioeconomic landscapes. Consequently, this study aims to examine the nexus between green finance and the SDGs within the Indian context to address this scholarly void.

Identifying research gaps concerning green finance in India is imperative for informing future academic inquiry and policy interventions. Based on current literature, the following areas warrant further exploration:

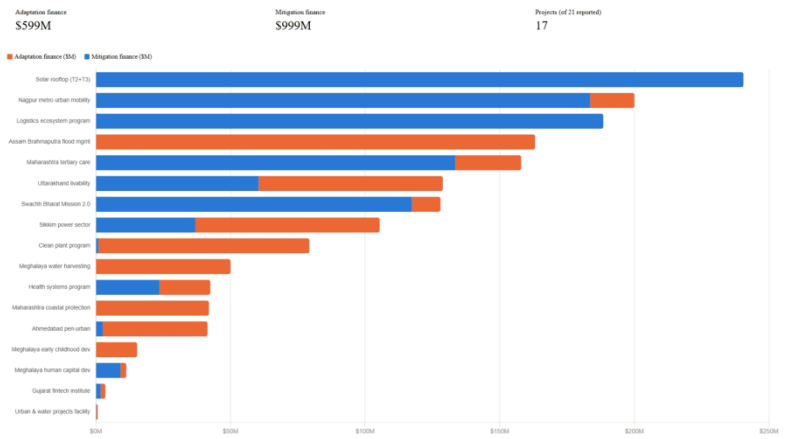
1. **Data Asymmetry and Standardized Disclosures:** Significant disparities in green finance data persist across diverse actors and sectors(Liu & Wu, 2023). Future research should address information asymmetry by advocating for standardized, mandated disclosures by regulatory bodies(Steuer & Tröger, 2022).
2. **Impact of FinTech:** While the role of FinTech in augmenting green finance is acknowledged (Sreenu & Mishra, 2023), further empirical research is needed to quantify its influence on the accessibility and efficacy of green financial instruments.
3. **Risk Mitigation and Innovative Financial Products:** There is a pressing need to expand the spectrum of financial instruments while mitigating risks inherent in existing ones. Investigation should prioritize the development of market-based incentives, innovative financial products, and robust de-risking mechanisms to catalyse investment in sustainable initiatives.
4. **Green Finance and Sustainable Development Goals:** Further research is required to explore how green finance mechanisms can contribute to the attainment of the SDGs by fostering economic prosperity, social equity, and environmental resilience.
5. **Role of Green Banking:** Further investigation is necessary to understand how green banking service practices can be enhanced through Green Corporate Social Responsibility activities(Prabhu & Aithal, 2021).
6. **Green Finance Beyond Mitigation:** While contemporary green finance is largely oriented toward climate change mitigation, there is substantial scope for research into adaptation projects, particularly within sectors such as water management and resilient agriculture.
7. **Private Sector Engagement:** Given fiscal constraints, the private sector is expected to account for a substantial proportion of green finance(Romanello et al., 2023). Research is required to identify effective strategies to incentivize and mobilize private sector investment toward green projects.

8. **ESG Investing and Greenwashing:** Further investigation is needed to determine whether green finance effectively mitigates extreme, hypocritical environmental, social, and governance risks while simultaneously avoiding greenwashing practices(Bo & Battisti, 2024). Furthermore, researchers should examine the efficacy of transparent climate risk disclosure policies in curbing deceptive corporate practices and aligning stock market behaviour with genuine sustainability objectives (Fu et al., 2024).

Findings- Mobilization of Private Sector Green Finance in India

The purview of the study lies in the observation of various sectors across the India which have been recipient of Green Finance the realm varying across sectors ranging from Renewable Energy Sources, Fintech, Power and Infrastructure. Due to paucity of data ADB's estimate of India's commitment towards Green initiative and bifurcation into Adaptation and Mitigation finance has been taken into account .GCF-ADB India's approved funding towards Clean Energy which includes a mix of blended finance, DFI's and Private Capital for Mitigation purposes .The Adaptation Funding estimates include estimates from NABARD Green Impact Fund and Innovation Fund. Taking a 60/40 percent split between Mitigation and Adaptation the results across various sectors have been forecasted.

Private sector green finance involves the aggregation of capital from non-public sources—such as commercial banks, institutional investors, corporations, private equity, venture capital, and capital markets—to support environmentally sustainable initiatives(Berensmann & Lindenberg, 2016). These include renewable energy, green construction, sustainable agriculture, clean transportation, energy efficiency, and climate-resilient infrastructure(Debrah et al., 2021).



This dataset is synthesized directly from the Asian Development Bank's raw 2024 project-commitments records, rather than the summarized annual report. While this approach yields greater granular detail than previous assessments, it results in a lower aggregate value, totalling $1.6 billion across 17 distinct project line items in India. This figure diverges from the $2.55 billion reported on the ADB's official India country page for combined mitigation and adaptation financing for that year.

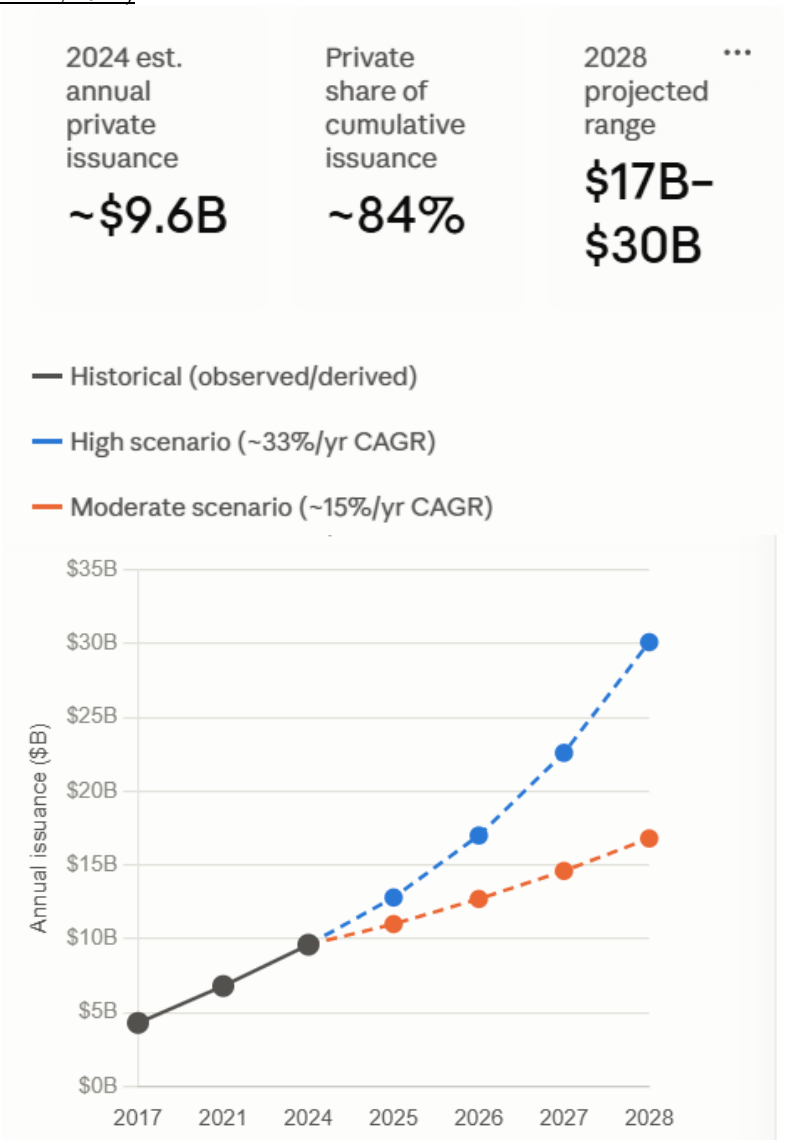
Transparency regarding this discrepancy is essential; the variance likely stems from the fact that the official country-page figures incorporate broader financing modalities that were either not discernible within the raw dataset or utilized distinct accounting conventions compared to the line-by-line sector tags utilized in this study.

- Adaptation-focused: The Assam Brahmaputra flood and riverbank erosion project ($163 million), the Clean Plant Program ($78 million), and Maharashtra coastal protection are exclusively adaptation-oriented initiatives.
- Mitigation-focused: Solar rooftop installations ($241 million) and the logistics ecosystem program ($188 million) focus exclusively on mitigation.
- Blended: The Nagpur Metro, Uttarakhand liveability, and Swachh Bharat 2.0 projects integrate both adaptation and mitigation, with a prevailing emphasis on mitigation.

Another major area that forms part of the study is the relevance of the issuance of the green bonds and the traction of the growth whether it is within the range required or below the commitment rates required.

This dataset is derived from the ADB's primary 2024 project-commitment records, providing greater granularity than summary reports by identifying $1.6 billion in commitments across 17 project line items, a figure that contrasts with the $2.55 billion reported on the ADB India country page. This variance likely arises from differences in financing modalities or accounting conventions between the raw dataset and the official summary. Consequently, the analysis serves as a structural overview of sectoral allocation rather than a reconciled

financial total. Despite these methodological discrepancies, the emerging trend toward green bonds and sustainability-linked loans indicates a growing appetite for private capital to bridge India's green financing deficit(Chakravarty et al., 2024).



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Current Sources of Private Green Finance

Major channels for mobilizing private green finance include green bonds, carbon funds, project finance, and cleantech venture capital((IPCC), 2023).

- Commercial banks: Providing loans for renewable energy, electric mobility, and energy-efficient building projects.
- Green bonds: Utilized by corporations and financial institutions to raise capital specifically for sustainable projects.
- Private equity and venture capital: Increasingly financing clean technology start-ups', including those in solar energy, battery storage, and climate technology.
- Infrastructure Investment Trusts: Enabling renewable energy companies to recycle capital and secure institutional investment.
- Foreign Direct Investment: Delivering significant capital from international investors into India's renewable energy sector(J & Majid, 2020).
- Institutional investors: Incorporating pension funds, sovereign wealth funds, insurance companies, and ESG-focused entities as primary providers of long-term green capital

Private Finance Mobilization Challenges

Several persistent obstacles consistently impede the scale, velocity, and quality of private green finance in India, as frequently documented in existing literature. These challenges negatively impact pricing mechanisms, investor confidence, and the capacity to finance a diverse range of green assets.

- **Market Depth and Scale**: A substantial financing gap persists, with current tracked green flows requiring a threefold increase to align with climate objectives, underscoring inherent demand-side limitations.
- **Regulatory Ambiguity and Disclosure Gaps**: The lack of standardized definitions, compounded by inconsistent environmental reporting, exacerbates transaction friction and increases due diligence expenses.
- **High Capital Costs and Tenor Mismatch**: High upfront capital requirements, combined with short loan tenures and a scarcity of long-term debt, discourage financial institutions from funding major renewable energy and infrastructure projects.
- **Credibility and Greenwashing Risks**: Insufficient independent verification and standardized labelling processes amplify investor caution and result in higher pricing premiums.
- **Limited Participation and Inclusion**: Few banks actively underwrite renewable projects, while many small and medium-sized enterprises and marginalized communities are excluded from formal green finance channels, thereby hindering equitable mobilization.
- **Fragmented Debt Markets and Low FDI**: Nascent domestic capital markets and limited foreign direct investment inflows restrict the diversification of investor sources.

IV. Recommendations

Policy Enablers and De-risking Options for Private Investors

Public policy interventions and targeted financial instruments are essential for converting private sector intent into actual investment. Current literature emphasizes a combination of regulatory, fiscal, and credit-enhancement measures that stimulate mobilization by mitigating risks, enhancing transparency, and standardizing market practices.

- **Sovereign Green Bonds**: Government-issued green bonds facilitate the creation of yield curves and benchmark assets, effectively crowding in private investment for public green initiatives.
- **Market Standards and Disclosure Mandates**: The adoption of SEBI-level principles and standardized frameworks for green bonds enhances investor confidence and asset comparability.
- **Concessional Finance and Blended Instruments**: The utilization of grants, concessional loans, and capital blending strategies is effective in bridging early-stage viability gaps and enabling larger private ticket sizes.
- **Credit Guarantees and Viability Gap Funding**: Guarantees and Viability Gap Funding mechanisms serve to reduce credit risk, thereby aligning private risk appetites with the long-term demands of infrastructure financing.
- **Capacity Building and Bank Governance**: Strengthening ESG frameworks and technical appraisal capabilities within banks is crucial for improving the origination and oversight of green projects. Furthermore, the systematic removal of fossil fuel subsidies remains a critical imperative to eliminate market distortions that currently dampen the comparative profitability of sustainable alternatives (SOUNDARRAJAN & Vivek, 2016).

V. Conclusion

Sector contributions and empirical evidence

Different sectors attract distinct private finance patterns; empirical studies quantify flows and reveal where private capital is concentrated and where policy focus is needed. The evidence highlights:

- Renewables as the largest recipient, while simultaneously identifying significant gaps in adaptation finance and SME reach, with solar capturing the largest share of financing(PERWEZ & Safiuddin, 2025).
- Finance for adaptation has shown an upward trend, indicating growing private and domestic attention to resilience.
- In terms of financial institutional involvement, private banks are documented as innovating green products and integrating ESG into their services, with selected banks showing positive environmental performance linked to green finance activity. However, manufacturing and SMEs continue to face

access and capacity barriers to green finance, necessitating targeted digital and community-based interventions to extend finance beyond large corporates.

- To close the financing shortfall for India's climate targets, studies emphasize the need for diversified instruments, such as expanding ESG-linked bonds, credit guarantees, blended finance, and green bank models. Furthermore, the strategic integration of fin tech and digital platforms is identified as a critical mechanism to mitigate systemic risks and enhance the transparency of climate-aligned lending practices (Shah et al., 2023).
- Targeted interventions are necessary to extend finance beyond large corporations.
- To address India's climate financing gap, research advocates for the expansion of diversified instruments—such as ESG-linked bonds, credit guarantees, blended finance, and green bank models. Furthermore, the strategic integration of fin tech and digital platforms serves as a critical mechanism to mitigate systemic risks and enhance the transparency of climate-aligned lending practices (Shah et al., 2023).

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