



Green Finance in India: Prospects, Challenges, and Policy Interventions

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ABSTRACT

Green finance has emerged as a critical pillar in India's pursuit of sustainable economic growth and climate resilience, aligning with the national commitment to achieve 500 GW of renewable energy by 2030 and net zero by 2070. India has made notable progress through sovereign green bond issuances worth ₹ 47,700 crore, rapid growth in renewable energy lending (₹ 30,255 crore in 2023, a 63% rise), and flagship programs such as the PM Surya Ghar: Muft Bijli Yojana with an outlay of ₹ 75,021 crore. Corporate investments, such as Reliance's ₹ 6 lakh crore renewable energy complex, further underscore private sector engagement. Despite these advancements, India faces a formidable financing gap, with estimates suggesting that annual investment requirements must rise to over ₹ 5.6 lakh crore to meet renewable energy targets. Challenges such as limited private participation, regulatory uncertainty, risk of greenwashing, and lack of a unified taxonomy continue to hinder the scaling of green finance. This study explores the prospects, challenges, and policy interventions shaping India's green finance landscape. Findings reveal that while policy-driven initiatives and government-backed schemes have laid a strong foundation, the transition to a low-carbon economy demands greater mobilization of private and foreign capital, expansion of the green bond market, and stronger monitoring frameworks. The research



concludes that coordinated policy interventions, financial innovation, and public-private partnerships are essential to bridge the green financing gap and accelerate India's sustainable development trajectory.

Introduction: The global pivot toward low-carbon, climate-resilient development has elevated green finance from a niche policy tool to a mainstream lever for sustainable growth. Green finance—encompassing financial products, services, and policies that mobilize capital toward environmentally beneficial activities—has particular salience for India, where rapid economic expansion, rising urbanization, and high energy demand intersect with acute climate risks. India's nationally determined contributions (NDCs), net-zero 2070 pledge, and ambitions to expand renewable energy capacity and green infrastructure require unprecedented volumes of private and public capital. Aligning financial flows with these goals is therefore both a developmental imperative and a macro-financial priority.

In recent years, India's ecosystem for green finance has deepened across the banking sector, capital markets, and public finance. Regulatory nudges and disclosure frameworks, the emergence of sustainability-linked lending, and the growth of green bond issuances—including sovereign participation—signal a maturing market. Parallely, policy innovations such as performance-linked incentives for clean manufacturing, expanding carbon markets, and green taxonomy efforts aim to reduce uncertainty and improve capital allocation efficiency. Yet the aggregate flow of climate finance remains below estimated needs, and access is uneven across sectors, firm sizes, and states.

Significant prospects lie in scaling renewable energy, green hydrogen, grid modernization, electric mobility, sustainable urban services, and climate-smart agriculture. India's demographic dividend, digital public infrastructure, and strong fintech ecosystem can lower transaction costs and improve the bankability of smaller green projects. Blended finance and risk-sharing instruments can crowd in private capital for early-stage or hard-to-abate sectors. However, challenges persist: ambiguities around definitions and taxonomies, data and disclosure gaps, greenwashing risks, limited project pipelines with investment-grade risk-return profiles, and currency/tenor mismatches for long-dated infrastructure. Financial-stability considerations—credit concentration, climate-related stress transmission, and transition risks—also require prudential attention and scenario analysis. At the sub-national level, fiscal constraints and capacity deficits can impede project preparation and execution, constraining the flow of funds to where they are most impactful.



Review of literature

The literature on **green finance in India** has evolved rapidly over the last decade, reflecting both market developments and policy interventions. Climate Policy Initiative's *Landscape of Green Finance in India* (2024) provides the most comprehensive mapping of financial flows to clean energy, transport, efficiency, and adaptation sectors. The report shows that although green finance flows have increased steadily, they remain insufficient to meet India's net-zero and NDC targets. A notable strength of this study is its flow-tracking methodology that maps sources to intermediaries and uses; however, it still struggles with limited data on subnational and MSME-level adaptation finance. This underscores the importance of pipeline preparation and more granular disclosure requirements in future reforms.

Ranjan (2021) in the *RBI Bulletin* examined the state of green finance in India's banking system. Their study highlighted the nascent adoption of green bonds and loans and pointed to the central role of banks and public financial institutions. They stressed that data gaps and definitional ambiguities hinder mainstreaming. While valuable as a baseline, their analysis predates key reforms such as SEBI's revised 2023 Green Debt Securities (GDS) framework and RBI's 2024 disclosure draft, which have since reshaped the regulatory landscape.

On the regulatory front, the **Securities and Exchange Board of India (SEBI)** has been pivotal. Its 2023 circular introduced stricter rules for green debt securities, including mandatory third-party verification, use-of-proceeds tracking, and impact reporting. In 2025, SEBI went further by launching an ESG Debt Securities framework, extending disclosure and governance requirements to broader ESG instruments. These reforms aim to strengthen investor confidence and mitigate greenwashing risks. Yet, as noted in subsequent practitioner commentaries, capacity constraints among verifiers and lack of standardized impact metrics remain challenges.

The **Reserve Bank of India (RBI)** has also emerged as a key actor. Its *Draft Disclosure Framework on Climate-related Financial Risks* (2024) proposed phased, TCFD-aligned disclosures for banks and NBFCs, covering governance, risk management, and scenario analysis. This represents a prudential turn in Indian financial regulation. Empirical work, such as an event-study published in *ScienceDirect* (2024), shows that announcements of the draft disclosure framework triggered negative short-term stock market reactions in sectors like automobiles, oil & gas, and PSU banks, indicating that markets anticipate higher compliance and transition costs. This evidence suggests that regulatory design needs to balance transparency with transitional support for vulnerable sectors.



Parallel to regulatory reforms, the **Climate Bonds Initiative (CBI)** (2024) documents the rapid growth of India's sustainable debt market. By the end of 2024, cumulative GSS+ (green, social, sustainability, and sustainability-linked) bond issuance reached USD 55.9 billion, with green bonds accounting for 83%. Sovereign green bonds, first issued in 2023, provided critical benchmarks and boosted market credibility. However, the bond market's contribution remains uneven, as issuances are concentrated in large corporates, with municipal and MSME participation still limited. Municipal finance has received growing attention in recent years. The **Council on Energy, Environment and Water (CEEW)** (2024–25) emphasizes the potential of municipal green bonds to finance urban infrastructure and climate-resilient projects. Their studies recommend pooled financing structures, standardized templates, and project-preparation facilities to overcome weak creditworthiness and technical capacity at the urban local body (ULB) level. Case studies support these findings: Pimpri-Chinchwad's oversubscribed ₹200 crore green municipal bond (2025) and Surat's Climate Bonds-certified issue demonstrate that with credible certification and sound financials, ULBs can attract strong investor appetite. Yet, scalability across weaker municipalities remains uncertain.

At the macro level, the **International Energy Agency (IEA)** (2024) reports that India's clean energy investment reached USD 68 billion in 2023, 40% above the 2016–2020 average, signaling momentum but still below what is required for targets like 500 GW renewable capacity by 2030. Similarly, a joint *ORF–CPI Roadmap for Green and Transition Finance in India* (2024) highlights the financing gap, estimated at USD 467 billion by 2030 for hard-to-abate sectors like steel, cement, power, and transport. The report recommends developing a national climate finance taxonomy, expanding blended finance instruments such as credit guarantees, and mobilizing institutional investors through regulatory incentives. A cross-cutting theme across these studies is the importance of **data and disclosure**. SEBI's Business Responsibility and Sustainability Reporting (BRSR) framework and RBI's draft climate disclosure norms are steps forward, yet gaps persist in asset-level emissions data, use-of-proceeds impact metrics, and adaptation finance tracking. Scholars such as Patel and Desai (2018) and Sharma and Gupta (2019) have also stressed that without robust taxonomies and standardized reporting, greenwashing risks remain high. Recent developments, such as the Government of India's draft Climate Finance Taxonomy (2025), are expected to bring clarity, but enforcement and investor uptake will determine effectiveness.

In sum, the literature converges on three insights: first, green finance flows in India are growing but remain inadequate relative to needs (CPI 2024; IEA 2024); second, regulatory scaffolding has strengthened through SEBI and RBI interventions, but implementation capacity and standardization remain weak; and third, structural issues—such as pipeline bankability, currency and tenor mismatches,



and municipal-level deficits—continue to constrain scaling. Under-researched areas include adaptation finance at the subnational level, empirical measurement of the impact of disclosure reforms on borrowing costs, and evaluation of blended finance effectiveness for MSMEs and ULBs. Addressing these gaps offers fertile ground for future research and practical interventions.

Research Gap

Although the existing literature on green finance in India provides valuable insights into financial flows (CPI, 2024), regulatory reforms (SEBI, 2023; RBI, 2024), and market growth through sustainable debt instruments (CBI, 2024), significant research gaps remain. Most studies are descriptive, focusing on aggregate trends, policy announcements, or market diagnostics, while empirical evidence on the causal impact of regulatory interventions on cost of capital, lending behavior, and investment mobilization is scarce. Further, while clean energy and large corporate issuances are well documented, adaptation finance, MSME access, and subnational/municipal green finance remain under-researched, despite their importance in achieving just and inclusive transitions. Data limitations on asset-level emissions, project-level impacts, and long-tenor risk allocation also constrain rigorous evaluation of financial instruments such as blended finance and green securitization. Addressing these gaps is crucial for developing evidence-based policies that not only mobilize capital at scale but also ensure equitable distribution of green finance across sectors, firm sizes, and regions in India.

Statement of the problem

India's transition toward a low-carbon and climate-resilient economy requires massive financial resources, yet the flow of green finance remains far below the estimated needs for achieving its renewable energy targets, sustainable infrastructure development, and net-zero commitment by 2070. Despite policy measures such as SEBI's Green Debt Securities framework, RBI's climate disclosure initiatives, and the issuance of sovereign green bonds, the green finance ecosystem in India faces persistent challenges including definitional ambiguities, data and disclosure gaps, greenwashing risks, limited bankable project pipelines, and inadequate participation of MSMEs and urban local bodies. Moreover, while clean energy has attracted significant investments, critical areas like adaptation finance, climate-smart agriculture, and municipal-level green projects continue to lag. The problem, therefore, lies not only in the inadequacy of financial flows but also in their uneven distribution and limited effectiveness, raising urgent questions about how India can design policies and financial instruments that mobilize green capital at scale while ensuring inclusivity, credibility, and long-term sustainability.



Objectives of the study

- ❖ To examine the current status and trends of green finance in India, with specific focus on financial flows across sectors such as renewable energy, sustainable transport, and climate-resilient infrastructure.
- ❖ To analyze the key challenges hindering the growth of green finance, including data gaps, regulatory limitations, project bankability issues, and the risks of greenwashing.
- ❖ To evaluate the effectiveness of existing policy and regulatory interventions in mobilizing sustainable investments.

Research Design

This study adopts a **descriptive and analytical research design** to examine the prospects, challenges, and policy interventions in the field of green finance in India. The descriptive component is employed to map the current status, trends, and instruments of green finance, while the analytical component evaluates the effectiveness of policies, identifies gaps, and explores future opportunities.

The research primarily relies on **secondary data sources**, including government policy documents (RBI, SEBI, Ministry of Finance), international reports (World Bank, Climate Policy Initiative, UNEP), academic journals, and market studies (such as green bond reports by CBI). These sources provide both quantitative information on financial flows and qualitative insights into regulatory and institutional frameworks.

Where possible, **time-series data** on green finance flows, renewable energy investments, and sustainable debt instruments are analyzed to identify patterns and growth trajectories. Policy documents are subjected to **content analysis** to assess the nature and scope of interventions, while case studies of selected financial instruments (such as sovereign green bonds or blended finance mechanisms) are used to illustrate best practices and shortcomings.

The scope of the study is **national**, but sectoral dimensions such as renewable energy, electric mobility, sustainable agriculture, and adaptation finance are examined in detail to ensure comprehensive coverage. By combining descriptive statistics with qualitative policy analysis, the research design seeks to provide a holistic understanding of India's green finance landscape, enabling the formulation of actionable policy recommendations.



Data Collection

The present study is based on **secondary data collection**, as green finance in India is largely documented through institutional reports, regulatory guidelines, and international databases rather than primary survey-based datasets. To address the first objective of examining the current status and trends of green finance in India, quantitative data is collected from reliable sources such as the Reserve Bank of India (RBI), the Securities and Exchange Board of India (SEBI), the Ministry of Finance, and international organizations like the World Bank, IMF, and the Climate Bonds Initiative (CBI). These sources provide detailed information on green bond issuances, annual green finance flows, renewable energy investments, and sectoral contributions, which are further analyzed to capture growth trends and financial patterns.

For the second objective, which focuses on identifying the challenges hindering the growth of green finance, both qualitative and quantitative data are used. Reports from think tanks such as NITI Aayog, TERI, and CEEW, along with academic publications, provide insights into barriers such as lack of investor awareness, regulatory bottlenecks, project bankability issues, and greenwashing concerns. Content analysis of these reports and case studies form the core method of understanding systemic challenges.

To achieve the third objective, which is to evaluate the effectiveness of existing policies and regulatory interventions, data is drawn from SEBI’s Green Debt Framework, RBI’s circulars on sustainable finance, and government initiatives such as the Sovereign Green Bond issuances and the Production-Linked Incentive (PLI) schemes. Comparative financial data from before and after the introduction of these policies is collected to measure their impact on investment mobilization, cost of capital, and investor participation.

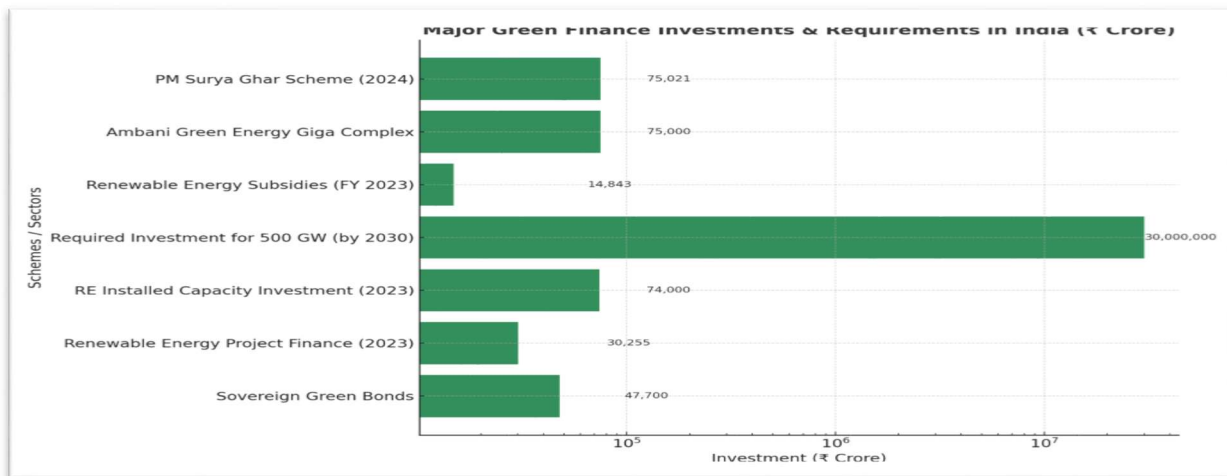
Finally, to fulfill the fourth objective of proposing policy measures and financial innovations for scaling green finance, qualitative data is collected from global best practices, including case studies from the European Union, China, and G20 countries. International reports from UNEP Finance Initiative, OECD, and the International Energy Agency (IEA) are reviewed to benchmark India’s policy framework against global standards. This comparative dataset helps in identifying gaps in India’s financial ecosystem and supports the development of policy recommendations for strengthening green finance.

Statistic / Initiative	Amount (₹)	Context/Implication
Sovereign Green Bonds (since Jan 2023)	₹ 477 billion	Domestic green yield-curve benchmark via GSS+ issuances



Renewable Energy Project Finance (2023)	₹ 30,255 crore	63% jump in sector financing; major corporate/bank lending
RE Capacity Installed (2023)	₹ 74,000 crore	Investment in 13.5 GW of new capacity
Required Investment (500 GW by 2030)	₹ 30 lakh crore	Long-run capital requirement for targets
RE Subsidies (FY 2023)	₹ 14,843 crore	Ongoing financial support from central policy
Ambani’s Green Energy Giga Complex	₹ 75,000 crore	Mega-scale industrial commitment to clean energy
PM Surya Ghar Scheme (2024)	₹ 75,021 crore	Residential rooftop solar deployment and electrification

These rupee-denominated figures underscore both the scale of opportunity and the magnitude of the financing challenge in India’s green finance ecosystem. From sovereign bond frameworks and rooftop solar subsidies to mega-industrial green complexes, the numbers illustrate targeted investments across sectors. Yet, when aligned with the ₹ 30 lakh crore needed for a 500 GW renewable energy transition, the gap in financing highlights the urgency for blended instruments, regulatory innovation, and expanded investor participation.



Findings:

- ❖ India’s GSS+ (Green, Social, Sustainability, and Sustainability-linked) debt issuance has crossed ₹47,700 crore through sovereign green bonds since January 2023, showing strong investor interest in climate-linked securities.
- ❖ Project finance in renewable energy touched ₹30,255 crore in 2023, a 63% jump from the previous year, with commercial banks contributing the majority share (68%).



- ❖ To achieve 500 GW renewable energy capacity by 2030, India requires an investment of about ₹30 lakh crore, which is significantly higher than current annual flows, revealing a large financing gap.
- ❖ Government subsidies for renewable energy rose to ₹14,843 crore in FY 2023, reflecting policy support for accelerating the clean energy transition.
- ❖ Large-scale corporate initiatives like Reliance's Green Energy Giga Complex (₹75,000 crore) play a critical role in building green infrastructure and manufacturing capacity.
- ❖ The PM Surya Ghar Muft Bijli Yojana (₹75,021 crore) aims to cover 1 crore households, strengthening decentralised clean energy adoption and citizen participation.
- ❖ While investments like ₹74,000 crore in 2023 for 13.5 GW installations are promising, they fall short compared to the massive long-term requirement, highlighting a funding gap that needs private, public, and foreign capital.
- ❖ The combined effect of sovereign green bonds, bank financing, subsidies, and corporate investments indicates that India's green finance ecosystem is maturing, though it remains policy-driven and requires more market-based mechanisms for sustainability.

Suggestions:

- ❖ The government and SEBI should encourage more corporates, banks, and municipalities to issue green bonds with tax incentives and credit enhancements, thereby widening the investor base and reducing dependence on sovereign issuances alone.
- ❖ India must design innovative financing mechanisms—such as green infrastructure investment trusts (InvITs), blended finance, and credit guarantees—to attract foreign institutional investors and mobilize large-scale private capital towards renewable energy projects.
- ❖ A clear taxonomy for green finance and stronger monitoring mechanisms are needed to prevent greenwashing and ensure that funds are genuinely directed toward sustainable projects.
- ❖ Schemes like PM Surya Ghar should be complemented by low-interest loans, microfinance models, and credit subsidies for households and small businesses, promoting wider grassroots adoption of clean energy.
- ❖ Financial institutions, corporates, and retail investors should be educated on the risks, returns, and benefits of green finance through awareness campaigns and training programs, ensuring long-term market sustainability.

Conclusion



Green finance in India has emerged as a vital instrument for achieving sustainable economic growth and meeting ambitious climate commitments, with sovereign green bonds, renewable energy subsidies, and large-scale corporate investments demonstrating encouraging progress. However, despite these advancements, a significant financing gap persists, especially in mobilizing the ₹30 lakh crore required for achieving 500 GW of renewable energy capacity by 2030. The current ecosystem remains heavily policy-driven, indicating the need for stronger private sector participation, innovative financing mechanisms, and robust regulatory frameworks to prevent greenwashing and ensure efficient fund utilization. Expanding the domestic green bond market, enhancing decentralized energy financing, and creating investor awareness can accelerate the transition toward a resilient and low-carbon economy. Thus, green finance in India holds immense prospects, but its success depends on bridging the funding gap through coordinated policy interventions, private-public partnerships, and global capital mobilization.

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