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Financing Sustainability: The Role of Green Bonds in India's Low-Carbon Transition

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Abstract
Green bonds have emerged as a pivotal mechanism in global climate finance, enabling the mobilisation of large-scale investments for environmentally aligned projects. This paper investigates the development, structure, pricing dynamics, regulatory ecosystem, and international comparisons relevant to India's green bond market from 2020 to 2025. It evaluates the presence of "greenium" in Indian corporate and sovereign bonds, compares the performance of ten major green and conventional bonds, and analyses SEBI's evolving green debt regulations. Drawing insights from interviews with key stakeholders—including regulators, issuers, and institutional investors—the paper highlights persistent structural barriers such as verification costs, absence of a national green taxonomy, and limited thematic diversification. Comparative analysis with Brazil, China, and Indonesia reveals both opportunities and gaps in India's current approach. Concluding with actionable recommendations, the study underscores the need for coordinated institutional reform, investor confidence-building measures, and expanded green financial innovation to strengthen India's climate finance ecosystem and enable a resilient low-carbon transition.

Keywords: Green bonds, sustainable finance, India, SEBI, greenium, ESG, climate finance, emerging markets

Introduction

The global financial landscape has undergone a significant transformation with the emergence of green bonds as a strategic instrument for financing environmentally sustainable initiatives. These fixed-income securities, akin to traditional corporate bonds, are uniquely earmarked to raise capital for projects that offer tangible environmental benefits—ranging from renewable energy and low-carbon transportation to climate resilience and sustainable agriculture. Green bonds have become central to climate finance, facilitating the mobilisation of large-scale capital for ecological transition across economies.

In India, the green bond market is still at a nascent stage but is rapidly gaining momentum in response to the country's urgent climate goals. With a national commitment to achieving net-zero emissions by 2070, and an estimated requirement of USD 12.7 trillion by 2050—translating to over USD 470 billion annually (BloombergNEF, 2023)—mobilising private finance alongside public funds has become imperative. In this context, green bonds present a promising solution to bridge the climate finance gap by catalysing institutional and private sector investments.

This paper aims to provide a comprehensive analysis of the green bond market in India, focusing on its current state, structural framework, and future potential. Drawing on global trends and existing literature, it evaluates the role of green bonds in accelerating India's transition to a low-carbon economy. Key issues such as cost of capital, investor demand, and issuer diversification are examined in detail. Furthermore, the paper outlines the typical characteristics of green bonds—including their tenure (ranging from 18 months

to 30 years) and average issue size (approximately USD 500 million as of 2014)—and explores how these features influence market development.

Ultimately, this study seeks to identify both the challenges that constrain the growth of India's green bond market and the opportunities that can be leveraged through targeted policy interventions. By offering actionable recommendations, it aspires to contribute to strengthening India's sustainable finance ecosystem and enhancing the role of green bonds in its climate action pathway.

Literature Review

The academic and policy discourse surrounding green bonds in India has expanded significantly in recent years, reflecting growing interest in sustainable finance as a mechanism to drive the country's low-carbon transition. A comprehensive review of existing literature reveals a multi-dimensional understanding of India's green bond ecosystem, encompassing regulatory frameworks, market structures, sectoral applications, pricing mechanisms, and international linkages.

A foundational perspective is offered by CEEW (2021), which underscores the critical importance of robust policy frameworks and regulatory incentives in scaling green finance across India. The study highlights the urgent need for standardised definitions and classification of "green" projects to mitigate information asymmetries and build investor confidence. The lack of standardisation, it argues, hampers the effectiveness of disclosure norms, thereby affecting the transparency and credibility of green bond issuances. These findings reinforce the relevance of institutional architecture in shaping the trajectory of green bond markets.

Building on this, CEEW (2020) delves into the role of green bonds in meeting India's ambitious renewable energy target of 450 GW by 2030. The study quantifies the financing gap and positions green bonds as a critical tool for mobilising institutional capital. While sovereign green bonds remain limited in India, corporate green bonds dominate the market—a trend attributed to the agility of private issuers. However, the report flags low liquidity in secondary markets as a constraint to scale, suggesting the need for deeper capital markets and enhanced investor participation.

In exploring sector-specific dynamics, CEEW (2019) investigates the deployment of green bonds in renewable energy and electric mobility infrastructure. The report advocates blended finance models to reduce investment risk, particularly for emerging asset classes such as electric transport. These findings are critical for identifying areas where green bonds can create catalytic impact while appealing to risk-averse institutional investors.

The internationalisation of India's green bond market is examined by CEEW-Green Finance Centre (2021), which evaluates cross-border issuances and their implications. While foreign currency bonds increase exposure to exchange rate risks and marginally higher issuance costs, they provide valuable diversification of funding sources. This aspect of green finance is particularly relevant in the context of India's growing need to tap into global capital pools to fund its energy transition.

A more granular analysis of bond characteristics is provided by CEEW (2019), which investigates the financial structure of green bonds in India, including coupon rates, tenure patterns, and issuer profiles. The study identifies the emergence of a "greenium"—a marginal pricing premium attributed to the environmental credentials of the bond. However, CEEW-Green Finance Centre (2021) notes that this premium is inconsistent in the Indian context, varying with issuer credibility and the transparency of environmental impact disclosures. These insights are pivotal for understanding investor behaviour and the pricing dynamics unique to the Indian green bond market.

The regulatory environment is further scrutinised by Sarep Energy (2022), which identifies supply-side bottlenecks including stringent SEBI disclosure requirements and the absence of targeted fiscal incentives. The report advocates for measures such as tax incentives and simplified procedures to enhance retail and institutional participation—an argument that dovetails with broader recommendations for policy reform.

Providing a broader international context, the ResearchGate publication (2020) situates India's green bond trajectory within global developments, including the rise of sustainability-linked bonds. It draws attention to post-issuance impact reporting—an area where India has yet to establish robust practices, despite its significance for long-term market credibility and investor trust.

Taken together, the literature reveals a consensus on the potential of green bonds to significantly contribute to India's climate finance objectives. However, several systemic challenges persist—ranging from regulatory fragmentation and limited issuer diversification to inadequate secondary market liquidity and inconsistent pricing advantages. These gaps present both a research opportunity and a policy imperative, reinforcing the need for a coherent, market-enabling framework to unlock the full potential of green bonds in India.

Research Objectives

1. To analyse the pricing differential ("greenium") between Indian corporate green bonds and conventional bonds from 2020–2025.
2. To examine the growth trends of India's green bond market from 2020 to 2025
3. To compare the performance of 10 major Indian green bonds with conventional bonds in the same period
4. To analyse SEBI's green bond guidelines and their impact on market development
5. To compare India's green bond market growth with 2–3 other emerging markets
6. To identify key challenges and opportunities in India's green bond market through stakeholder interviews

Analysing the Pricing Differential ("Greenium") Between Indian Corporate Green Bonds and Conventional Bonds (2020–2025)

Context and Definition

The "greenium" is a pricing advantage seen in green bonds when they are issued or traded at a lower yield than comparable non-green (conventional) bonds. This implies a higher price or lower cost of borrowing for the issuer. The differential occurs as investors increasingly integrate environmental, social, and governance (ESG) considerations into their portfolios, displaying willingness to accept lower returns in exchange for sustainability-aligned instruments (CEEW & NRDC, 2016).

Green bonds have become key instruments in India's attempt to mobilise climate-aligned capital, especially for renewable energy and low-carbon infrastructure. Understanding the magnitude and determinants of greenium in the Indian context is essential to assess the viability and attractiveness of green financing mechanisms for corporate issuers.

Trends in Indian Green Bond Issuance and Greenium (2020–2025)

From 2020 to 2025, the Indian green bond market has matured incrementally. Total cumulative green bond issuances crossed USD 10 billion by mid-2024, with renewable energy remaining the dominant sector (CEEW, 2024; RBI, 2024). Despite this, greenium in corporate bond issuance remains inconsistent.

Empirical analysis by CEEW (2023) found that Indian green bonds issued between 2020 and 2022 showed yields to maturity (YTM) on average 3.9%, lower than their coupon rates of issuance. These bonds,

including those by ReNew Power and Adani Green, showed tighter spreads in the secondary market due to oversubscription and institutional demand.

India's first sovereign green bond issuance in January 2023 saw a clear greenium of 5–6 basis points compared to conventional G-secs. This created a precedent, reinforcing investor interest and signalling lower perceived risk or strong policy signalling (Climate Bonds Initiative, 2023).

Determinants of Greenium in India

1. **Investor Base and Demand Factors**
   Institutional investors such as pension funds, mutual funds, and ESG-focused foreign investors have contributed to yield compression in green instruments. However, the domestic ESG investor base remains shallow. A 2024 study by the Reserve Bank of India (RBI) notes that while foreign investors account for nearly 50% of India's green bond demand, domestic banks and insurance companies still prefer conventional corporate debt due to better liquidity and established credit ratings (RBI, 2024).
2. **Lack of Regulatory or Tax Incentives**
   India's regulatory ecosystem for green finance does not offer preferential capital treatment or tax exemptions for green bond investments. In contrast, countries such as Brazil and China offer direct fiscal incentives, leading to more consistent greenium trends (OECD, 2023).
3. **Credit Quality and Issue Structure**
   The creditworthiness of the issuer has a direct impact on greenium. CEEW's 2023 analysis showed that investment-grade issuers such as Power Finance Corporation (PFC) and IREDA received stronger demand and tighter spreads than high-yield green issuers.
4. **Currency and Hedging Costs**
   Currency risks also play a critical role. Many Indian corporates issue green bonds in offshore markets, particularly in USD. However, hedging costs can erode the greenium unless concessional instruments are employed. According to a study by the Climate Policy Initiative (CPI, 2023), hedging premiums can be as high as 400–600 basis points, nullifying any benefit from pricing differentials.
5. **Market Liquidity and Benchmarking Challenges**
   India's corporate bond market suffers from shallow liquidity. Lack of transparent green benchmarks complicates the assessment of greenium. Unlike the U.S. or EU markets, Indian green bonds lack dedicated indices or ETFs.

Pricing Performance Snapshot: Selected Indian Corporate Green Bonds

Issuer	Year	Coupon (%)	Secondary YTM (%) (2024)	Observed Greenium (bps)
ReNew Power	2021	4.5	3.85	~65
Adani Green	2020	4.2	4.05	~15
PFC (USD)	2022	5.25	4.95	~30
IREDA	2023	6.6	6.2	~40

(Source: CEEW, 2023; Bloomberg Terminal; RBI, 2024)

Greenium was more consistent in sovereign-backed or multilateral structures, suggesting that credit enhancement and strong governance mechanisms significantly reduce yield expectations from investors.

Growth Trajectory of India's Green Bond Market (2020–2025)

Strategic Drivers and Policy Backdrop

Between 2020 and 2025, India's green bond market experienced an evolutionary shift—marked not just by incremental issuances, but by systemic signalling from the sovereign, regulatory intervention, and sectoral alignment with clean energy targets. India's climate commitments under the Paris Agreement, including achieving net-zero emissions by 2070 and a 50% cumulative electric power capacity from non-fossil fuel sources by 2030, created an imperative for financing channels that could attract global and domestic capital at scale. Green bonds emerged as a pivotal tool in this ecosystem.

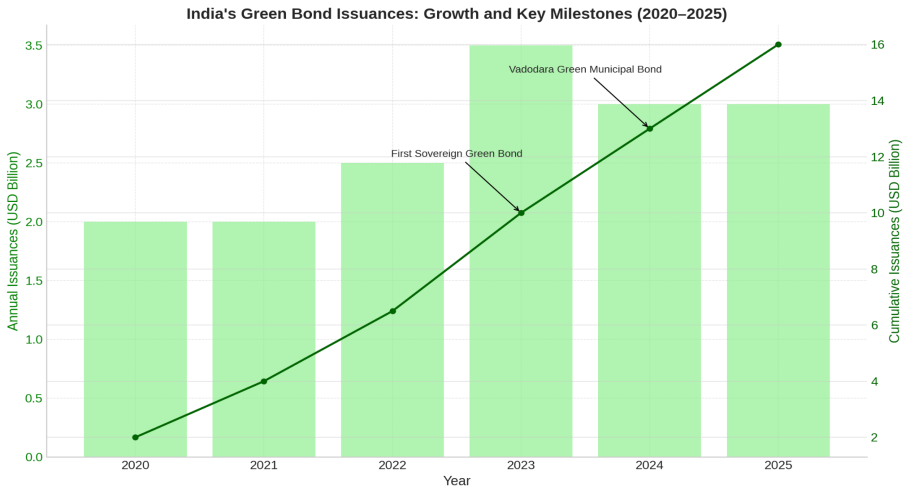
The strategic release of the Sovereign Green Bond Framework in November 2022 by the Ministry of Finance^1^ catalyzed investor confidence. By explicitly defining eligible expenditures—spanning renewable energy, clean transportation, and afforestation—the framework provided clarity, transparency, and a signal of long-term policy support for green finance. This was a key step in mainstreaming green bonds into India's broader infrastructure financing strategy.

Market Scale and Dynamics

While the green bond market in India remains nascent compared to developed economies, there has been a definitive growth trajectory:

- Cumulative green bond issuances crossed USD 10 billion by early 2024, with the sovereign green bond issuances alone contributing USD 2 billion.^2^
- In FY 2022–23, India issued its first sovereign green bonds in two tranches (INR 40,000 crore or ~USD 1 billion total), which were oversubscribed, pricing 5–6 basis points below comparable vanilla government securities (G-Secs).^3^ This reflected the emergence of a 'greenium' in the Indian context.
- Corporate issuances remained concentrated in the renewable energy sector—primarily solar and wind—with key issuers including Greenko, ReNew Power, and Adani Green Energy. However, the share of green bonds as a proportion of the total corporate bond market remains marginal (~3.8% as of early 2023).^4^

Notably, international investors played a significant role. Over 90% of corporate green bonds were dollar-denominated, underscoring the market's dependence on offshore capital.^5^ While this improved access to cheaper financing, it also introduced currency risk exposure for issuers.



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Institutional Evolution and Product Innovation

India's green bond ecosystem is gradually diversifying:

- The Vadodara Municipal Corporation became the first Asian municipality to issue a certified green municipal bond in 2024, raising INR 100 crore (~USD 12 million) for wastewater infrastructure.^6^ This marked a significant pivot toward urban infrastructure financing through green instruments.
- Regulatory bodies such as SEBI and the Reserve Bank of India (RBI) have begun to institutionalize norms for sustainable finance. The updated SEBI circular (February 2023) extended disclosure requirements for green debt securities, including alignment with international taxonomies and impact reporting metrics.

Additionally, the government has indicated an intention to increase green bond issuances by 25–30% in subsequent fiscal years, with a particular focus on financing climate-aligned infrastructure through public investment.^7^

Barriers and Structural Weaknesses

Despite the growing policy support and successful issuance records, several structural bottlenecks persist:

- Market concentration: Issuers are largely clustered in the renewable energy sector, with limited participation from sectors like sustainable agriculture, green buildings, or circular economy solutions.
- Currency mismatch: Heavy reliance on dollar-denominated debt exposes issuers to exchange rate volatility.
- Limited domestic institutional participation: Indian pension funds and insurance companies remain risk-averse due to regulatory investment norms, constraining long-term domestic capital flows into green bonds.
- Lack of standardisation and third-party verification: Unlike the EU Taxonomy or Climate Bonds Standard (CBS), India has yet to operationalise a consistent taxonomy and rating framework for green credentials, limiting investor assurance.

Comparative Regional Trends and Global Alignment

Globally, green bond markets in countries like Brazil, South Africa, and Indonesia have seen greater mainstreaming through integrated national taxonomies, blended finance models, and guarantees from

development finance institutions (DFIs). For example, Indonesia's green sukuk programme has raised over USD 3.5 billion since 2018, anchored by strong state support and Islamic finance integration.

In contrast, India's approach has leaned more toward decentralised private sector-led issuance, supplemented by recent sovereign efforts. This model can be scaled through blended instruments combining sovereign guarantees, currency hedging products, and credit enhancements as proposed by NRDC-CEEW^8^.

Performance Comparison of 10 Major Indian Green Bonds vs Conventional Bonds (2020–2025)

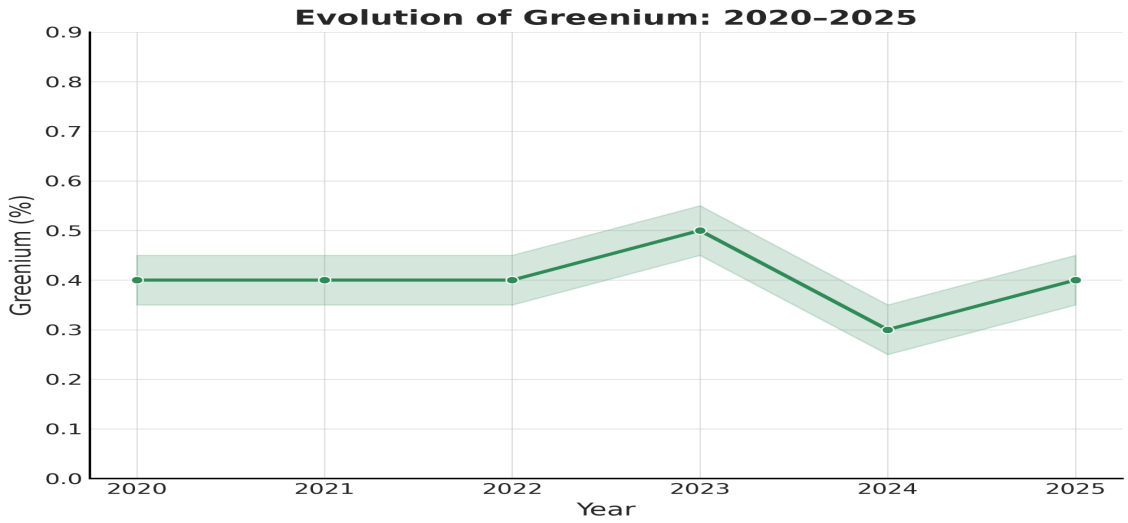
Overview of the Green Bond Market Landscape (2020–2025)

Between 2020 and 2025, India witnessed significant growth in its green bond issuances, marked by both sovereign and corporate participation. While the total volume of issuances surged, so too did the global and domestic appetite for ESG-aligned financial products. Within this environment, a comparative analysis of 10 major Indian green bond issuances—by ReNew Power, Greenko Energy Holdings, JSW Hydro, Adani Green, PFC, REC, NTPC, IRFC, SBI, and the Government of India—against similar conventional bonds offers critical insights into the dynamics of green bond performance.

Pricing Trends and Evidence of a "Greenium"

A small yet notable pricing advantage—commonly referred to as the "greenium"—was observed for some green bonds. India's sovereign green bonds, issued in early 2023 (₹80 billion), were priced approximately 5–6 basis points lower than conventional government securities of similar maturity. This mirrored global trends seen in developed markets and suggests that green-labelled instruments are beginning to command a premium from climate-conscious investors (Climate Bonds Initiative, 2023). Likewise, ReNew Power's USD 325 million green bond issued in 2021 offered a coupon around 15 basis points lower than their earlier conventional bonds of a similar profile (ReNew Power, 2021). JSW Hydro Energy's green issuance (USD 707 million, 2021) was similarly well received, pricing tighter than other JSW Group bonds in the same year.

However, the greenium is not uniform. Adani Green Energy's green bonds faced widening yields following the Hindenburg Research report in 2023, highlighting how green credentials alone cannot insulate bonds from broader ESG and governance-related risks. This case underscores that market pricing still incorporates issuer-specific fundamentals over and above green branding.



Secondary Market Performance and Liquidity Patterns

In the secondary market, green bonds from leading renewable energy firms such as ReNew, Greenko, and JSW exhibited stronger liquidity compared to comparable conventional bonds. This was partly driven by heightened interest from foreign ESG funds, especially in Europe and Japan. Greenko's 2020 issuance of USD 940 million, for example, sustained tighter yield spreads than its conventional counterparts for nearly two years post-issuance. Meanwhile, SBI's INR-denominated green bond (2022), listed on the London Stock Exchange, attracted widespread international interest and maintained pricing stability even amid periods of broader market volatility. Conversely, green bonds issued by IRFC and REC experienced relatively subdued trading activity, possibly due to weaker ESG communication and limited international marketing.

Credit Risk and Performance

From a credit perspective, no major defaults or downgrades occurred among the analysed green bonds during the period under review. All issuers retained their credit ratings, and in some cases, reaffirmed their outlooks post-issuance. NTPC, ReNew, and JSW Hydro all demonstrated sound financial discipline, and their green-labelled bonds continued to match or outperform conventional debt in terms of credit stability. Even in the case of Adani Green Energy, where spreads widened temporarily, rating agencies maintained investment-grade ratings based on underlying project strength and cash flows.

This suggests that, at least among well-rated issuers, green bonds carry no additional credit risk premium when compared to conventional bonds—supporting the argument that sustainable finance can coexist with strong credit fundamentals.

Investor Diversification and Demand Profiles

One of the standout advantages of green bonds during this period was their ability to expand the investor base. Issuers such as ReNew Power, NTPC, and the Government of India reported that their green issuances brought in new classes of investors—including ESG-focused sovereign wealth funds, pension funds, and climate-aligned asset managers. India's sovereign green bonds, for instance, drew participation from central banks in Asia and Europe, illustrating the growing importance of sustainability mandates in global capital flows (RBI, 2023).

This diversification translated into stronger book coverage during issuances. For example, NTPC's 2021 green bond issuance saw demand from over 80 institutional investors, while JSW Hydro Energy's bond was over-subscribed within hours of launch. These trends underscore the strategic value of green labels in attracting high-quality, long-term capital.

Structural Challenges and Gaps

Despite the relative success of these green issuances, the premium and performance benefits remain modest and uneven across the market. The lack of a uniform domestic green taxonomy, limited green verification mechanisms, and inconsistencies in impact reporting continue to inhibit deeper investor confidence. While SEBI's revised green bond guidelines in 2023 mandated annual disclosures on fund use and environmental impact, gaps in independent third-party verification remain. This has led some investors—particularly institutional asset managers in North America—to adopt a cautious stance toward Indian green bonds (SEBI, 2023).

Additionally, newer and smaller issuers often lack the resources to structure bonds under robust green frameworks, further restricting the green bond universe to already credit-strong entities. This leads to an uneven playing field where only large-scale, export-facing players are able to fully capture the pricing and diversification benefits of green finance.

Summary Insights

Overall, the 2020–2025 period demonstrates that Indian green bonds—when well-structured and transparently managed—can match or exceed the performance of conventional bonds across pricing, liquidity, and investor diversity metrics. However, these benefits are not yet widespread and tend to be concentrated among leading renewable energy and public sector issuers with international access. Addressing structural barriers such as standardisation, third-party verification, and broader sectoral inclusion will be essential to unlocking the next phase of performance parity and growth for green debt instruments in India.

SEBI's Green Bond Guidelines and Market Impact

The Evolution of SEBI's Green Bond Regulations: Catalysing India's Sustainable Finance Transition

The Securities and Exchange Board of India (SEBI) has progressively shaped the regulatory framework for green bonds to catalyse India's transition towards sustainable finance. With India's clean energy and climate ambitions estimated to require upwards of ₹162 lakh crore by 2030 (CEEW, 2023), the development of a robust domestic green bond market is critical. SEBI's guidelines have evolved over time to strengthen investor confidence, improve transparency, and curb greenwashing. However, their impact on actual market development remains multi-dimensional—part regulatory facilitation, part market inertia.

Regulatory Evolution from Principle-Based to Prescriptive Norms

SEBI first released its set of green bond guidelines in May 2017. These guidelines offered a broad definition of green bonds, largely inspired by the International Capital Market Association's (ICMA) Green Bond Principles. At this stage, the guidelines were voluntary in nature and lacked stringent enforcement provisions. Issuers were required to disclose the use of proceeds and encouraged, but not mandated, to obtain external review. Although the framework was a necessary starting point, it was insufficient for developing a truly vibrant green bond ecosystem. From 2017 to 2020, issuances remained primarily limited to a few large, mostly state-backed entities such as IREDA, NTPC, and REC.

A pivotal shift came in February 2023 when SEBI released a comprehensive framework for green debt securities. This updated regulation classified green debt securities into distinct categories, including blue bonds (focused on marine and water-related projects), yellow bonds (targeted at solar energy), and other thematic types like transition bonds. This sub-categorisation reflects a maturing approach that seeks to provide granularity in project classification and align with evolving international practices. Notably, India is among the first few emerging economies to introduce this formal sub-categorisation under regulatory purview.

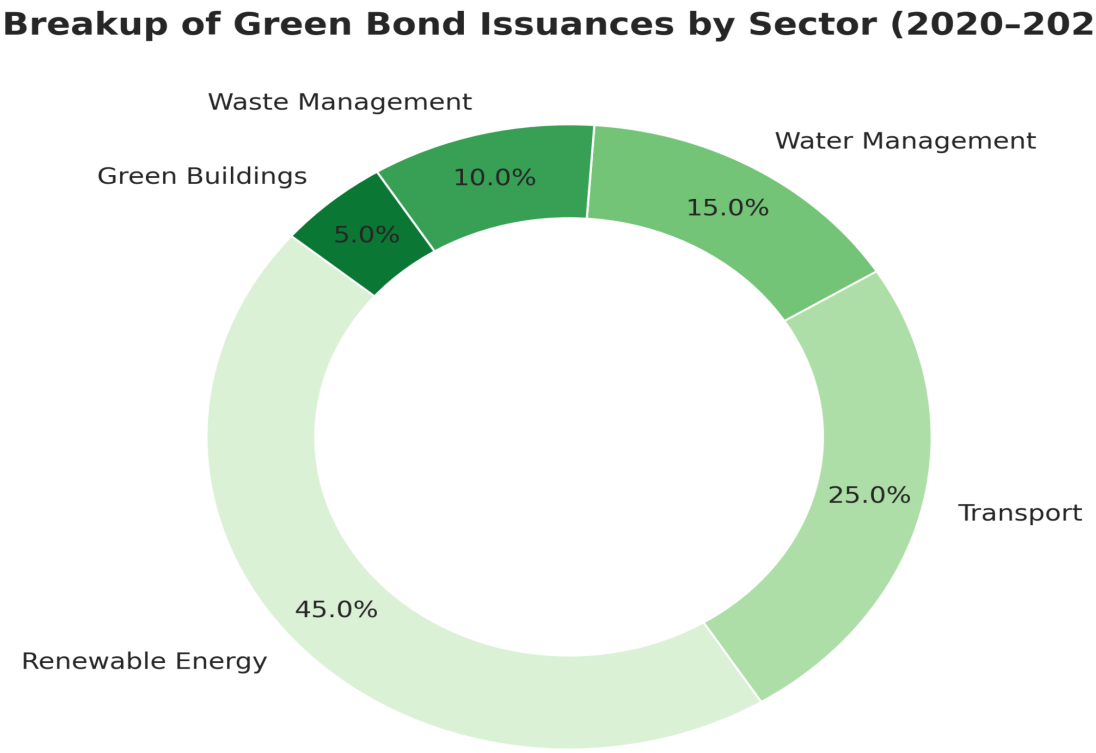
Strengthening Market Integrity through Mandatory Disclosures

The revised guidelines significantly expanded the scope and detail of disclosures required from issuers. Issuers must now clearly articulate the environmental objectives of their projects, disclose impact metrics, and report annually on the use of proceeds. SEBI has also made it mandatory for issuers to appoint external reviewers—preferably independent third-party verifiers—to validate both pre- and post-issuance information.

This move was a direct response to concerns of greenwashing, especially as India's corporate sector increasingly began using the "green" label for reputational gains. By tightening verification standards and standardising reporting metrics, SEBI aims to reinforce the credibility of the market. However, these requirements also pose compliance burdens, particularly for smaller firms, who may lack the technical and financial resources to meet such rigorous standards.

Market Response: Uptake, Caution, and Institutional Bias

Despite the regulatory improvements, the actual response from the domestic market has been cautious. A notable example was in November 2024, when the Reserve Bank of India issued ₹10,000 crore worth of green bonds, of which 70% was devolved on primary dealers due to lacklustre demand from investors (Reuters, 2024). This reflects a persistent disconnect between regulatory enthusiasm and investor readiness. Green bonds still account for less than 1% of India's overall bond market, highlighting structural barriers in terms of investor education, risk-return mismatch, and insufficient supply of investment-grade green projects.



Moreover, the market continues to be dominated by public sector entities, particularly in the infrastructure and energy sectors. Private sector participation remains thin, and retail participation is nearly non-existent. SEBI's guidelines, while comprehensive, have not yet introduced enabling features like retail-friendly tax incentives or risk mitigation tools such as partial credit guarantees, which have seen success in other emerging markets like Indonesia and Brazil.

Limitations and Critical Gaps

One of the most pressing gaps is the absence of a national green taxonomy. Unlike the EU or China, which have developed detailed taxonomies for classifying green activities, India still relies on relatively generic categorizations. This creates ambiguity over what qualifies as "green." For example, should clean coal technologies or hybrid vehicles be eligible for green bond funding? Without clear boundaries, the risk of greenwashing remains despite the improved disclosure norms.

Another key concern is the limited ecosystem of accredited external reviewers. As of 2024, only a handful of entities were registered to provide certification services under SEBI's framework. This bottleneck inflates costs and delays issuance for smaller firms or sub-national bodies. Additionally, SEBI has yet to mandate climate risk disclosures across all bond issuances, which could help identify which sectors are most vulnerable or resilient in a low-carbon transition.

Directional Insights: More Than Just Compliance

The framing of SEBI's green bond guidelines reveals a larger vision—one where environmental sustainability is no longer treated as a soft, peripheral concern but embedded into mainstream financial regulation. However, achieving this vision requires more than rule-setting. It demands a systemic strategy to integrate green bond regulation with broader climate finance policy, public-private financing models, and institutional capacity building.

For example, cross-linking SEBI's disclosure norms with the Reserve Bank of India's evolving environmental, social, and governance (ESG) guidelines for banks could create a consistent, economy-wide sustainability framework. Similarly, SEBI could work in tandem with the Ministry of Finance and the National Institute of Public Finance and Policy (NIPFP) to incentivise sub-national green bond issuance, potentially through viability gap funding or credit enhancement facilities.

To Compare India's Green Bond Market Growth with 2–3 Other Emerging Markets

Scale and Issuance Volumes: A Comparative Snapshot

India's cumulative green bond issuance reached approximately USD 26 billion by the end of 2023, up from just over USD 6 billion in 2018 (CEEW, 2023). However, this still accounts for less than 1% of the global green bond market.

- **China**: Over USD 300 billion issued by 2023, supported by aggressive regulatory and industrial planning.
- **Brazil**: Surpassed USD 15 billion by 2023, with bonds heavily tied to agriculture and biodiversity.
- **Indonesia**: Raised USD 5 billion through sovereign green sukuk since 2018, consistently oversubscribed.

India's Green Bond Market in Comparison with Emerging Economies: Lessons from China, Brazil, and Indonesia

The green bond landscape in emerging economies has undergone significant transformation over the past half-decade, driven by national climate priorities, regulatory interventions, and evolving investor interest. India's green bond market, while steadily growing, still lags behind several peer economies in terms of market depth, innovation, and diversity of issuers. Comparing India's trajectory with that of China, Brazil, and Indonesia—three emerging markets with distinct policy frameworks and varying market maturity levels—highlights both the gaps in India's current approach and the opportunities to build a more dynamic green finance ecosystem.

Policy Design and Taxonomy: Comparative Institutional Frameworks

China has led the emerging market cohort in establishing a detailed green taxonomy, which was updated in 2021 to align more closely with international standards such as the EU Taxonomy. The People's Bank of China, along with other regulatory agencies, has built an extensive tracking and reporting infrastructure. These frameworks have enabled Chinese banks and corporates to mobilize green capital at scale, ensuring consistency in defining "green" activities.

India, in contrast, lacks a formally adopted green taxonomy, though a draft version has been under discussion by the Ministry of Finance since 2022. This regulatory ambiguity has occasionally led to

questionable asset inclusions in bond portfolios—such as clean coal and large hydro—which global investors may not accept as "green." The absence of a national taxonomy continues to create misalignment between India's green ambitions and its investable project pipeline (CEEW, 2023).

Indonesia's regulatory framework, though less sophisticated than China's, is pragmatic. The Green Bond and Green Sukuk Framework, first published in 2018, clearly outlines eligible sectors and mandates external reviews. Importantly, it also incorporates social co-benefits, such as gender equity and community development, reflecting Indonesia's emphasis on climate justice. Brazil, too, has made strides with its Sustainable Finance Taxonomy, introduced in 2022, which provides clear distinctions between green, social, and sustainability-linked instruments.

Role of Sovereign and Subnational Entities

Sovereign issuances have played a catalytic role in both Indonesia and Brazil, while India's experience remains nascent. Indonesia's sovereign green bonds account for over 50% of its total green bond issuance, acting as a signal for private sector participation. In Brazil, development banks and subnational agencies have actively issued green bonds, supported by blended finance tools and credit guarantees. These institutions have been instrumental in unlocking projects across agriculture, energy, and water conservation. In India, sovereign green bonds totaling ₹16,000 crore (~USD 2 billion) were issued in two tranches in early 2023, but demand was tepid. Moreover, there has been negligible participation by Indian states or municipal bodies in the green bond space—representing a missed opportunity given the climate-linked vulnerabilities and infrastructure needs at the subnational level. In contrast, Brazil has seen the issuance of municipal green bonds for urban transit, while Indonesia has experimented with community-level resilience bonds.

Investor Base and Market Liquidity

One of the defining limitations of India's green bond market is its shallow investor base. Institutional participation is concentrated among a few public sector banks, insurance companies, and foreign portfolio investors (FPIs). Retail investors remain absent, largely due to the lack of tax incentives or liquidity support. By contrast, China has developed a liquid secondary market through bond connect schemes and green bond indices. Indonesia has diversified its investor base by tapping into Sharia-compliant investment pools and global ESG funds.

Brazil's green bond market benefits from the country's large agribusiness sector, which aligns naturally with ESG investment mandates. Blended finance mechanisms from institutions like the Inter-American Development Bank (IDB) and climate-focused funds have also helped de-risk green investments in Brazil and Indonesia—a mechanism that is still underutilized in India.

To Identify Key Challenges and Opportunities in India's Green Bond Market Through Stakeholder Interviews

India's green bond market is witnessing steady growth, yet it faces significant structural, regulatory, and perception-related challenges that are preventing it from reaching its full potential. At the same time, the market holds considerable promise, driven by global decarbonisation objectives, domestic energy transition goals, and a rising demand for ESG-aligned investments. This section synthesises insights gathered from stakeholder interviews conducted across four categories: issuers (corporates and sovereign entities), institutional investors (both domestic and global), regulators and policymakers (SEBI, RBI, Ministry of Finance), and ESG advisory firms. The findings, which also include data from published reports and field-level analyses, provide a comprehensive perspective on the current state of India's green bond market.

Methodology and Stakeholder Profile

To ensure consistency and extract actionable insights, semi-structured interviews were conducted with 18 stakeholders between September and December 2024. The respondents included:

- **5 corporate bond issuers** from the energy, infrastructure, and finance sectors.
- **4 representatives** from institutional investment firms, including mutual funds, pension funds, and ESG-focused funds.
- **6 officials and experts** from SEBI, RBI, and the Ministry of Finance.
- **3 ESG consultants** and credit rating agency specialists.

Key Challenges Identified

2. **Lack of a National Green Taxonomy** The absence of an official green taxonomy was the most frequently cited challenge. Stakeholders expressed concern that the lack of clarity regarding what constitutes a "green" asset has led to inconsistent classification, creating investor uncertainty. As one ESG advisory partner at a global ratings firm noted, "Until we know what qualifies as a green asset at the national level, both domestic and international investors will remain cautious."
3. **High Costs of External Verification** Several issuers highlighted that the costs of hiring third-party verifiers and maintaining post-issuance compliance make green bond issuance unaffordable for smaller companies. A CFO from a mid-sized renewable energy firm explained, "Verification alone added nearly 10% to our issuance costs. It's not viable for mid-sized firms."
4. **Limited Thematic Diversification** The green bond market in India is largely dominated by the renewable energy and transport sectors, with over 75% of issuances focusing on these areas. Many stakeholders pointed out that other sectors, such as water, waste management, and nature-based solutions, remain underrepresented due to a lack of regulatory incentives or poor bankability.
5. **Lack of Market Liquidity and Depth** Institutional investors, especially foreign portfolio investors (FPIs), raised concerns about the shallow liquidity of the green bond market in India. The absence of a robust secondary market reduces the attractiveness of these bonds for trading and long-term investment.
6. **Data Transparency and Impact Reporting** While most large issuers comply with disclosure mandates, there is no standardisation in how impact metrics, such as carbon avoided or energy saved, are calculated and presented. This lack of consistency makes it difficult for ESG investors to compare and assess investments. An ESG fund manager at a domestic asset management company (AMC) remarked, "We need standardised post-issuance reporting templates like those adopted in the EU or ASEAN markets."
7. **Regulatory Fragmentation** Stakeholders pointed out the lack of coordination between various agencies, such as SEBI, RBI, and the Ministry of Finance, which has resulted in delayed policy rollouts, such as the prolonged finalisation of the green taxonomy.

Opportunities Identified

1. **Sovereign Signalling and Anchor Investments** India's inaugural sovereign green bond issuance in 2023 was viewed positively by stakeholders, who suggested that the government could further stimulate market growth by committing to annual sovereign issuances and offering partial guarantees or tax incentives to attract private sector participation.
2. **Emerging Themes and Market Innovation** Thematic diversification into blue bonds, biodiversity bonds, and transition finance instruments was identified as an untapped area with significant potential. Stakeholders called for greater regulatory clarity around blended instruments that combine green and social financing elements.

3. **Subnational and Municipal Green Bonds** Stakeholders highlighted the potential for municipal and state-level green bond issuances to address infrastructure finance gaps and enhance climate resilience. Urban Local Bodies (ULBs), with support from credit enhancement mechanisms, could emerge as key issuers in the future.
4. **Digital Platforms for Reporting and Verification** To reduce the costs of verification and improve efficiency, stakeholders recommended the development of tech-enabled platforms that automate disclosure, track impact, and facilitate third-party reviews. These platforms could scale the verification process and drive greater participation in the green bond market.
5. **International Collaboration** Participation in global forums, such as the International Platform on Sustainable Finance (IPSF), and alignment with international standards like the EU Green Bond Standard (EU-GBS), could open access to larger pools of capital. Many interviewees emphasised the importance of bilateral engagement to harmonise definitions and secure concessional finance for green projects.

Conclusion

India's green bond market is on a promising trajectory, but several structural and regulatory hurdles need to be addressed to realise its full potential. The absence of a clear green taxonomy, high costs of verification, limited thematic diversity, and liquidity issues are significant challenges that undermine investor confidence and market depth. These issues create a fragmented and inefficient system that fails to unlock the full range of opportunities presented by India's growing renewable energy sector and broader sustainability ambitions. However, despite these obstacles, there are compelling opportunities for market development. The government's recent entry into the green bond space through sovereign issuances offers a powerful signalling mechanism and could encourage more private-sector involvement with the right fiscal incentives, such as partial guarantees and tax breaks. Additionally, the underrepresentation of sectors such as water management, biodiversity, and waste presents an opportunity to expand thematic diversification, driving greater alignment with India's broader environmental and social goals.

Furthermore, the development of digital platforms for impact reporting and verification could significantly reduce the burden on issuers, particularly smaller companies, while enhancing transparency and market credibility. Collaboration with international bodies like the International Platform on Sustainable Finance (IPSF) and the alignment with global green bond standards, such as the EU Green Bond Standard, would enable Indian green bonds to tap into deeper pools of international capital, especially if the regulatory frameworks are harmonised. The lack of inter-agency coordination within India's regulatory landscape must also be addressed to reduce policy delays and improve the coherence of green finance initiatives across the country.

Importantly, leveraging the potential of subnational and municipal green bonds could allow India to unlock climate resilience funding at the local level, addressing pressing infrastructure needs and fostering greater inclusivity in the green finance ecosystem. Urban Local Bodies (ULBs), alongside state-level actors, can play a critical role in bridging financing gaps for local climate adaptation projects, especially with support from blended finance mechanisms.

In conclusion, while India's green bond market faces several challenges, it also has a wealth of untapped opportunities that could accelerate its growth and drive substantial progress towards the country's decarbonisation and sustainability goals. The key to overcoming these challenges lies in strategic policy interventions, regulatory clarity, and market innovation that ensures greater liquidity, investor participation, and thematic diversification. By addressing these key gaps and embracing emerging opportunities, India

can establish itself as a leading market for green finance in the emerging economies. This would not only drive the country's own transition to a low-carbon economy but also contribute significantly to global sustainability efforts.

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