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GREEN FINANCE IN INDIA: KEY CHALLENGES, OPPORTUNITIES, AND REGULATORY REFORMS

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ABSTRACT

Economic growth, environmental sustainability and social progress are key priorities of the twenty-first century. Climate change, loss of biodiversity, and energy crises are changing the way the world's economies work. Green finance is now necessary for long-term development. Green finance helps people around the world manage risks and find new opportunities that are good for the environment. It does this through things like green bonds, green loans, green insurance, and carbon markets. India's economy is growing quickly, and the country wants to keep it that way while also meeting its climate commitments under the Paris Agreement and its goal of reaching net-zero emissions by 2070. India's Nationally Determined Contributions (NDCs) will cost more than $2.5 trillion by 2030. This research utilizes secondary data from reports and articles to analyze the concept, instruments, challenges, and opportunities of green finance in India. The results show that green bonds, green loans, and sustainable investments are making progress, but there are still problems with regulatory frameworks, risk perception, capacity building, and market development. The study suggests that to grow green finance, we should make rules stronger, make the market deeper, and take advantage of chances in renewable energy, urban development, and fintech.

Keywords: Green Finance, Climate Finance, Regulatory Framework, Sustainable Development, Green Bonds.

INTRODUCTION

In today's global economy, climate change and sustainability are important factors in making decisions about money and business. The UN's Sustainable Development Goals (SDGs), especially Goal 13 (Climate Action) and Goal 7 (Affordable and Clean Energy), stress the importance of making financial systems work with environmental goals. Green finance has become a crucial means of connecting economic growth with environmental responsibility by channelling funds into projects that reduce damage and help people adapt (OECD, 2017; World Bank, 2020).

India really needs green finance right now. According to the IMF (2022), the country is the third largest emitter of greenhouse gases in the world. It is also very vulnerable to climate changes like extreme temperatures, unpredictable monsoons, floods, droughts, and loss of biodiversity (RBI, 2022). India's development goals include reaching 500 GW of renewable energy capacity by 2030 and making electric vehicles more common. Both of these will require a lot of long-term investment (Bhattacharya et al., 2019). A joint assessment by NITI Aayog and the Ministry of Finance says that India needs almost USD 170 billion a year to reach its NDC goals. This is much more than the current amount of climate finance (Chaudhry & Singh, 2021; RBI, 2022). Traditional financing mechanisms, characterized by short-term return expectations, are insufficient for long-gestation green projects, highlighting the necessity for specialized green finance instruments (Ehlers & Packer, 2017; Flammer, 2021).

Green finance refers to money that goes to projects that have measurable positive effects on the environment, such as renewable energy, energy efficiency, sustainable farming, waste management, green buildings, sustainable transportation, water conservation, and protecting biodiversity (Climate Bonds Initiative, 2023).

This paper looks at green finance trends in India and around the world, looks at major tools like green bonds and sustainability-linked financing, looks at India's progress, finds policy and regulatory gaps, and points out new opportunities. The paper ends with suggestions for how to improve India's green financial system and help the economy become more resilient and low-carbon.

LITERATURE REVIEW

Global Perspectives

Initial research on environmental economics and Ecological Modernisation Theory (EMT) posited that economic growth and environmental conservation can be mutually reinforcing when facilitated by policy, technological advancements, and institutional reform (Mol & Sonnenfeld, 2000). This theoretical foundation transitioned into finance-specific research, wherein scholars acknowledge that the alignment of financial systems with climate objectives is crucial for sustainable development. The OECD (2017) says that changing the flow of money to low-carbon paths is a must for the Paris Agreement. The World Bank (2020) says that climate finance needs to grow from "billions to trillions" in order to help the world adapt and mitigate climate change.

There has been a lot of research on green finance tools, especially green bonds. Flammer (2021) finds that issuing green bonds can lower a company's cost of capital and improve its environmental performance. Ehlers and Packer (2017) demonstrate that certification and reporting requirements enhance transparency; however, they also acknowledge ongoing challenges, including inconsistent standards across markets. While these authors focus on how green bonds can help the economy, others say that the market is still broken up, with different definitions and worries about credibility.

Carbon markets are another important area of research. Newell et al. (2013) contend that compliance carbon markets significantly contribute to substantial emission reductions, whereas voluntary markets function as an

auxiliary mechanism to foster innovation within the private sector. Recent literature also emphasizes the regulatory function of financial authorities. The IMF (2022) says that taxonomies and disclosure rules for sustainable finance can stop greenwashing and make investors more confident. A lot of people use the EU Green Taxonomy as a guide for how to set up sustainable investment flows.

Indian Perspectives

Since India signed the Paris Agreement in 2016, Indian writing on green finance has picked up speed. Bhattacharya et al. (2019) observe that India's green finance ecosystem is still in its early stages compared to developed markets, but it is slowly getting stronger thanks to changes in policy and new ideas in the financial markets. Chaudhry and Singh (2021) delineate various impediments to the proliferation of green bonds in India, encompassing elevated transaction costs, insufficient standardization, and gaps in investor awareness. However while they focus on structural problems, other researchers point out that policy changes since 2021, like the issuance of sovereign green bonds, are starting to fill these gaps.

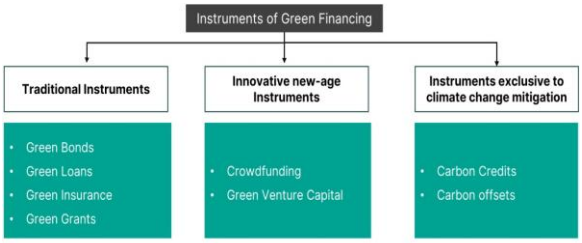
Macro-level financial assessments further highlight the difficulty. The Reserve Bank of India (2022) says that to reach net-zero by 2070, we will need to invest more than 2.5% of GDP in green projects each year. This shows that there is a big gap in funding. Another important area of research has been regulatory reforms. Jain and Kumar (2022) say that SEBI's Business Responsibility and Sustainability Reporting (BRSR) framework makes businesses more open, but they also say that businesses need to be more in line with global ESG standards to get international investment.

Recent studies also look at how India's municipal green bond market is growing. KPMG (2023) looked at the Vadodara Municipal Corporation's 2023 green bond issuance and found that it shows how local governments can get money for climate-resilient urban infrastructure. Authors disagree on whether municipal green bonds can be used in more than one city because each city has different administrative abilities.

To summarise, Indian academic literature and analysis have coalesced around three key strands of argument: (i) increasing relevance of green bonds and loans, (ii) criticality of regulatory support and taxonomies, and (iii) financing gap between India's climate ambitions and the finance required.

INSTRUMENTS OF GREEN FINANCING

Green Financing helps individuals businesses support sustainable development. These are categorised in broad categories as cited in diagram shown below.



Green Bonds: These are debt securities issued by a company or the government to raise money from investors only for projects that are good for the environment or the climate. Funds are capital that comes from a variety of investors, such as institutional investors, retail investors, and impact investors. Green bonds can help the shift to a low-carbon economy by giving money to projects that use renewable energy, make buildings more energy-efficient, and other investments that are good for the environment.

Green Loans: These loans help people, businesses, and governments get the money they need to pay for projects and businesses that are good for the environment. Businesses and families can both make a lot of money with green loans. Green loans usually have lower interest rates than regular loans.

Green Insurance: Green insurance encourages businesses and products that are good for the environment by giving them lower premiums or better terms. Insurers around the world have started to put sustainability-linked insurance products at the top of their lists. This is especially true since UNEP FI released the Principles for Sustainable Insurance (UNEP FI, 2012).

Green Grants: International organizations like the Global Environment Facility (GEF) or the Green Climate Fund (GCF) or government programs give money to projects that may not have a clear short-term commercial return but will have a long-term ecological or social benefit, like restoring mangroves or protecting biodiversity.

Crowdfunding: Crowdfunding is a way for a business or person to get money from a lot of people who are interested in it. Each person gives a small amount of money directly, without the help of a traditional financial middleman. The donation can be purely charitable, or the donor may be looking for a social or environmental return. Crowdfunding can help green businesses get started when they can't get traditional loans.

Green Venture Capital (VC): Green VC can give money to projects and businesses that are working on eco-friendly technologies to help protect the environment and fight climate change. It can help sectors like energy, waste, and transportation get the money they need to make cleaner technologies. It can be hard for technology-based green startups to get money from traditional sources because they are so risky. VC funding can help lower these risks.

Carbon Credits: Carbon credit allows a company to emit up to one tonne of carbon dioxide in the atmosphere. Companies that pollute get credits that let them pollute up to a certain level (cap). These credits are reduced every year, which encourages businesses to be more environmentally friendly. Developing countries can use carbon credits to help their economies grow while also moving toward a low-carbon economy.

Carbon Offsets: Carbon offsets are real, measurable cuts in greenhouse gas (GHG) emissions that are used to make up for emissions that happen somewhere else. People, businesses, or governments buy these offsets to "neutralize" their carbon footprint by paying for projects that remove or lower emissions that are equal to what they make.

The terms **Carbon Offsets** and **Carbon Credits** are often used interchangeably despite the two instruments serving different purposes as Carbon credits allow regulated emissions up to a permitted limit, while carbon offsets compensate for emissions by funding projects that reduce or remove greenhouse gases elsewhere.

PROGRESS OF GREEN FINANCE IN INDIA

India's shift to a low-carbon and climate-resilient economy has sped up a lot in the last ten years, thanks to strong national commitments and more ways to get money. India promised to cut the emissions intensity of its GDP by 33–35% from 2005 levels and get half of its electricity from renewable sources by 2030 as part of the Paris Agreement (OECD, 2017; IMF, 2022). To reach these goals, a lot of money is needed. Estimates say that India will need almost USD 2.5 trillion between 2015 and 2030 to meet its Nationally Determined Contributions. (Bhattacharya et al., 2019; World Bank, 2020).

Green finance has become an important way to get long-term, patient capital to help reach these sustainability goals. The conventional capital markets often focus on short-term returns, which means that there is a big funding gap for green infrastructure and investments that are good for the environment (Ehlers & Packer, 2017). On the other hand, green finance tools like green bonds, sustainability-linked loans, and social bonds have made it possible for both public and private organizations to get money for renewable energy, clean transportation,

climate-resilient infrastructure, and other environmental goals (Flammer, 2021).

India's sustainable debt market has grown quickly. India had become the fourth-largest source of GSS+ (Green, Social, Sustainability, and other labeled) debt in emerging markets by December 2024. The total amount issued had grown by 186% since 2021 to USD 55.9 billion (Climate Bonds Initiative, 2024). The rise of green-labelled instruments, which made up 83% of all aligned issuance, has been a big part of this growth. Green loans alone reached USD 5.5 billion in 2024, issued by 19 companies (Chaudhry & Singh, 2021).

Since 2023, the Government of India has issued eight tranches of sovereign green bonds, worth INR 477 billion (USD 5.7 billion). These issuances have helped to make the domestic green yield curve more stable and set price standards for private issuers (RBI, 2022). The investor base has also grown, with more domestic banks, global asset managers, and development finance institutions getting involved. This has made both the primary and secondary markets stronger.

Social finance has also picked up speed. In 2024, Indian issuers issued seven social bonds worth USD 5.5 billion, and non-banking financial companies arranged USD 1.8 billion in social loans. This shows that capital flows that are focused on sustainability are becoming more diverse (KPMG, 2023). Vadodara Municipal Corporation issued Asia's first Climate Bonds-certified municipal green bond at the local level. This shows that urban local governments are getting better at getting climate finance (KPMG, 2023).

Even with this progress, there are still big gaps in funding. India will need $1.3 trillion in climate investments by 2030, and $756 billion of that must come from private sources (World Bank, 2020). It will cost about $650 billion to switch to low-carbon industries like steel and cement. This is a big challenge and a big chance for transition-aligned finance (UNEP FI, 2012).

Changes in policy have made the enabling environment even stronger. The Business Responsibility and Sustainability Reporting (BRSR) framework from SEBI, the green deposit scheme from RBI, the sustainable finance guidelines from IFSCA, and the upcoming national taxonomy are all making disclosures more standard and boosting investor confidence (Jain & Kumar, 2022). The US dollar (USD) and the Indian rupee (INR) are the most common currencies in the market. However, issuers are looking into other currencies like the Japanese yen and the euro to lower costs and reach more investors.

Overall, the path of green finance in India shows strong structural momentum, thanks to policy frameworks, new ideas in the market, and more and more investors from India and other countries. India is becoming more committed to using financial markets for sustainable development, as shown by the increase in green bond issuance from USD 1.2 billion in 2013 to USD 55.9 billion in 2024. **CHALLENGES IN SCALING UP GREEN FINANCE IN INDIA**

There are a number of structural and institutional problems that make it hard for India to efficiently move climate-aligned capital. One problem that keeps coming up is that there is no standard way to define "green" investment. India depended on voluntary disclosure rules until draft national taxonomy guidelines were released. This made investors unsure about the environmental credibility of financial instruments (Jain & Kumar, 2022). This lack of clarity has made people worry about greenwashing, especially in areas like renewable energy financing, where different issuers give different levels of environmental impact information for each project (Chaudhry & Singh, 2021).

Data availability and disclosure quality present another significant barrier. In India, obtaining reliable, detailed, and comparable environmental data continues to be a challenge. This makes it hard for investors to figure out long-term risk and climate alignment. The Business Responsibility and Sustainability Reporting (BRSR) framework from SEBI has made corporate reporting better, but many small and mid-sized Indian companies still don't have standard ways to measure their carbon emissions or climate exposure (RBI, 2022). This lack of data makes it hard to create advanced financial products like sustainability-linked loans, which need measurable performance indicators to work.

The challenge of **risk assessment** is closely related to these data limitations. Indian banks and non-banking financial companies often have trouble figuring out how much to charge for climate-related risks because there aren't any long-term records of how well the environment is doing and policies are changing (IMF, 2022). For instance, renewable energy developers in India still have trouble getting credit ratings because of delays in buying land, problems with connecting to the grid, and changing tariff systems. These risks that are unique to each sector make it more expensive to finance green projects than regular infrastructure projects.

Another limitation is the perception of the unpredictable financial performance of green assets, especially in the short term. Investors are still cautious about investing in renewable energy in India, even though the long-term returns have been good. This is because of problems like payment delays from state distribution companies (DISCOMs), changes in state-level renewable policies, and a lack of liquidity in the secondary market for green bonds (World Bank, 2020). Because of the higher upfront costs and longer payback periods, short-term investors see green finance as less appealing than traditional debt instruments.

Uncertainties in regulations and policies make investors even more hesitant. Government-led programs like renewable purchase obligations (RPOs), green hydrogen mandates, and viability gap funding for clean infrastructure have a big impact on India's green finance ecosystem. But frequent changes in state policies, like changes to the rules for solar rooftop net-metering or the cancellation of power purchase agreements, make it hard for private investors to know what to do (OECD, 2017). These differences make people worry about the long-term profitability and regulatory stability of green investments.

Lastly, India faces clear transition risks as it works to become a low-carbon economy. Sectors like steel, cement, and thermal power, which together make up a large part of India's industrial output, will need big improvements in technology and money to meet the country's climate goals (Climate Bonds Initiative, 2025). These changes could cause asset-stranding risks, changes in consumer preferences toward low-carbon products, and uneven adaptation across industries. For example, India's heavy reliance on coal—over 70% of the electricity it generates—makes it hard to get rid of fossil-fuel-based assets (RBI, 2022).

These problems show that India needs to improve its climate data systems, finish its national green taxonomy, make its policies more consistent, and add more risk-mitigation tools, like guarantees and blended finance, to help investors feel more confident and speed up the growth of green finance.

OPPORTUNITIES FOR GREEN FINANCE IN INDIA

Policy Support: India's policy and regulatory landscape are converging towards global sustainability practices. SEBI's Business Responsibility and Sustainability Reporting (BRSR) framework requires listed companies to report ESG-related

performance. This will push investors to channelize capital towards greener businesses. The Reserve Bank of India (RBI) has issued guidelines for green deposits, which are mobilising retail and institutional savings for green projects. India is also working on a national green taxonomy to formally define what "green" means in terms of activity. This clarity reduces the risk of "greenwashing" and will improve investor confidence, leading to greater inflows domestically and internationally.

- **Renewable Energy Push**: India's renewable energy capacity target of 500 GW by 2030 is positioning the country as a leader in the clean energy transition. Achieving this target will need large scale capital investments in solar parks, offshore/onshore wind farms, hydropower, and green hydrogen as an emerging market. The quantum of investment to be made will open up a plethora of opportunities in green bonds, sustainability-linked loans, infrastructure investment trusts (InvITs), public–private partnerships. Private equity funds, venture capital and global climate financiers have their eyes on the Indian renewable market as an opportunity that is both profitable and impactful.
- **Urban Transformation**: Urbanization in India is expected to reach nearly 40% by 2030, increasing the demand for sustainable infrastructure. Government initiatives like the Smart Cities Mission focus on energy efficiency, electric mobility, sustainable housing, and waste management, which require funding. A significant innovation in this sector is green municipal bonds, a green bond launched by Vadodara to enable city governments to raise funds for green projects. As more urban local bodies issue such instruments, opportunities for institutional investors and ESG funds are likely to grow.
- **International Climate Funds**: India's commitments under the Paris Agreement and its COP28 targets make it eligible for international climate finance. Initiatives like the Green Climate Fund (GCF) and Global Environment Facility (GEF) provide concessional financing and grants that can be combined with private investment to de-risk projects. Blended finance mechanisms, which use public or philanthropic funds to reduce risks and attract private capital, can unlock large pools of capital for renewable energy, sustainable agriculture, and climate-resilient infrastructure. This can provide India with greater access to global investors that are mandated to set aside a proportion of their funds for climate-positive projects.
- **FinTech and Digital Platforms**: Digital finance is also expected to be a significant driver in green investments. Crowdfunding platforms are allowing retail investors to directly finance small-scale renewable energy projects or community-based sustainability initiatives. Tokenisation of carbon credits on blockchain platforms is enhancing traceability and preventing double-counting, which could increase trust in carbon markets. AI-driven ESG rating platforms are also starting to emerge, which could lead to more granular analysis of corporate sustainability performance. These innovations have the potential to make green finance more inclusive, transparent, and scalable, appealing to both institutional and retail investors.
- **Corporate Demand**: The global capital markets are fast evolving to make ESG compliance mandatory. Asset managers and sovereign wealth funds as well as pension funds across the world are more willing to invest in corporates that have sustainable practices. Indian corporates are increasingly raising funds through green bonds, sustainability-linked bonds and ESG-focused private equity funding. Large corporates such as Reliance, Adani, NTPC and many more are fast accessing green financing instruments for their expansion plans and to meet investor expectations. This is likely to

spill over to mid-size firms as well in the coming years, which will provide more opportunities for green finance.

POLICY RECOMMENDATIONS

1. **National Green Finance Roadmap** – Adopt a single taxonomy and common reporting guidelines - to create a level of playing field and comparability between stakeholders in the market; to avoid greenwashing and earn investors' trust; and to align with global sustainability initiatives.
2. **Risk Mitigation Instruments** – Launch government-backed guarantees, blended finance structures and partial credit enhancement to de-risk green projects. These instruments will crowd in private capital by reducing financial risks in renewables, green hydrogen and other breakthrough technologies.
3. **Capacity Building** – Enhance institutional capabilities by educating bankers, NBFCs, and rating agencies on green project appraisal. This involves incorporating climate risk analysis, carbon mitigation potential, and long-term sustainability factors in financial assessments.
4. **Retail Participation** – Mobilise retail investors into green mutual funds, ETFs and standardised simple small-investor green bonds so that ordinary people can support the transition to a sustainable economy and diversify their savings.
5. **Carbon Pricing & Trading** – Carbon markets should be operationalised with transparent, robust and predictable pricing and trade mechanisms. This will drive the industry to reduce emissions, fund low-carbon technologies and create a new asset class for investors.
6. **Strengthening Municipal Finance** – Issue more municipal green bonds to fund waste management, transport and water infrastructure. Local governments should have easier access to green finance rather than having to wait on state or central funds.

CONCLUSION

India is at a crossroads for greening its finance systems. The positive momentum that has built over the last few years with issuances of bonds, sovereign tranches, and municipal firsts is tempered by the urgent need to address institutional gaps such as lack of standardised regulations, perceived high-risk factor, and the lack of an enabling mechanism to track its climate finance flow. However, India is also in an enviable position due to its inherent renewable energy and resource management capacities, the emergence of fintech and crowdfunding platforms, and external concessional multilateral climate finance sources. The opportunity to develop a single-window operational green finance mechanism, supported by a strong institutional backbone and an innovative de-risking and capital raising structure, to meet its trillion-dollar annual green needs is also unprecedented. India has the opportunity to make an internationally replicable game-changing shift to sustainable and equitable finance. This can only be done by a green finance strategy that mainstreams ESG standards across all financial markets and is strongly linked to both climate mitigation and adaptation, while unlocking finance to achieve its true economic and climate potential and also addressing future systemic climate risks

India's experience in scaling up green finance may also have lessons for other developing countries where economic growth and environmental conservation need to go hand in hand. Strong coordination between the public and private sectors and with civil society will be key to ensuring that green finance becomes available across sectors and for both urban and rural areas to finance an inclusive growth story. With a judicious combination of continued policy innovation, capacity building, and monitoring and evaluation, green finance can make India's green dreams a reality for millions of

people, and create a just, low-carbon, and resilient future for all.

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