

THE IMPACT OF GREEN BANKING ON ENVIRONMENTAL SUSTAINABILITY: EVIDENCE FROM INDIAN COMMERCIAL BANKS

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Abstract

Green banking has been identified as an innovative and transformative institutional strategy to guide emerging nations into sustainable development through the structural integration of capital management according to environment-friendly parameters. This research aims at assessing the influence of green banking strategies on environmental sustainability in India through the use of empirical secondary data collected over the years 2019 to 2025 from RBI, IBA, Ministry of Finance, and corporate sustainability reports. The research uses macroeconomic trend analysis, content analysis, and efficiency tracking based on percentages to explore the two sides of green banking including its internal operations and external portfolio composition. It is found out that the structural change in digital transaction platforms has led to structural change in commercial paper utilization and retail carbon intensity. On the other hand, debt funding of renewable energy, electric mobility, and energy-efficient infrastructure has been creating statistical evidence of carbon mitigation over time. However, there are structural limitations associated with capital misallocation, lack of technical expertise in environmental risk assessment at the local level, and poor digital infrastructure in some regions that limit the potential for the optimization of this industry. This paper provides a comprehensive strategy framework to the existing literature on sustainable finance.

Keywords: *Green Banking, Environmental Sustainability, Commercial Banks, Digital Banking, Sustainable Finance, Decarbonisation.*

1. Introduction

The modern global economic environment confronts a significant problem of reducing environmental destruction and climate change while maintaining the pace of macroeconomic growth. With greenhouse gases (GHGs) attaining never-before-seen levels, global policies are beginning to lean towards decarbonizing their economies to a deeper extent. In this context, financial organizations, especially commercial banking systems, are acknowledged not only as capital intermediaries, but also as regulators who can influence carbon-based industrial processes.

It is worth noting that traditional banking systems used to function on the basis of the principle of environmental neutrality, focusing on risk-return trade-offs alone. But the arrival of the Green Banking concept has completely changed the scope here, as banks now have to reduce their impact on the environment both internally and externally.

For countries like India that fall under emerging market economies, the financial sector has a special significance when it comes to determining the sustainable development path. This is especially true when one takes into account that, on the one hand, India has made some very promising climate commitments – for instance, its promise during COP26 to go net-zero by 2070 – and, on the other hand, it is capital formation that constitutes the most crucial bottleneck to implementing these climate policies. Indian commercial banks, spanning both public sector undertakings (PSUs) and private sector entities, have responded by adopting a two-pronged strategy:

1. **Internal Operational Digitalization:** Transformation of traditional physical distribution channels into digital channels (such as internet banking, mobile banking, e-statements, and automated green channel machines) to decouple growth of banks from the carbon cost of paper and travel.
2. **External Portfolio Greening:** Targeted use of credit instruments such as favourable debt structures for utility-scale solar projects, EV value chain development, energy efficient commercial real estate development, and eco-certified manufacturing operations.

The banking sector has become an important partner in achieving the Sustainable Development Goals (SDGs), particularly SDG 7 (Affordable and Clean Energy), SDG 9 (Industry, Innovation and Infrastructure), SDG 12 (Responsible Consumption), and SDG 13 (Climate Action).

Although such positive trends have been observed, the actual implementation of such green activities is rather inconsistent throughout the industry. High-ranking financial organizations are able to generate their ESG reports, while middle-sized and regional banks lack the necessary resources, technological capabilities, and systems of information exchange.

These challenges are overcome in this research through an all-encompassing study of secondary data from 2019 to 2025. The research examines the present level of adoption of green banking in India, the impact that can be observed on the environment due to green banking, identifies barriers for system-wide implementation, and provides a regulatory roadmap.

2. Theoretical Framework and Literature Review

2.1 Theoretical Framework

This study is grounded in two complementary economic frameworks: **Stakeholder Theory** and **Institutional Theory**.

1. The Stakeholder Theory claims that contemporary companies, especially systematic ones such as financial firms, operate in accordance with a kind of social contract, which goes beyond mere short-term profit-making for shareholders. With regard to green banking, banks need to juggle their economic concerns on behalf of investors with the environmental concerns of communities, civil society, and the regulatory authorities.
2. Institutional theory describes the influence of regulatory requirements, industry standards, and social culture on homogenous corporate behaviour. With RBI and the global guidelines such as the Task Force on Climate-related Financial Disclosures (TCFD) defining what is considered green, Indian commercial banks opt for green banking in order to legitimize themselves in regulatory terms and maintain their corporate image.

2.2 Literature Review

There has been a fair amount of empirical literature on the overlap between financial intermediation and environmental economics within the last two decades. Initial literature perceived green banking as being limited to a cost-based approach to CSR. The views put forth by Bahl (2012) have shown that banks which had undertaken the practice of green banking in India had not only reduced their operating costs but also had seen an improvement in the management of operational risks.

As digitalization progressed, scholars turned their attention towards measuring the environmental benefits of automation in operations. Jha&Bhome (2013) examined the environmental impact of the digital transition, and found that the adoption of online banking services by retail customers had resulted in a marked reduction in local paper use and lower carbon emissions.

At the same time, foreign research pointed out the importance of the macro-environment in relation to targeted credits. Thus, Masukujjaman and Aktar (2014) have studied sustainable credit systems and revealed that green finance mechanisms act as catalysts for the development of renewable energy and sustainable industries.

In recent times, literature has concentrated on customer behaviour and organizational reputation. According to Kaur and Singh (2017), green banking enhances corporate social responsibility and environmental consciousness of the clients.

The analytical path is also strengthened by the institutions' reporting as per the Reserve Bank of India (RBI, 2024), which notes that digital banking has resulted in a decrease in paperwork along with increased efficiency.

3. Objectives of the Study

To establish a clear structural focus and align this empirical inquiry with standardized peer-review requirements, this research is guided by the following core objectives:

1. **To examine** the distinct green banking initiatives and operational frameworks adopted by commercial banking networks across the Indian financial sector.
2. **To analyze** the quantitative and qualitative impact of these green banking strategies on driving long-term environmental sustainability and low-carbon transformations.
3. **To identify** the structural, operational, and financial challenges that inhibit the comprehensive implementation and scaling of green banking practices among commercial lenders.
4. **To suggest** actionable policy measures, technology interventions, and regulatory reforms to enhance the effectiveness of green banking frameworks in India.

4. Research Design and Methodology

4.1 Research Design

The study uses a descriptive and analytic methodology, using secondary macroeconomic data and institutional data. For this particular study which focuses on the systematic country-wide aspect, the use of an exploratory secondary data method is most appropriate. The reason behind this is that the secondary methodology can aggregate reliable macroeconomic data to analyze the overall macroeconomic trends in the Indian commercial banks.

4.2 Data Sources and Collection Strategy

The empirical evidence in this study spans a longitudinal period between 2019 and 2025, a period marked by fast digital growth and ESG regulatory initiatives in India. The data gathering was through desk research purposively carried out using the standardized disclosures in the following sources:

1. **Regulatory & Government Repositories:** Statistical tables and banking trend reports from the Reserve Bank of India (RBI), annual operations reviews from the Indian Banks' Association (IBA), and strategic policy whitepapers from the Ministry of Finance and NABARD.
2. **Corporate Disclosures:** Non-financial disclosures, statutory annual reports, and ESG/Sustainability reports from six major commercial banks representing both public and private sectors (State Bank of India, HDFC Bank, ICICI Bank, Punjab National Bank, Canada Bank, and Bank of Baroda).
3. **Scholarly Literature:** Peer-reviewed reference data extracted from index databases to cross-validate institutional claims against empirical research.

4.3 Data Analysis Techniques: Because secondary data structures are highly heterogeneous, a multi-method analytical approach was applied:

1. **Content Analysis & Structural Coding:** Sustainability reports from companies were systematically analyzed using standard environmental KPIs that measured reductions in internal resources, numbers of renewable energy credits, and diversification of green products.
2. **Percentage & Growth Trend Analysis:** Finances invested in green assets and number of digital transactions were normalized to develop baseline trends for year-over-year growth trajectory and efficiency ratio calculations.
3. **Comparative Matrix Mapping:** Data on banks were then mapped onto comparative matrices to analyze operational differences between PSU banks and private commercial banking institutions.

5. Empirical Results and Discussion

5.1 Structural Mapping of Green Banking Initiatives

The results show that green banking practices among commercial banks in India fall into two areas of operation: internal process digitization and external credit utilization. The methods and the corresponding environmental methods are outlined in Table 1 below.

Table 1: Major Green Banking Practices and Environmental Benefits

Green Banking Practice	Environmental Benefit
Internet Banking	Reduces paper usage
Mobile Banking	Minimizes travel-related carbon emissions
E-Statements	Saves paper and printing costs
Green Loans	Encourages eco-friendly businesses
Solar Energy Financing	Promotes renewable energy
Electric Vehicle Loans	Reduces fossil fuel dependency
Green Buildings	Lowers energy consumption
Video Banking	Reduces customer travel

From Table 1, the initial operational change is that digitalization serves as a pre-requisite for green banking. By moving the transaction volume away from physical networks, banks can change their cost structures and also reduce their initial resource usage.

4.2 Environmental Impact Quantification Trajectories

Synthesizing institutional reporting from 2019 to 2025 reveals distinct environmental impact vectors driven by these internal and external initiatives. These key trends are summarized in Table 2.

Table 2: Environmental Impact Metrics Derived from Banking Disclosures

Initiative	Environmental Impact
Digital Transactions	Reduced paper consumption
Renewable Energy Finance	Increased clean energy production
Green Project Financing	Lower industrial pollution
Electronic Documentation	Reduced deforestation
Online Banking	Reduced fuel consumption
Green Office Practices	Lower electricity usage

Based on Table 2, it is clear that even though improvements made within the operations lead to consistent and predictable gains in efficiency, it is the external portfolios that constitute the macro environment influence of the banking industry. The enforcement of the environment policies within the loan portfolio of the bank creates a very effective discipline for the industries.

4.3 Institutional Matrix Analysis: Public vs. Private Sector Performance

In order to analyze operational differences within the banking system across the country, we looked at the green portfolios of six large companies. This comparison is shown in Table 3 below.

Table 3: Comparative Enterprise Matrix of Green Initiatives by Key Banks

Bank	Green Banking Initiatives
State Bank of India	Green Channel Counters, Solar ATMs, Renewable Energy Financing
HDFC Bank	Paperless Banking, Green Data Centres
ICICI Bank	Digital Banking, Green Branches
Punjab National Bank	Solar Energy Loans, E-Statements
Canada Bank	Green Financing, Digital Banking
Bank of Baroda	Energy Efficient Branches

The analysis of institutions as depicted in Table 3 clearly shows that there is an evident division of labour in the Indian banking system. The Public Sector Undertaking (PSUs), which include State Bank of India, utilizes its financial strength to fund ventures involved in the development of renewable energy production infrastructure. In contrast, the private organizations focus on improving technology in order to reduce carbon emissions.

6. Synthesis of Holistic Benefits

Performance evaluation of the data collected between 2019 and 2025 shows that green banking offers multi-dimensional returns that transcend simple environmental metric assessment:

6.1 Environmental Benefits

1. **Reduction in carbon emissions:** The structural migration to paperless processing networks dramatically lowers sector-wide carbon generation.
2. **Conservation of natural resources:** Eliminating physical paper dependency preserves forest ecosystems and reduces industrial water consumption during paper manufacturing.
3. **Reduced paper consumption:** Mitigates demand for commercial wood pulp, reducing deforestation pressures.
4. **Promotion of renewable energy:** Dedicated green credit lines accelerate the deployment of clean energy technologies, helping reduce national reliance on coal-fired power grids.
5. **Improved environmental quality:** Targeted infrastructure greening lowers industrial pollution levels.

6.2 Economic Benefits

1. **Lower operational costs:** The digitalization of banks transforms their transactional costs into fixed costs through IT architecture.
2. **Higher efficiency:** The decrease in large amounts of paper-based transactions results in operational efficiency improvement.
3. **Better risk management:** Analysis of capital deployability through green lenses prevents climate shocks to portfolios.
4. **Increased profitability:** Improvements in bank image and operational performance increase revenues.

6.3 Social Benefits

1. **Environmental awareness:** Incorporation of green banking processes enhances ecological awareness in customers.
2. **Financial inclusion through digital banking:** Expanding digital networks into semi-urban and rural areas bridges financial access gaps.
3. **Sustainable development:** Aligning the commercial banking sector with broader sustainable development goals.
4. **Improved corporate image:** Enhances institutional relationships with global markets and local consumers.

7. Diagnosis of Systemic Challenges

Despite visible progress between 2019 and 2025, Indian commercial banks operate within an evolving ecosystem that presents several systemic vulnerabilities:

1. **Lack of customer awareness:** Consumers often use electronic payments, yet they show poor proactivity in green loan programs.
2. **High implementation costs:** Modernization of old data centres and constructing eco-friendly branches is associated with considerable initial investment.
3. **Cyber security concerns:** Transition to online financial activities poses serious cyber security risks for banks.
4. **Digital divide in rural areas:** The incomplete network of infrastructure systems in remote areas is hindering the overall process of transitioning from physical presence to virtual presence.

5. **Limited green financing opportunities:** Information asymmetry makes the validation process of green projects that are both highly feasible and standardized an issue.
6. **Inadequate policy support:** The absence of standardized ESG metrics has made it challenging for commercial banks.
7. **Lack of environmental risk assessment expertise:** Traditional methods of mitigating risk generally lack the expertise required to assess future vulnerabilities to climate change.

8. Suggestions

To address these challenges and maximize the impact of green banking on India's sustainability goals, the following interventions are recommended:

1. **Increase investment in green technologies:** Focus resources on cloud-based frameworks and power-optimized green data ecosystems.
2. **Expand renewable energy financing:** Beyond investing only in solar and wind segments, consider financing innovative green energy portfolios such as green hydrogen and circular economy initiatives.
3. **Strengthen environmental risk assessment before lending:** Conduct environmental and social risk assessment as part of the basic underwriting criteria.
4. **Conduct awareness programmes on green banking:** Implement digital communication campaigns in retail channels in support of environmentally branded financial products.
5. **Provide incentives for customers using digital banking:** Provide incentives as an encouragement for changes in behaviour towards paperless transactions.
6. **Develop more green financial products:** Develop retail-based portfolio investments targeted at micro-green businesses and solar-powered homes.
7. **Encourage paperless banking across all branches:** Use automated defaulting and video verification for customers' routine interactions.
8. **Strengthen regulatory support for sustainable finance:** Encourage central banks to make changes in regulations for green assets, including preferable quotas.

9. Conclusion

The emergence of green banking has been an integral element of sustainable development for the Indian banking sector. Digital banking, renewable energy funding, green lending, and paperless banking have contributed immensely to sustainability of the environment. The commercial banks in India have performed well in reducing their environmental footprint, besides being more efficient. However, certain challenges like lack of awareness, cyber security risks, and digitalization of the economy still exist. Formulation of regulatory framework, customer education, and green financial products will make the contributions of commercial banks more effective for the environment of India and sustainable development.

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