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Review Article

From Pledge to Performance: A Study of Carbon Neutrality in HDFC and SBI Banks

Simarjeet Kaur[1] & Dr. Kamlesh Rani[2]

[1]*PhD, Research Scholar, Department of Commerce, Chaudhary Devi Lal University, Sirsa, Haryana, India.*
[2]*Associate Professor, Department of Commerce, Chaudhary Devi Lal University, Sirsa, Haryana, India.*

Email: simarjeetphd207@cdlu.ac.in, kamlesh@cdlu.ac.in

ABSTRACT: In our fast-paced world, the importance of sustainable finance and green practices has become increasingly paramount. Numerous Indian banks are actively progressing towards achieving carbon neutrality. This paper presents a comprehensive study that examines the impact of the pledge on the financial performance and carbon footprint of a private bank HDFC and a public bank SBI. The study employs exploratory and descriptive research designs, collecting data from secondary sources, and employing qualitative and quantitative analysis methods. The analysis of the collected data involved a combination of accounting and financial management techniques, such as cost-benefit ratio analysis, risk management assessment, financial reporting analysis, carbon footprint evaluation, and financial performance analysis. The results indicate that the efforts towards achieving a carbon neutral pledge had a favorable impact on the bank's financial performance. The increase in earnings per share (EPS) after the pledge indicates that the effort towards establishing a balance between finance and green considerations has a positive impact on bank performance. Overall, the analysis suggests that the banks have made deliberate efforts to balance finance and sustainability. Despite progress, there is room for enhancement, as banking is in early stage of carbon neutrality commitments.

KEYWORDS: Carbon neutrality, Climate change, Carbon footprint, Sustainable banking practices, Financial performance.

INTRODUCTION

In recent years, the conversation surrounding the connection between finance, economic activity, and the pressing issue of climate change has gained tremendous momentum. This growing momentum is driven by the increasing recognition of the profound impact that climate change poses on global economies, financial systems, and societies at large. The 2015 Paris Climate Conference (COP21) placed finance at the forefront of discussions concerning environmental degradation. The G20 leaders expressed their ambitions to expand green finance initiatives to finance low-carbon infrastructure and other climate-related solutions (De Haas & Popov, 2019).

Climate change has garnered increasing attention from the public, with a growing recognition of its significant impact. It gives rise to a range of consequences, including environmental mutations, extreme climatic conditions, erosion of groundwater, melting glaciers, and rising sea levels. These consequences profoundly disrupted social and economic activities, posing a significant threat to human society and its long-term survival (Lee et al., 2022). Approximately 82 percent of global warming is attributed to carbon dioxide emissions (UN Environment "Walks the Talk" on Carbon Neutrality, 2019). In response to this global crisis caused by excessive greenhouse gas emissions, the concept of carbon neutrality has gained significant attention and is widely discussed in academic and political circles (Lee et al., 2022). Carbon neutrality serves as a crucial mitigation strategy in addressing climate change (Flagg, 2016). The concept of carbon neutrality involves reducing emissions and offsetting any remaining emissions, resulting in a net balance of zero emissions (UN Environment "Walks the Talk" on Carbon Neutrality, 2019).

During the United Climate Change Conference (COP26) held in November 2021 in Glasgow, India reaffirmed its dedication to climate action and net zero emissions. This global commitment, coupled with the growing urgency to address climate change and promote sustainability. This commitment prompted a heightened emphasis on carbon neutrality within the Indian banking sector. Reflecting this shift, the Reserve Bank of India (RBI) issued a statement advocating for the greening of India's financial system. This pronouncement is anticipated to have a substantial impact on the policies and procedures of the financial services industry, paving the way for a more sustainable and environmentally conscious approach to banking in India (Leading Responsibility, 2022).

Several Indian Banks are making significant strides toward carbon neutrality. State Bank of India (SBI) and Yes Bank had pledged to achieve carbon neutrality by 2030 (Powered by Purpose, 2022; Shaping the Future with Responsible Banking, 2022). Similarly, HDFC Bank has announced its commitment to become carbon neutral by the Financial Year 2032 (HDFC Bank Limited Integrated Annual Report 2021-22, 2022). By setting these targets, banks demonstrate their dedication to reducing their carbon footprint and contributing to a more sustainable future. As the banking industry increasingly recognizes the importance of environmental sustainability, banks in India are striving to strike a balance between financial performance and green initiatives. The transition towards carbon neutrality presents both challenges and opportunities for the Indian banking sector. The challenges include the requirement for substantial financial investments, changes in lending practices, and the potential impacts on performance indicators. The carbon neutrality pledge presents banks with opportunities for enhanced reputation, risk mitigation, and investor attraction. There is a need for Banking institutions to harmonious the balance between finance and green initiatives. Striking a balance between finance and green initiatives will position Indian banks as leaders in sustainable finance and contribute to a greener, more resilient future.

This article presents a comprehensive study that examines how carbon neutrality initiatives influence the performance and sustainability practices of a private bank HDFC and a public bank SBI. The study seeks to evaluate the impact of the carbon neutrality pledge on financial performance by analyzing interest rates, deposits, and earnings per share (EPS). Moreover, the study assesses the carbon footprint of the banks. The also study investigates the reporting practices, risk management policies, and various initiatives and investments aimed at achieving carbon neutrality. undertaken by HDFC and SBI banks.

This study focuses on a significant yet less explored environmental and finance research topic in one of South Asia's substantial emerging economies. This research offers valuable insights into the range of initiatives undertaken by banks and their impact on performance. It can facilitate knowledge sharing within the banking industry, encouraging collaboration and the exchange of ideas. It can provide a basis for designing frameworks, guide policymakers, financial institutions, and stakeholders in developing strategies that align economic growth with environmental protection and pave the way for a more sustainable future. The study encourages financial institutions to align their operations with the objectives of the United Nations Framework Convention on Climate Change (UNFCCC), Sustainable Development Goals (SDGs), Paris Agreement, Intergovernmental Panel on Climate Change (IPCC), United

Nations Environment Programme (UNEP), Task Force on Climate-Related Financial Disclosures (TCFD), and various other international pacts aimed at addressing climate change.

OBJECTIVES OF THE STUDY

- To assess the impact of the carbon neutrality pledge on the financial performance of HDFC and SBI banks through the analysis of interest rates, deposits, and earnings per share (EPS).
- To explore the reporting practices of HDFC and SBI banks and analyze risk management policies relative to carbon neutrality.
- To assess the carbon footprint of banks.
- To examine the initiatives and investments by HDFC and SBI banks aimed at achieving carbon neutrality.

LITERATURE REVIEW

Cooremans (2011) introduced a novel strategic evaluation method for assessing investments. It demonstrates that while the financial return is not the primary drive but strategic nature of investment holds the utmost importance as a decision-making factor. Therefore, projects aimed at reducing emissions should be evaluated more based on their strategic value in contributing to competitive advantage in three dimensions: Costs, Value, and Risks, rather than solely relying on financial considerations.

De Haas and Popov (2019) examined the connection between financial system structure and carbon emissions in numerous countries and industries from 1990 to 2013. The study stated that banks could contribute to the elimination of the most polluting enterprises by effectively identifying and rejecting lending to companies that visibly contribute to environmental harm. It concluded that financial development, in isolation, does not impact carbon emissions. Banks were relatively ineffective in reducing pollution. It was only after 2015 that banks began incorporating the pricing of climate risk associated with lending to companies possessing significant fossil fuel reserves.

McNamee (2020) investigated the reasons behind the current requirement for banks to achieve carbon neutrality. It observed that the consequences of climate change, including floods and droughts, could lower productivity, resulting in increased food prices, ultimately impacting inflation and interest rates. It highlighted the interconnectedness of environmental and financial issues. The study emphasized that initiatives focused on sustainable operations and low carbon not only foster the development of innovative solutions but also generate economic value.

Chen (2021) exposed a notable amount of time wasted in acknowledging the severity of the problem - global warming and implementing essential measures to tackle this urgent issue. Carbon neutrality is deemed capable of combating global warming and can yield a multitude of favourable outcomes. The researcher proposed that carbon neutrality could be considered the fifth industrial revolution, following the four previous industrial revolutions ranging from steam to the internet. The past industrial revolutions have improved our standard of living but have also resulted in the depletion of natural resources, including non-renewable ones impacting our planet. The emergence of the fifth industrial revolution holds the potential to tackle these fundamental challenges and pave the way for a sustainable future.

Ji (2021) study revealed a detrimental effect of carbon emissions on investment performance, supporting the need to prioritize carbon-neutral options. It led conclusion that the transition from conventional firms to sustainable alternatives was in progress. Moreover, when compared to similar emerging markets, funds with reduced carbon emissions demonstrated superior performance.

Nair *et al*. (2021) examined the connections between CO2 emissions, institutional quality, and economic growth. The Granger Causality test uncovered significant interdependence among the variables. The findings indicated that less sound institutional quality and CO2 emissions had positive impacts on long-term economic growth. The research emphasized the crucial role played by sound institutions in framing effective policies & regulations and management systems. These institutions were instrumental to ensure stakeholders' compliance with CO2 emission targets.

Whelan *et al*. (2021) analyzed over 1,000 research papers since 2015, shedding light on the connection between ESG and financial performance. The results indicated that prioritizing a low-carbon future had a positive impact on financial performance. However, solely focusing on ESG disclosure did not drive financial performance. Furthermore, different decarbonization strategies were associated with distinct risk-adjusted returns. More aggressive carbon reduction strategies demonstrated superior performance. The research suggested that investments in carbon-efficient enterprises could yield profitability even without government incentives.

Desai *et al*. (2022) examined the influence of carbon emissions on Indian corporate's financial performance to improve the managers' understanding of the economic consequences of emissions. The firms that report emissions statistics on the "Carbon Disclosure Project (CDP)" were assessed for empirical analysis. The findings suggested that carbon emissions had a notable adverse effect on financial performance.

Mikheeva and Ryan-Collins (2022) aimed to present a novel framework that could generate public value while promoting sustainable and innovation-led economic growth. The researcher analyzed finance governance to facilitate swift economic transitions in response to the climate emergency and the goal of achieving a net zero-carbon economy by 2050. It stated that transformation to a carbon-neutral economy requires significant changes in financial flows. However, the study expressed concerns that even with directed finance, the transition to carbon neutrality might struggle to generate comparable levels of employment and growth.

RESEARCH METHODOLOGY

The methodology employed in this study encompasses both exploratory and descriptive research designs. Two prominent Indian banks, HDFC and SBI were selected based on their highest market capitalization on the NSE listing. Both banks had publicly declared their commitment to achieving carbon neutrality. This selection represents a diverse representation of the banking industry encompassing both private and public sector institutions, to gain valuable insights into the efforts made by different entities to mitigate their environmental impact. The secondary data source was utilized for data collection, including annual reports, business responsibility reports, sustainability reports, and other relevant banking reports. The data collection spanned from 2019 to 2023, encompassing two years before and after the carbon neutrality pledge.

The analysis of the collected data involved a combination of qualitative and quantitative methods. Various accounting and financial management techniques, such as cost-benefit ratio analysis, risk management assessment, financial reporting analysis, carbon footprint evaluation, and financial performance analysis, were employed to evaluate the results. Additionally, the study examined the banks' initiatives and investments related to carbon neutrality.

By utilizing exploratory and descriptive research designs, collecting data from secondary sources, and employing qualitative and quantitative analysis methods, the study aimed to gain insights into the impact of the carbon neutrality pledge on the selected banks' financial performance and related accounting measures and analyze the balance between finance and green.

RESULTS AND DISCUSSION

Financial Performance Analysis

Financial performance refers to the measurement and evaluation of a company's financial results and overall financial health. This analysis focuses on examining the relationship between sustainability initiatives and the financial success of banks. It seeks to understand if there is a correlation between sustainable practices and key financial metrics. This analysis includes assessing indicators such as deposits and earnings per share (EPS). These indicators provide valuable insights into the liquidity and profitability of a company, helping to assess its financial performance and investor attractiveness.

Deposits

Analyzing deposits helps gauge the bank's ability to attract and retain customer funds. Analyzing deposit trends reflect customer trust and loyalty toward the bank. Customers are attracted to brands that associate them with responsible and environmentally conscious practices. The orange line in Figure 1 represents the trend of deposits of HDFC Bank, indicating a slight increase in pace after the announcement of the pledge. Whereas Figure 2 illustrates the deposits of SBI Bank. There is no significant increase in pace observed after the pledge announcement.

Earnings per Share (EPS)

EPS is a financial metric that measures the profitability of banks and indicates the portion of earnings allocated to each outstanding share of common stock. Integrating sustainability initiatives into this analysis can provide insights into whether sustainable practices positively impact the bank's financial results. In Figure 1, the blue line depicts the trend of EPS for HDFC Bank, showing a minimal increase in pace after the pledge announcement. In contrast, Figure 2, representing the trend of EPS for SBI Bank, displays a substantial increase in pace observed following the pledge announcement.

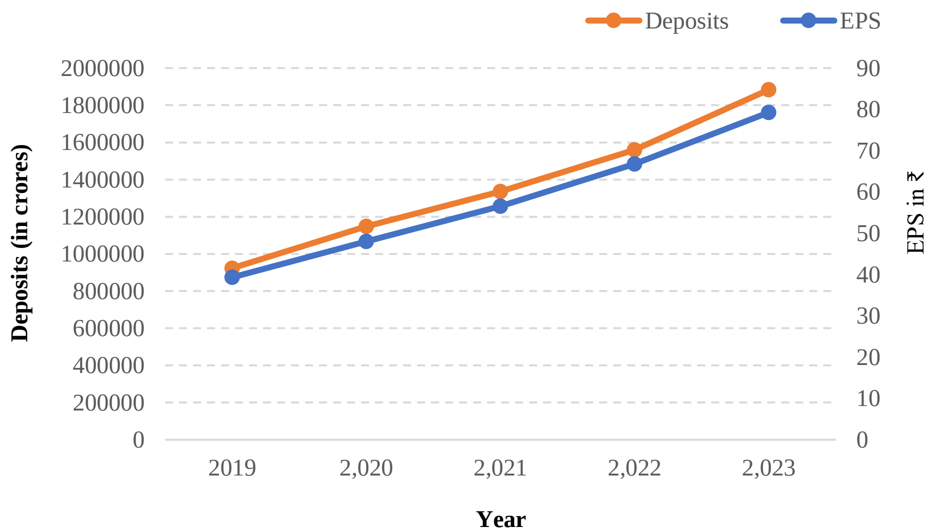

Figure 1: Graph represents trend of deposits and EPS of HDFC Bank

[Source: Created using financial reports of the bank (Financial Results for the Year Ended March 31, 2023, 2023; Leading Responsibility, 2020; Leading Responsibility, 2021; Leading Responsibility, 2022)]

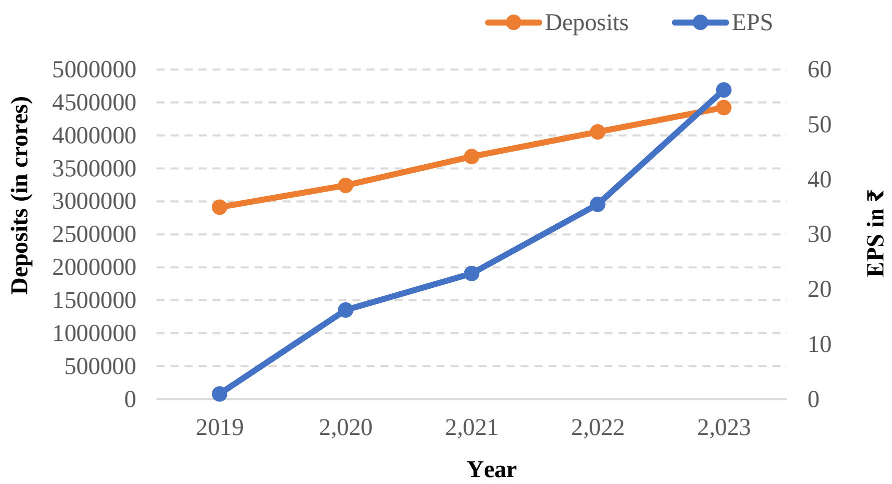

Figure 2: Graph represents trend of deposits and EPS of SBI Bank

[Source: Created using financial report of the bank (Responsive Responsible Resilient, 2023)]

Cost-benefit analysis

This section explores the cost-benefit ratio of adopting carbon neutrality, specifically focusing on its influence on interest earned. It delves into the changes observed in loan approval processes after implementing an ESG & SEMS framework and examines the implications for interest rates. Based on the information from the annual reports of HDFC Bank, figure 3 illustrates the trend of Loans and advances, Interest earned on loans and advances, and the Interest rate as a percentage of loans and advances over five years. The analysis revealed a rise in loans & advances and Interest earned over the years. However, when comparing the rate of Interest-earned as a percentage of loans and advances, it gradually decreased. In 2023, there was a slight increase in the rate of Interest-earned, which indicates a deviation from the previous trend.

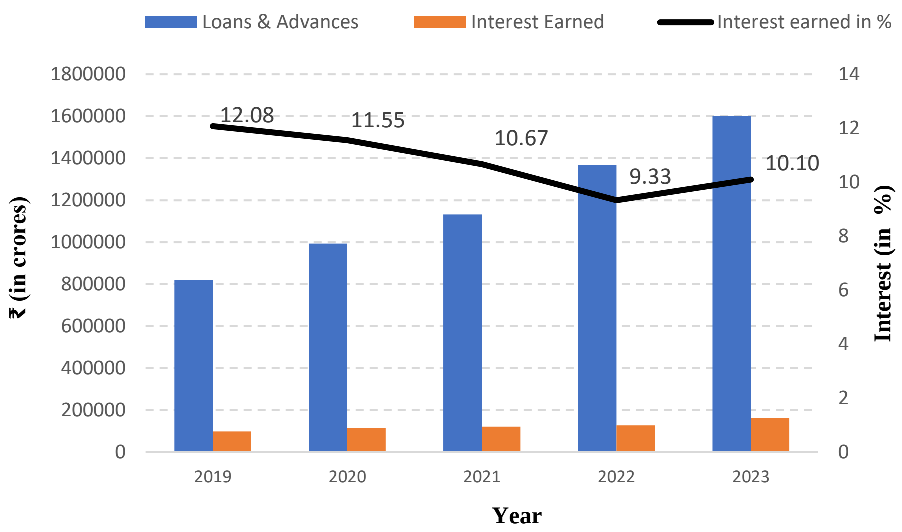

Figure 3: Graph representing Loans and Advances, Total Interest earned and Interest rate of HDFC bank.

[Source: Created using financial reports of the bank (Financial Results for the Year Ended March 31, 2023, 2023; Leading Responsibility, 2020; Leading Responsibility, 2021; Leading Responsibility, 2022)]

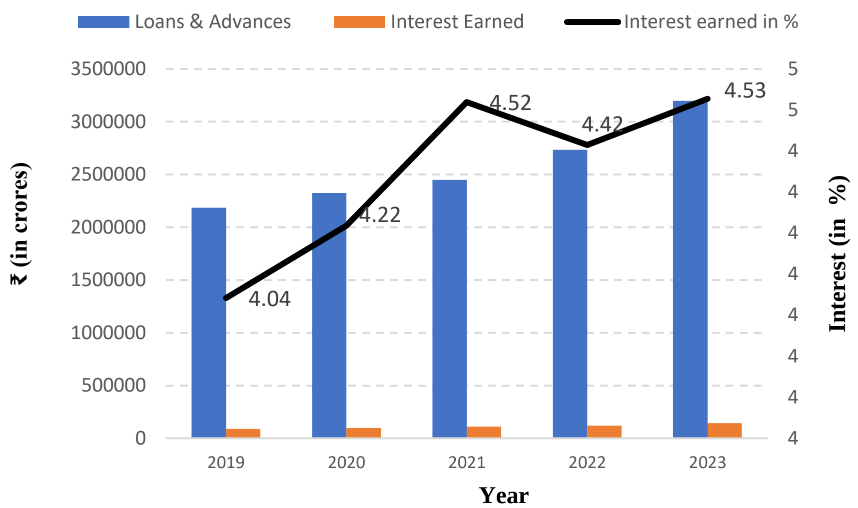

Figure 4: Graph representing Loans and Advances, Total Interest earned and Interest rate of SBI bank.

[Source: Created using financial report of the bank (Responsive Responsible Resilient, 2023)]

Similarly, based on the information from the annual reports of SBI bank, figure 4 illustrates the trend of Loans & advances, Interest earned on loans and advances, and the Interest rate as a percentage of loans and advances over five years. The analysis revealed an increase in Loans & advances and Interest earned over the years. However, when comparing the rate of Interest-earned as a percentage of loans and advances, it gradually increased during the pledge making the interest rate fall. In 2023, there was a slight increase in the rate of Interest earned, suggesting that the bank might have adjusted its lending strategies or market conditions changed.

Financial Reporting

Financial reporting from a carbon neutrality perspective refers to the disclosure of relevant financial information and metrics related to a company's carbon neutrality efforts. Financial reporting plays a critical role in promoting accountability and transparency. HDFC Bank has implemented a sustainability strategy and reporting program that effectively communicates its approach to sustainability. It identifies risks and opportunities, along with its performance on relevant ESG topics.

- HDFC places significant importance on report assurance. As a result, their “Sustainability Report and Green House Gas (GHG) emissions” undergo verification by third-party auditors, following the International Standard on Assurance Engagements (ISAE) 3000 (revised) standards.
- HDFC has taken steps to implement Task Force on Climate Related Financial Disclosures (TCFD) recommendations.
- It also furnishes Business Responsibility and Sustainability Report.

SBI Bank provides comprehensive financial reporting on its carbon-neutral initiatives. It follows the Global Reporting Initiative (GRI) standards.

- SBI also includes information from the Business Responsibility and Sustainability Report (BRSR) in its reporting.
- The SBI report incorporates recommendations from TCFD and highlights initiatives driving progress on the UN SDGs.
- SBI disclosures also align with the “National Voluntary Guidelines on Social, Environmental, and Economic Responsibilities of Business (NVGSEE).”

Risk Management associated with Climate Change

By prioritizing climate change risk management, financial institutions can navigate the challenges and seize the opportunities presented by climate change, contributing to a sustainable and resilient future. HDFC has integrated social and environmental risk assessment into its credit appraisal process. The bank is actively exploring resilience to transition and physical risks, conducting climate risk analysis and scenario analysis. In the financial year 2021, HDFC updated its materiality study to align its ESG strategy with business goals, including addressing climate change risks and opportunities. They have formulated a policy framework for ESG to mitigate these risks.

SBI has implemented a Climate Change Risk Management Policy to guide its transition toward a low-carbon and climate-resilient future. Additionally, the bank established an ESG framework to manage sustainability risks and opportunities.

Carbon footprint

It evaluates the bank's carbon emissions and tracks the progress in reducing them over time. It includes measuring Scope 1, Scope 2, and Scope 3 emissions, as defined by the Greenhouse Gas Protocol. By measuring and understanding carbon footprint, banks can identify areas for improvement, set reduction targets, and develop strategies to mitigate climate change risks.

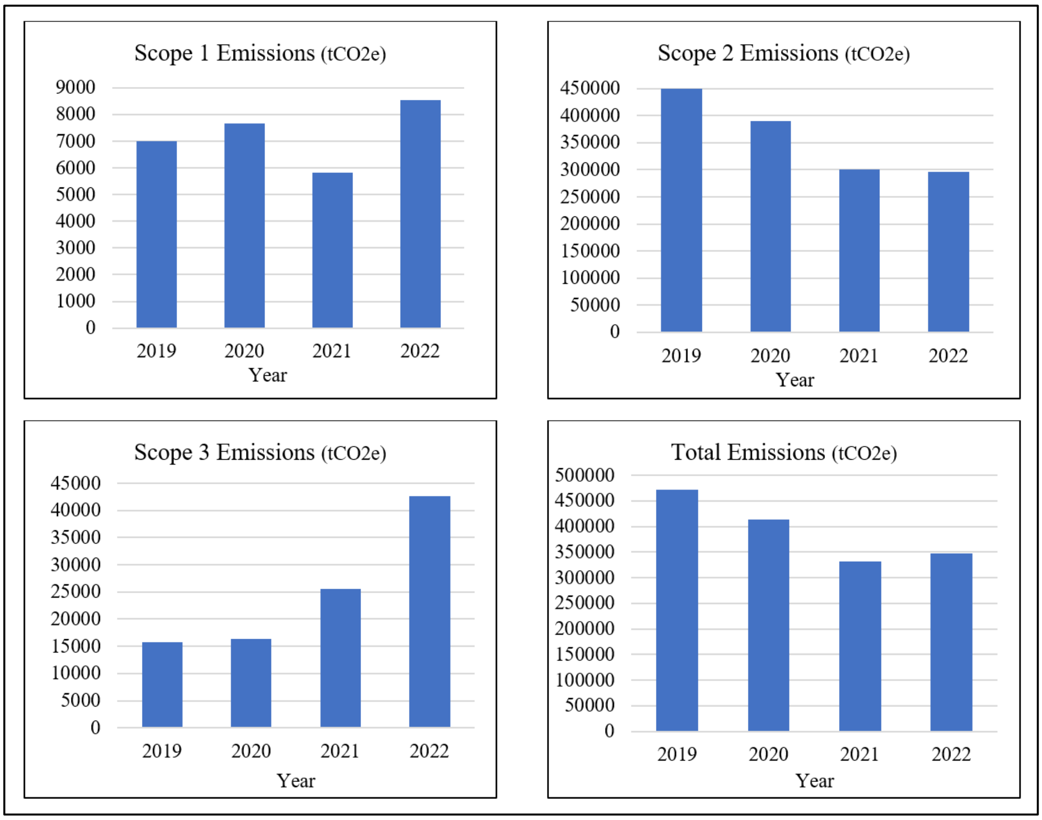

Figure 5: Graph represents carbon emissions of HDFC from different scopes.

[Source: Created using financial reports of the bank (Financial Results for the Year Ended March 31, 2023, 2023; Leading Responsibility, 2020; Leading Responsibility, 2021; Leading Responsibility, 2022)]

*** Note:** In FY22, HDFC Bank included emissions from diesel consumption in their Scope 1 category, which previously was categorized under Scope 2. To ensure consistency and facilitate comparison study considered diesel emissions in Scope 2.

HDFC Bank

Figure 5 exhibits carbon emissions from different scopes of HDFC Bank. Emissions from Scope 1 and Scope 3 increased after the pledge. Whereas emissions from Scope 2 declined after the carbon neutrality pledge.

SBI Bank

Figure 6 exhibits carbon emissions from different scopes of SBI Bank. Scope 1 and Scope 2 emissions slightly decreased. While emissions from Scope 3 had a minimal increase after the carbon neutrality pledge. There was a decline in total emissions from all the scopes.

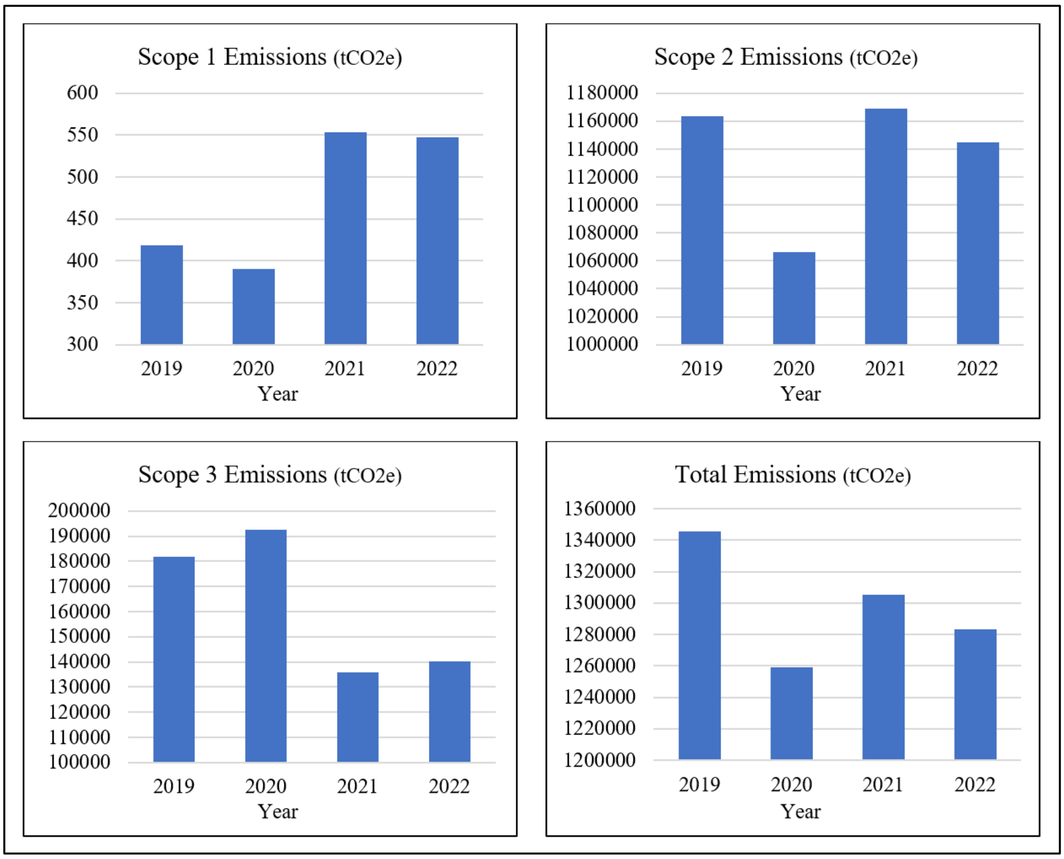

Figure 6: Graph represents carbon emissions of SBI Bank from different scopes.

[Source: Created using financial reports of the bank . (Powered by Purpose, 2022; Spearheading Digital India: Banking Solutions for a Sustainable Tomorrow, 2019)]

Initiatives and Investments

This section focuses on highlighting the innovative initiatives and investments undertaken by SBI and HDFC Bank, two prominent banks, in their pursuit of carbon neutrality. These initiatives demonstrate their commitment to environmental sustainability and reducing their carbon footprint. Here are some key examples of their efforts:

HDFC Bank

In June 2021, the HDFC Bank pledged to become carbon neutral by FY32. To fulfill this pledge, the bank has undertaken a range of initiatives and made various investments.

- HDFC Bank committed in June 2021 to attain carbon neutrality for Scope 1 and Scope 2 by FY32.

- HDFC Bank has implemented an ESG assessment framework for corporate lending to raise awareness among corporate clients and gain insights into their ESG initiatives.
- HDFC Bank strictly avoids funding projects with negative environmental, health, or safety impacts. The bank prioritizes funding projects that are environmentally sustainable and contribute to mitigating risks associated with climate change.
- Through the SEMS framework, 861 loan proposals have been reviewed and approved.
- HDFC Bank monitors and verifies carbon emissions externally to efficiently manage and reduce their environmental impact.
- Over 17.69 lakh+ trees have been planted, with a goal to plant more than 25 lakh trees by FY25.
- 41,810+ solar lights had installed, and there is a commitment to use LED lights exclusively in all buildings.
- The underwritten amount for wind and solar projects is INR 14,839 Cr, with a combined capacity of 5,860 MW.
- There is progress in adopting technological solutions to decrease energy consumption at operational locations. Infrastructure assets modified to improve energy efficiency.
- Customers are encouraged to opt for green banking choices.
- HDFC Bank's digital banking initiatives, including the 'green event' initiative, have saved around 2.1 million square feet of paper.
- Efficient data centers, such as Netmagic-DC3B in Bangalore, is certified green data center. Various energy-saving measures had implemented, including efficient cooling units, cold-aisle containments, and usage of Smart iPDUs and Li-ion batteries.

SBI Bank

SBI had set a strategy to achieve the status of a carbon-neutral organization by the year 2030. The following initiatives undertaken by SBI reflect their commitment to carbon neutrality & sustainability and their efforts to create a greener future.

- SBI is endeavouring to enhance sustainability practices in a formalized manner by adapting to the "Business Responsibility and Sustainability Report (BRSR)" framework.
- SBI continuously installs solar systems, energy-efficient lighting, and air conditioning systems at their premises while utilizing windmills for captive use.
- SBI offers unique loan products like E-Rickshaw Loan and Green Car Loans, as well as financing options for solar and biofuel projects. Bank is actively involved in wind and solar energy projects with a total capacity exceeding 3,500 MW.
- SBI Green Bonds worth USD 650 million are dual-listed on the "India International Exchange and the Luxembourg Stock Exchange".
- In FY 2020-21, SBI raised a green loan worth €50 million.
- SBI has installed solar power systems in approximately 500 bank premises and relied on solar power for over 3000 ATMs.
- Till now, 18 premises of SBI have been certified by the "Indian Green Building Council".
- During the financial year 2022, SBI planted over six lakh trees and more than eight lakh trees in the FY2023 nationwide.
- YONO, the flagship digital app of SBI, has drastically decreased the amount of paper used, saving over 383 lakh sheets of paper during the financial year 2021-22.

- SBI launched an online quiz to engage employees actively and raise their awareness regarding ESG and SDGs related matters.

CONCLUSION

The main findings of this study, based on the analysis conducted, reveal significant insights. The cost-benefit ratio analysis showed a gradual decrease in the interest rate earned just after the carbon neutrality pledge. However, in the following year, both HDFC and SBI banks witnessed an increase in interest rates, indicating that the banks may have made some adjustments in their lending strategies to strike a balance between finance and green initiatives. In terms of financial performance analysis, deposits and earnings per share (EPS) were analyzed. The SBI bank showed a constant increase in deposit growth and a substantial increase in EPS. The increased EPS after a carbon neutral pledge indicates that the efforts towards carbon neutrality had a favorable impact on the bank's financial performance. While HDFC bank exhibited a slight increase in the pace of EPS and deposits. An increase in deposits indicates the preference of customers for sustainability and their willingness to support banks that are actively working towards carbon neutrality and implementing sustainable initiatives.

HDFC and SBI banks reported their performance and framed Business Responsibility and Sustainability Reports (BRSR) as per SEBI regulations. Additionally, both banks worked towards implementing recommendations from the Task Force on Climate-related Financial Disclosures (TCFD) and followed various other standards for reporting on carbon neutrality, sustainability, and green initiatives. It demonstrates their commitment to transparency and accountability in disclosing their environmental, social, and governance (ESG) performance, providing valuable information on the progress and initiatives related to carbon neutrality. Both banks implemented risk management policies aligned with the Environmental, Social, and Governance (ESG) framework to mitigate transition and physical risks associated with the carbon neutrality commitment.

Regarding carbon emissions, HDFC Bank witnessed a gradual increase in Scope 1 and Scope 3 carbon footprint, a slight decrease in Scope 2 emissions, and a slight increase in total emissions. On the other hand, SBI bank experienced a slight increase in Scope 3 emissions, a slight decrease in Scope 1 emissions, and a significant decline in Scope 2 emissions and total emissions. HDFC and SBI banks made investments in various initiatives to achieve carbon neutrality. These included implementing solar lights, LED lights, solar, wind and biofuel projects, green vehicle loans and issuing green bonds. Both banks also focused on digital banking, reducing paper usage, tree planting, raising awareness, and implementing various other sustainability initiatives.

Overall, the analysis suggests that HDFC and SBI banks have made deliberate efforts to balance finance and green considerations. They have taken significant steps towards reducing their carbon footprint and integrating sustainable practices while maintaining financial performance. However, the outcomes are not as positive as expected. It is that the banks are still in the early stages of implementing strategies and initiatives to manage their carbon emissions and improve their sustainability practices. It is reasonable to expect banks will gradually improve management as they gain experience. Achieving carbon neutrality is not only an environmental imperative but also a financial opportunity for the Indian banking sector. By integrating sustainability into their core operations, banks may position themselves as leaders in driving the transition toward a greener and more sustainable financial sector.

Limitations and Future Scope

The study acknowledges several limitations that need to be addressed and identifies potential areas for future research and expansion. Firstly, the sample size was limited to two prominent banks, HDFC and SBI. The findings may not fully represent the entire banking industry which may limit the generalizability. Future researchers can expand upon this study by including a larger and more diverse sample size from various banks within the industry. The study relied on a relatively short time frame due to the recent adoption of the carbon neutrality pledge. Current outcomes may not fully reflect the effectiveness of banks' actions toward carbon neutrality. It is important to note that these institutions are still in the early stages of implementing measures. Future research may yield more promising results due to increased awareness, more time to implementation, and the long-term commitment to carbon neutrality. Finally, the study focused on financial performance indicators, carbon emissions, and green initiatives. Other important aspects, such as social impacts, stakeholder perspectives, or broader sustainability considerations, were not extensively explored. Future researchers may acknowledge these limitations when interpreting the study's findings and consider them in the context of further research and decision-making processes.

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