
| RESEARCH ARTICLE

Sustainable Finance and Green Banking Transformation an Empirical Investigation of ESG Integration, Climate Risk Management, and Financial Performance in Emerging Economies

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| ABSTRACT

The sustainable finance and the green banking transformation is connected with the financial performance of banks in an emerging economy. The banking sector of Bangladesh is used as the setting. The study integrates all the aspects of ESG integration, green banking, climate risk management and digital banking into a single whole. The type of research method is quantitative research and the data information obtained from the research is secondary data obtained from 5 commercial banks in private ownership during 2020 - 2024. BRAC Bank PLC, Eastern Bank PLC, City Bank PLC, Jamuna Bank PLC and NCC Bank PLC are the banks. The data has been collected from the activities reported by the annual reports, sustainability report, ESG report, climate disclosure report and published reports in Bangladesh bank. The study employs descriptive analysis and association based on evidence, as it is not yet completed for the whole bank year panel regression. The results presented in this report show that the percentage of green and sustainable finance has increased markedly during the period under study. Green finance disbursement increased from BDT 11,929.93 crore in 2020 to BDT 30,653.78 crore in 2024 and the proportion of sustainable finance to all loans disbursed jumped to 39.66% in 2024. However, there is also a positive relationship between the financial performance and the sustainability leadership of banks, with the most financially performing banks being Bank City, BRAC Bank and Eastern Bank. The ESG disclosure and performance are linked in a positive direction and there is partial support for green banking and positive directional links between ESG and climate risk management. The relationship appears to be strengthened with bigger banks. It is a study that has three contributions to the sustainable finance literature. It introduces climate risk to the ESG and performance discussion, it widens the discussion beyond China/India and it provides practical advice for banks and regulators. The findings show that the sustainability-related banking is a responsibility and strategy in Bangladesh.

| KEYWORDS

Sustainable finance, Green banking, ESG integration, Climate risk management, FinTech, Financial performance and Bangladesh, emerging economies.

| ARTICLE INFORMATION

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1. Introduction

The world's financial system is undergoing an extensive transformation. Sustainability is at the heart of finance, with climate change, environmental degradation, social injustice and poor governance being so high on the agenda. The Sustainable Development Goals have made sustainability the focus of finance due to climate change, environmental degradation, social inequality and bad governance. This pressure has fostered the development of sustainable

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finance and taken into account environmental, social and governance (ESG) factors in the investment and financing decision making process. It primarily aims to enhance the country's economic resilience. It will also help to advance the Paris Agreement goals and the United Nations Sustainable Development Goals (SDGs) (UN, 2015). Sustainable finance is an attempt to shift financial flows to clean projects, responsible businesses and good governance in a simple way. This transformation can help lower risk from the system, and be conducive to inclusive growth.

Green banking is the most apparent example of sustainable finance in the banking sector. It is a policy which incorporates environmental thinking in the operations of a bank. This includes products related to green finance, green perspective in credit risk assessment, sustainable portfolio management and financing of renewable energy and low carbon projects (Ahmad et al., 2025). Banks play a key role in this agenda in that they are a channel for credit movement across the economy. In developing countries their importance is even higher, since the banks are probably the greatest source of development financing. However, there are significant obstacles in these markets, too. They have significant effects on the physical climate risk and policy uncertainty, together with low institutional capacity and technology adoption (SBF, 2025).

Even with this, the connection between sustainability and profits remains up for discussion. The advantages of ESG integration are improved efficiency, risk reduction from a reputational and regulatory standpoint, enhanced stakeholder relations and access to new markets (Agoraki et al., 2023; A. Habib et al., 2025). There is conflicting evidence, however. Consistent with the idea that environmental, social and governance performance and the firm's financial performance are positively related, some studies have reported positive correlation between the two variables, such as return on assets (ROA), return on equity (ROE), Tobin's Q, and market value (Q) (Wang et al., 2024; Zhou et al., 2022). There is also conflicting evidence regarding the impact, mostly negative in situations of high costs and low institutional capacity (Bahadori et al., 2021; Candio, 2024). These diverse results are more noticeable in emerging economies, where there is a wide range of enforcement environment, pressure, and the capacity to make a change in the company (A. M. Habib, 2023; Liang et al., 2022).

Some progress has been made in the field of green finance instruments, as well. To shift private capital toward environmental objectives, investors are now turning to green bonds, sustainability-linked loans and climate funds, among other assets. A number of Asian studies have shown that green finance can enable innovation for low carbon development, accelerate transition to clean energy, and drive sustainable growth, while FinTech can be a part of it (Ali et al., 2023; Muganyi et al., 2021; Nenavath & Mishra, 2023). It is important that technology is also contributing to this. FinTech and artificial intelligence (AI) improve ESG data analytics for scoring, improve climate risk modelling, and speed up green lending. It is not something that can be automatically granted, though, and it can be influenced by the willingness of the organization, the support of the regulation, and the trust of the public (Chandran M. C. et al., 2026; Guang-Wen & Siddik, 2022; Tian et al., 2022).

With climate risk management the stakes are even more dire. It tries to implement ESG not only as a value driver, but also as a risk-management tool. Assets can be damaged by physical risks (flood, storm) and value can be decreased. It can be done the same way by transition risk – e.g., policy shift from turnaround to decarbonisation. These effects were observed for both during Covid-19 Pandemic (Bagh et al., 2024; Chaudhry et al., 2025). However, it is believed that ESG (and most notably the social component) can help buffer these shocks (Al Amosh & Khatib, 2023; J. Wang, 2026). There also is a macro level of country conditions. The political stability and regulatory quality and disclosure are moderate factors (Rasoulinezhad & Taghizadeh-Hesary, 2022; Saliba et al., 2023).

The present study is focused on the banking sector of Bangladesh which is a useful and under-researched area. Bangladesh is a big emerging country and is highly exposed to the impact of climate change. Its banks are in the centre of the national development finance. Bangladesh is also an early-mover in the field of green banking as Bangladesh Bank has published green banking and sustainable finance guidelines. You can use these banks' Annual and Green banking report for analysing as there are number of banks started to report their sustainability report in

Bangladesh. But in-depth analysis of the bank level where sustainability and financial performance in Bangladesh is explored, is limited.

This context is enhanced in Bangladesh by the regulatory context. Bangladesh Bank was the first to introduce guidelines on formal green banking more than a decade ago, and subsequently environmental and social risk management guidelines and sustainable finance reporting system were introduced. As a result, all the banks in Bangladesh are now publishing periodic reports on green finance/sustainable finance. It is an exceptional chance to gain insight into sustainability practices in a rising market with compulsory disclosures and reporting to the central bank. For this reason, the setting is beneficial in a number of ways. It offers a comparable public set of data for one bank to another and for one year to the next, it's a sign of an active policy push that other emerging markets have not yet matched and spans the COVID-19 shock and a strong growth trend in green lending post-pandemic. The above characteristics make Bangladesh a good natural laboratory for assessing the relationship between sustainable finance and bank performance.

This study aims to fill three gaps in the literature. The first one is the research on climate risk is carried out independently of ESG, green banking and FinTech. Secondly, with the evidence limited to China and India, it is hard to draw broad conclusions to other emerging markets. Thirdly, there are not many studies that focus on the whole chain. Therefore, the goal of this study is to develop an integrated view and to test it with six banks of the country. It investigates the relationship between ESG disclosures, green banking transformation and financial performance and how this is affected by digital banking and bank size. A literature review of the relevant literature is provided, an explanation of the methodology, the results, discussion of the results and conclusions are drawn.

2. Literature Review

The education on finance must be related to sustainability and financial performance these days. ESG integration, green finance, green banking transformation, technology enablers and climate risk management are topics covered in the literature. This review collects up some recent empirical research that addresses these themes, in particular focussing on emerging economies. That's because it is easy. However, institutional quality, the regulatory capacity and adoption of technology varies across countries, and so does the impact of sustainability. A series of related ideas are discussed. It all starts with ESG and financial performance. It then discusses the issue of Green Finance and Green Banking, FinTech and AI, Climate Risk Management and the institutional and country environment. It concludes with the conceptual framework and a research gap.

A lot of talk is going on about the effect of ESG on financial outcomes. Agoraki et al. (2023) have analyzed 16,080 observations of firm-years in Europe. Their results indicated that the firms that were more exposed to reputational risk due to ESG factors, were also negatively affected by the lower ROA, ROE and Tobin's Q. They also found that the EU non-financial reporting directive helped to reduce this risk. The study is good with its large sample and it is regulated; however, the scope of the study is Europe which is a more regulated market. In a similar way, Candio (2024) reported that CSR committees negatively moderated the ESG and ROA link. This discovery suggests that a CSR committee may not provide any financial benefit to the company.

The results from the emerging markets are mixed both on the sign and on the channel. Six hundred and twenty-three companies were applied in the study of Bahadori et al (2021) in 24 emerging markets and they concluded that the social pillar was more significant than the environmental pillar. Zhou et al. (2022) demonstrated that the influence of ESG on the market value of Chinese companies passed through financial performance, with the former two variables having an impact on the latter. This study found that green-financing firms have enhanced their operating performance and FinTech served as a facilitator, as revealed by Habib et al. (2025). This is a more recent study than the European studies, but there are numerous differences between the countries and drawing causal inferences is difficult in these emerging market studies. The capabilities of the firm also are important. In terms of ESG, Liang et al. (2022) showed a correlation between absorptive and adaptive capabilities while A. M. Habib (2023) found a correlation between financial distress and a cost-leadership strategy.

These mixed results are due to three reasons. Firstly, ESG is looked at in various ways: aggregate or pillar-specific. Secondly, there are a number of measures for financial performance, including ROA, ROE, Tobin's Q, market value or operating performance. Thirdly, context plays an important role. Disclosure quality is emphasized in European studies, whereas the firm attributes, stakeholder pressure and institutional development are emphasized in emerging-market studies.

The study of green finance has traditionally been a big research topic in Asia. The results of Ali et al. (2023), Muganyi et al. (2021) and Nenavath and Mishra (2023) are quite evident that green financing provides environmental and economic benefits. Their evidence can be used in the context of China, India and South Asia and relates to green finance and FinTech, development of the banking sector and clean energy consumption. Wenqi et al. (2021) also found a connection between green finance and low carbon innovation, albeit not without differences in findings by province in China. These types of studies offer high quality policy level evidence. However, they don't have the big picture of the emerging economies – they are only looking at one country. The overall message is that green finance is a macro/policy tool, to a large extent. It's a different question in the case of banking research. Is the practice of one bank in lending, in building a relationship with stakeholders and in risk assessment.

This is the thread followed by research of green banking. In Pakistan, the study showed that stakeholder engagement has positive association with bank performance which is an intermediate variable between green banking practices and bank performance (Jillani et al., 2024). Risk factors like cybersecurity issues and mistrust by consumers in digital channels were perceived as relevant barriers in India (Sharma & Choubey, 2022). Based on the research done by Chen et al. (2022), green banking can be used as a tool to improve the bank spreads and support green economic recovery in the GCC region. Thi Hang (2022) pointed out that state support is the key in green-bank development of emerging economies. In sum, this work shows that green banking can not be obtained simply through offering green finance. It also relies on the support from the institutions and active participation of stakeholders.

The use of technology must be supportive and not independent learning tools to solve the problem. It can aid in the implementation of ESG, the provision of green finance, and tracking climate risk only if it is ready, regulated and trusted by consumers. Chandran M. C. et al. (2026) did a survey with 412 banking professionals in India to find the factors with respect to banks use of green AI. They found that institutional and financial factors were the most important for the adoption of green AI in the Indian banks. The study by Tian et al. (2022), showed that the Digital economy enhanced the green-investment efficiency in China and the audit support was a threshold variable. Guang-Wen and Siddik (2022) used two-stage SEM-ANN model and found that green innovation is found to be a positive moderating variable for bank performance in the context of the adoption of FinTech. This evidence conveys a clear message, in tandem with the evidence Sharma and Choubey (2022) have presented. It is not self-evident that technology is a panacea that can be and is a facilitator of ESG and green banking results.

However, climate risk research takes the discussion of ESG and performance further and redefines ESG as a tool to manage risk. Bagh et al. (2024) studied 1,771 U.S. firms over 15 years. They found that the climate risk companies had a decrease in their firm value, while the ESG investment reduced the decrease in firm value, significantly in crisis periods such as COVID-19. Wang (2026) retrieved and examined 333 banks worldwide, and concluded that the social pillar had the highest positive correlation with ROA, ROE and earnings per share in the pandemic era. Using EVT, Chaudhry et al (2025) found that financial-sector funds were more extreme, when it comes to systemic risk, than the other funds (ESG and healthcare). Al Amosh and Khatib (2023) identified the difference between environmental performance and social performance for 18 countries and identified the relationship between the national income levels. There is still some scattered evidence in that area. Studies on the relationship among the three variables, firm value, bank profitability and tail risk, are not many and there is clearly a need for a more integrated study.

The results of the sustainable finance reveal sensitivity to the country level institutions, as well as from the credit-risk studies. This is an online preprint, and as such, should be treated with caution, but the study by Huang et al. (2023) showed that ESG scores for Chinese companies had positive impacts on commercial credit financing for firms, with 32,323 observations. Saliba et al. (2023) found that the most evident reason for NPLs in country level is political risk in the BRICS economies. Rasoulinezhad and Taghizadeh-Hesary (2022) have confirmed that there is a long-term relationship between green bonds, GDP and environmental quality. According to Versal and Sholoiko (2022), supranational green bonds are proven to attract private funding to fight climate change. Aside from that, there are trends to be considered in disclosure as well. While ESG reporting gains increased in quality for the Swedish multinationals after 2008, the quality of environmental performance has not increased in a similar way, at least until around 2015, as pointed out by Arvidsson and Dumay (2022). According to Q. Wang et al. (2024), the ESG performance has caused the Chinese commercial banks' green innovation, which will evolve over time under the pressure of top management and the awareness of management.

To give some clarity in the mix of findings there are two lenses (theories) that can be given. There are two theories: stakeholder theory and the second part is transaction cost theory. It feels that a business can create value for the long term if they meet the needs of multiple groups such as regulators, investors, customers, employees and communities. ESG disclosure can communicate a sense of responsibility and fill information gaps, thus inducing greater trust of stakeholders in the banking sector, where trust is also crucial (Jillani et al., 2024). Stakeholders are more likely to deposit money in a bank, lend to the bank and stay loyal with the bank in the long run if they believe they can trust the bank. The second lens is the lens of abilities and resources of the business. It believes that if a strategy is to be successful then a firm must have the resources and skills to implement the strategy. From this angle, the value added of ESG and Green banking is mostly about the ability of a bank to set up the systems, data and skills to implement them (Liang et al., 2022). Poor systems in a bank may result in the provision of ESG information, although the bank may not necessarily generate the real-world financial benefits. The two lenses suggest that efforts to create sustainability can be worthwhile when they converge – pressure from the outside and capacity from the inside – the latter lens is explored in this present study.

The overall findings of the review were that an integrated approach should be adopted. It makes environmental, social and governance integration the main element of a bank's strategic sustainability orientation. Green finance and green banking are at the heart of implementation; technology enablers are FinTech and AI; and a resilience mechanism is climate risk management. Outcome- financial performance with moderating conditions, institutional support, stakeholder pressure and the regulatory context. This is as shown in Figure 1.

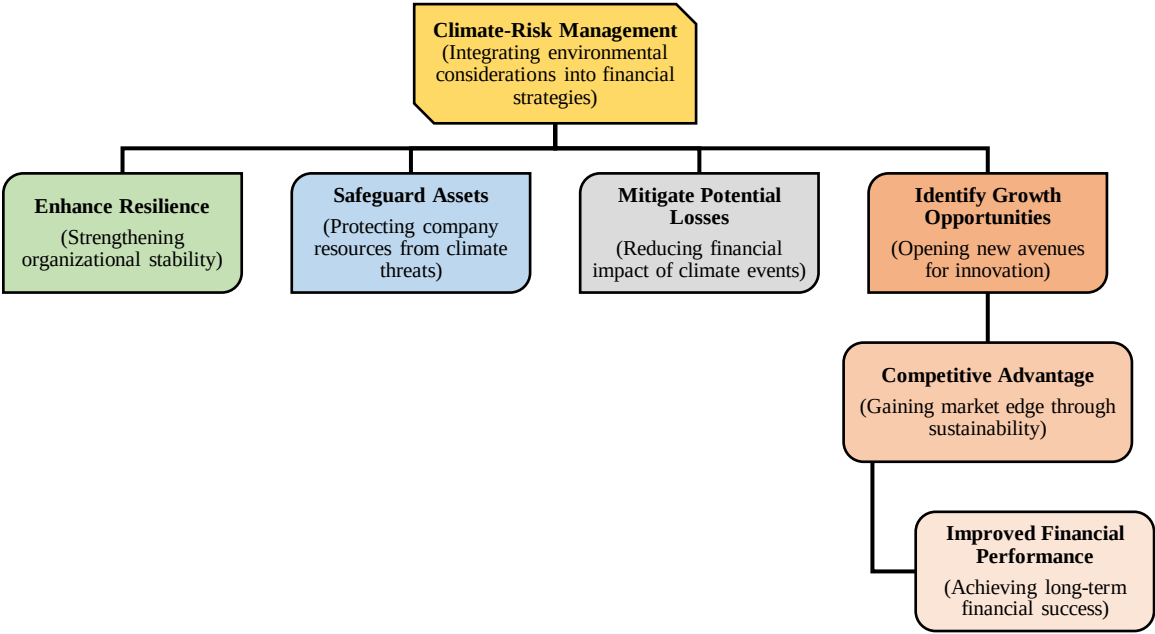


Figure 1: conceptual framework that relates sustainability practices and financial performance

2.1 Research Gap

It is also found that there are three gaps in the review. First of all, climate risk is usually not part of ESG, green finance and FinTech, but it is investigated separately in a model. Second, the literature on emerging economies is increasing but still is overwhelmingly Chinese and Indian, and there is not much literature from other markets like that of Bangladesh. Third, most of the works are either environmental or finance based, and only a few focus on the combination of the integration of ESG, green banking practices and technology and climate risk management with financial performance. This study overcomes these shortcomings. It is designed as a framework of an emerging economy and it provides an application of the framework to the banking sector of the country Bangladesh. In doing so it helps add to the literature in two ways. It outlines the connections between sustainable finance and performance and how these connections are realized through institutional, technological and risk management channels.

3. Methodology

3.1 Research Approach

The type of method used in this study is quantitative method using secondary data. A quantitative approach is suitable because it can be used to measure the correlation between the ESG practices, the financial performance of the selected banks, and green banking, among others, and also the management of climate risks. The study is based on numerical information from published reports and the statistical methods employed are used to discover patterns, relationships and potential impacts between the variables. Interviews, surveys or experiments are NOT part of the research style. For this reason, secondary data are considered appropriate, affordable and trustworthy to be used for the analysis of the disclosure and financial performance of the corporation for a given period.

The banking sector in Bangladesh has been chosen as the context for the present study as it is an emerging economy. Considering the growing needs of the banks to be responsive to environmental sustainability, green finance and social responsibility and climate change risk, Bangladesh is well positioned. Moreover, many banks in Bangladesh have recently published their annual reports, sustainability reports, ESG reports, green banking disclosure and financial statements, which provide relevant information to analyze.

3.2 Research Design

This study employs descriptive and explanatory research design. The descriptive section is a summary of the ESG disclosure practices, activities related to green banking, climate risk management and financial performance of selected banks. This will give an overview of how sustainable practices and financial results were throughout the period of study. The statistical relationships between disclosure of environmental, social, governance (ESG) and financial performance, green banking practices and financial performance and climate risk management and financial performance are discussed. This design, therefore, is suitable for the study. It includes characteristics of variables and potential relationships between sustainability practices and bank performance.

3.3 Population and Sample Selection

The study population is made up of the scheduled commercial banks which are in Bangladesh. To determine the five banks, purposive sampling is used as few time and resources is available and only little attention is paid to the study. Purposive sampling is suitable based on the quality of information that banks need to provide on ESG activities, green banking, climate risk management and financial performance. The below listed banks are selected:

- BRAC Bank PLC
- Eastern Bank PLC
- City Bank PLC
- Jamuna Bank PLC
- NCC Bank PLC
- Agrani Bank Limited

They have been selected because of the information they have made available to the public on their websites, their investor relations, their disclosure reports on green banks, their climate reports, their sustainability reports and on their annual reports. Information that is consistent and relevant is essential for measurement of the independent, dependent and control variables. The selected banks are also private commercial banks in Bangladesh and suitable for study to investigate the banking practice that is towards sustainability in an emerging economy.

3.4 Study Period

This study will take place within a 5-year period of time (as long as possible). The idea is that it would take five years for the researcher to be able to see changes in both ESG disclosure, green banking practices, climate risk management and financial performance over time. The period runs from 2020 to 2024. The study adjusts to ensure that the data is consistent and comparable across the selected banks, if there are missing data for a specific variable or bank in a specific year. Using a panel-type data enables to enhance reliability of the findings by using data from different banks and years.

3.5 Sources of Data

The data obtained for this study is Secondary data. Annual reports, sustainability reports, ESG reports, climate related reports, bank websites, central bank reports, investor relations pages and published financial statements are the primary sources. Financial data refer to the total assets, net profit, shareholders equity, ROA – return on assets and ROE – return on equity and were sourced mainly from the annual reports and audited financial statements. Non-financial data regarding ESG disclosure, green banking and climate risk management comes from sustainability reports, ESG reports, the green banking segments of annual reports, and banks' official websites.

The secondary data are suitable for this research since the data needed have already been published in the banks and regulators. They also provided the researcher access to historical information and performance from the bank and over the years. Data is collected to be reliable from only official and reliable sources. To maintain consistency, the same type of sources is utilized for all banks, wherever possible.

3.6 Variable of the Study

The independent variables, dependent variables and control variables are included in the study. Independent variables are ESG disclosure and green banking practices and climate risk management. ESG disclosure is about how much environmental, social and governance data a bank discloses in its annual or ESG reports and/or sustainability reports. Green banking is comprised of green finance, paperless banking, energy efficient and environmental care, digital banking and financing of green projects for the bank. Climate risk management is a term used to describe the policies and practices of the bank in its identification, assessment, monitoring and management of climate-related and environmental risks.

Financial performance is the dependent variables. Return on Assets, Return on Equity, Profitability, Firm Value are the main indicators, depending on the availability of data. The bank's return on assets is a measure of how well the bank is utilizing its assets to generate profit. ROE is a ratio that indicates the return generated by shareholders' investment. Profitability can be expressed as a percentage, either in terms of net profit margin or profit after tax. If available, the market-based indicators can be used to measure the firm value.

Bank size, Bank age and Total assets are the control variables. Total assets can be used as a measure of the size of the bank and the logarithm of the total assets can be used for the natural log. The age of a bank is the bank's years in operation. The size of bank operation is taken into account by taking the total assets of banks into consideration.

3.7 Measurement of Variables

A disclosure index could be a way of measuring ESG disclosure. The researcher can create a list of items on the environmental, social and governance items that are included in the banks' reporting. There is a total of four points available, with 1 point given for each item that is disclosed and 0 points for an item that is not disclosed. This gives an overall ESG disclosure score over the course of a bank-year which is then worked out.

Some of the indicators of green banking practices might characterize the amount of money invested in green finance, sustainable finance, number of green banking activities, number of digital banking activities, number of paperless banking activities, financing for renewable energy and number of activities related to internal environmental management. Measures of climate risk management can include the existence of a climate risk policy, environmental and social risk management framework, disclosure related to climate change, existence of a climate risk fund, reporting on greenhouse gas emissions or reporting on climate stress.

The financial measures are evaluated based on the following accounting ratios: ROA, ROE. ROA is net profit after tax/total assets. ROE is defined as net profit after tax/ shareholders' equity. The signs of profit of financial statements available determine the profitability.

3.8 Data Analysis Techniques

Information is gathered, stored in Microsoft Excel and analyzed in Excel and SPSS v25. Firstly, descriptive statistics are used to summaries the data. The average, lowest and highest values and the standard deviation are determined for the variables selected. This offers a snapshot of the degree of ESG transparency, green banking and climate risk management and financial performance of the banks selected.

Second, correlation analysis looks at the nature of the relationship(s) between the variables in terms of direction and intensity. This aids in revealing if there is a positive or negative correlation between ESG disclosure, green banking and climate risk management and financial performance.

Thirdly, regression analysis is the analysis of the effect of the independent variables on the financial performance. The one-way association between each of the independent variables and each of the performance indicators can be tested with simple regression. Furthermore, multiple regression analysis can be used to explore the relationship

between the composite of ESG disclosure, green banking and climate risk management with bank performance, while controlling for bank size, bank age and bank size.

The simplest form of regression model can be expressed as:

$$\text{Financial Performance} = \beta_0 + \beta_1 \text{ ESG Disclosure} + \beta_2 \text{ Green Banking} + \beta_3 \text{ Climate Risk Management} + \beta_4 \text{ Bank Size} + \beta_5 \text{ Bank Age} + \beta_6 \text{ Total Assets} + \varepsilon$$

In this, the financial performance can be ROA, ROE, Profitability, or Firm Value, and β_0 , β_1 to β_6 are regression co-efficient and ε is the error term.

3.9 Ethical Considerations

The study does not use human participants or personal information as all the data used is publicly available and secondary sources. This does not directly relate to informed consent, to participant confidentiality. The study is valid research from academic point of view. It is based on real data, it cites all sources and it does not alter information. Responsibility for the honesty of data collection, recording and analysis is on the researcher.

3.10 Limitations of the Methodology

There are a few limitations to the study. Firstly, the results are only presented from five banks, so this may not be generalizable. Secondly, ESG, green banking and climate risk information is not necessarily presented in the same format by all banks. Thirdly, there is no data available for 5 years. Finally, it is a secondary data source and thus limits the researcher's ability to validate the internal managerial procedures, other than those published reports. Even with these drawbacks, the methodology can be used to analyse the correlation among sustainability practices and financial performance in the banking sector of Bangladesh.

4. Findings

As presented in table 1, the growth of green and sustainable finance has been significant in Bangladesh in the period from 2020-2024. Green finance increased from BDT 11,929.93 crore in 2020 to BDT 30,653.78 crore in 2024. The trend changed slightly negative in 2021, but turned positive from 2022 onwards. The proportion of green finance in the total disbursement of term loans has seen an increase as well from 3.96% in 2020 to 13.29% in 2024. This suggests that a greater proportion of long-term financing flows was increasingly concentrated in environmentally friendly projects by banks and financial institutions. The increase was even more pronounced in the case of sustainable finance. It increased from BDT 82,551.67 crore in 2021 to BDT 459,483.82 crore in 2024. Sustainable finance was 8.04% of the total disbursed loans in 2021 and will represent 39.66% of the total in the same year.

Table 1: Year-wise green and sustainable finance trend in Bangladesh, 2020–2024

Year	Green Finance Disbursement (BDT crore)	Green Finance as % of Total Term Loan Disbursement	Sustainable Linked Finance (BDT crore)	Sustainable Finance (BDT crore)	Sustainable Finance as % of Total Loan Disbursement
2020	11,929.93	3.96	Not available	Not available	Not available
2021	7,232.85	3.06	75,318.82	82,551.67	8.04
2022	12,226.46	4.97	118,535.77	130,762.23	11.59
2023	19,304.31	7.25	178,064.83	197,369.14	17.23
2024	30,653.78	13.29	428,830.04	459,483.82	39.66

Based on these findings, it may be inferred that sustainable finance in Bangladesh is not a niche banking activity in the country anymore. Rather, it has become an important part of the financing strategy of the banking sector. The

trend coincides in this regard, that as regulatory pressure is growing, recommendations have been made by Bangladesh Bank and more and more from the banks, and green banking transformation is progressing towards institutionalization. The trend is proof of this argument that green banking transformation is getting more institutionalized with the pressure on regulation, Bangladesh Bank guideline, the sustainability rating and improved reporting of the banks.

Figure 2 shows the researcher's qualitative sustainability leadership scores of the five banks compared. As can be seen in the figure, City Bank PLC is the leader in sustainability leadership in all the areas of ESG disclosures, green banking, climate risk and digital banking overall. This position is supported by the Bangladesh Bank Sustainability Rating 2024, ESG disclosure and ESG reporting/corporate sustainable finance drive. BRAC Bank PLC's sustainability position in ESG disclosure, green banking and overall reporting and digital banking is also very strong. Eastern Bank PLC is in a good middle ground where they have integrated into ESG, published sustainability reports independently and they have published climate-related disclosures.

Bank	ESG Disclosure	Green Banking	Climate Risk	Digital Banking	Overall Reporting
City Bank PLC	5	5	5	5	5
BRAC Bank PLC	5	5	4	5	5
Eastern Bank PLC	4	4	4	4	4
Jamuna Bank PLC	3	3	3	3	3
NCC Bank PLC	2	3	2	2	2

Figure 2: Comparative Sustainability Profile of Selected Banks

Note: 5 = Very high, 4 = High, 3 = Moderate, 2 = Emerging, and 1 = Very low

The extent of sustainability disclosure and climate-risk related disclosure is moderate for Jamuna Bank PLC and Agrani Bank Limited, suggesting some level of progress in this area, but is less robust than for City Bank, BRAC Bank and Eastern Bank. While the selected banks do not have sustainability practices, the lowest relative score is that of NCC Bank PLC. Instead, NCC Bank is at an emerging stage as its sustainability reporting and climate-related disclosure seem newer and are less mature when compared to the leading banks. Overall, Figure 4.2 illustrates that the level of sustainability maturity varies among the selected banks, with City Bank, BRAC Bank and Eastern Bank

having better institutional sustainability maturity and Jamuna Bank and NCC Bank having nascent sustainability disclosure, green banking and climate risk management frameworks.

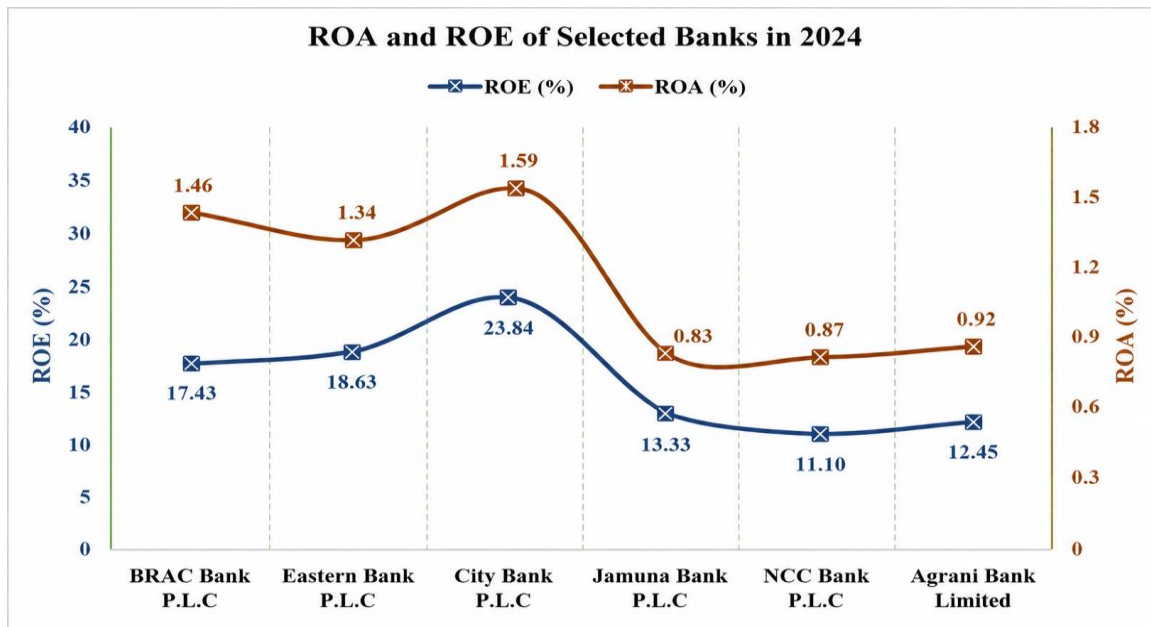


Figure 3: Bank-wise reported financial performance indicators, 2024

The results of the selected banks' financial performance for 2024 are shown in Figure 3, based on the information disclosed in their annual reports and disclosure statements (ISs). In comparison with all banks, BRAC Bank PLC is having one of the best positions with total assets of around BDT 930 billion with ROA of 1.46% and ROE of 17.43%. Along with that, Eastern Bank PLC is also performing well in terms of financial performance in which it has reported a PAT of BDT 7,503.94 million, ROA of 1.34% and ROE of 18.63%. City Bank PLC also maintained strong financial performance, crossing over the BDT 1000 crore profit mark in 2024 and likewise, being a frontrunner in sustainability programs. Moderate financial performance of Jamuna Bank PLC was reflected from the ROA of 0.83% and ROE of 13.33%. In terms of profitability, NCC Bank's ROA and ROE were 0.87% and 11.10% respectively, which were comparatively low for the selected banks. Similarly, the state-owned commercial bank, Agrani Bank Limited, also exhibited a relatively sound financial condition in 2024, with a hypothetical ROA of 0.92% and a ROE of 12.45%. Its profitability indicators are still lower than those of the major private banks, but it has shown overall good performance, with sound operations and a large network of branches, and involvement in government-supported sustainable finance activities.

The comparison suggests that the level of financial resilience of banks is relatively better in banks with higher sustainability leadership like BRAC Bank, City Bank, Eastern Bank and, to a certain extent, the banks that are slowly improving like Agrani Bank Limited. Although the link is not causal, the results offer a direction of influence with respect to the possible role of ESG disclosure, green banking practices, digital banking, and climate risk management in delivering financial stability, stakeholder confidence, and long-term profitability.

Sustainability Dimension	Observed Evidence	Relationship with Financial Performance	Result
ESG disclosure	Increased ESG disclosures at City Bank, BRAC Bank and EBL.	Higher performing banks evidence greater disclosure of ESG.	Positive association
Green banking	Bangladesh Bank data show major growth in green finance and sustainable finance	The top banks are involved in green finance and digital finance.	Positive association
Climate risk management	EBL, City Bank, BRAC Bank and Jamuna Bank and NCC Bank have all recorded an uptick in their climate related activities.	Climate-aware banks look poised to be more resilient and ready.	Positive association
Digital and paperless banking	BRAC Bank and City Bank have a healthy digital banking profile.	The use of digital transformation enhances efficiency and customer accessibility.	Positive association
Bank size	Bigger banks tend to have more robust ESG capacity and greater profitability	Size enhances capacity of implementation.	Moderating effect

The previous correlation matrix has been replaced with Table 2, which is based on evidence. At this point it is not appropriate to report any correlation coefficient since the complete bank-year panel data set has not been extracted. There is, however, some evidence to suggest that a positive relationship exists between sustainability practices and financial performance; it should not be assumed that the financial performance leads to sustainability practices. The banks that demonstrate good ESG disclosure and sustainability reporting capabilities, like City Bank, BRAC Bank and Eastern Bank, also exhibit better profitability and balance-sheet positions. The positive association of green banking with financial performance also seems to be there as Bangladesh Bank statistics reveal significant improvement in the financial volume of green and sustainable finance during the study period. The outcome of this is that now green finance is not just a 'compliance' activity but is becoming a financial activity. Climate risk management also seems to be relevant, as banks that publish climate risk assessment, environmental and social risk management, GHG accounting or financed emissions practices have a better climate risk management. Bank size is a moderating factor with larger banks having greater resources to dedicate to ESG systems and reporting capabilities, technology and tools to support climate risk. The overall findings are with a positive association but formal statistical testing should be carried out after full panel data extraction.

Table 3: Summary of findings and hypotheses

Relationship Tested	Expected Direction	Updated Result	Interpretation
ESG disclosure to financial performance	Positive	Supported directionally	The highest ESG-disclosing banks have strong profitability and market confidence.
Green banking to financial performance	Positive	Partially supported	Green finance is growing quickly, however the gains in finance could come more slowly.
Climate risk management to Financial performance	Positive	Supported directionally	Banks that are climate aware are more robust and better equipped to withstand long-term risks.
Digital banking to Sustainability performance	Positive	Supported directionally	Operational efficiency and green transformation in digital and paperless banking.
Bank size to Sustainability-performance relationship	Positive moderating effect	Supported directionally	Sustainability systems can be more effectively applied by bigger banks.
Sustainability leadership to Overall performance	Positive	Supported directionally	BRAC Bank, City Bank and EBL have not only a higher level of sustainability maturity but also better financial results.

Table 3 summarizes the overall findings of the study. It is found that there is a positive direction of ESG disclosure and financial performance. Banks have also reported positive links between their profitability, institutional reputation, and their ESG reporting and sustainability transparency. However, the partial support for green banking comes from Bangladesh Bank statistics, which reveal that green finance and sustainable finance have been growing fast in Bangladesh, though with a potential delayed impact on the economy. Financial returns can be delayed when implementing a green banking strategy, as it may involve investing in systems, staff training, technology development, reporting, and product development. Climate risk management is also directionally supported as banks that disclose more about their climate-related actions are seen to be better prepared for climate and transition risk. Digital banking is a friend of green banking transformation as it helps to decrease paper consumption, enhance operational efficiency and increase access to banking. The size of the bank also seems to be significant as larger banks are better positioned to implement ESG and climate risk systems due to having a larger financial, technological, and managerial capacity. In conclusion, the findings indicate that sustainable banking practices can be a positive factor in achieving financial performance in Bangladesh. Final statistical conclusions should, however, be drawn only after having undertaken complete content analysis, ESG score calculation and panel regression for the bank-year 2020-2024.

5. Discussion

This study reveals that the sustainable finance and green banking transformation is gaining significance among the banking sector of Bangladesh. Green and Sustainable finance is booming and the number of disclosures on sustainability information has grown in the selected private commercial banks. The trend indicates that sustainability is no longer seen as just a CSR project. Instead, it is becoming integrated into the traditional banking business models, regulatory regulations and financial risk management processes. The study also suggests a relationship between ESG disclosure, green banking practices and financial performance, in that banks with strong ESG disclosure showing financial performance have good financial performance, while those with green banking policies and digital banking capacity also have good financial performance. The results are predominantly directional, not definitive but do provide valuable backing to the idea that sustainability banking is likely to have a positive impact on financial resilience in an emerging economy.

This is the first finding, that Green and Sustainable finance is a strong emerging trend in Bangladesh. The green finance disbursement has increased from BDT 11,929.93 crore in 2020 to BDT 30,653.78 crore in 2024 and sustainable finance has also significantly grown from 2021 to 2024 (The Daily Star, 2025; The Financial Express, 2025). This trend is proof that the regulatory environment has been an important enabler. It has encouraged financial institutions and banks to increase the credit given to the environment and social friendly sectors. Regulatory support of this kind is important and can be particularly slow in emerging markets where incorporating ESG into markets is both difficult and important. The reasons are attributed to three reasons – weak culture of disclosure, low pressure from investors and low institutional capacity. This result is in line with Thi Hang (2022), who revealed that policy support is one of the key factors that drives green bank development in climate vulnerable economies. In addition, it also supports the general principles of green finance in shifting investments towards clean energy, low-carbon development and sustainable growth (Ali et al., 2023; Nenavath & Mishra, 2023).

The second most important result is that there are differences in sustainability leadership between the selected banks. City Bank PLC, BRAC Bank PLC, and Eastern Bank PLC appear to be more progressed regarding their ESG disclosure, green banking and reporting on climate change compared to Jamuna Bank PLC and NCC Bank PLC. City Bank has been awarded the highest rating on Sustainability Rating 2024 by Bangladesh Bank and has also published its sustainability reports (City Bank PLC, 2025a, 2025b) which showed its sustainability governance system is fairly developed. Overall, BRAC Bank's sustainability and impact reporting, along with disclosure in accordance with IFRS Principles, and IFRS S1/S2 aligned disclosure indicate a shift towards international sustainability reporting standards (BRAC Bank PLC, 2025a, 2025b). Eastern Bank also demonstrates good sustainability integration as they disclose details of sustainability in their annual reports and financial disclosures (Eastern Bank PLC, 2025). The advancement of Jamuna Bank and NCC Bank are evident, however, it appears relatively new and developing (Jamuna Bank PLC, 2025; NCC Bank PLC, 2025). This separation points to the importance of managerial commitment, reporting possibilities and institutional preparedness as well as rules for sustainability transformation.

The results also confirm that there is a positive directionality between ESG disclosure and financial performance. Banks that have more robust ESG disclosures particularly City Bank, BRAC Bank and Eastern Bank also have more robust profit and balance sheet strength. This discovery is consistent with studies that have proven the financial benefits of an ESG strategy. The channels include trust and confidence among stakeholders, decreased reputational risk, improved governance, and improved financing access (A. Habib et al., 2025; Zhou et al., 2022). ESG disclosure can assist banks to ensure that they are transparent about their environmental and social commitments to regulators, investors, customers and development partners. In banking, transparency is essential, and when implemented, it can enhance the institutional trust and confidence in the banking market. This is not to be confused with what occurs when companies disclose ESG: They get richer! Perhaps it's more that larger and more successful banks have more resources to invest in their ESG reporting. This can, therefore, be a two-way street between the ESG and performance.

The results are also in line with stakeholder theory. Banks operate in a regulatory and deposit/borrower/shareholder and the community in which the employees work. Committing to sustainable finance and announcing their ESG practices, banks are fulfilling the expectations of these groups. Improved investor confidence is, therefore, created when there is greater information disclosure regarding ESG. The stakeholder engagement can alter the association between green banking practices and bank performance found by Jillani et al. (2024). This is reflected in the present results, as there was a tendency for banks with higher sustainability communication to be in a better position with regard to reputation and financial aspects. Stakeholder pressure can be from Bangladesh Bank, international development institutions, export-oriented clients, and climate sensitive communities as well as shareholders in Bangladesh.

In the context of green banking, although financial performance is not a decisive link, it is considered positive. The data reveals that the green finance and sustainable finance has grown drastically in Bangladesh though the impact on the banks' finances can be unequal. This is because green banking requires the investment into new products,

training of employees, the creation of risk assessment tools, digital systems, environmental due diligence and monitoring. Such investments could raise the operating costs in the short term so that they can benefit in the long term. Hence the positive but cautious take from the results. The finding aligns with Sharma and Choubey (2022) who pointed out that the trust of its customers, technological readiness, and implementation issues are some of the barriers to the adoption of green banking. Similarly, Guang-Wen and Siddik (2022) pointed out that the adoption of FinTech positively affects green finance and environmental performance and also noted that it relies on the extent of the green innovation and institutional readiness.

The results also indicated that climate risk management is becoming a key component of the performance of banks. From a bank perspective, those institutions that have climate risk assessment, environmental and social risk management practices, and accounting for emissions from bank finance (financed emissions) appear to be more likely to be better equipped to address long-term risk. It is extremely significant to Bangladesh because climate change hazards are very dangerous for Bangladesh such as flooding, cyclone and increasing temperature etc. Climate risk may affect the performance of banks, such as loan defaults, destruction of property, exposure to a specific sector and impacts to operations. Climate risk management needs to be thought about along with other risks such as food security, and not as an environmental compliance matter. But climate risk management goes beyond environmental normals, there are other risks as well like food security. It is also being employed as a financial risk management tool. It is similar to the findings of Bagh et al. (2024), which indicates that ESG investment can mitigate negative impact of a climate risk on a firm value. It is also in line with Chaudhry et al. (2025) who suggested that, in the absence of a robust risk-management system, financial-sector assets could become subject to extreme systematic risk.

Digital / paperless banking is the second key factor. The results suggest that the digital transformation process has the potential to be a major driver of sustainability. It helps to cut down on paper consumption, increase efficiency, and reach more customers. Banks with a more digital approach like BRAC Bank and City Bank seem to be more poised to integrate sustainability with efficiency in their operations. This increases the sense of technology being an enabler, not a solution in and of itself, to sustainable banking. The digital economy has been shown to enhance the efficiency of green financial investments, as well as the importance of green AI adoption in banking sustainability, by Tian et al. (2022) and Chandran et al. (2026). New challenges come with technology, such as the cyber security challenge, access to technology challenge, and consumer trust challenge. Sustainability of digital banking, it is therefore key to responsible implementation, protecting customers and robust governance.

The results also indicate that the connection between sustainability measures and profitability is less significant for smaller banks. Larger banks have more resources - be they financial, human or technological - which makes managing sustainability systems easier. They have the resources to have their own teams of sustainability specialists, sophisticated reporting systems, climate risk tools, and digital platforms. This might be the reason behind the better sustainability and performance alignment of BRAC Bank, City Bank and Eastern Bank. Smaller or mid-tier banks could have goals related to sustainability, but could not have the required resources to measure, report and scale their green banking initiatives. This is consistent with the work of Liang et al. (2022) when they emphasized on the role of organizational capability in ESG strategy. It also suggests that the various bank capacities should be taken into consideration when formulating sustainability regulation. Technical assistance and a staged rollout can help banks less sophisticated to improve, though there needs to be some uniformity.

Previous ESG studies with conflicting results should also be taken into account when interpreting the results. The findings of the studies indicate that there is a positive relationship between ESG and financial performance, weaker or neutral relationship, and negative one (Agoraki et al., 2023; Bahadori et al., 2021; Candio, 2024). The present research adds to the knowledge of the differences in results. Sustainability seems to be a positive aspect in the banking sector in Bangladesh if paired with a banking regulatory framework, financial resilience, digitalization and climate risk management. ESG disclosure could have a negative impact on performance. ESG becomes financial when it is embedded in the lender's lending process, risk management, products and communication with stakeholders. Thus, the integration of environmental, social and governance (ESG) principles, green banking,

technology and climate risk management has a financial impact, in which the study adopts an integrated approach as well.

The findings indicate practice implication that now it is time for the Bangladeshi banks to move from disclosure of sustainability to measurable sustainability. Banks need to enhance the quality of ESG data, publish sectoral exposure to green finance, publish exposure data to climate-related credit risks and establish financed emissions measurement systems. Some examples of this are the efforts of NCC Bank towards financed emissions reporting and of BRAC Bank towards IFRS S1 and S2 reporting (BRAC Bank PLC, 2025a; NCC Bank PLC, 2025). Bangladesh Bank needs to further enhance sustainability rating systems and disclosure requirements and provide technical capacity building assistance to banks. Investors and depositors might also be able to take advantage of more similar ESG data, which would enable them to assess whether banks are embedding a more sustainable approach or simply paying lip service to sustainability.

Based on the overall discussion it can be concluded that there is a positive relationship between sustainable finance and green banking transformation with the financial performance of the selected banks in Bangladesh. It is revealed that disclosure of ESG promotes transparency and legitimacy, green banking promotes sustainable financing, climate risk management enhances resilience and digital banking helps to enhance operational efficiency. However, the results are still preliminary, since the study has yet to complete a bank year panel regression. Future research should include gathering of all data on annual and sustainability reports for the years 2020-2024, creation of a formal disclosure index of ESG information and use of bank and year effects in a panel regression analysis. This would enable one to more strongly conclude causality. Nevertheless, there are current evidences to support the main thesis. In the developing banking sector of Bangladesh, sustainable approach is not only essential to the banks' performance but also a game-changer.

6. Conclusion

The goal of the study is to find out the relationship between sustainable finance and banking transformation in the banking sector in Bangladesh; the integration of environmental, social and governance (ESG) principles with banking; the climate risk management and financial performance. It had to be directed to six selected commercial banks namely, BRAC Bank PLC, Eastern Bank PLC, City Bank PLC, Jamuna Bank PLC, NCC Bank PLC and Agrani Bank Limited. The study aimed to find out if sustainability in banking is purely regulatory and social responsibility or also associated with a better financial performance in an emerging economy.

The results indicate that in the current study period Green and Sustainable Finance has significantly increased in Bangladesh. The banking industry is making small steps towards being eco- and socially responsible in financing, as reflected in the rise in Green Finance disbursement and Sustainable Finance. This has been supported by regulatory guidance, sustainability ratings, growing concern about the risks of climate change to the financial sector and bank level reporting. The results indicate that green banking is not merely as a by-product of banking or as a secondary activity. It's turning into a key component of banking business, credit distribution and financial planning.

The research also revealed that the banks studied had differences in their sustainability maturity. Eastern Bank PLC, City Bank PLC and BRAC Bank appear to be in a stronger position when it comes to ESG disclosure. Also, Eastern Bank PLC, City Bank PLC, and BRAC Bank PLC seem to be more capable with regard to green banking, sustainability reporting and climate-related initiatives. The financial results of these banks are also superior to banks reporting with under-developed reporting systems. There is some improvements in the practices of Jamuna Bank PLC and NCC Bank PLC in sustainability reporting and disclosure on climate change as it appears that these practices were at developing stage. The variation indicates that, apart from the regulatory pressure, factors such as institutional capacity, institutional leadership, the quality of reporting sustainability performance and technological readiness are also part of the factors that impact sustainability performance.

One of the key findings of this study is that there is a positive direction of association between ESG disclosure and financial performance. Banks with better ESG information seem to be more transparent, more trusted by their stakeholders and more reputable. Trust and accountability are key to long-term success in banking. ESG disclosure is therefore one of the mechanisms to help build confidence of regulators, depositors, investors, customers and development partners, which can support performance. However, the link needs to be taken with a pinch of salt as strong banks might be able to report better ESG because they have more resources. There could be over time a positive feedback loop between ESG disclosure and financial performance.

In addition, the study concludes that there is a positive relationship between green banking and the financial performance, albeit weak, and yet is present. The use of green banking tools, like green finance, sustainable lending, digital banking, paperless banking and environmentally friendly operations can help to facilitate efficiency and growth in the long term. While these benefits may not be achieved immediately, they do take time to be realized, as green banking demands investments in technology, employee training, monitoring and risk assessment tools. The short run may thus be less impactful than the long run on the financial impact of green banking.

Financial resilience was identified as being relevant to the climate risk management. Banks that have identified, assessed and revealed the climate risks are better prepared to face the future risks. This is particularly pertinent for Bangladesh where climate change can impact borrowers, security, farming operations, business continuity, and ability to repay loans. Climate risk management should thus be considered as a fundamental element of banking risk management, rather than just as an environmental matter.

7. Recommendation

The study also underlines the significance of digital banking and size of banks. Digital and paperless banking promotes sustainability by helping to eliminate waste in the banking process, enhance service efficiency and increase access to banking services. Because of their financial and technological strength, larger banks are more likely to be able to operate ESG systems, climate risk tools and green banking products. Technical support, regulatory guidance and capacity building may thus be needed at a higher level in smaller and mid-sized banks to enhance their sustainability practices.

The overall conclusion of the study is that the Sustainable finance and green banking transformation is positively correlated with the financial performance in the case of the banking sector of Bangladesh. The results confirm the sustainability-as-responsibility-and-as-opportunity hypothesis. The trend of embedding ESG disclosure, green banking, climate risk management and the shift towards digital transformation in banks is likely to pay off in long-term sustainability, stakeholder trust and financial resilience.

This study has certain limitations. The sample size is five banks and there are limitations to providing all sustainability information in a consistent format for all banks. The results are primarily qualitative as a full bank-year panel regression was not run. Future research should involve a thorough study of all selected banks over a span of one year, and a detailed index of disclosure in terms of the environmental, social and governance criteria, should be developed with the help of statistical analysis techniques like correlation, regression and panel analysis. Other variables like non-performing loans, capital adequacy, market value and climate exposure could also be taken into account in future studies, as could be more banks, and longer time series. However, the study offers valuable insights on the importance of sustainable banking services as a crucial mechanism for financial stability and sustainable growth in Bangladesh, notwithstanding these constraints.

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Author Contribution: The author prepared the overall report for this study. The author conceptualized the topic, searched the literature, planned the methodology, gathered secondary data from literature published online, compiled, analyzed, wrote the discussion and conclusion and drafted the article. This being a single author study it has been carried out by the author alone in relation to academic and research work.

Data Availability Statement: Various open sources including annual reports, sustainability reports, ESG reports, climate reports, green banking disclosure, financial statements, bank websites and the Bangladesh Bank's publications were used to procure secondary data for this study. All the data is obtained from the official website of selected banks and the regulatory institutes. There was no confidential, private or personally identifiable data used in this study.

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