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Do Green Banking Activities Improve the Banks' Environmental Performance? The Mediating Effect of Green Financing

Xin Zhang [1], Zhihui Wang [1,*], Xiaobing Zhong [1], Shouzhi Yang [2] and Abu Bakkar Siddik [3,*]

[1] School of Humanity & Social Science and Law, Harbin Institute of Technology, Harbin 150000, China; drzhangxin@hit.edu.cn (X.Z.); zhongyan@hit.edu.cn (X.Z.)
[2] School of Economics and Management, Northeast Agricultural University, Harbin 150000, China; ryandavidyang@163.com
[3] School of Economics and Management, Shaanxi University of Science and Technology (SUST), Xi'an 710021, China
* Correspondence: sjjjxh_hlj@126.com (Z.W.); ls190309@sust.edu.cn (A.B.S.)

Abstract: The main purpose of this study is to identify the impact of green banking activities on green financing and banks' environmental performance. It also identifies the mediating effect of green financing on the relationship between green banking activities and environmental performance of private commercial banks (PCBs) in Bangladesh. Besides, this study also examines the major challenges and benefits of green banking development in an emerging economy like Bangladesh. The convenience sampling technique was used to collect primary data from bankers of PCBs in Bangladesh, and a final sample size of 352 was recorded. To assess the relationship among the study variables, the Structural Equation Modelling (SEM) approach was employed. The empirical results revealed that green banking activities exhibit a significantly positive effect on banks' environmental performance and sources of green financing, and that sources of green financing significantly influence banks' environmental performance. Additionally, it was observed that green financing mediates the association between green banking activities and banks' environmental performance. Furthermore, the study identified customers' insufficient awareness towards green banking, high investment costs, technical obstacles, lack of capable and competent staff in appraising green credits/loans, and difficulties and complexity in assessing green projects as major challenges affecting the development of green banking in Bangladesh. Moreover, the study also discovered that increasing banks' competitiveness, reducing long-term costs and expenses, providing online banking facilities, improving customers' goodwill, and reducing carbon footprints are the key benefits of green banking development, as it helps in the achievement of the sustainable economic development of the country. Therefore, major theoretical and managerial policy implications are further discussed with study limitations and future research directions.

Keywords: green banking activities; green financing; banks' environmental performance; SEM; Bangladesh

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1. Introduction

The planet suffers from climate crises such as droughts, storms, coastal flooding, rising sea level, and tsunamis. These climate changes endanger the sustainable lifestyle on this globe, prompting developed and developing countries, particularly Bangladesh, to act urgently and collectively [1]. Bangladesh is perceived as one of the world's next growing economies, as it is characterized by enormous investments, development, and economic potential to become a prominent market in the 21st century [2,3]. Nevertheless, emerging countries such as Bangladesh experience challenges of climate change and its associated implications on the environment [1,4]. Evidently, Bangladesh is regarded as one of the

most affected nations by climate change due to increasing global sea temperatures, which harm natural ecosystems and result in economic instability [5–7]. From that point of view, appropriate long-term initiatives must be undertaken to sustain future growth through the execution of green strategies and frameworks. As a result, Bangladesh has adapted the design of green structures to its wide scope of sustainable development through the broad implementation of green banking. In addition, banking and financial institutions specially influence an economy through their financing roles in various operations, which will affect the overall economy and ultimately the mitigation of environmental risks in the real world [5,7]. These organizations may greatly promote the campaign for a cleaner environment, introduce a 'green' policy, and facilitate clean technology for customer businesses. Therefore, all financial institutions must pursue a long-term plan to monitor the environmental impact of their clients or projects to ensure overall sustainability, as it tends to decrease costs and contribute to the growth of new businesses [1,8].

Green banking (GB), also known as socially responsible banking, sustainable banking, and ethical banking, is widely used in academic and business settings and has a variety of meanings [3–5,9,10]. GB is a form of banking with an ultimate goal of preserving the environment and protecting natural resources, while taking all social and environmental factors into consideration (Bangladesh Bank, 2020). On the one hand, the banking sector is regarded as one of the key sources of funding for industrial projects that generates maximum carbon dioxide emissions via steel, paper, cement, pesticides, fertilizer, electricity, and textiles. Consequently, the banking sector may act as an intermediary between social and economic growth, and environmental conservation, thus fostering environmentally and socially responsible investments [1,4]. Therefore, it can be concluded that the GB is a type of banking established in green and environmentally friendly areas, aimed at reducing the overall internal and external carbon emissions and improving environmental performance.

Moreover, the banking sectors in Bangladesh are faced with challenges, which forestall the development of GB in their daily operations, thus hindering their achievement of sustainable economic growth [1,5,7,8,11]. In addition, Islam [11] studied the challenges and opportunities of GB development in Bangladesh and discovered that high operating costs, diversification issues, start-up, reputational risk, and credit risks were the major challenges of GB development in Bangladesh. More recently, Qureshi & Hussain [12] studied the challenges and issues of GB products development among Islamic and traditional banks in Pakistan. The study identified lack of knowledge and skills, identification of target market, lack of funding, and customer persuasion as the key barriers to the development and implementation of GB products in Pakistan. Furthermore, Sharma & Choubey [13] studied GB initiatives in the Indian banking sector from a qualitative approach. The study identified the challenges preventing the Indian banking sector from "going green" as: lower customer trust in green goods and services, customers' reluctance to adopt new tools and technologies, lack of customers' awareness on GB products and technology, lack of education, lack of knowledge of GB activities among banking staff, high implementation costs in the short-run, and technical obstacles. Therefore, it can be concluded that high operation costs, diversification issues, start-up, reputational risks, credit risks, insufficient awareness of customers about green banking products and technology, lack of education, and ignorance of banking staffs regarding the green banking activities hinder the development of GB in developing nations such as Bangladesh.

Recently, various studies have been undertaken in the area of GB development, green financing, and also the various challenges and benefits associated with GB globally [1,3,6,9,12–21]. However, these studies are mainly focused on the adoption of GB [9,22,23]; GB activities and its development in the Bangladeshi economy [3,7,19]; challenges and benefits of GB [11–13,24]; performance and environmental sustainability of GB [4,6,14,19]; and sustainable financing [1,5,25]. Besides, a couple of studies have examined the impact of GB practices on banks' environmental performance in Pakistan [9], Nepal [26], India [20], and Sri Lanka [27]. In Bangladesh, few studies have measured the relationship between GB activities and GB performance based on secondary data [6,14,19]. However, there are very few documented

studies in the current literature that highlight the influence of GB activities on banks' environmental performance via the mediating effect of green financing in emerging countries such as Bangladesh. Therefore, a thorough investigation and exploration of the issue in Bangladesh is necessary.

This study attempts to bridge the research gap in the following ways: First, it identifies the relationship between GB activities, sources of green financing, and banks' environmental performance based on primary data. Second, the study analyzes the mediating effect of green financing in assessing the relationship between GB activities and banks' environmental performance. Third, this research identifies the major challenges and benefits of GB development by private commercial banks (PCBs) in Bangladesh. Therefore, the main purpose of this study is to investigate the impact of GB activities on green financing and banks' environmental performance, and also examine the mediating role of green financing on the relationship between GB activities and banks' environmental performance in the context of PCBs in Bangladesh. This study also identifies the major challenges and benefits of GB development in an emerging economy like Bangladesh. In order to achieve the aforementioned objectives, this study attempts to answer two questions: (i) "What are the impacts of GB activities on PCB's green financing and environmental performance in Bangladesh?" and (ii) "What are the major challenges and benefits of GB development experienced by PCBs in Bangladesh?".

The remainder of the article is structured as follows: Section 2 presents recent literature on GB, GB initiatives in Bangladesh, theoretical background and research hypotheses, and the challenges and benefits of GB development. Section 3 covers sampling, data collection, survey instruments, and data analysis techniques. Section 4 provides empirical findings and discussions, followed by the conclusion of the study, major policy implications, and study limitations and directions for future studies in Section 5, Section 6, and Section 7, respectively.

2. Literature Review and Hypotheses Development

2.1. Green Banking

Green banking is a developing idea that plays a critical role in the domains of climate issues, capital market operations, and sustainable economic development of a country [3]. GB was first introduced by the Dutch bank, Triodos Bank, in 1980 [28], and later implemented in 2009 by the State of Florida [13]. GB is a type of banking system whereby banks take the initiative to act as a conscientious institution in the society to achieve environmental sustainability internally and externally [13]. Banks engaging in such banking operations are referred to as green banks, socially responsible and sustainable banks, and ethical banks [4,10,29]. Furthermore, a Green Bank indulges in banking activities that support and implement eco-friendly technologies to decrease carbon emissions and enhance environmental management in bank transactions internally and externally [18]. GB is advantageous, as it helps to promote the goodwill and brand image of banks, which demonstrates their dedication in environmental protection [6,30]. Therefore, it can be said that GB contributes towards the development of sustainable business practices and alleviation of the negative effects of banking activities on the environment through the supply of loans for environmentally favorable initiatives.

2.2. Green Banking Initiatives in Bangladesh

Bangladesh Bank (BB), the country's central bank, is regarded as the world's first central bank to promote GB activities through the issuance of clear GB guidelines for banks and non-bank financial institutions to protect the environment from adverse weather conditions, greenhouse gas emissions, and decreasing air quality [1,4,5]. Additionally, in 2011, the BB issued GB guidelines instructing banks to implement and enforce extensive GB principles in three dimensions. In the first part, banks were required to formulate an environmental strategy, implement it in their internal operations and lending strategy, and establish a separate GB unit. Furthermore, banks were required to establish top-level regulatory bodies

to revise, manage, and allocate budgets for green finance, environmental risk funds, and internal capacity building [3,10,18]. In the second step, banking organizations were expected to design industry-specific investment strategies for their clients to make them mindful of their environment and encourage the development of green branches [3,10,18,31]. They were also required to integrate environmental issues into structured credit risk standards, develop a project evaluation environmental risk management guide, and publicly report sustainable banking activities. In the final step, banks were required to provide innovative products and constantly disclose reliable GB activity logs. The GB policy outline of the BB is presented in Table 1.

Table 1. The GB policy guidelines issued by the Bangladesh Bank (BB).

Guidelines of Green Banking	Year	References
• Guidelines were released to determine environmental risks in banks' and financial institutions' lending. • Guidelines for GB adoption were issued to banking institutions.	2011	BRPD Circular No. 01/No.02
• To facilitate a standardized presentation of banks' GB activities, a standard reporting format was established.	2012	BRPD Circular No. 07
• From January 2016, the minimum goal of direct green financing of all banks and financial institutions was fixed at 5% of the overall financed loan disbursement/investment.	2014	GBCSRD Circular No. 04
• Banks and financial institutions were instructed to set up the 'climate risk fund' and allocate a minimum of 10% of their corporate social responsibility budget for the fund. The funds may also be provided via subsidies or lower interest rates.	2015	GBCSRD Circular No. 04/2015
• Banks and financial institutions were advised to develop the Sustainable Finance Unit (SFU) and the Sustainable Finance Committee (SFC) in place of all green and corporate social responsibility units.	2016	SFD Circular No. 02
• In order to assess the environmental and social risks of the Credit Risk Management (CRM) of banks and financing institutions, the Environmental and Social Risks Management (ESRM) and excel-based risk-rating model were released. • For banks and financial institutions, a detailed list of green finance products/initiatives was circulated.	2017	SFD Circular No. 02/ No. 04
• Banks and financial institutions were paraded to track their compliance to green bank policies and other regulations, and ensure the accuracy and uniformity of information provided by banks and financial institutions through the new quarterly summary report.	2018	SFD Circular No. 01
• Scheduled banks and financial institutions' investment in the BSEC (Alternative Investment) rules of 2015 for environmentally sustainable sectors/proposals with scales of energy efficiency and resource, renewable energy, waste management and care, climate friendly transport, women's protection, child right protection, etc., are to be regarded as green finance.	2019	SFD Circular No. 01
• From September 2020 onwards, the minimum green finance target for all banks and FIs was set at 5% of the total funded term loan disbursement/investment.	2020	SFD Circular Letter No. 05/2020

Source: Sustainable Finance Department, BB (2021), for more information see: https://www.bb.org.bd/ (accessed on 1 December 2021).

2.3. Green Finance

Green finance, often known as green investment, is a term that has a lot of different meanings in academia and business [32]. Green finance is a nascent idea [33] with no clear and uniform definition [34]. Green finance is critical in advancing the green transition, which is becoming increasingly popular in both developed and developing countries [35]. However, the purpose of green finance is to achieve long-term development by balancing the advancement of monetary events, environmental stability, and ecological conservation [36]. Green finance is a new monetary phenomena [37] that integrates economic rewards with environmental protection, making it the greatest alternative for supporting environmentally friendly initiatives and organizations that promote environmental protec-

tion [1]. According to the European Commission, green finance in financial services entails investment decisions that incorporate environmental, social, and governance aspects to ensure customer and societal satisfaction [38]. As a result, in this study, green finance is defined as the financing of various environmentally friendly projects such as renewable energy, alternative energy, energy efficiency, recycling and recyclable products, waste management, and green industry development projects in order to achieve organizational sustainability [38].

2.4. Environmental Performance

Environmental performance is described as "the influence of a business's actions on the natural environment" [39]. Environmental performance includes the use of environmentally friendly elements in products, reduced pollution, reduced carbon emissions and waste at the source, improvements in energy-savings, resource efficiency, and the use of ecologically hazardous elements, among other things [40]. On the other hand, carbon and emission taxes both have the effect of reducing energy inputs, outputs, profits, and emissions of an organization [41]. Although the environmental performance of a company can be measured through its activities and products [39], the best way to assess the environmental efficiency of businesses remains the effective use of the material, as stated by Tung et al. [42]. It is noteworthy that environmental performance is not organizational protection of the environment; rather, it involves constructive and consistent administration of activities to achieve well-defined and long-term goals of natural resources conservation and business productivity [27]. As a result, environmental performance can be characterized in this study by giving green training to employees on energy and paper conservation, as well as reducing energy consumption and carbon emissions from banking activities, all of which contribute to the country's long-term development [38].

2.5. Research Hypotheses

Green banking activities are supported not only at firm level but also at policy level through the financing of green projects to ensure environmental sustainability [9]. Thus, GB practices contribute to banks' environmental performance by cutting down on activities with negative impacts on the environment (e.g., reduction of paper use, fuel consumption, and carbon emissions) and promoting environmental benefits (e.g., improvement of employee environmental training and understanding, green infrastructure, and the use of solar and wind power) [5–7]. On the other hand, green finance can be characterized as a modern financial event, which considers environmental improvement for social and economic rewards [37]. Similarly, green finance provides a new engine for sustainable economic development, with a focus on social responsibility and environmental conservation [43]. In addition, banks' overall internal carbon footprint and external carbon production can be reduced via the green financing of GB activities [1]. Thus, the purpose of green finance is to harmonize monetary progress, environmental stability, ecological security, and sustainable economic development of a country [36]. Although the environmental performance of a company can be measured through its activities and products [39], the best way to assess the environmental efficiency of businesses remains the effective use of the material, as stated by Tung et al. [42]. It is noteworthy that environmental performance is not organizational protection of the environment; rather, it involves constructive and consistent administration of activities to achieve well-defined and long-term goals of natural resources conservation and business productivity [27]. Furthermore, the emission intensity was applied to estimate the environmental performance of the firm [44], and the study stated that the firm's environmental impact can be calculated by using different indexes, rankings, or environmental scores. Therefore, it can be concluded that the activities of GB are essential to the improvement of banks' green financing and environmental performance, towards the attainment of a sustainable economic development.

More recently, Zheng et al. [1] studied the role of PCBs in the development of green finance in Bangladesh and identified the four major sources of green financing based on

the bankers' perception. The sources include investment in waste management, green establishment, green brick manufacturing recycling, and recyclable products, all of which are instrumental to the environmental improvement of banks and the sustainable economic development of a country. In another study, Rehman et al. [9] highlighted a positive relationship between GB practices (operations and policy-related practices) and banks' green financing. Furthermore, the GB activities in banks resulted in the improvement of their environmental performance by minimizing daily activities with negative environmental impact, such as cutting down on paper use, reducing energy conservation, financing ecofriendly projects, lowering fuel consumption, and minimizing carbon emissions [27]. Banks also exert a positive effect on the environment through the promotion of proper GB activities via the enhancement of environmental training and staff awareness, development of green buildings, provision of loans for green projects, and the use of solar and wind energy [1,5,27]. Miah et al. [14] studied the factors influencing the environmental performance of the banking sector in Bangladesh using a multiple regression analysis based on secondary information. They observed that the credit-rating score had a positive effect on banks' environmental performance, as opposed to bank's longevity in service.

More recently, Rehman et al. [9] studied the association between GB activities and its impact on banks' environmental performance based on the Socially Responsible Investment (SRI) theory. The findings indicate that a strong positive relationship exists among policy-related practices, daily operations practice, and green financing activities of GB in Pakistan. Similarly, Shaumya & Arulrajah [27], studied the impact of GB practices on banks' environmental performance in Sri Lanka. The study discovered that GB practices had a positive and significant effect on the banks' environmental performance. In addition, the study also revealed that staff, day-to-day activities, and policy-related practices had a positive effect on banks' overall environmental performance change, while banks' customer-related practices of GB were statistically insignificant on their environmental performance. Another study conducted by Kala [20] identified the various green initiatives integrated by banking institutions to improve their environmental performance. The GB activities include environmental training of employees, energy-efficient practices, green financing, green projects, and green policies. The study further revealed that GB activities positively influenced banks' environmental performance in Coimbatore city of India. Similarly, Risal & Joshi [26] studied the impact of GB activities on banks' environmental performance in Nepal using a multiple regression analysis. The study concluded that environmental training, banks' green policies, and the availability of energy-efficient equipment significantly affected the environmental performance of banks, contrary to customer-related practices (green financing and green projects) whose effects were discovered to be statistically insignificant. Therefore, it can be said that the involvement of businesses in GB activities and banks' financing of eco-friendly projects are means by which banks can reduce carbon emissions, improve their environmental performance, enhance their business reputation, and ultimately achieve sustainable economic development.

Based on the above discussion, two key research variables and one mediating variable were identified and include green banking practices as independent variables, sources of green financing as a mediating variable, and banks' environmental performance as a dependent variable. As a result, the current study adds to the existing literature on the GB and green funding, as well as organizational environmental management. Besides, this is recognized as one of the earliest studies to investigate the role of green financing in mediating the relationship between GB activities and bank environmental performance in emerging economies such as Bangladesh. Therefore, the following research hypotheses are provided in view of the theoretical background and review of the previous literature:

Hypothesis 1 (H1). *GB activities significantly influence banks' environmental performance.*

Hypothesis 2 (H2). *GB activities significantly impact the sources of green financing.*

Hypothesis 3 (H3). *Sources of green financing significantly affect banks' environmental performance.*

Hypothesis 4 (H4). *The relationship between GB activities and banks' environmental performance is significantly mediated by the sources of green financing.*

2.6. Challenges and Benefits of Green Banking Development

The banking sector in Bangladesh is faced with numerous challenges pertaining to the development of GB in its daily operations, which is expected to help in the achievement of the country's sustainable economic growth [1,5,7,8,11]. In addition, Islam [11] studied the challenges and opportunities of GB development in Bangladesh and discovered that high operating cost, diversification issues, start-up, reputational risks, and credit risks were the major challenges affecting GB development in Bangladesh. More recently, Qureshi & Hussain [12] studied the challenges affecting the development of GB products among Islamic and traditional banks in Pakistan. The study revealed that the key barriers in GB product design and execution in Pakistan were lack of skills, awareness, identification of a target market with suitable sources of funding, and persuasion of the people. In addition, [13] studied the GB initiatives in the Indian banking sector based on the qualitative approach and identified the various challenges of "going green'", with major challenges being a lower customer trust issue with green goods and services, customers' reluctance to adopt new tools and technology, insufficient customer awareness towards GB products and technology, lack of education, lack of knowledge among banking staffs regarding the GB activities, high implementation costs in the short-run, and technical obstacles.

In another study by Jayadatta & Nitin [45], it was discovered that the majority of banking personnel believed that GB is a proactive strategy to ensure future sustainability. However, Indian banks significantly lag behind their counterparts in industrialized nations due to the lack of education, knowledge, and preparedness to implement green projects. In the same year, Tu & Dung [23] identified the numerous challenges of green banking development in the Vietnamese banking sector, and the challenges include high costs, long pay-back duration, difficulties and complexity in assessing green projects, lack of well-trained staff, and insufficient customer awareness on the importance of GB services. Besides these disadvantages, the study also identified the various benefits of adopting GB in the banking sector. The major advantages of GB include an increase in bank competitiveness and reputation, achievement of sustainable economic development and green growth, environmental benefits, higher profits, and increased customer goodwill. Moreover, in another study conducted by Srivastava [24], it was discovered that various benefits of GB include the conservation of energy, provision of eco-friendly projects, provision of online banking facilities, reduction of long-term costs and expenses, tax advantages, improved business image, and reduction in paper consumption. Therefore, it can be concluded that GB contributes to the environmental, social, and sustainable economic development of a country. However, the insufficient awareness of customers towards green banking, high investment costs, technical obstacles, lack of capable and well-trained staff in appraising green credits, difficulties and complexity in assessing green projects, and issues relating to diversification make the development of GB inadequate in an emerging economy like Bangladesh.

3. Research Methods

3.1. Study Sample and Data Collection

Private commercial banks, amongst other banks and non-bank financial institutions, were selected due to their significant contributions to GB development in Bangladesh [1,7]. Therefore, the primary purpose of this study is to determine the impact of GB activities on banks' environmental performance and the mediating effect of green financing on the association between GB activities and banks' environmental performance. Furthermore, this study identifies the major challenges of the implementation of GB by PCBs in Bangladesh

and also shows the significant benefits of GB. To attain the aforementioned research objectives, we employed a structured questionnaire and convenience sampling method to obtain primary data from the bankers of selected PCBs in Bangladesh from May to July 2019. Convenience sampling is a sort of non-probabilistic or non-random sampling in which participants are selected who meet the specified requirements, such as ease of access, geographic closeness, availability at a specific time, or desire to participate, and are included in the study [46]. As a result, the convenience sampling strategy was a viable alternative due to the lower costs and ease of obtaining the requisite responses [47,48]. The study's sample size was calculated using criteria of Barclay et al. [49], which developed a tenfold sampling rule in which the maximum number of indicators used in the SEM technique was multiplied by 10. Based on these criteria, the survey required 140 (10 × 14) respondents. A total of 405 inquiries were delivered, of which 352 were retrieved, indicating a response rate of 86.91%. However, in order to reduce the possibility of difficulties stemming from the small sample size, 352 respondents were reached using non-probability convenience sampling approaches. The demographic information of the surveyed bankers are presented in Table 2. The output revealed that approximately 80% of the respondents were males, while 20% were females. With regards to age, the majority (52.56%) of the respondents were aged between 26 and 35 years, 22.73% between 36 and 45 years, 14% between 18 to 25 years, and the remainder of the respondents were aged 46 years and above. Among the respondents, 68.18% had a master's degree, 27% had a bachelor's degree, and only 5% had a PhD qualification. In addition, 52.56% had a working experience of 3–5 years; 38.35%, less than 2 years; and 09.90%, over 5 years.

Table 2. Demographic information of the respondents.

Variable	Items	Frequency (N)	Percentage (%)
Gender	Male	282	80.12
	Female	70	19.88
Age (years)	18–25	50	14.20
	26–35	185	52.56
	36–45	80	22.73
	46 and Above	37	10.52
Educational qualification	Bachelor	94	26.71
	Masters	240	68.18
	PhD	18	05.11
Working experience	Less than 2 years	135	38.35
	3 to 5 years	185	52.56
	Above 5 years	32	09.09

Note: N = 352. Source: Authors' calculations.

3.2. Survey Instrument

The GB activities were formulated based on the study of existing GB literature, which identifies the factors influencing the sources of green financing (mediating variable) and banks' environmental performance (BEP). To calculate these two study variables (GB and BEP) and one mediating variable (SGF), the initial survey comprised 16 items: The eight items for GB activities, five for sources of green financing (SGF), and four for banks' environmental performance (BEP). Therefore, Table 3 presents all the questionnaire items that were developed based on the existing literature on GB and green financing. As an instance, seven items were applied in the assessment of GB activities based on the extant studies of [5,9,26,27]. Four items were adopted in the assessment of the major sources of green financing according to the studies of [1,5,8], and three items were adopted in assessing banks' environmental performance [20,26,27]. Furthermore, the bankers were requested to assess the major challenges hindering the development of PCBs' GB in Bangladesh. Eleven items were extracted in the identification of major challenges affecting GB [11,12,23,50]. The respondents were also questioned to identify the major benefits of GB, with 13 items being adopted based on the previously conducted studies [23,24]. The questionnaire was

based on a five-point Likert scale (ranging from one = strongly disagree to five = strongly agree) for all the study instruments.

Table 3. Questionnaire items.

Item	Description	References
	Green banking activities (GBA).	
GBA1	Introducing energy efficient systems, solutions and practices.	[5,9,26,27]
GBA2	Introducing online banking facilities.	
GBA3	Providing loans for ecofriendly projects.	
GBA4	Organizing seminars and symposiums to promote ecofriendly practices.	
GBA5	Establishment of more green branches.	
GBA6	Reduction in paper consumption.	
GBA7	Encouragement of customers to indulge in ecofriendly-banking activities such as online bill payment, remote deposit, and e-statements.	
	Sources of green financing (SGF).	
SGF1	My bank has invested more on renewable energy sectors.	[1,5,8,38]
SGF2	My bank has invested more on energy efficiency projects.	
SGF3	My bank has invested more on recycling and recyclable products.	
SGF4	My bank has invested more on waste management and other ecofriendly projects.	
	Bank's environmental performance (BEP).	
BEP1	Reducing energy consumptions.	[20,26,27]
BEP2	Reducing carbon emissions.	
BEP3	Providing green training to staff on energy and paper savings.	

Note: Deleted measurement items from the final analysis were not included here.

3.3. Data Analysis Technique

The multivariate statistical analysis is a widely used technique, owing to its production of an accurate and realistic result [51]. The structural equation modeling (SEM) is regarded as a multivariate statistical method often used to verify the relationship among latent variables. The collected primary data were analyzed in four steps using the SPSS 22.0 (Statistical Package for the Social Sciences) and AMOS 23.0 (Analysis of Moment Structures). Descriptive statistics such as the mean and standard deviation were applied in ranking the major challenges and benefits of GB in the context of PCBs in Bangladesh. To further assess the accuracy and validity of the measurement models, the study employed the exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). After the validation of the measurement models, the SEM technique was applied to test the research hypotheses used in this study, in accordance with [52]. In addition, the Cronbach's alpha scores were employed to examine the internal reliability of the research constructs. In order to determine the convergent validity of the study, the average variance extracted (AVE), standardized factor loading values, composite reliability (CR), and various model fit indices were used. The model fit was assessed by employing the goodness-of-fit indices, in accordance with [53].

4. Results and Findings

4.1. Descriptive Statistics

Table 4 presents the outcomes of descriptive statistics, EFA via a principal component analysis (PCA), and the reliability of the study variables. We applied the EFA to calculate the factor weights of the different variables in the present study. The number of variables to be processed was determined by applying the Eigenvalue criteria, according to Cattell (1996). Furthermore, the Cronbach's α values were employed to determine the reliability and validity of the research data. Based on the EFA results, four items (GBA8, SGF5, SGF6,

and BEP4) were deleted from the green banking activities, sources of green financing, and banks' environmental performance construct, due to their factor loading being less than 0.5. The Cronbach's alpha coefficients for all the variables ranged from 0.823 to 0.845, which is satisfactory [54]. Therefore, it can be concluded that the data utilized in this study are reliable and satisfactory.

Table 4. Descriptive statistics and EFA.

Variables	Item	Mean	SD	CA (α)	EV	FL
Green banking activities (GBA)	GBA1	4.50	0.964	0.845	3.642	0.740
	GBA2	4.52	0.936			0.737
	GBA3	4.34	0.986			0.731
	GBA4	4.55	0.932			0.724
	GBA5	4.50	0.993			0.723
	GBA6	4.42	0.966			0.677
	GBA7	4.13	0.969			0.653
Sources of green financing (SGF)	SGF1	3.63	1.192	0.823	2.619	0.858
	SGF2	3.86	1.137			0.850
	SGF3	3.72	1.214			0.812
	SGF4	3.95	1.116			0.686
Bank's environmental performance (BEP)	BEP1	3.39	1.244	0.831	1.671	0.765
	BEP2	3.51	1.344			0.722
	BEP3	2.52	1.534			0.707

Note: SD: standard deviation; CA: Cronbach's alpha; EV: eigen value; FL: factor loading.

4.2. Discriminant Validity

In order to analyze the validity of the discriminant, a distinction was established between the AVE square root value and the inter-construct correlation coefficient [55,56]. Comparing the AVE square root value with the inter-factor correlation, the AVEs were observed to exceed their inter-factor correlation as presented in Table 5. Empirical results, therefore, show that no discriminating validity exists among the variables employed in the analysis.

Table 5. Discriminant validity.

	GBA	SGF	BEP	AVE	CR
GBA	0.634			0.402	0.965
SGF	0.168	0.739		0.546	0.827
BEP	0.052	0.258	0.787	0.620	0.829

Note: The AVE root is specified in italic form for diagonal values, and off-diagonal values are inter-construct squared correlations.

4.3. Measurement Model of the Study

Table 6 shows the scale items and outputs of the measurement model. To evaluate the measurement model of the study, the values of the standardized coefficients, critical ratios, and various model fit indices were applied according to [57]. The study further employed various fit indices such as goodness-of-fit index (GFI), comparative fit index (CFI), root mean square error of approximation (RMSEA), standard root mean square residual (SRMR), chi-square/degree of freedom (χ^2/df), Tucker–Lewis index (TLI), adjusted goodness-of-fit index (AGFI), and incremental fit index (IFI) to assess the overall model fit for both the measurement and structural models. The standardized factor loadings lie between 0.635 and 0.964 for all the items, which exceeds the minimum standard level of 0.6 [58]. The critical ratio values lie between 6.044 and 14.325 for all the items. This indicates that the path coefficient for all the items is significant at the 0.001 level. The measurement model fit indices were all in the acceptable standards as specified by [53]. The measurement model fit indices (χ^2/df = 2.357, GFI = 0.931, SRMR = 0.068, CFI = 0.936, TLI = 0.921, IFI = 0.937,

AGFI = 0.902, RMSEA = 0.062, *p*-value = 0.000) are shown in Table A1. Therefore, the empirical results indicate that the overall model fit is acceptable and satisfactory.

Table 6. Scale items and confirmatory factor analysis.

Construct	Item No	SRW	S.E.	CR	*p*-Value
GBA →	GBA1	0.830	0.086	9.612	***
GBA →	GBA2	0.865	0.086	10.007	***
GBA →	GBA3	0.679	0.090	11.084	***
GBA →	GBA4	0.958	0.085	11.300	***
GBA →	GBA5	0.685	*	*	
GBA →	GBA6	0.964	0.085	11.312	***
GBA →	GBA7	0.700	0.088	11.365	***
SGF →	SGF1	0.816	*	*	
SGF →	SGF2	0.777	0.063	14.325	***
SGF →	SGF3	0.715	0.068	13.215	***
SGF →	SGF4	0.635	0.063	11.674	***
BEP →	BEP1	0.726	*	*	
BEP →	BEP2	0.724	0.120	6.044	***
BEP →	BEP3	0.899	0.143	6.274	***

Note: SRW: standardized regression weight; CR: critical ratio; S.E.: standard error. * Unstandardized regression weights anticipated as 1. *** Significant level at $p < 0.001$.

4.4. Structural Model of the Study

The structural model of the study influences the association among the latent variables and constructs as depicted in Figure 1. The findings of the study indicate that the entire paths are positive and significant, and various model fit indices were applied to determine the model's appropriateness. The model fit indices (χ^2/df = 1.675, GFI = 0.953, SRMR = 0.068, CFI = 0.969, TLI = 0.969, IFI = 0.961, AGFI = 0.932, RMSEA = 0.044, *p*-value = 0.000) are presented in Table A1. Therefore, the overall structural model is satisfactory and acceptable based on the results of the different model fit indices, which were within standard limits [53].

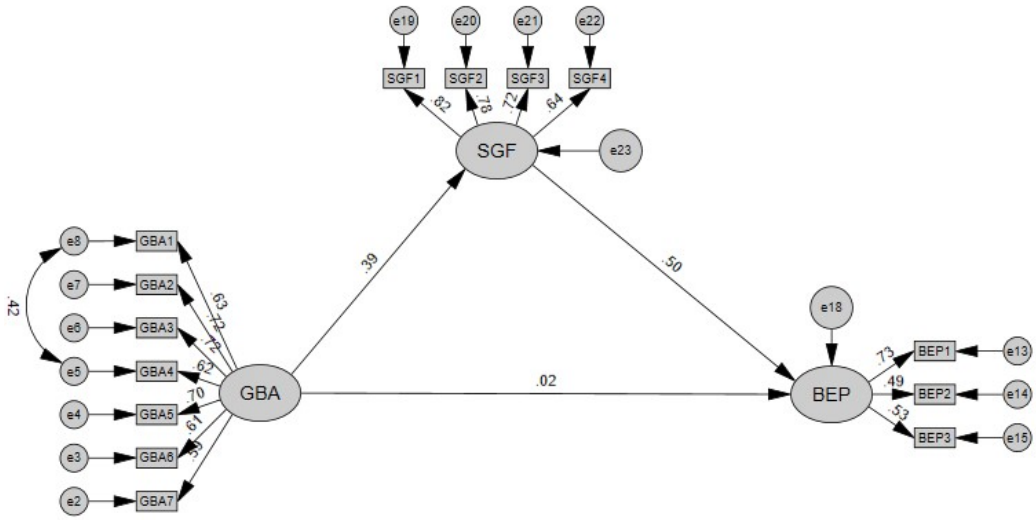

Figure 1. Structural Model with Mediation. Note: GBA, green-banking activities; SGF, green financing; BEP, banks' environmental performance.

4.5. Test of Research Hypotheses

The SEM was used to test the research hypotheses, and the results are presented in Table 7. The empirical findings show that every path was significant at the level $p < 0.0001$. According to the results in Table 7, green-banking activities had a significant affirmative impact on banks' environmental performance ($\beta = 0.269$, $p < 0.001$), thus validating H1.

The green banking activities also had a significant positive effect on the sources of green financing (β = 0.389, $p < 0.001$), which in turn significantly influence banks' environmental performance (β = 0.499, $p < 0.001$), thereby validating research Hypotheses 2 and 3. Moreover, outputs from the mediation analysis showed that the sources of green financing had significantly mediated the association between green banking activities and banks' environmental performance ((β = 194, $p < 0.001$), which affirms Hypothesis 4. Therefore, all research hypotheses are valid.

Table 7. Test of research hypotheses.

Hypotheses	Path	Standardized Estimate	*p*-Value	Decisions
H1	GBA→BE P	0.269 ***	0.000	Accepted
H2	GBA→SGF	0.389 ***	0.000	Accepted
H3	SGF→BEP	0.499 ***	0.000	Accepted
H4	GBA→SGF→BEP	0.194 ***	0.000	Full Mediation

Note: Significant at $p < 0.000$ ***.

4.6. Major Challenges of the Green Banking Implementation in Bangladesh

The respondents were requested to mention their extent of agreement or disagreement with the different barriers to the implementation of GB in PCBs of Bangladesh. Table 8 ranks the major challenges influencing the execution of GB by PCBs in Bangladesh based on descriptive statistics such as the mean and standard deviation (SD). The empirical results revealed that high investment costs and insufficient customer knowledge regarding GB, both of which have a similar mean value (mean = 4.15), are the main challenges affecting the implementation of GB in Bangladesh. Also, technical obstacles (mean = 4.14), lack of capable and well-trained staff in the appraisal of green credits (mean = 4.11), difficulties and complexities in the assessment of eco-friendly projects (mean = 4.09), diversification issues (mean = 4.08), and credit risks (mean = 4.07) are critical challenges affecting the growth and development of GB in the Bangladeshi banking sector, especially PCBs. In addition, other challenges affecting the growth and implementation of GB in Bangladesh include the reduction in banks' competitiveness in a short term period (mean = 4.06), operational self-insufficiency (mean = 4.03), and low demand for eco-friendly projects with a mean value of 3.98. Therefore, it can be concluded that these challenges need to be addressed to foster the growth and development of GB towards achieving a sustainable green economy and developed nation.

Table 8. Major challenges affecting the implementation of green banking in Bangladesh.

SL	Challenges of GB	Mean	SD	Rank
1	Insufficient awareness of customers regarding GB.	4.15	0.711	1
2	High investment costs.	4.15	0.784	2
3	Technical obstacles	4.14	0.822	3
4	Lack of capable and well-trained staff in appraising green credits/ loans.	4.11	0.844	4
5	Difficulties and complexity in assessing green projects.	4.09	0.835	5
6	Diversification issues	4.08	0.818	6
7	Credit risks	4.07	0.836	7
8	Reduction in banks' competitiveness in short terms	4.06	0.807	8
9	Operational self-insufficiency	4.03	0.848	9
10	Low demand for green credits/loans.	3.98	0.846	10

Source: The authors' calculations.

4.7. Major Benefits of Green Banking

Again, respondents were requested to check whether they were in agreement or disagreement with the various advantages of GB to assess the major benefits to be derived from the implementation of GB by PCBs in Bangladesh. Table 9 presents the major benefits of GB. The findings from the descriptive statistics show that an increase in banks' competitiveness (mean = 4.18, SD = 0.687), reduction in long term costs and expenses (mean = 4.16, SD = 0.854), provision of online banking facilities (mean = 4.15, SD = 0.711), improvement in customer goodwill (mean = 4.12, SD = 0.747), and reduction in the carbon footprint from banking activities (mean = 4.08, SD = 0.857) are the major benefits of GB. Interestingly, the results indicate that environmental-related benefits of GB include conservation of energy and provision of ecofriendly projects, both of which exhibit the same mean value of 4.07. Furthermore, achievement of a sustainable economic development by the country (mean = 4.06, SD = 0.852), increased profits for banks in the long term (mean = 4.03, SD = 0.716), tax advantages (mean = 4.01, SD = 0.801), economy in paper consumption (mean = 3.99, SD = 0.846), and promotion of banks' image (mean = 3.98, SD = 0.846) were identified as other significant benefits of GB. Therefore, to derive the full benefits of GB, it is suggested that banking authorities take appropriate measures to combat the climate change issues and achieve the sustainable development goals (SDGs) through the implementation of GB in their daily operations.

Table 9. Major benefits of green banking.

SL	Benefits of GB	Mean	SD	Rank
1	Increase in bank competitiveness.	4.18	0.687	1
2	Reduction in long term costs and expenses.	4.16	0.854	2
3	Provision of online banking facilities.	4.15	0.711	3
4	Improvement of customers' goodwill.	4.12	0.747	4
5	Reduction in the carbon footprint.	4.08	0.857	5
6	Provision of environmental related benefits.	4.07	0.789	6
7	Conservation of energy.	4.07	0.836	7
8	Provision of ecofriendly products.	4.07	0.849	8
9	Contribution towards the attainment of a sustainable economic development of the country.	4.06	0.852	9
10	Higher profits for banks in long terms.	4.03	0.716	10
11	Tax advantages.	4.01	0.801	11
12	Economy in paper consumption.	3.99	0.846	12
13	Promotion of reputation.	3.98	0.846	13

Source: The authors' calculations.

5. Discussion and Conclusions

During the last two decades, researchers, academics, and experts have become much more interested in the subject of GB and green financing in developed and developing countries. Therefore, the objective of this study was to examine the impact of GB activities on banks' environmental performance, and the mediating effect of green financing on the association between GB activities and banks' environmental performance. The study further identifies the major challenges encountered in the implementation of GB by PCBs in Bangladesh and presents the significant benefits of GB. Primary data were used in this study to achieve the above research objectives, and data were collected from bankers of the selected PCBs in Bangladesh through structured questionnaires. The SEM technique was applied to assess the research model of the study. The empirical outcomes of different model fit indices revealed that the overall research model was valid and appropriate. The outcome indicates that Hypothesis 1 is supported, highlighting a significant positive relationship

between GB activities and banks' environmental performance. This result is supported by previous studies [20,26,27]. Therefore, it can be concluded that GB activities have a positive impact on the improvement of PCBs' environmental performance in Bangladesh.

Empirical findings revealed that GB activities have a substantial positive impact on green financing of PCBs in Bangladesh, validating Hypothesis 2. This implies that GB activities play a crucial role in the growth and development of green financing in Bangladesh, as it helps to reduce environmental pollution and achieve sustainable development in the country. This finding is supported by the study conducted by Rehman et al. [9], who discovered that GB activities have a positive effect on green investments of Pakistani banking institutions. As per the results, Hypothesis 3 is validated, implying a strong positive relationship between green financing and banks' environmental performance. This finding is consistent with the study conducted by [20], but inconsistent with the study conducted by Risal & Joshi [26]. According to the study by Risal & Joshi [26], it was discovered that green loan and green projects have a negative impact on banks' environmental performance in the Nepalese banking sector. Therefore, it can be concluded that green financing helps to improve the environmental performance of banks through the investment in various ecofriendly projects such as renewable energy, energy efficiency, recycling and recyclable, waste management, and other ecofriendly projects.

This is the first study to examine the mediating effect of green financing on the association between GB activities and banks' environmental performance in the context of commercial banks in Bangladesh. The empirical findings suggest that green financing had significantly mediated the association between GB activities and banks' environmental performance, thus validating Hypothesis 4. The mediating role of green financing on the relationship between GB activities and banks' environmental performance is yet to be given due academic attention. As a result, the findings of this study considerably contribute to the current literature in its claim that green financing mediates the association between GB activities and banks' environmental performance.

The current study also revealed the significant barriers to GB development in Bangladesh, and the empirical results showed that high costs and long payback periods with ecofriendly projects, and customers' insufficient knowledge regarding GB, technical obstacles, lack of capable and well-trained staff in appraising green credits, difficulties and complexity in assessing ecofriendly projects, diversification issues, and credit risks are critical challenges affecting the growth and development of GB in the Bangladeshi banking sector. Similar findings were cited by the previously conducted studies [11,12,23,50]. In addition, other challenges affecting the growth and implementation of GB in Bangladesh include the reduction in banks' competitiveness in the short term, operational self-insufficiency, and low demand for ecofriendly projects. These results are consistent with the earlier studies [11,12,23], which identified similar challenges of GB development in developing countries such as Pakistan, Vietnam, and Bangladesh. Therefore, it is suggested that these challenges should be addressed to facilitate the growth and development of GB towards the achievement of a sustainable green economy and development of the nation.

Moreover, the findings from the descriptive statistics showed that an increase in bank competitiveness, reduction in long-term costs and expenses, provision of online banking facilities, improvement in customers' goodwill, and reduction in carbon footprints from banking activities are regarded as the major benefits of GB. Interestingly, the results indicate that benefits of GB also include environmental benefits, such as the conservation of energy and provision of ecofriendly projects, both of which have a similar mean value of 4.07. In addition, facilitating the attainment of sustainable economic development, higher profits for banks in the long term, tax advantages, economy in paper consumption, and promotion of banks' reputation are highlighted as other benefits of green banking. These results are supported by previously conducted studies [23,24]. Therefore, to derive the full benefits of GB, it is suggested that banking authorities take appropriate measures to combat climate change issues and achieve the SDGs.

6. Managerial Implications of the Study

The findings of the study provide some valuable implications to researchers, academics, managers, bankers, government authorities, banking institutions, and investors in Bangladesh to stimulate green banking through the financing of eco-friendly projects to improve banks' environmental performance. First, the empirical findings reveal that GB activities positively influence banks' environmental performance. As such, banking authorities should be more focused on the development of GB activities in their daily operations by providing online banking facilities, online bill payments facilities, remote deposits, mobile banking, green debit and credit cards, etc., to improve banks' environmental performance, as well as their profitability. In addition, the government of Bangladesh should provide tax-free incentives for banks and non-bank financial institutions to promote GB, as it would help to attain a sustainable development of the country. Second, the empirical findings indicate that green financing had significantly mediated the association between GB activities and banks' environmental performance. Therefore, to improve banks' environmental performance, banking institutions should increase their budget for ecofriendly projects such as renewable energy, alternative energy, waste management, green industry development, and energy efficiency projects. It is suggested that BB should strongly monitor the financing activities of PCBs, as this will help the country in the attainment of a sustainable economic development and SDGs. Third, the study identified various challenges such as high investment costs, lack of knowledge of customers about green banking, technical obstacles, lack of capable and well-trained staff in appraising green credits, difficulties and complexity in assessing ecofriendly projects, diversification issues, and credit risks towards the development of GB in the Bangladeshi banking sectors. In order to minimize high investment costs in the implementation of GB activities by the banking institutions in Bangladesh, the BB should provide a cooperative loan scheme to enable banks and non-bank financial institutions to work together in the development of GB in their daily operations. In addition, to increase awareness among customers and employees of banks about GB activities, banking authorities should organize educational training, seminars, and symposiums on GB. Therefore, the present study proposes the need for a collaboration among nations, banks and non-bank financial institutions, international organizations, and businesses to mitigate the problems of GB. In this respect, the BB could play a major role in monitoring, stimulating, and organizing activities relating to GB. Finally, based on this study, researchers, academics, analysts, and investors will have a better understanding of the adoption of green banking and the manner in which these activities affect banks' environmental performance in general.

7. Study Limitations and Future Directions

Given the considerable contributions offered by this study, several drawbacks that should be noted for future studies exist. First, the present study was chosen for convenience, it was restricted to bankers of PCBs, which limits the generalization of the outcomes to an extent. Therefore, the outcomes of the study could be enhanced in terms of generalization through the examination of various stakeholders including customers and clients of all state-owned commercial banks (SOCBs), foreign-owned commercial banks (FCBs), Islamic Banks (IBs), and non-bank financial institutions (NBFIs). Second, this study only employed an independent variable (GB activities) in the determination of the effect of GB activities on banks' environmental performance. Thus, future studies may include more independent variables such as employee, operation, policy, and customer-related GB practices to assess banks' environmental performance. Third, the study variables of this paper are based on the primary data obtained from the employees of PCBs. As such, future studies may combine both primary and secondary data in assessing the status of GB and green financing by banking institutions in Bangladesh, thereby enriching the study with a greater substance and an in-depth comprehension of the subject by allowing for a more communicative vision of customers.

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Appendix A

Table A1. Model fit indices.

Model Fit Indices	Measurement Model	Structural Model	Standard Value
χ^2/df	2.357	1.675	<0.05
p-value	0.000	0.000	*** $p < 0.001$
SRMR	0.068	0.068	<0.08
GFI	0.931	0.953	>0.900
AGFI	0.902	0.932	>0.900
RMSEA	0.062	0.044	<0.08
CFI	0.936	0.969	>0.900
IFI	0.937	0.961	>0.900
TLI	0.921	0.969	>0.900

Note: χ^2/df: chi-square/degree of freedom; SRMR: standard root mean square residual; GFI, goodness-of-fit index; AGFI, adjusted goodness-of-fit index; RMSEA, root mean square error of approximation; CFI, comparative fit index; IFI, incremental fit index; TLI, Tucker–Lewis index; *** significant at 0.001 level.

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