

## The profitability of green banking activities of selected banks (SCBs and PCBs) in Bangladesh: An empirical analysis



Sanjoy Kumar Sarker<sup>1\*</sup>  
Md. Golam Sharoar<sup>2</sup>  
Kamal Hossain<sup>3</sup>  
Mithun Bairagi<sup>4</sup>  
Feroz Khan<sup>5</sup>

<sup>1,4,5</sup>Department of Finance and Banking Islamic University, Kushtia 7003, Bangladesh.

<sup>1</sup>Email: [sanjayru06@gmail.com](mailto:sanjayru06@gmail.com)

<sup>2</sup>Email: [bairagipolice@gmail.com](mailto:bairagipolice@gmail.com)

<sup>3</sup>Email: [ferozkhanu98@gmail.com](mailto:ferozkhanu98@gmail.com)

<sup>2</sup>Department of Finance & Banking Bangabandhu Sheikh Mujibur Rahman Science and Technology University, Gopalganj 8100, Bangladesh.

<sup>2</sup>Email: [shahriarru20@gmail.com](mailto:shahriarru20@gmail.com)

<sup>3</sup>Department of Business Administration Pabna University of Science and Technology, Pabna 6600, Bangladesh.

<sup>3</sup>Email: [hossain.kamal7523@gmail.com](mailto:hossain.kamal7523@gmail.com)



(+ Corresponding author)

### ABSTRACT

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Global warming is a significant global issue, and Bangladesh is one of the countries most adversely impacted, facing numerous environmental and economic problems. This study addresses these challenges by reviewing existing research to identify gaps in knowledge and aims to assess the profitability of green banking activities in Bangladesh. The research focuses on how green banking activities, guided by specific policy frameworks, can contribute to financial performance. However, it explores not only the profitability of these activities but also the associated challenges and opportunities, providing prospects, suggestions, and recommendations for selected banks. The statistical techniques are used, i.e., descriptive statistics, graphic presentations, ANOVA, post-hoc test (LSD), linear regression in SPSS, and regression for panel data in Gretl, etc. After analyzing the data, the results of this study inform us of the theoretical understanding by statistical proved for areas of policy guidelines of green banking practice and informs us empirical understanding by statistical verified for the profitability of green banking activities regarding policy guidelines of green banking by selected SCBs & PCBs. Finally, it is observed comparatively among SCBs, the RBL is the best performer, and among PCBs, the IBBL is the best performed comparatively, but JBL among SCBs and BAL among PCBs are in the most unfavorable position comparatively. The implications of the empirical analysis on the profitability of green banking activities among selected banks (SCBs and PCBs) in Bangladesh extend beyond the immediate financial realm, encompassing environmental sustainability, regulatory compliance, and the long-term viability of the banking sector.

**Contribution/ Originality:** Beyond profitability, the study contributes to the discourse on environmental sustainability and regulatory compliance within the banking sector. By linking green banking practices to tangible financial outcomes, the research supports the argument for more sustainable banking operations.

### 1. INTRODUCTION

The concept of "Green" encompasses a wide range of social, ethical, and environmental aspects (Cepni, Demirer, & Rognone, 2022; Kanamura, 2020; Siddique, Nobanee, Hasan, Uddin, & Nahiduzzaman, 2024). Across

cultures, it signifies life, growth, and renewal, symbolizing efficiency and the reduction of wasteful practices in both personal and business endeavors. In this context, green banking utilizes advanced technologies and innovative strategies to enhance financial operations while reducing costs compared to traditional methods (Cao, Nie, Sun, Sun, & Taghizadeh-Hesary, 2021; Lv, Shao, & Lee, 2021). This approach fosters a lifestyle that is economically sound, spiritually uplifting, debt-free, and environmentally conscious.

Green banking involves conducting banking operations in a way that minimizes carbon emissions and reduces the overall environmental footprint (Bukhari, Hashim, & Amran, 2020; Zhang, Wang, Zhong, Yang, & Siddik, 2022). Although banks and financial institutions may not be directly impacted by environmental issues, they play a crucial role in supporting businesses that meet stringent environmental standards. Green Banking (GB) aligns with traditional banking while integrating social, environmental, and ecological considerations to protect natural resources. It's also known as ethical or sustainable banking (Park & Kim, 2020).

Bangladesh Bank took the lead in establishing green banking regulations in 2011, becoming the first central bank globally to create clear guidelines for State-Owned Commercial Banks, Private Commercial Banks, and Foreign Commercial Banks (Khairunnessa, Vazquez-Brust, & Yakovleva, 2021; Rifat, Nisha, Iqbal, & Suviitawat, 2016). This initiative aimed to encourage the banking sector in Bangladesh to adopt green practices and contribute to environmental sustainability. Following Bangladesh Bank's guidance, commercial banks in Bangladesh actively implemented green banking policies in 2011. According to the [Green Banking and CSR Department of Bangladesh Bank \(2013\)](#) green banking units and financing policies were developed, leading to significant progress in funding green products. Bangladesh Bank's success in promoting green financing projects led to the introduction of special refinancing schemes to further support the development of green products in the country.

It is revealed that green banking was formally started in 2003 for protecting the environment in global banks. After introducing green banking, the initial decision was to minimize the paper used in banking works, reduce the Oxygen, and increase the carbon dioxide in the global environment. At present, climate change is one of the most important challenging issues in the world (Gazi, Nahiduzzaman, Shaturaev, Dhar, & Halim, 2022). Bangladesh is also facing serious natural and climate change every year. The banking sector is one of the major sources for financing industrial projects such as steel, paper, cement, chemicals, fertilizers, power, textiles, etc., which cause maximum carbon emission (Gazi, Nahiduzzaman, Harymawan, Masud, & Dhar, 2022; Naim, 2018). The banking sector can play a significant role between economic development and environmental protection for promoting environmentally sustainable investment (Gazi, et al., 2022). That's why Banks developed the new concept of banking is 'Green Banking.' Green banking helps to reduce the external carbon emission and internal carbon footprint (Choudhury & Saha, 2017).

Ullah (2018) noted that Bangladesh Bank introduced a uniform reporting format for reporting green banking activities in a structured manner for banks in 2012. In 2013, 'Policy Guidelines for Green Banking' were also issued to the Financial Institutions and the scheduled banks 2013, where they were brought under the structured reporting system. Bangladesh Bank has created Tk. 2 billion funds for other green products, including solar energy and bio-gas and effluent treatment plants (ETP). Bangladesh Bank enhanced the product line to 50 under 11 categories, including Renewable Energy, Energy Efficiency, Solid Waste Management, Liquid Waste Management, Alternative Energy, Fire Burnt Brick, Non-Fire Block Brick, Recycling and Recyclable Product, Green Industry, Ensuring Safety & Work Environment of Factories etc. So, the banks are trying more to follow the prescriptions of Bangladesh Bank.

For developing countries like Bangladesh, environmental sustainability and climate change resilience are key elements of inclusive socio-economic development (Gazi et al., 2021). In addition to lending, in Bangladesh, internal banking operations have considerably increased the carbon discharge due to their massive use of energy through lighting, air-conditioning, electrical equipment, etc (Rahman, Ahsan, Hossain, & Hoq, 2013). Bangladesh

Bank is quite concerned about the environmental degradation situation and has been providing continuous support and directions to all scheduled banks. Bangladesh Bank issued a circular for the country's scheduled banks, asking them to adopt green strategic planning for 2013 and beyond ([Green Banking and CSR Department of Bangladesh Bank, 2011](#)).

Since with climate change and environmental degradation posing severe threats, banks are increasingly adopting green initiatives to reduce their carbon footprint and contribute to a more sustainable future. This research aims to explore the profitability of green banking activities among selected banks in Bangladesh, focusing on both SCBs and PCBs.

The remainder structure of this paper is organized as follows: Section 2 provides a review of the pertinent literature. Section 3 describes the methods and data used in the study. Section 4 displays the outcomes from the empirical analyses and robustness checks. The findings of this study are demonstrated in the Section 5. Lastly, Section 6 offers the conclusions and potential recommendations.

### *1.1. Objectives of the Study*

- To highlight the present scenarios of income generating from green banking activities of selected banks during 2011-2018.
- To evaluate profitability of green banking activities of the selected banks during study period.
- To focus on comparative status of the selected banks during study period.
- To suggest for improvement of financial performance of green banking activities.

## **2. REVIEW OF RELATED LITERATURE**

[Aggrawal \(2010\)](#) conducted a study entitled "Factors Affecting Green Marketing in India: A Study of Metro Consumers." This study was prepared for identifying the green challenge in the case of green banking. The study was based on empirical in nature and found the consumer perception of the green products and the factors that affect their purchasing behavior for the green products. The researcher found that there are selected factors that affect green marketing, especially the consumers' satisfaction. So suggested that the banks should increase the green products to ensure consumers' satisfaction.

[Agha \(2016\)](#) presented an important idea in the article "Green Finance for Developing Countries." The report was developed by [Forstater, Halle, and Zadek \(2016\)](#) from the UNEP Inquiry drawing on interviews with practitioners, regulators, and experts from developing countries, including Bangladesh, Colombia, Kenya, Mongolia, Morocco, Nigeria, Peru, and Vietnam. It draws on a meeting co-hosted with the Swiss Ministry of Finance in Geneva with practitioners and regulators from Egypt, Honduras, Jordan, Kenya, Mauritius, Mongolia, Morocco, Philippines, Thailand, and Vietnam. The scenario of developing countries green finance was not satisfactory. She was suggested that green finance should be increased in developing countries to ensure sustainable economic growth and a favorable environment.

[Ahmad, Zayed, and Harun \(2013\)](#) prepared a critical study entitled "Factors behind the Adoption of Green Banking by Bangladeshi Commercial Banks." This study represents the trying of green banking activities of Bangladeshi commercial banks and finding out the reasons behind adopting green banking. The total sample size was 300 respondents from the members of ten commercial banks. Factor analysis was the main tool for generating findings and outcomes. It revealed the six factors, i.e., economic factor, policy guideline, loan demand, stakeholder's pressure, environmental interest, and a legal aspect, which directly and indirectly affects green banking activities. These identified six factors have a combined variance of 65.25% on the decision regarding adopting green banking issue by the commercial banks to ensure sustainable economic development of Bangladesh.

Papastergiou and Blanas (2011) performed a research study on "Sustainable Green Banking: The Case of Greece." The author analyzed this paper for the banks' sustainable development in Greece and approached the new area in an innovative integrated way. This study tries to analyze the situation using the model of Jeucken. The aim was to present the recent literature and the information provided by banks to get clear the picture of sustainable banking in Greece. The methodology was selected based on literature review and secondary data. The theoretical description and the green banking system of Greece were presented in detail in this paper. This paper revealed that the banks' sustainable attitude, which can be financed, including risks for product development, environmental care, and communication for the organization.

Aro-Gordon (2016) passed an opinion in the article entitled "Green Banking in Nigeria: The First Steps." This study was prepared based on the study of Nigeria's sustainable banking principles and applications to priority sectors. Nigeria's central bank has set up several policies for green banking to ensure the higher practice of green banking by Nigeria's commercial banks. Firstly, green banking growth was growing slow rate, but it was growing rapidly in Nigeria after some period. So, several strategies & policies should be developed for commercial banks to ensure green banking in Nigeria.

Bangladesh Bank (2011) revealed a report on green banking entitled "Banking Regulation & Policy Department Bangladesh Bank." This report demonstrates that urgent measures are required by stakeholders for sustainable development and thereby save the planet. Banks hold a unique position in an economic system that can affect production, business, and other economic activities through their financing actions, contributing to the polluting environment. Moreover, energy and water efficiency and waste reduction are highlighted concerns to the banks. Green banks' environmentally responsible banks improve their standards and affect other businesses worldwide' socially responsible behavior.

Deka (2018) conducted a study entitled "Adoption and Usage of Sustainable Green Banking Practices: An Empirical Study on Internet Banking in Assam." It has evaluated the different green banking practices in Assam, which is adopted by commercial banks, and studying the adoption and usage of green banking practices, including merits-demerits, utility, and employment issues of internet banking by the researcher. The researcher has collected primary information from five districts in Assam: Jorhat, Kamrup Rural, Kamrup Metro, Dibrugarh, and Nagaon through a number of 500 questionnaires and secondary data been used to get the required result by using descriptive statistics tools. The author found from the analysis that people are not aware of green banking practices. The respondents are used various green banking practices irrespective of gender, lower age, higher income, and higher educated group people are more effective users of green banking.

Dharwal (2015) wrote an important article on "Green Banking: An Innovative Initiative for Sustainable Development." Climate change is the most complicated issue the world is facing new. It is noted that the number of innovative green banking initiatives for sustainable development is very poor in the banking sector. Each of the banks should adopt technology, process, and products, which result in a substantial reduction of their carbon footprint and develop a sustainable banking business.

Fashli, Herdiansyah, and Saragi (2018) conducted a study entitled "Green Banking and Infrastructure Project Financing for Sustainable Development." The authors have identified the utilization of funds by industrial projects and sustainable development financed by green banking projects by the banks in Indonesia. This study is based on the quantitative analysis used by the Sustainable Equity and Responsible Investment index. Also, I have argued that this paper will encourage a reference to the corporation to incorporate aspects of environmental protection and the development of green banking policies in the future for sustainable growth.

Ha (2015) conducted a study entitled "Green Banking Model-International experiences and lessons for Vietnam." The research focused on the green banking model, international experiences, and lessons learned for Vietnam. The objectives were to clarify the categories of green banking and Green Bank concepts by conducting a

comparative analysis between green banking characteristics and traditional banking activities and evaluating two green banking models as the two distinguished cases. The case study method was followed in this research and revealed that the current legal framework supports the creation of better conditions for developing a green bank model within Vietnam's specific context. The research study showed that the green bank concept is no longer a new issue in Vietnam. [Hasnain \(2014\)](#) developed a study on "Concept Paper on Green Banking in Infrastructure, Housing, and SME Finance Department." The term 'Green' has a broader usage and covers banks' social responsibility as corporate citizens. The term green banking means developing inclusive banking strategies that ensure sustainable economic development. This paper used secondary data from the Infrastructure, Housing, and SME Finance Department websites, analyzed the data, and represented that green banking significantly impacts every department. So, the concerned departments should concentrate on the green banking system for ensuring a green environment in all sections of society. [Hoque, Mowla, Uddin, Mamun, and Uddin \(2019\)](#) wrote an important article on "Green Banking Practices in Bangladesh: A Critical Investigation." The authors considered non-bank financial institutions and commercial banks to get the present status of green banking by taking primary and secondary information and using applied techniques to determine the actual condition. They considered 44 banks out of 57 banks, and 13 out of 33 NBFIs (NBFIs" stands for Non-Bank Financial Institutions) have practiced green banking by direct and indirect green financing, although 45 banks 25 NBFIs are concerned with environmental risk rating management. They also explored every bank and NBFIs that has green banking policy guidelines, but they do not provide green banking services as much as the desired of countries.

[Pal \(2015\)](#) prepared an important study entitled "Smart Green Banking: Product with Deposit-Payment Mechanism in Education Discipline for Inclusive Financial Growth." The green economy is the elemental philosophy of Sustainable Development Goals (SDG). The author identified the smart green banking product with a payment mechanism and showed the relevancy to financial inclusion. They were suggested that green technology should be applied from the basic level. Some steps should be taken for going green banking, including online banking, green accounts, green financing, power savings types of equipment, green debit cards/ credit cards, save paper and mobile banking, etc.

[Ramila and Gurusamy \(2015\)](#) conducted a study entitled "Impact of Green Banking Initiatives Adopted by Public Sector Banks on Profitability." The author investigates green banking initiatives such as NEFT, RTGS, ECS, ATM, POS, and Mobile banking, which positively impact the public sector banks' profitability. It was found that both ECS and ATM transactions create a more positive impact on public sector banks' profitability among the other events compared to other green banking initiatives. So, suggested that banks should be considered green banking practices towards green banking and take the initiative of green banking practice. [Rao \(2015\)](#) conducted a study entitled "An empirical study on Green Banking in India." This paper revealed that banks in India still have a long way to go. As part of the "Green Initiative," the NBFs take proactive steps to promote day-to-day using electronic payment systems. This study provides detailed information on green banking, important initiatives, etc., that are taken for the country. It plays a vital role in the sustainable development of the nation and the global warming effects. A survey was conducted on green banking to collect the response through questionnaires from 40 customers and seven banks. Practically it is a form of banking, taking into account the social and environmental impacts. Its main motive is to protect and preserve the environment. So, the banks should use green banking for the well-being of the stakeholders. [Srivastava \(2016\)](#) presented an essential idea in the article entitled "Green Banking: Support and Challenges." A good thing is proposed that there are greater awareness and a growing commitment to address environmental problems. It is the ways and technologies to go green through "Green Banking" and the confronting challenges of going green in the banking sector. The qualitative and descriptive methods were used in this study. It describes the support and challenges connected with green banking. So, the banks should consider the benefits and challenges of green banking (GB) in India to take the initiative regarding GB. [Zhelyazkova and](#)

Kitanov (2015) wrote an important article on "Green Banking – definition, scope, and proposed business model." This term, green banking is gaining more popularity in recent years. It is a popular PR strategy section in several financial institutions, but the lack of initiatives makes green banking less popular. Green banking makes a connection and relationship between green banking and the environment, along with the stakeholders. It was suggested that banks understand the meaning, process, and scope of green banking and implement green banking's business model in the real field of banking.

### 3. DATA AND METHODOLOGY OF THE STUDY

This chapter is expressed about methodology of the study, including sample of the study, sources of data & data collection, period of the study, methods of analysis, evaluations & justifications of statistical methods or techniques and used statistical tools, etc.

#### 3.1. Sample of the Study

Table A displays the number of sample banks included in this study. The Commercial Banks are selected based on purposive sampling. The banks were selected no. of 4 State-owned Commercial Banks (SCBs) & 4 Private Commercial Banks (PCBs), i.e., the reason behind choosing those banks is the availability of data on green banking activities provided by the selected banks in Bangladesh. Another ground of choosing those banks is to play a proactive role of SCBs and PCBs for adopting the green banking guidelines and financing green projects over the period. The selected samples of the study are as follows;

Table A. Sample banks.

Sample banks	
State-owned commercial banks (SCBs)	Private commercial banks (PCBs)
1. Agrani bank limited (ABL)	1. Dutch-Bangla bank limited (DBBL)
2. Sonali bank limited (SBL)	2. Bank Asia limited (BAL)
3. Janata bank limited (JBL)	3. National bank limited (NBL)
4. Rupali bank limited (RBL)	4. Islami Bank Bangladesh limited (IBBL)

#### 3.2. Sources of Data

The study covers the period 2011-18 based on secondary data. The research is completed both quantitative & qualitative nature. The secondary data has been collected from annual reports of the selected commercial banks, quarterly, half-yearly & yearly reports of Bangladesh Bank, bulletins, magazines, journals, websites, etc.

#### 3.3. Period of the Study

The selected period covers eight years, i.e., during 2011-2018.

#### 3.4. Techniques of Analysis

The statistical techniques are used in this study, i.e., descriptive statistics, graphic presentations, chi-square test, ANOVA, linear regression and regression for panel data using Gretl etc.

## 4. ANALYSIS AND INTERPRETATION OF DATA

### 4.1. Green Banking Profitability

This segment highlights green interest income; green interest income compares to total interest income, green non-interest income, green operating income, and green operating income compared to total income during 2011-18 for selected banks. Table A-01 to A-04 is shown the descriptive analysis of green banking profitability.

Table A-1. Interest income from green finance &amp; investment of banks in 2011-18 (Tk. in a million).

Year	SCBs				Avg.	PCBs				Avg.	GA
	ABL	SBL	JBL	RBL		DBBL	BAL	NBL	IBBL		
2011	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	0.00	0.00	0.00	134.00	34.00	0.00	10.00	39.00	3163.00	803.00	418.00
2013	1.00	1.00	213.00	73.00	72.00	0.00	4.00	40.00	5269.00	1328.00	700.00
2014	17.00	2.00	67.00	3.00	22.00	14.00	3.00	112.00	5541.00	1418.00	720.00
2015	31.00	3.00	32.00	3.00	17.00	37.00	5.00	73.00	7133.00	1812.00	915.00
2016	38.00	3.00	116.00	3.00	40.00	3372.00	1.00	204.00	7845.00	2856.00	1448.00
2017	28.00	1.00	75.00	3.00	27.00	2572.00	3.00	1135.00	7864.00	2894.00	1460.00
2018	38.00	5.00	75.00	5.00	31.00	5126.00	3.00	8218.00	856.00	3551.00	1791.00
Avg.	19.00	2.00	72.00	28.00	30.00	1390.00	4.00	1228.00	4709.00	1833.00	932.00
SD	17.00	2.00	70.00	49.00	21.00	2029.00	3.00	2849.00	3073.00	1193.00	599.00
CV	87.63	91.04	96.22	176.08	68.50	145.93	79.23	232.08	65.25	65.12	64.34
AGR	256.00	79.00	274.00	-96.00	128.00	1331.00	122.00	649.00	-73.00	507.00	343.00
Max.	38.00	5.00	213.00	134.00	72.00	5126.00	10.00	8218.00	7864.00	3551.00	1791.00
Min.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Annual reports of the selected banks during 2011-2018.

Table A-1 presents the tabular representations of the interest income from green finance and investment of the selected banks over the study period (2011-2018). The JBL had a maximum average volume of green interest income, i.e., Tk. 72.00 million followed by RBL, ABL & SBL, i.e., Tk. 19.00, 2.00 & 28.00 million respectively. The JBL average is above, but the average of ABL, RBL & SBL is below the average of SCBs, i.e., Tk. 30 million. The IBBL is the highest volume of green interest income, i.e., Tk. 4709 million after that DBBL, NBL & BAL, i.e., Tk. 1390.00, 228.00 & 4.00 million respectively. The average of IBBL is above, but the average of DBBL NBL & BAL is below the average of PCBs, i.e., Tk. 1833 million. The average of SCBs is lower & PCBs are greater than grand average, i.e., Tk. 932 million.

The SBL had the minimum SD, i.e., Tk. 2.00 million afterward ABL, RBL & JBL, i.e., Tk. 17.00, 49.00 & 70.00 million, respectively but the average of SCBs, i.e., Tk. 21 million. The BAL had minimum SD, i.e., Tk. 3.00 million, followed by DBBL, NBL & IBBL, i.e., Tk. 2029.00, 2849.00, and 3073.00 million, respectively but the average of PCBs, i.e., Tk. 1193 million. The average SD of SCBs is lower, and the PCBs average is greater than the grand average of SD, i.e., 599.00% during 2011-18, which implies the huge variation for the same.

The annual growth rate of the ABL, JBL, SBL & RBL, i.e., 256.00, 274.00, -79.00 & 96.00 percent respectively but the average of SCBs, i.e., 128.00%. The selected PCBs the DBBL, NBL, BAL & IBBL, i.e., 1331.00, 649.00, 122.00 & -73.00 percent respectively but the average of PCBs, i.e., 507.00%, while grand average, was 443.00%.

Tables A-2 highlights that the percentage of green interest income of the selected banks' total interest income during 2011-2018. The RBL had maximum average, i.e., 0.23% followed by JBL, ABL & SBL, i.e., 0.21, 0.08 & 0.01percent respectively. The average of SCBs, i.e., 13%. The IBBL is the highest average, i.e., 9.29% subsequently DBBL, NBL & BAL, i.e., 7.66, 4.61 & 0.03 percent respectively. The average of SCBs is below, and PCBs, i.e., 5.39%, are upper than the grand average, i.e., 2.76%.

The SBL had the minimum SD, i.e., 0.01% afterward ABL, JBL & RBL, i.e., 0.07, 0.20 & 0.42 percent respectively but the average of SCBs, i.e., 0.17%. The BAL had minimum SD, i.e., 0.02% followed by IBBL, NBL & DBBL i.e., 5.90, 10.15 & 10.73 percent respectively compare with the average of PCBs, i.e., 6.70%. The average SD of SCBs, i.e., 17%, is lower than, and PCBs average, i.e., 6.70%, is greater than the grand average of SD, i.e., 3.44% during 2011-18.

Table A-2. Green interest income as % of total interest income of banks in 2011-18 (In percentage).

Year	SCBs				Avg.	PCBs				Avg.	GA
	ABL	SBL	JBL	RBL		DBBL	BAL	NBL	IBBL		
2011	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	0.00	0.00	0.00	1.15	0.29	0.00	0.07	0.21	7.24	1.88	1.08
2013	0.01	0.01	0.59	0.57	0.29	0.00	0.03	0.21	10.94	2.80	1.54
2014	0.07	0.01	0.20	0.02	0.07	0.09	0.02	0.54	11.28	2.99	1.53
2015	0.13	0.01	0.11	0.02	0.07	0.23	0.03	0.38	14.85	3.87	1.97
2016	0.18	0.01	0.36	0.02	0.14	21.55	0.01	1.08	14.88	9.38	4.76
2017	0.13	0.00	0.24	0.02	0.10	15.56	0.02	5.04	13.81	8.61	4.35
2018	0.12	0.02	0.22	0.03	0.10	23.87	0.02	29.39	1.28	13.64	6.87
Avg.	0.08	0.01	0.21	0.23	0.13	7.66	0.03	4.61	9.29	5.39	2.76
SD	0.07	0.01	0.20	0.42	0.17	10.73	0.02	10.15	5.90	6.70	3.44
CV	88.10	86.14	91.21	183.31	112.19	140.08	88.70	220.44	63.58	128.20	120.20
AGR	1866	220.00	-62.99	-97.38	481.57	25288	-79.73	14168	-82.37	9823	5152
AAGR	170.72	44.92	12.74	-14.18	53.55	1360.05	-2.24	166.84	-1.70	380.74	217.14
Max.	0.18	0.02	0.59	1.15	0.48	23.87	0.07	29.39	14.88	17.05	8.77
Min.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Table A-01 & exhibit B-09, calculating using Microsoft office excel.

The annual growth rate of selected SCBs, the ABL, SBL, JBL & RBL, i.e., 1866, 220.00, -97.38 & -62.99 percent respectively, and the average volume of SCBs, i.e., 481.57%. The selected PCBs the DBBL, NBL, BAL & IBBL, i.e., 25288, 14168, -82.37 & -79.73 percent respectively, and the average of PCBs, i.e., 9823%. The average of selected SCBs, i.e., 481.57, and within PCBs, the BAL & IBBL is lower than the grand average, i.e., 5152%, and the average of DBBL & NBL is upper than grand average, i.e., 5152%.

Table A-3. Non-interest income of GB activities of selected banks during 2011-18 (Tk. in million).

Year	SCBs				Avg.	PCBs				Avg.	GA
	ABL	SBL	JBL	RBL		DBBL	BAL	NBL	IBBL		
2011	1209	2862	2088	611	1692	1279	300	235	877	673	1183
2012	1051	2557	2180	484	1568	1707	447	913	1122	1047	1308
2013	1040	1524	1379	509	1113	2091	505	969	986	1137	1125
2014	971	1175	1797	681	1156	2196	571	761	1223	1188	1172
2015	1025	533	1778	578	979	2259	582	713	1729	1321	1150
2016	1426	675	1831	580	1128	2351	683	535	2102	1418	1273
2017	1111	313	1999	767	1048	3076	809	593	3132	1903	1475
2018	1374	257	2002	1160	1198	3533	985	1165	3958	2410	1804
Avg.	1151	1237	1882	671	1235	2311	610	735	1891	1387	1311
SD	169	1007	249	217	255	715	214	288	1119	541	229
CV	14.72	81.37	13.22	32.36	20.64	30.92	35.14	39.20	59.18	38.97	17.49
AGR	13.62	-91.00	-4.12	89.97	-29.19	176.30	228.25	394.64	351.55	258.29	52.58
AAGR	3.64	-24.78	1.32	12.42	-3.62	16.24	19.21	49.76	25.46	21.16	6.83
Max.	1426	2862	2180	1160	1692	3533	985	1165	3958	2410	1804
Min.	971	257	1379	484	979	1279	300	235	877	673	1125

Source: Annual reports of the banks during 2011-2018 & calculating using Microsoft office excel.

Table A-3 focuses on the non-interest income of selected banks' green banking activities during 2011-18. The JBL had the maximum average volume of non-interest income of green banking activities, i.e., Tk. 1882 million followed by SBL, ABL & RBL, i.e., Tk. 1237, 1151 & 671 million, respectively, while the average of SCBs, i.e., Tk. 1235 million. The DBBL had the maximum average volume, i.e., Tk. 2311 million next to IBBL, NBL & BAL, i.e., Tk. 1891, 735 & 610 million, respectively, while the average of PCBs, i.e., Tk. 1387 million. The average of SCBs is below, and the PCBs is upper than the grand average, i.e., Tk. 1311 million.



The annual growth rate of selected SCBs the ABL, SBL, JBL & RBL, i.e., 13.62, -91, -4.12 & 89.97 percent respectively, and the average volume of SCBs, i.e., -29.9%. The selected PCBs the DBBL, NBL, BAL & IBBL, i.e., 176.30, 228.25, 394.64 & 351.55 percent respectively, and the average of PCBs, i.e., 258.29%. From the grand average, i.e., 52.58%, which is higher than the SCBs average but below the PCBs average. The minimum of green non-interest income for selected banks over the study period is 0, but the maximum of selected banks is ABL, SBL, JBL, RBL, DBBL, BAL, NBL & IBBL, i.e., Tk. 1426, 2862, 2180, 1160, 3533, 985, 1165, 3958 million respectively.

The ABL had the minimum SD, i.e., Tk. 169 million afterward RBL, JBL & SBL, i.e., Tk. 217, 249 & 1007 million respectively while average of SCBs, i.e., Tk. 255 million. The BAL had minimum SD, i.e., Tk. 214 million than NBL, DBBL & IBBL, i.e., Tk. 288, 715 & 1119 million respectively but the average of PCBs, i.e., Tk. 541 million. The average SD of SCBs is lower than, and PCBs is greater than the grand average of SD, i.e., Tk. 229 million during 2011-18.

**Table A-4.** Operating income from GB activities of selected banks in 2011-18 (Tk. in million).

Year	SCBs				Avg.	PCBs				Avg.	GA
	ABL	SBL	JBL	RBL		DBBL	BAL	NBL	IBBL		
2011	1209	2862	2088	611	1692	1279	300	235	877	673	1183
2012	1051	2557	2180	618	1602	1707	457	952	4285	1850	1726
2013	1041	1526	1592	582	1185	2091	509	1009	6254	2466	1825
2014	988	1176	1863	684	1178	2211	575	873	6764	2606	1892
2015	1463	678	1946	582	1167	5722	685	739	9947	4273	2720
2016	1140	315	2074	770	1075	5648	813	1728	10996	4796	2935
2017	1412	263	2077	1165	1229	8659	988	9383	4814	5961	3595
2018	1170	1239	1954	699	1266	3702	614	1963	6600	3220	2243
Avg.	1184	1327	1972	714	1299	3877	617	2110	6317	3231	2265
SD	173	965	183	194	223	2588	214	2989	3192	1708	777
CV	14.61	72.72	9.30	27.13	17.15	66.74	34.65	141.63	50.53	52.87	34.29
AGR	-3.25	-56.70	-6.41	14.51	-25.22	189.50	104.58	733.83	652.88	378.62	89.65
AAGR	1.95	26.48	-0.04	5.95	-3.35	30.76	14.01	111.31	68.77	38.36	13.13
Max.	1463	2862	2180	1165	1692	8659	988	9383	10996	5961	3595
Min.	988	263	1592	582	1075	1279	300	235	877	673	1183

Source: Annual reports of the selected banks during 2011-2018.

Table A-4 shows the operating income from green banking activities of the selected banks during 2011-2018. The JBL had a maximum average volume, i.e., Tk. 1972 million next SBL, ABL & RBL, i.e., Tk. 1327, 1184 & 714 million, respectively, while the average of SCBs was Tk. 1299 million. The IBBL had the maximum volume, i.e., Tk. 6317 million later on DBBL, NBL & BAL, i.e., Tk. 3877, 2110 & 617 million, respectively, and the average of PCBs was found Tk. 3231 million. If we look at the average, SCBs had the below, and the volume of PCBs was shown upper than the grand average, i.e., Tk. 2265 million.

The ABL had the minimum SD, i.e., Tk. 173 million, which impels the poor variation followed by JBL, RBL & SBL, i.e., Tk. 183, 194 & 965 million, respectively, while the average of SCBs, i.e., Tk. 223 million. The BAL had minimum SD, i.e., Tk. 214 million, subsequently DBBL, NBL & IBBL, i.e., Tk. 2588, 2989 & 3192 million, respectively, whereas the average of PCBs, i.e., Tk. 1708 million.

RBL had positive AGR, i.e., 14.51%, but other Banks, i.e., ABL, SBL & JBL, had negative growth among the selected SCBs during 2011-18. PCBs had a positive AGR among the selected PCBs like BAL, i.e., 733.83, IBBL, i.e., 652.88, DBBL, i.e., 189.50 & NBL, i.e., 104.58 percent respectively, but the average volume was 378.62% found in the selected PCBs. Practically grand average of the same was 89.65%, where the average of SCBs had lower, and PCBs had a higher position, which indicates positive for the same during the study period.

**Table A-5.** Green operating income as % of total operating income of banks 2011-18 (In percentage).

Year	SCBs				Avg.	PCBs				Avg.	GA
	ABL	SBL	JBL	RBL		DBBL	BAL	NBL	IBBL		
2011	5.70	4.65	4.56	13.53	7.11	9.35	21.99	9.45	7.02	11.95	9.53
2012	16.43	10.78	6.85	17.41	12.87	5.90	8.61	2.54	1.06	4.53	8.70
2013	10.94	14.36	7.54	33.59	16.61	14.26	22.86	18.65	8.20	15.99	16.30
2014	3.02	2.85	2.85	10.57	4.82	4.19	5.93	5.99	4.24	5.09	4.96
2015	6.26	7.44	9.64	30.22	13.39	14.70	54.39	43.19	30.85	35.78	24.59
2016	1.41	1.92	2.20	8.87	3.60	3.68	6.20	4.98	3.09	4.49	4.04
2017	0.97	3.00	3.93	6.97	3.72	4.25	5.98	10.77	26.08	11.77	7.74
2018	3.47	10.9	26.18	59.46	25.00	39.17	69.05	69.96	11.98	47.54	36.27
Avg.	6.03	6.99	7.97	22.58	10.89	11.94	24.38	20.69	11.57	17.14	14.02
SD	5.28	4.60	7.78	17.83	8.87	11.86	24.38	23.77	11.02	17.76	13.32
CV	87.60	65.90	97.58	78.95	82.51	99.37	100.03	114.88	95.32	102.40	92.45
AGR	-68.28	-24.09	247.21	241.53	99.09	834.84	701.97	2654.33	1030.19	1305.33	702.21
AAGR	26.28	46.61	106.24	124.47	75.90	144.72	267.31	252.11	264.69	232.21	154.05
Max.	16.43	14.36	26.18	59.46	29.11	39.17	69.05	69.96	30.85	52.26	40.68
Min.	0.97	1.92	2.20	6.97	3.02	3.68	5.93	2.54	1.06	3.30	3.16

Source: Table A-06 & exhibit B-13, calculating using Microsoft office excel.

Table A-5 expresses the green operating income as percentage of the selected banks' total operating income during 2011-2018. The RBL had maximum average volume, i.e., 22.58%, followed by JBL, SBL & ABL, i.e., 7.97, 6.99 & 6.03 percent, respectively among SCBs. The RBL had the above-average than the sample average, but the average of ABL, JBL & SBL was found less than the sampled average.

If we look at the PCBs, BAL had the highest volume of the same, i.e., 24.38%, followed by NBL, DBBL & IBBL, i.e., 20.69, 11.94 & 11.57 percent respectively. The average volumes of BAL & NBL are shown above the average of selected PCBs, i.e., 17.14%. If we look at the grand average, then we find that the average of selected SCBs is below the grand average, i.e., 14.02%, and within PCBs, the BAL, i.e., 24.38 NBL, i.e., 20.69 both are greater grand average, i.e., 14.02, and the average of IBBL, DBBL, i.e., 11.57 & 11.94 percent of PCBs both are less than grand average, i.e., 2.76%. The annual growth rate of the ABL & SBL had negative growth, i.e., -68.28%, -24.09%, while JBL & RBL had positive growth, i.e., 247.21 & 241.53 percent respectively for the average of SCBs, i.e., 99.09%. But PCBs (BAL DBBL, NBL, & IBBL) had a huge positive growth rate i.e., 834.84, 701.97, 2654.33 and 1030.19 percent during the study period.

#### 4.2. Comparative Analysis of Green Interest Income

This is used to discuss mean comparison (ANOVA & Post-Hoc Test) among and between the selected banks on green interest income. This is highlighted in Table A-6 to A-10.

**Table A-6.** Descriptive statistics of amount of green interest income of banks.

Banks	N	Mean	Std. deviation	Std. error	95% confidence interval for mean		Min.	Max.
					Lower bound	Upper bound		
					ABL	8		
SBL	8	1.90	1.73	0.61	0.46	3.35	0.00	5.23
JBL	8	72.29	69.56	24.59	14.14	130.44	0.00	213.24
RBL	8	28.08	49.44	17.48	-13.26	69.42	0.00	134.28
DBBL	8	1390.11	2028.57	717.21	-305.81	3086.03	0.00	5126.31
BAL	8	3.67	2.91	1.03	1.24	6.10	0.00	9.84
NBL	8	1227.75	2849.34	1007.39	-1154.35	3609.86	0.00	8218.19
IBBL	8	4708.82	3072.53	1086.30	2140.12	7277.52	0.00	7864.41
Total	64	931.47	2186.53	273.32	385.30	1477.65	0.00	8218.19

Source: Table A-01, computing by using SPSS.

Table A-7. Test of homogeneity of variances of green interest income of banks.

Levene statistic	df1	df2	Sig.	Crit F
9.478	7	56	0.000	2.17

Source: Table A-01, computing by using SPSS.

These tables are focused on the test of homogeneity of variances by Levine statistic to examine the homogeneity of variances in the selected banks' mean regarding green interest income. It is pragmatic that the calculated F statistic of Levine, i.e., 9.478, is greater than the critical value of F, i.e., 2.17; while the significant p-value is lower than alpha (.05). So, the null hypothesis is rejected; this implies a significant difference in mean variances among the selected banks regarding green interest income for the study period.

Table A-8. ANOVA of green interest income of selected banks.

Tests	Sum of squares	Df	Mean square	F	Sig.	Crit F
Between groups	149423993.459	7	21346284.780	7.876	0.000	2.17
Within groups	151772770.972	56	2710228.053			
Total	301196764.431	63				

Source: Table A-01, computing by using SPSS.

The table is used to show ANOVA of green interest income of selected banks which experimented with the calculated F statistic, i.e., 7.876, which is greater than the critical value of F, i.e., 2.17, at the same time the p-value, i.e., 0.00 which is lower than the alpha (.05), so that the null hypothesis is rejected.

Table A-9. Robust tests of equality of means green interest income of selected banks.

Test	Test	Test	df2	Sig.	Crit F
Brown-forsythe	Brown-forsythe	Brown-forsythe	19.135	0.000	2.17

Source: Table A-01, Computing by Using SPSS.

From the table, the Robust Tests of equality of means green interest income of selected banks, and highlighted that the Brown-Forsythe statistic is 7.876 with respect the critical value of F is 2.17, and the significance p-value is .000, which is significantly lower than the alpha (.05), that implies the null hypothesis is rejected.

Table A-10. Summary statistics of multiples comparison through LSD for green interest income of selected banks.

Banks	Sta.	ABL	SBL	JBL	RBL	DBBL	BAL	NBL	IBBL
ABL	M.D.		17.26	-53.12	-8.91	-1370.94	15.50	-1208.59	-4689.65
	Sig.		0.98	0.95	0.99	0.10	0.99	0.15	0.00
SBL	M.D.	-17.26		-70.39	-26.18	-1388.21	-1.77	-1225.85	-4706.91
	Sig.	0.98		0.93	0.98	0.10	1.00	0.14	0.00
JBL	M.D.	53.12	70.39		44.21	-1317.82	68.62	-1155.47	-4636.53
	Sig.	0.95	0.93		0.96	0.12	0.93	0.17	0.00
RBL	M.D.	8.91	26.18	-44.21		-1362.03	24.41	-1199.67	-4680.74
	Sig.	0.99	0.98	0.96		0.10	0.98	0.15	0.00
DBBL	M.D.	1370.94	1388.21	1317.82	1362.03		1386.44	162.36	-3318.71
	Sig.	0.10	0.10	0.12	0.10		0.10	0.84	0.00
BAL	M.D.	-15.5	1.77	-68.62	-24.41	-1386.44		-1224.09	-4705.15
	Sig.	0.99	1.00	0.93	0.98	0.10		0.14	0.00
NBL	M.D.	1208.59	1225.85	1155.47	1199.67	-1811.30	-1811.30		-3481.06
	Sig.	0.15	0.14	0.17	0.15	.84	0.14		0.00
IBBL	M.D.	4689.65	4706.91	4636.53	4680.74	3318.71	4705.15	3481.06	
	Sig.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Source: Table A-08, computing by using SPSS.

This table expressed the summary statistics of multiples comparison for selected banks by using Least Significant Difference (LSD), which is used to compare mean value for green interest income by using LSD of selected banks. Mean difference between the chosen banks, either positive or negative those are statistically significant or not, are measured like ABL with DBBL & IBBL; SBL with DBBL, NBL & IBBL; JBL with DBBL & IBBL; RBL with DBBL & IBBL; DBBL with ABL, SBL, JBL, RBL, BAL & IBBL; BAL with DBBL, NBL & IBBL; NBL with ABL, SBL, JBL, RBL, & IBBL, and IBBL with all the selected banks the mean differences are statistically significant where the p-value is equal or less than 0.15 at the 15% level of significance. Figure A-1 demonstrates the mean plot of green interest income of banks during 2011-18. It is observed that IBBL have maximum mean and ABL has lower mean.

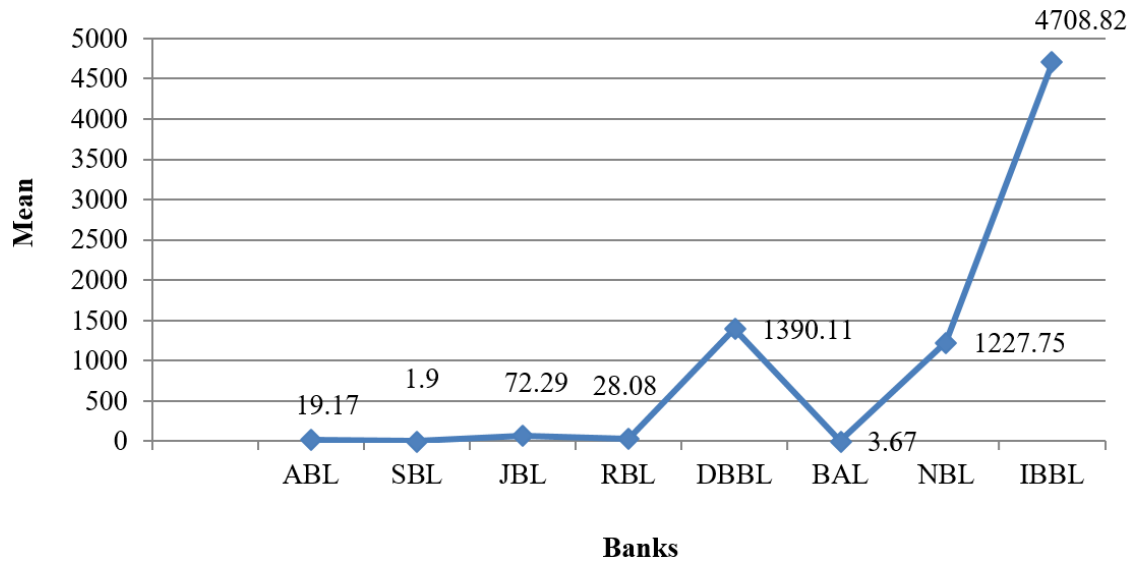


Figure A-1. Mean plot of green interest income of banks during 2011-18.

Source: Table A-01, computing by using Microsoft office excel.

#### 4.3. Comparative Analysis of Green Non-Interest Income

This is used to discuss mean comparison (ANOVA & Post-Hoc test) among and between the selected banks on green non-interest income is highlighted as below;

Table A-11. Descriptive statistics of green non-interest income of selected banks.

Banks	N	Mean	Std. deviation	Std. error	95% confidence interval for mean		Min.	Max.
					Lower bound	Upper bound		
ABL	8	1150.92	169.37	59.88	1009.32	1292.52	971.13	1425.70
SBL	8	1237.05	1006.52	355.86	395.57	2078.52	257.42	2861.56
JBL	8	1881.66	248.74	87.94	1673.71	2089.62	1378.83	2180.10
RBL	8	671.20	217.21	76.80	489.61	852.79	484.08	1160.06
DBBL	8	2311.41	714.64	252.66	1713.96	2908.86	1278.59	3532.77
BAL	8	610.34	214.49	75.83	431.03	789.66	300.13	985.19
NBL	8	735.49	288.30	101.93	494.47	976.52	235.45	1164.63
IBBL	8	1891.19	1119.25	395.71	955.47	2826.90	876.63	3958.43
Total	64	1311.16	842.42	105.30	1100.73	1521.59	235.45	3958.43

Source: Table A-03, computing by using SPSS.

Table A-12. Test of homogeneity of variances of green non-interest income of selected banks.

Levene statistic	df1	df2	Sig.	Crit F
6.473	7	56	0.000	2.17

Source: Table A-03, computing by using SPSS.

From the table (Table A-12), the test of homogeneity of variances by Levene statistic examines the homogeneity of variances in the mean of the selected banks regarding green non-interest income. Observed that the calculated F statistic of Levene, i.e., 6.473, which is greater than the critical value of F, i.e., 2.17, and the significant p-value is lower than alpha (.05), implies the null hypothesis is rejected.

Table A-13. ANOVA of green non-interest income of selected banks.

Statistics	Sum of squares	Df	Mean square	F	Sig.	Crit F
Between groups	23405278.178	7	3343611.168	8.789	0.000	2.17
Within groups	21303636.748	56	380422.085			
Total	44708914.927	63				

Source: Table A-03, computing by using SPSS.

The table (Table A-13) is used to show the ANOVA of green non-interest income of selected banks and experimented that the calculated F statistic, i.e., 8.789, which is greater than the critical value of F is 2.17. The p-value is .000, which is significantly lower than the alpha (.05). The null hypothesis is rejected.

Table A-14. Robust tests of equality of means green non-interest income of banks.

Test	Statistic <sup>a</sup>	df1	df2	Sig.	Crit F
Brown-Forsythe	8.789	7	22.572	0.000	2.17

Note: a. Asymptotically F distributed.

Source: Table A-03, computing by using SPSS.

Table A-14 is used to shows the Robust tests of equality of means of green non-interest income of selected banks. It has experimented that the Brown-Forsythe, i.e., 8.789, is greater than the critical value of F, i.e., 2.17, and the p-value, i.e., 0.000 is significantly lower than the alpha (.05). That is why the null hypothesis ( $H_0$  = There is equality of means among all of the selected banks regarding green non-interest income.) is rejected.

Table A-15. Robust tests of equality of means of operating income for green banking.

Test	Statistic <sup>a</sup>	df1	df2	Sig.	Crit F
Brown-Forsythe	9.181	7	22.030	0.000	2.17

Note: a. Asymptotically F distributed.

Source: Table A-03, computing by using SPSS.

Table A-16. Summary statistics of LSD for green operating income of banks.

Banks	Sta.	ABL	SBL	JBL	RBL	DBBL	BAL	NBL	IBBL
ABL	M.D.		-69.13	-783.88	470.88	-2531.50	555.75	-793.13	-5429.88
	Sig.		0.94	0.41	0.62	0.01	0.56	0.40	0.00
SBL	M.D.	69.13		-714.75	540.00	-2462.38	624.88	-724.00	-5360.75
	Sig.	0.94		0.45	0.57	0.01	0.51	0.45	0.00
JBL	M.D.	783.88	714.75		1254.75	-1747.63	1339.63	-9.25	-4646.00
	Sig.	0.41	0.45		0.19	0.07	0.16	0.99	0.00
RBL	M.D.	-470.88	-540.00	-1254.75		-3002.38	84.88	-1264.00	-5900.75
	Sig.	0.62	0.57	0.19		0.00	0.93	0.19	0.00
DBBL	M.D.	2531.50	2462.38	1747.63	3002.38		3087.25	1738.38	-2898.38
	Sig.	0.01	0.01	0.07	0.00		0.00	0.07	0.00
BAL	M.D.	-555.75	-624.88	-1339.63	-84.88	-3087.25		-1348.88	-5985.63
	Sig.	0.56	0.51	0.15	0.93	0.00		0.15	0.00
NBL	M.D.	793.13	724.00	9.25	1264.00	-1738.38	1348.88		-4636.75
	Sig.	0.4	0.45	0.99	0.19	0.07	0.15		0.00
IBBL	M.D.	5429.88	5360.75	4646.00	5900.75	2898.38	5985.63	4636.75	
	Sig.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Source: Table A-03, computing by using SPSS.

From the above Table, A-15 is expressed that the Robust tests of equality of means of operating income for green banking activities of selected banks. It is highlighted that the Brown-Forsythe statistic is 9.181, which is greater than the critical value of F is 2.17, and the significance p-value is .000, which is lower than alpha (.05), so null hypothesis is rejected. Table A-16 is highlighted the summary statistics of multiples comparison for selected banks by using the least significant difference (LSD), which is used to compare the mean for green operating income using the LSD of selected banks. There is a mean difference between all the selected banks, either positive or negative, but all of those are not statistically significant. The ABL with DBBL & IBBL; the SBL with DBBL & IBBL; the JBL with DBBL & IBBL; the RBL with DBBL & IBBL; the DBBL with all banks; the BAL with JBL, DBBL, NBL & IBBL; the NBL with DBBL, BAL & IBBL, and the IBBL with all the banks, the mean differences are statistically significant since the p-value is equal or less than .15 at 15% level of significance. Figure A-2 demonstrates the mean plot of green non-interest income of banks during 2011-18. It is observed that DBBL have maximum mean and BAL has lower mean.

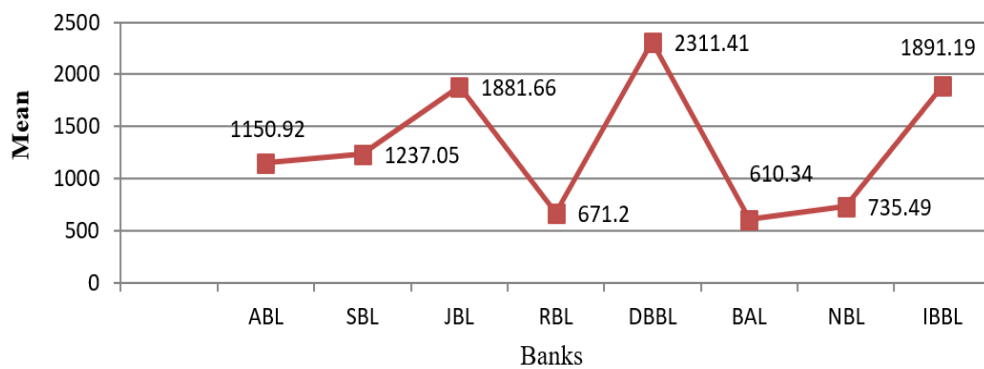


Figure A-2. Mean plot of green non-interest income of selected banks 2011-18.

Source: Table A-11, computing by using Microsoft office excel.

Regression Analysis: Regression analysis highlights how the green operating income bank-wise explains the total operating income? Moreover, Gretl is used to measure the relationship between total operating income and the green operating income for the banks at a glance during 2011-8.

Table A-17. Summary output of regression statistics of green operating income (GOI), and total operating income (TOI) of selected banks during 2011-18.

Banks	The summary output of regression statistics						
	Multiple R	R square	Adj. R square	N	F	P-value	
ABL	0.595	0.354	0.247	8	3.291	0.093	0.093
SBL	0.513	0.264	0.141	8	2.148	0.000	0.000
JBL	0.602	0.363	0.256	8	3.412	0.065	0.065
RBL	0.742	0.551	0.476	8	7.353	0.606	0.606
DBBL	0.910	0.828	0.799	8	28.839	0.000	0.000
BAL	0.990	0.979	0.976	8	286.159	0.000	0.000
NBL	0.455	0.207	0.075	8	1.568	0.000	0.000
IBBL	0.533	0.284	0.164	8	2.376	0.004	0.004

Source: Annual reports of the selected banks, calculating using Microsoft office excel.

Table A-17 is highlighted the summary output of regression statistics of green operating income and total operating income of selected banks during 2011-18, which is provided the value of R, R square, adjusted R square, and significant p-value. The R, R square, adjusted R square, and significant p-value help determine how well the regression model is fit for the data? And how the responses (DV) explain by the predictors (IVs). The value of R stand multiple correlation coefficients are used to measure the dependent variable's quality of prediction, i.e., total operating income. R square's value explains the variance in the dependent variable, which is explained by the

independent variables. R square only indicates how well the regression model fits a set of data, not tells the entire story, so an adjusted R square is used.

The multiple R of ABL, SBL, JBL, RBL, NBL & IBBL, i.e., 0.595, 0.513, 0.602, 0.742, 0.455 & 0.533 respectively which implies the level of prediction is well, and R for DBBL & BAL, i.e., 0.910 & 0.990 which indicates the level of prediction is excellent. The adjusted R square of ABL, SBL, JBL, RBL, DBBL, BAL, NBL & IBBL, i.e., 0.247, 0.141, 0.256, 0.476, 0.799, 0.976, 0.075, and 0.164, respectively, the variation of the dependent variable explained by the independent variable. So opined that the selected PCBs had maximum variations of total operating income by green banking operating income, and SCBs had less variation for the same.

**Table A-18.** Summary statistics of the result of F, LM, and Hausman test.

Test		Model-1
F-test	F-statistics	21.198
	P-value	0.000
Hausman test	Chi-square statistics	1.268
	P-value	0.260
LM test	Chi-square statistics	94.926
	P-value	0.000

Source: Fixed and random effect estimators of regression model, computed by using Gretl.

To decide whether the pool OLS model, fixed-effect model, and random effect model is the fitted model for panel data among the three models, i.e., recommended with the help of panel diagnostics F tests, LM test, and Hausman test. If the p-value of the F statistic is very low (at 1%, 5%, 10% level), so the null hypothesis is rejected. The F statistic advocated in favor of the fixed-effect model over the pooled model, and if the P-value of LM test is very low (at 1%, 5%, 10% level), so the null hypothesis is rejected, i.e., LM test statistic advocates in favor of r, random effect model over the pool model. To identify the correct model between fixed effect & r, random effect model, the researcher has to use the Hausman test. If the Hausman test's P-value is very low (at 1%, 5%, 10% level), since the null hypothesis rejected, i.e., Hausman test statistic advocated in favor of the fixed-effect model over the r, random effect model, and vice-versa. Table A-18 is highlighted the summary statistics of the result of the F, LM, and Hausman test for the regression model. It is found that the p-value of the F statistic is very low so that the null hypothesis is rejected at a 1% level of significance, which advocates in favor of the fixed-effect model over the pooled model. The p-value of the LM test is very low, so that the null hypothesis is rejected at a 1% level of significance, which advocates in favor of the random effect model over the pooled model. The p-value of the Hausman tests is also very high, i.e., 0.2602, so that the null hypothesis is rejected that advocates in favor of the random effect model over the fixed effect model.

**Table A-19.** Summary statistics of result of regression models the relations between green operating income (GOI) and total operating income (TOI).

Tests	Random effect model		
	Coefficient	p-value	
Const	16209.300	0.000 ***	
Op. income of G. banking (OIGB)	0.849	0.001 ***	
Mean dependent var	18115.420	S.D. dependent var	8131.056
Sum squared resid	3.37e+09	S.E. of regression	7308.445
Log-likelihood	-659.7024	Akaike criterion	1323.405
Schwarz criterion	1327.723	Hannan-Quinn	1325.106
Rho	0.753	Durbin-Watson	1.527

Note: \*\*\* to indicate statistical significance at the and 1% levels, respectively.

Source: Random effect estimators of regression model, computed by using Gretl.

Table A-19 is highlighted the summary statistics of the result of regression models (Random Effect Model), which is used to measure the relations between green operating income and total operating income. The result of regression models expresses that the predictor OIGB (Operating Income of Green Banking), i.e., significant at 1% level, and highly positive relations are found between OIGB (Operating Income of Green Banking) and total operating income. The Spearman's Rho is a non-parametric test which is used for measuring the strength of association between two variables, where, Rho = 1 indicates a perfect positive correlation, and Rho = -1 indicates a perfect negative correlation, i.e., the very high positive, high positive & moderate low having 0.90, 0.70, 0.50 & 0.30 respectively, since if we look at Rho in table, opined that there is a very high positive correlation between predictors, and response. The Durbin-Watson (DW) is used to test the autocorrelations; the value of DW is always between 0 to 4; if the value of DW is around 2, it indicates no autocorrelations, and below around 2 indicates positive autocorrelations if DW is greater than 2 which indicate positive autocorrelations. The regression model's result shows the value of DW is 1.53, and it implies that there are no autocorrelations.

## 5. FINDINGS

To measure the profitability of green banking activities following parameters are to be used, i.e., green interest income as a percentage of total interest income, volume of green operating income, and green operating income as a percentage of total operating income. Table A-20 shows the consolidated information of profitability of green banking activities.

Table A-20. Consolidated information of profitability of green banking activities.

Ratios/Volume	SCBs					PCBs					GA
	Ranking				Avg	Ranking				Avg	
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>		1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>		
Green interest income as a percentage of total interest income	RBL	JBL	ABL	SBL	0.13	IBBL	DBBL	NBL	BAL	5.39	2.76
	0.23	0.21	0.08	0.01		9.29	7.66	4.61	0.03		
Green operating income as a percentage of total operating income	RBL	JBL	SBL	ABL	10.89	BAL	NBL	IBBL	DBBL	17.14	14.02
	22.58	7.97	6.99	6.03		24.38	20.69	11.57	11.94		
The volume of green operating income (Tk. in millions)	JBL	SBL	ABL	RBL	1299	IBBL	DBBL	NBL	BAL	3231	2265
	1972	1327	1184	714		6317	3877	2110	617		
The output of Regression of green operating income and total operating income (Adj. R square)	RBL	JBL	ABL	SBL	0.28	BAL	DBBL	IBBL	NBL	0.50	0.39
	0.48	0.26	0.25	0.14		0.98	0.80	0.16	0.078		

Source: Table A-02, 04, 05, 17 & 19.

- Green Interest Income: It is found that the selected SCBs, i.e., RBL, JBL, ABL & SBL, earn insignificant green interest income, i.e., 0.23, 0.21, 0.08 & 0.01 percent respectively, and among the selected PCBs, i.e., IBBL, DBBL, NBL, & BAL earn 9.29, 8, 5 & 0.03 percent respectively as a percentage of total interest income. There is a difference among the selected banks about the green interest income. The IBBL, DBBL, NBL, JBL, RBL, ABL, BAL & SBL respectively performed on green interest income, but only IBBL, DBBL & NBL meet up the guidelines of Bangladesh Bank. The guideline of Bangladesh Bank, a minimum of 5%, should be earned through green interest income of total interest income for the year. The comparative status of PCBs is better than SCBs during 2011-18.



- b. Green Operating Income: The JBL had the maximum volume of green operating income, i.e., Tk. 1972 million followed by SBL, ABL, and RBL, i.e., Tk. 1327, 1184, and 714 million respectively among the selected SCBs, while IBBL had the maximum volume of green operating income, i.e., Tk. 6317 million followed by DBBL, NBL & BAL, i.e., Tk. 3877, 2110, and 617 million respectively among the selected PCBs. The IBBL is the best performer, followed by DBBL, NBL, JBL, SBL, and ABL RBL & BAL, respectively, on green operating income during the study period. But among the selected SCBs, i.e., RBL had the highest percent, i.e., 22.58%, followed by JBL, SBL & ABL, i.e., 7.97, 6.99, and 6.03 percent, respectively. In context, the selected PCBs, i.e., BAL, had the highest percent, i.e., 24.38, followed by NBL, DBBL & IBBL, i.e., 20.69, 11.94, and 11.57 percent, respectively. The RBL is the best performed followed by RBL, NBL, DBBL IBBL, JBL, SBL & ABL respectively green interest income as a percentage of total interest income. It is also found that there is a difference in performance based on the volume of green operating income and green operating income as a percentage of total operating income among the selected banks due to the volume of total operating income. PCBs' Comparative status is better than SCBs, but both the PCBs and SCBs on volume of green operating income is not performed well during 2011-18.

Found that ABL, IBBL, JBL, SBL & NBL had weak relationships, RBL had a moderate relationship, and ABL & DBBL had a strong relationship between total operating income and green operating income due to variation of total operating income explained by green operating income. By using gretl it is concluded that there are highly positive relations found between operating income from green banking (OIGB) and total operating income for selected banks at a glance during the study period. Since Spearman's Rho is .75. The selected PCBs had greater variation than the SCBs on total operating income by operating income from green banking during 2011-18.

Finally, if we look at the SCBs, i.e., RBL is the best position, and SBL had the worst position at the above selected parameters used to measure the financial performance of green banking activities. While IBBL had the top and BAL had the worst position among PCBs during the study period. The comparative position of PCBs is better than SCBs in the financial performance of green banking activities, but overall financial performance on green banking activities of selected SCBs and PCBs is weak during 2011-18.

## 6. CONCLUSIONS & SUGGESTIONS

Bangladesh is an extremely adverse affected country for global warming. To save the country from the adverse effect of global warming, promote sustainable development. For sustainable development, the banking sector have to be adopted sustainable banking practices, i.e., green banking. Green banking had multi-stakeholders so that the banks have to work/engage closely with other banks, central banks, GOs, NGOs, clients, and other industries, etc., to achieve their goal. It is observed from the study of Profitability of the green banking activity, RBL had the best position and SBL had the worst position at the financial performance of green banking activities among selected SCBs, comparatively.

While IBBL had the top and BAL had the worst position among selected PCBs, comparatively during the study period. The comparative position of selected PCBs is better than selected SCBs, but both the selected SCBs and PCBs Profitability on green banking activities is found below satisfactory during the study period. From the financial activities performed on green banking, comparatively, RBL and ABL are the best performer, followed by SBL and JBL, respectively among selected SCBs. While IBBL is best performer comparatively followed by DBBL, NBL & BAL among selected PCBs. Comparatively among the selected SCBs & PCBs, IBBL is the best followed by DBBL, NBL, BAL, RBL, ABL, SBL, and JBL, respectively performed regarding Profitability on green banking activities during 2011-18.

The comparative position of selected PCBs is better than selected SCBs. Moreover, the performance of both selected SCBs and PCBs is not satisfactory for this objective. The commercial banks of Bangladesh are started to be

taken initiatives on green banking practice based on green banking policy guidelines but the initiatives not enough at all by commercial banks. The green banking practice to be needed much more development and given more emphasis for improvement of present conditions. The selected SCBs and PCBs should be concentrated to improve the financial performance of green banking and ought to be increased green operating income as a significant portion of total operating income, while improving financial performance; Since the banking sector is an integral part of our economy.

So that the banking industry is integrated with all other industrial sectors, the banks should be formed a co-operate with all sectors, which will help to achieve slowly & steadily the sustainable development that's lead by banking sectors from the front.

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