

# Green Finance During the COVID-19 Pandemic and Beyond: Implications for Green Economic Recovery

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## Abstract

The main purpose of study is to identify the impact of COVID-19 pandemic on the green financing of banks and non-bank financial institutions (NBFIs) in an emerging economy such as Bangladesh. Also, this study shows the green banking activities of the banks and NBFIs during the pandemic. To analyze the impact of the pandemic on green financing, secondary data were obtained from the quarterly and annual reports of Bangladesh Bank (BB) on green financing as well as the annual reports and websites of 61 banks and 34 NBFIs in Bangladesh for the period 2021–2019. Subsequently, the study deployed dependent t-test statistics, growth rate (year-on-year), descriptive statistics, relative percentage changes, and varying tables and graphs to analyze the obtained secondary data. The empirical findings revealed that during the COVID-19 pandemic, there was an increase in green finance for all banks and NBFIs compared to before the epidemic, indicating that the pandemic had no negative impact on the total green finance growth of all banks and NBFIs. On the other hand, compared to the pre-pandemic period, bank-wise growth in green financing was higher for state-owned commercial banks (SOCBs), specialized banks (SDBs), and private commercial banks (PCBs) but lower for foreign-owned commercial banks (FCBs) during the COVID-19 epidemic. This suggests that the pandemic does not affect the expansion of green finance by SOCBs, SDBs and PCBs but significantly impacted the growth of green financing by FCBs. Furthermore, the research findings showed that the total outstanding and classified loans within the green finance investment decrease for both banks and NBFIs during the COVID-19 pandemic. The results indicated that the Bangladeshi banks' level of automation towards green banking were satisfactory during the pandemic. Therefore, major policy implications for the green economic recovery by the government, BB, and managers of the banks and financial institutions in emerging economies like Bangladesh were discussed.

**Keywords:** COVID-19; green finance; green banking; green economic recovery; financial institutions; Bangladesh.

## 1. Introduction

The COVID-19 pandemic, which threatened the human life, has also taken its toll on the global economy (Caldecott, 2020; Kemfert et al., 2020). As a result, economic sustainability via capital creation and investment promotion has become the priority for governments and economic

organizations to mitigate the economic and societal consequences of the epidemic (Yu & Khan, 2021). On the other hand, emerging economic recovery packages must avoid upsetting the delicate balance between economic expansion and natural capital in the region. Many international scholars have advocated for the crucial role of green infrastructure in sustaining economic growth and livelihoods while adhering to the Paris Agreement commitments (ADB, 2020)<sup>1</sup>. In this regard, innovative financing structures such as green financing can play a critical role in accelerating much-needed private funding for a sustainable and green regional recovery (Ngo et al., 2021). In addition, green financing can increase capital formation and proper government expenses on educational sectors, thereby benefiting and speeding economic growth (Chien et al., 2021).

Green finance can be described as the procedures of allocating funding to initiatives aimed at improving the quality of natural resources, the environment, and the health of living creatures by mitigating the adverse environmental impact of human activity (Zhang et al., 2019; G. W. Zheng et al., 2021). Green funding does not only improves quality of the environment and encourages social activities, but also provides the economy a viable environment, secures the availability of high-quality natural resources, and promotes economic growth (Ngo et al., 2021). Hence, banks and other financial institutions can champion sustainable economic growth by granting green finance to social and business sectors (Dalia & Vitaliy, 2021). Green financing encompasses a variety of financial instruments such as green securities, green bonds, green loans, and ecofriendly projects financing that can help affected countries improve their environmental quality and economic development during the COVID-19 pandemic (Ngo et al., 2021).

The COVID-19 outbreak, which is considered one of the world's most deadly communicable diseases, has significantly impacted the worldwide financial industry (Narayan et al., 2021). The countrywide social distance, quarantine, and lockdown measures have generated far-reaching social and economic effects, putting an unexpected and multifaceted burden on financial markets, enterprises, the health sector, communities and people (Narayan et al., 2021; Yang & Deng, 2021). The financial sector, on the other hand, is more fragile during this outbreak, as its activities are directly or indirectly dependent on the daily economic activities (Wójcik & Ioannou, 2020). Furthermore, governments in several countries have introduced several stimulus programs through the banking system to alleviate the economic needs of their people (Narayan et al., 2021). Consequently, there is an increase in liquidity stress on the global financial system (L. Li et al., 2020). Additionally, the liquidity challenges faced by individuals, government institutions and corporate sectors due to the COVID-19 pandemic are also contributing to the increase in non-performing loans, which is hazardous to the sustainability of the banking sector (Wójcik & Ioannou, 2020). Nevertheless, in order to maintain the stability of the economy during the pandemic, banks are required to continue their daily operations in any manner (McKibbin & Fernando, 2020). While this may prove challenging, adoption of green banking including internet banking has ensured a seamless operation that enable people to safely conduct their fundamental transactions, albeit the government's monitoring of the disease's development.

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<sup>1</sup> Asian Development Bank (2020). Green Finance Strategies for Post-Covid-19 Economic Recovery in Southeast Asia. <http://dx.doi.org/10.22617/TCS200267-2>

To date, numerous studies have reported the possible devastating consequences of the pandemic on the economies through different macroeconomic indicators such as aggregate demand, output, supply, trade flows, savings, investment and employment, all of which could increase poverty and cause potential recession or depression (Agrawala et al., 2020; Barua & Barua, 2021; Chen et al., 2020; Coibion et al., 2020; Shafi et al., 2020). Furthermore, a study investigated the impact of green finance and the COVID-19 pandemic on the economic development of ASEAN economies and revealed that green finance together with capital formation and government educational expenditures exhibited a favorable relationship with ASEAN countries' economic growth during the COVID-19 pandemic (Ngo et al., 2021). Therefore, green financing can be considered a potential promoter of global economy, particularly during the pandemic. Recently, various studies have been conducted in the context of Bangladesh on the green finance development (G. W. Zheng et al., 2021), green banking development (Khairunnessa et al., 2021), green finance and sustainability performance (G. Zheng et al., 2021), COVID-19 implications for the banking institutions (Barua & Barua, 2021), role of commercial banks in economic resilience during the pandemic (Ghosh & Saima, 2021), and mobile banking during the COVID-19 pandemic (Khatun et al., 2021). However, there exists a limited study in the direction of the impact of COVID-19 pandemic on the green finance including green banking activities of banks and NBFIs, particularly in emerging countries such as Bangladesh. As a result, researchers are inspired to examine the influence of the COVID-19 pandemic on green financing by banks and NBFIs, as well as its role in mitigating COVID-19's negative effects and sustaining economic growth. Therefore, the main purpose of the study is to identify the impact of COVID-19 on the green financing of banks and NBFIs during the pandemic in Bangladesh using a secondary data. Additionally, this study also shows the green banking activities of the banks and NBFIs during the COVID-19 outbreak.

This paper is expected to contribute to the current literature, especially on green banking and financing during the COVID-19 period in the following ways. First, by analyzing the COVID-19 impact on the green financing of banks and financial institutions in Bangladesh during the pandemic, vital insights could be availed for other emerging economies, especially those with similar financial and economic system. Second, the study showed the status of green banking activities of the banks and NBFIs in Bangladesh during the pandemic, which could aid other emerging economies to respond effectively to crises via green recovery. Third, the study also considered the major in-house environmental management steps taken by the banks and NBFIs during the COVID-19 pandemic to improve their environmental performance as well as reduce the adverse effects of the outbreak. Finally, the study's findings provide some useful implications for researchers, banking institutions, managers, and policymakers in emerging economies like Bangladesh to lessen the negative effects of the COVID-19 pandemic on the economy. These include financing of various ecofriendly projects and the development of online banking for the country's sustainable development.

The reminder of the paper is organized as follows: Section two outlines the literature review, role of financial institutions in economic resilience, green finance and the post-pandemic economic recovery. Sections three and four present the research methodology and the findings of the study,

respectively, followed by the discussion, conclusion, implications, limitations and future research of the study in the section 5.

## **2. Literature Review and Hypotheses Development**

### **2.1 Literature Review**

Undoubtedly, the COVID-19 pandemic disrupts the global economy, especially the financial markets and institutions (Barua & Barua, 2021; Ghosh & Saima, 2021). In particular, the pandemic creates multifaceted crises for banks, resulting in higher banks' failure rates and could get worse, especially in emerging economies where financial market development is weak (Barua & Barua, 2021; Mahmud, 2020). Bangladesh, an emerging market, has been able to maintain an excellent economic development during the last decade, and its expected gross domestic product (GDP) growth rate for Fiscal Year (FY) 2019–2020 was 8.20 %; however, this assumption has now been impeded by the negative impact of the COVID-19 global epidemic, especially in the last quarter of FY 2019–20 (Ghosh & Saima, 2021). Consequently, the financial impacts induced by the COVID-19 epidemic slowed down the economic development of Bangladesh during the FY 2019-20, as projected by International Monetary Fund (3.8%), Asian Development Bank (4.5%), and World Bank (2–3%). Thus, the stability of banking institutions is a prerequisite for an economic growth capacity to expand in a sustainable way. As a result of the viral outbreak, various organizations recorded low income, resulting in drop in personal incomes, remittance flow, purchasing power (Mahmud, 2020; Rashid, 2020). These also explain why the banking sector in Bangladesh had already recorded a high level of non-performing loans (NPLs). Ultimately, the bank's daily available funds become lower, as the depositors withdraw their existing deposits to cushion the effect of the financial crisis. Also, the pandemic and the resulting lockdown of many sectors of the country had serious effect on different risks of the banking sectors such as credit risk, liquidity risk and NPLs, all of which are very detrimental to the economy (Mahmud, 2020).

Adaptation of technology to the banking systems is essential to the management of COVID-19 complications to ensure business continuity. Similarly, online training and development systems for continuous capacity growth initiatives is required to minimize the costs of banks and reduce the risks of contamination (Rashid, 2020). The author further said that customers do not need banks as they need banking. As such, it is high time financial institutions introduce green banking systems including online banking, online payments, and technological innovations to meet customer's need and also minimize the effect of crisis such as the COVID-19 pandemic. Green banking (GB) is a type of bank operation aimed at protecting the environment (natural resources), society and economy (Khairunnessa et al., 2021; G. W. Zheng et al., 2021). In 2011, Bangladesh Bank (BB), the central bank of Bangladesh, released the green banking and environmental risk management guidelines for banks in a struggle to ensure sustainable growth of the country. The BB is considered the world's frontline central bank in promoting GB activities to combat climate change, increase greenhouse gas and reduce air pollution in the world (Zhixia et al., 2018). To reduce the impact of the COVID-19 pandemic on the banks and NBFIs in Bangladesh, BB had initiated several green recovery measures, such as green refinance scheme for pandemic-affected marginal people through banks, regulatory responses against the

outbreak to strengthen the GB, and other policy initiatives to cushion the effect of the pandemic on the banking sector. On the other hand, the financial institutions including banks and NBFIs also undertook various initiatives such as donating to the governments fund to support their struggle against the adverse effects of the deadly pandemic in Bangladesh (see appendix Table A1).

Numerous studies have shown that the COVID-19 outbreak devastated the economies, affecting several macro-economic factors such as total demand, production, supply, trade flows, savings, investment and jobs, all of which could lead to rise in poverty level and possible recession or depression (Agrawala et al., 2020; Barua & Barua, 2021; Chen et al., 2020; Coibion et al., 2020; Shafi et al., 2020). Therefore, pandemic or post-pandemic environment could be hostile to the survival and viability of banks and financial institutions in emerging or developed countries with financial stability, security and regulation discipline (Agrawala et al., 2020; Barua & Barua, 2021; Ghosh & Saima, 2021). This is evident from impact of the recent pandemic on banking and financial sector in Bangladesh, which impedes the growth of the sustainable economic development of the country. As such, Bangladeshi banking system is faced with severe problems, such as high level of NPLs (Barua & Barua, 2021; Ghosh & Saima, 2021; Mahmud, 2020), liquidity crisis (Ghosh & Saima, 2021; Mahmud, 2020), and credit risk (Mahmud, 2020) due to the pandemic. In addition, the banking sector in Bangladesh is susceptible to low profitability due to the withdrawal of deposits by depositors to mitigate the effect of the crisis. Furthermore, banks experienced reduced deposits from customers due to the limited operation of several companies during the lockdown in Bangladesh, resulting in the late receipt of their income. Ghosh & Saima (2021) examined the financial sustainability and resilience of Bangladeshi commercial banks against the negative effects of COVID-19 pandemic using MCDM-based techniques. The study declared the Eastern Bank Limited (EBL) and Dutch-Bangla Bank Limited (DBBL) to be the most resilient banks in Bangladesh towards the COVID-19 pandemic, while ONEBANK Limited was the least resilient. Furthermore, the study suggested that banks with lower liquidity, capital adequacy, and performance as well as greater NPLs are more susceptible to the aftermath of the pandemic. Therefore, it can be said that the lower liquidity and higher NPLs induced by the COVID-19 pandemic directly affect the profitability, sustainable growth and survival of the banking sector in Bangladesh.

Furthermore, related research has highlighted a variety of routes through which economies can build a healthy economic foundation, including components of green finance and financial innovation. Therefore, the adoption of green finance is expected to have a favorable impact on the sustainable economic development of countries during the pandemic. Green financing has responded positively to the devastating COVID-19 pandemic by providing safety-enhancing financial tools that help to keep the economy growing (Ngo et al., 2021). It was further demonstrated by countries that prioritize green finance including green investment, green credit, and green security continue to make significant progress even during the pandemic (Li et al., 2021; Ngo et al., 2021; Sun et al., 2021). Despite the fact that a country's conditions and environmental quality might affect its economic performance, sustainable economic development can still be achieved through the proper use of green finance, such as financing various environmentally friendly initiatives, green loans, and green security. Furthermore, the

impact of regulatory policies has been extensively documented in the literature, and the effect of COVID-19 has already been vividly underlined in the case of developing countries like Bangladesh. Although the unpredicted features of the pandemic harm both developed and emerging economies, in this regard, the good aspects of green financing can support particular scenarios. More recently, Zheng et al., (2021) conducted a research on the factors influencing the sustainability performance of financial institutions operating in Bangladesh. The study confirmed that green financing can aid financial institutions in achieving sustainability, thereby contributing to the country's long-term development. Similarly, financial development fosters economic growth and green financing. Thus, it is possible to infer that the spread of COVID-19 affected the global communities' economies (Ngo et al., 2021), and that the adoption of green finance, along with green investment, green credit, and green security are effective strategies to deal with the consequences.

Therefore, the study aims to analyze the impact of COVID-19 on the green finance of banks and NBFIs in Bangladesh during the period 2019–2021. Also, the study depicts the green banking activities of banks and NBFIs during the study period. In achieving the aforementioned goals, our study attempts to address the following three questions: What are the impacts of the COVID-19 pandemic on green financing of financial institutions in Bangladesh? What is the current status of green banking of financial institutions in Bangladesh during this pandemic? What are the major steps taken by the financial institutions to mitigate the adverse effects of the pandemic in Bangladesh?

## **2.2 The Role of Financial Institutions in Economic Resilience**

Due to the COVID-19 pandemic, the economic growth of many countries has been hindered, and many businesses have been forced to close (Ghosh & Saima, 2021). The countrywide social distance, quarantine, and lockdown measures have generated far-reaching social and economic effects, putting an unexpected and multifaceted burden on financial markets, enterprises, the health sector, communities and people (Narayan et al., 2021; Yang & Deng, 2021). The financial sector, on the other hand, is more susceptible to the outbreak, as its activities directly or indirectly rely on society's economic activities (Wójcik & Ioannou, 2020). The financial institutions were severely hit by the pandemic, thus setting off negative economic developments. Also, various sectors of Bangladesh's economy were adversely impacted by the pandemic; the manufacturing was the hardest hit of the three primary sectors, followed by the service sector, while agriculture escaped the pandemic's shock waves largely unscathed. The readymade garments, real estate, tourism, health, education, airlines, transportation, and SME sectors, in particular, have been severely affected. In addition, governments in several countries have declared various forms of stimulus programs through the banking system to alleviate their people's economic demands (Narayan et al., 2021). In this regard, Bangladesh Bank (BB) and other finance industry regulatory authorities have collaborated with the government on a variety of fronts, incorporating fiscal and monetary stimulus, supervisory and regulatory measures, and financial policy developments to mitigate the pandemic's adverse influence on the country's economic development. As a result, the government of Bangladesh, in partnership with the BB, issued a number of stimulus packages and refinance programs totaling BDT 1284.4 billion,

which is 4.59% of GDP, to help the country recover from the economic losses caused by the COVID-19 (Bangladesh Bank, 2021). The BB, the country's monetary authority, implemented numerous refinancing schemes and reviewed key policy rates to ensure sufficient liquidity and fund flows into the financial system, thereby facilitating a speedy turnaround of the real economy. On April 20, 2020, the BB proposed a BDT 30 billion refinancing fund to remedy the detrimental impact of COVID-19 on marginalized persons. In this regards, 36 private commercial banks (PCBs) donated US\$ 16.13 million (approx. BDT 137 crore) to the Prime Minister's Relief and Welfare Fund (PMRWF) to support the government's effort in cushioning the adverse effect of the pandemic (The Financial Express, 2020). Also, four state-owned commercial banks (SOCBs) contributed a total of US\$ 0.59 million (approx. BDT 5 crore) to the fund. The major initiatives undertaken by the other banks and financial institutions to mitigate the effects of the COVID-19 pandemic and revive the economy of the country are shown in Table A1 (see appendix).

### **2.3 Green Finance and the Post-pandemic Economic Recovery**

Surprisingly, the COVID-19 pandemic was not the first unfavorable event that certain economies have utilized to catalyze inclusive growth (Ghosh & Saima, 2021). The 2007-2008 global financial crises also demonstrated the importance of long-term investment in stimulus packages. To project the current scenario with the COVID-19 epidemic, one must consider the global economic crisis and analyze the function of green financing throughout the post-green recovery phase. Generally, pandemics are sometimes viewed as an indication of an impending ecological disaster because even wealthier countries lacked efficient crisis-management mechanisms to limit viral spread (Dalia & Vitaliy, 2021). Even after the green recovery, high levels of government debt would remain in the long run. To adapt to climate change in Southeast Asia alone, an estimated \$1.5 billion in infrastructure funding is required each year. Closing this gap is critical for private-sector finance, considering that the funding shortfall for selected Southeast Asian countries is expected to be \$102 billion per year (Dalia & Vitaliy, 2021; Nepal et al., 2021). In this regard, attractive financial methods have the potential to catalyze much-needed private funding for a green and sustainable regional recovery. Green strategy and investments in infrastructure present a narrow window of opportunity to advance investments that cut greenhouse gases, decrease energy intensity and promote carbon sequestration repair. As a result, investing in varied green infrastructure can help the economy recover and create jobs that are much needed.

Moreover, the COVID-19 pandemic demonstrated the importance of sustainable finance to the health and well-being of people and the world. In this case, green financing can be a long-term solution in places such as the Asia, Middle East, Africa, Europe, and Latin America where economic recovery is critical (Dalia & Vitaliy, 2021; Ngo et al., 2021). Initiatives to reestablish green finance should take into account the possibility of raising funding from international investors. In recent years, the global green bond market has experienced tremendous expansion, with investors increasingly concentrating on green bonds as a long-term investment strategy (Keliuotytė Staniulėnienė & Daunaravičiūtė, 2021). In the coming decades, sustainability will be a major driving factor in the field of green finance (Ansari & Holz, 2020). According to a World

Bank study, green fixed assets will exceed \$30.7 trillion by 2030, as financial institutions are enticed to join the fight against global warming on a global scale (World Bank, 2020). Besides, the COVID-19 pandemic encouraged the formation of a worldwide strategy to reduce and mitigate climate change, as well as develop economic recovery measures. Green finance has the potential to hasten global recovery from COVID-19 while also offering incentives for much-needed investment in renewable energy and sustainable infrastructure projects (Fan et al., 2021). Therefore, green financing, green bonds, and COVID transition bonds can be considered innovative techniques of obtaining emergency financing for economic recovery (Ngo et al., 2021), all of which contribute to the country's long-term economic development (G. W. Zheng et al., 2021). However, for green recovery solutions to be effective, they are expected to be ecologically responsible, socially equitable and climate resilient.

## 2.4 Hypotheses Development

The COVID-19 pandemic is thought to have affected practically every country on the planet, causing extremely complex economic and health complications. In Bangladesh, as in other countries, the spread of the virus has caused national economies and enterprises to assess its revenue, with the government and BB implementing several economic policies to combat the negative impact of the pandemic. The financial sector, on the other hand, is more fragile during this outbreak owing to its directly or indirectly relationship with the economic activities of human society (Wójcik & Ioannou, 2020). Hence, the financial institutions would be affected by the pandemic, resulting in the negative economic development of countries. In this case, green financing can be a long-term solution in many places such as the Asia, Middle East, Africa, Europe, and Latin America where economic recovery is critical (Dalia & Vitaliy, 2021; Ngo et al., 2021). Initiatives to reestablish green finance should take into account the possibility of raising funds from international investors to combat the pandemic. In recent years, the global green bond market has experienced tremendous expansion, with investors increasingly concentrating on green bonds as a long-term investment strategy (Keliuotytė Staniulėnienė & Daunaravičiūtė, 2021). As a result, innovative techniques of obtaining emergency financing for economic recovery can include green financing, green bonds, and COVID transition bonds (Ngo et al., 2021), all of which positively impact the country's long-term economic development (G. W. Zheng et al., 2021). Given the contribution of green finance to the sustainable economic recovery from the pandemic, the study aims to analyze the impact of COVID-19 on the green finance of financial institutions in emerging economies such as Bangladesh during the pandemic. To this end, the following research hypotheses were developed and evaluated.

Hypothesis 1 ( $H_1$ ): The COVID-19 pandemic has a negative impact on the growth of green finance by all sample banks.

Hypothesis 2 ( $H_2$ ): The COVID-19 pandemic has a negative impact on the growth of green finance by NBFIs.

Hypothesis 3 ( $H_3$ ): The COVID-19 pandemic has a negative impact on the growth of green finance by SOCBs.

Hypothesis 4 (H<sub>4</sub>): The COVID-19 pandemic has a negative impact on the growth of green finance by SDBs.

Hypothesis 5 (H<sub>5</sub>): The COVID-19 pandemic has a negative impact on the growth of green finance by PCBs.

Hypothesis 6 (H<sub>6</sub>): The COVID-19 pandemic has a negative impact on the growth of green finance by FCBs.

### 3. Research Materials and Methods

The present study is descriptive in nature and is primarily based on the secondary data. The major advantage of this review process is the prior availability of adequate and accurate data (Goodwin, 2012). Majorly, this study aims to identify the impact of COVID-19 on the green financing of banks and NBFIs during the pandemic using a secondary data. Besides, this study also shows the green banking activities of the banks and NBFIs during the COVID-19 outbreak. To this end, secondary data were obtained from the quarterly and annual published reports of BB on green banking activities, annual reports, and websites of the sample banks and NBFIs in Bangladesh for the period 2019–2021. To collect the necessary secondary data for this study, the documentation technique was primarily used, as it is considered one of the most important data collection techniques in interpretive research (Bhattacharjee, 2012). The following formula was used to compute the quarterly annual growth (year on year) of the researched variables for the entire period between 2019 and 2021 (i.e., April 2019 to March 2020 and April 2020 to March 2021).

$$\text{Growth} = \frac{\text{Value}_{t1} - \text{Value}_{t0}}{\text{Value}_{t0}} \times 100\% \dots \dots \dots \text{(I)}$$

Where, Growth = year-on-year growth; Value<sub>t1</sub> = the expected value of the variable in the same quarter this year; and Value<sub>t0</sub> = the expected value of the variable in the same quarter last year.

The dependent sample t-test was used to investigate the rate of growth of the studied variables in two different contexts (before and during the epidemic) and ultimately to examine the proposed research hypotheses.

H<sub>0</sub>:  $\mu_1 = \mu_2$ ; the variables' means are the same for 2019/2020 (before the pandemic) and 2020/2021 (during the pandemic). Thus, H<sub>0</sub>= the COVID-19 pandemic has no influence on green financing by Bangladeshi banks and NBFIs.

H<sub>1</sub>:  $\mu_1 \neq \mu_2$ ; the variables' means for the period 2019/2020 (before the pandemic) and 2020/2021 (during the pandemic) are not equal. Therefore, H<sub>1</sub>= the COVID-19 pandemic significantly affects green financing by Bangladeshi banks and NBFIs.

The following formula was used to compute the test statistic t.

$$t = \frac{\bar{x}_d}{S\bar{x}_d} \dots \dots \dots \text{(II)}$$

Where,  $\bar{x}_d$  = mean difference;  $S\bar{x}_d$  = standard deviation of the means.

Subsequently, the study utilized descriptive statistics, percentage changes, and different graphs to analyze the obtained secondary data. The scope of this study is limited to banks and NBFIs operated in Bangladesh, as indicated in Table 1.

**Table 1:** Samples of the Study

SL	Banks and NBFIs	Abbreviation	Frequency
1	State-Owned Commercial Banks	SOCBs	06
2	Specialized Banks	SDBs	03
3	Foreign-Owned Commercial Banks	FCBs	09
4	Private Commercial Banks	PCBs	43
<b>Total</b>			<b>61</b>
1	Non-Bank Financial Institutions	NBFIs	34
<b>Total</b>			<b>34</b>
Source: Bangladesh Bank, (2021). For more details, see <a href="http://www.bb.org.bd">www.bb.org.bd</a> .			

## 4. Empirical Findings

### 4.1 Comparative Scenario of Green Financing During the COVID-19 Pandemic

- *Overall Green Finance of Banks and NBFIs During and Before the Pandemic.*

**Table 2:** Green Finance by All Banks and NBFIs in Bangladesh before (2019/20) and During (2020/21) the Pandemic.

Quarterly	All Banks (61)			FIs (34)		
	Before the Pandemic	During the Pandemic	Growth Rate (%)	Before the Pandemic	During the Pandemic	Growth Rate (%)
April-June	23,676.38	25,021.29	0.06	1,542.40	25,021.29	15.22
July-September	19,104.82	23,204.75	0.21	19,104.82	23,204.75	0.21
October-December	33,421.96	38,470.45	0.15	33,421.96	38,470.45	0.15
January-March	28,372.12	18,881.04	-0.33	28,372.12	18,881.04	-0.33
Total (amount in BDT million)	104,575.28	105,577.53	0.02	82,441.30	105,577.53	3.81

Table 2 summarizes the total amount of green finance provided by banks and non-bank financial institutions (NBFIs) before and during the COVID-19 pandemic. According to the empirical findings, total green finance growth by all banks and NBFIs increased during the pandemic compared to the pre-pandemic period. Figure 1 and Table 5 shows the sector-wise green financing of sample banks and NBFIs before and during the COVID-19 pandemic. The findings revealed that green financing in various projects such as renewable energy, alternative energy, energy efficiency, waste management, and so on decreased for NBFIs during the COVID-19 pandemic compared to before the pandemic, with the exception of the ‘others’ sector, which increased by more than 100%. On the other hand, the growth rate of sector-wise green financing for all sample banks witnessed an increasing trend for renewable energy, energy efficiency, alternative energy, and recycling and recyclable product. As a result, it can be said that banks are the primary promoter of renewable energy, alternative energy, energy efficiency, recycling, and

recyclable product sectors during the COVID-19 epidemic, as it contributes to the country's long-term development.

**Table 3:** Differences in the Growth (y-o-y) of Green Finance of Sample Banks and NBFIs During the Periods 2019/20 and 2020/21.

Quarterly	SOCBs (%)	SDBs (%)	PCBs (%)	FCBs (%)	All Banks (%)	FIs (%)
April-June	1.71	4.31	0.28	-0.30	0.06	15.22
July-September	1.27	1.38	0.73	-0.46	0.21	0.21
October-December	23.24	-0.54	-0.01	-0.10	0.15	0.15
January-March	2.98	9.83	-0.17	-0.86	-0.33	-0.33
Mean	7.30	3.74	0.21	-0.43	0.02	3.81
SD	10.65	4.52	0.40	0.32	0.25	7.61

The above Table 3 shows the difference in the growth rate of green financing by banks and NBFIs before (2019/2020) and during the pandemic (2020/2021), as well as their corresponding means and standard deviations. Differences in green financing growth rates for all sample banks, NBFIs, SOCBs, SDBs, and PCBs before and during the pandemic were found to be positive, implying that green financing growth rates during the COVID-19 epidemic were higher than those before the epidemic. The overall mean difference and its associated standard deviations are 0.02% and 0.25 for all banks, 3.81% and 7.61 for NBFIs, 7.30% and 10.65 for SOCBs, 3.74% and 4.52 for SDBs, and 0.21% and 0.40 for PCBs, respectively. During the COVID-19 pandemic, FCBs had a downward trend in green financing, with a mean value of 0.43% and a standard deviation of 0.32.

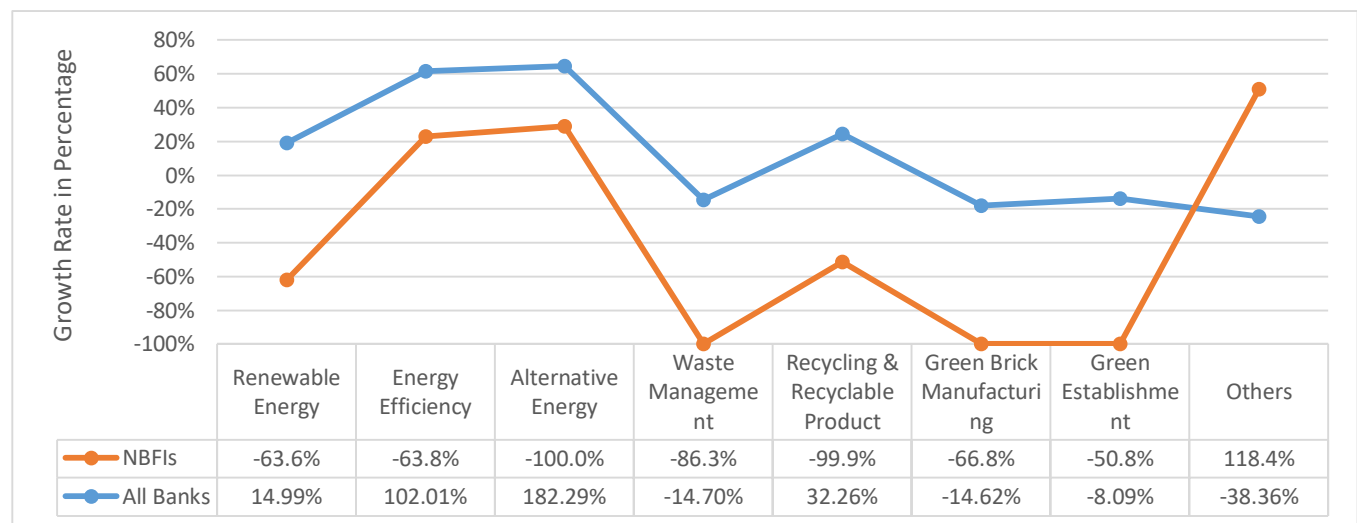
Moreover, an inferential statistical analysis (dependent sample t-test) was performed to see whether this difference, both positive and negative, is statistically significant and to determine whether the COVID-19 epidemic has an impact on the green financing of banks and NBFIs in Bangladesh. Table 4 shows the results of the dependent t-test for the mean differences in growth (y-o-y) of banks and NBFIs in Bangladesh before and during the pandemic. The empirical findings revealed that the increase of green finance for all banks and NBFIs was greater during the pandemic than before the pandemic. This means that the overall green financing growth rate of all banks and NBFIs during the pandemic was higher than before the epidemic, and that the pandemic had no negative impact on the total green finance growth of all banks and NBFIs. On the other side, bank-wise growth in green financing by SOCBs, SDBs, and PCBs was higher during the pandemic than prior to the pandemic, whereas FCBs saw a decline in green financing during the COVID-19 pandemic. This means that the expansion of green finance by SOCBs, SDBs and PCBs was unaffected by the pandemic; however, the growth of green financing by FCBs was significantly impacted.

**Table 4:** Results of the Dependent T-test for the Mean Differences in Growth (y-o-y) of Banks and FIs in Bangladesh before (2019/20) and during the pandemic (2020/21)

Banks and FIs	Mean differences (%)	Change Direction	p-value	Hypothesis
All Banks	0.02	Increased by 0.02%	0.512	Not-supported
NBFIs	3.81	Increased by 3.81%	0.963	Not-supported
SOCBs	7.30	Increased by 7.30%	0.209	Not-supported
SDBs	3.74	Increased by 3.74%	0.491	Not-supported
PCBs	0.21	Increased by 0.21%	0.614	Not-supported
FCBs	-0.43	Decreased by 0.43%	0.067*	Supported
Source: Authors' calculation.				
*Significant at alpha value of 10%				

### • Sector-Wise Green Finance of Banks and NBFIs

Table A2 shows the sector-wise green financing of banks and NBFIs during the study period. The overall banking sectors' green financing projects such as renewable energy, energy efficiency, recycling and recyclable product, and alternative energy were increased during the pandemic than before it. However, green financing in waste management, green brick manufacturing, and green establishment by all banks were decreased during the pandemic compared to pre-pandemic. Furthermore, sector-wise green financing by NBFIs during the pandemic was shown to be reducing during the pandemic than before it, with the exception of financing in an unidentified sector, which had an increasing growth rate throughout the pandemic. As a result, during the pandemic, there were variations in growth (y-o-y) of sector-wise green financing by all banks and NBFIs, as illustrated in Figure 1.



**Figure 1:** Differences of growth (y-o-y) of sector-wise green financing of sample banks and NBFIs between 2019/20 and 2020/21.

### • Sector-Wise Green Finance of SOCBs, SDBs, PCBs and FCBs

Table 6 shows the sector-wise green financing of SOCBs, SDBs, PCBs and FCBs before and during the period of pandemic. The empirical findings indicate that category-wise green financing of PCBs increased by 0.12% during the pandemic, while SOCBs' sector-wise green financing witnessed 6.32% increase during the same period. The results further revealed that FCBs' green financing during the pandemic decreased by 0.43% during the pandemic compared to the pre-pandemic. Therefore, it can be concluded that banking institutions play crucial role in the development of green economy during the pandemic through green financing of various ecofriendly projects.

**Table 6:** Sector-Wise Green Finance of SOCBs, SDBs, PCBs and FCBs (amount in BDT million)

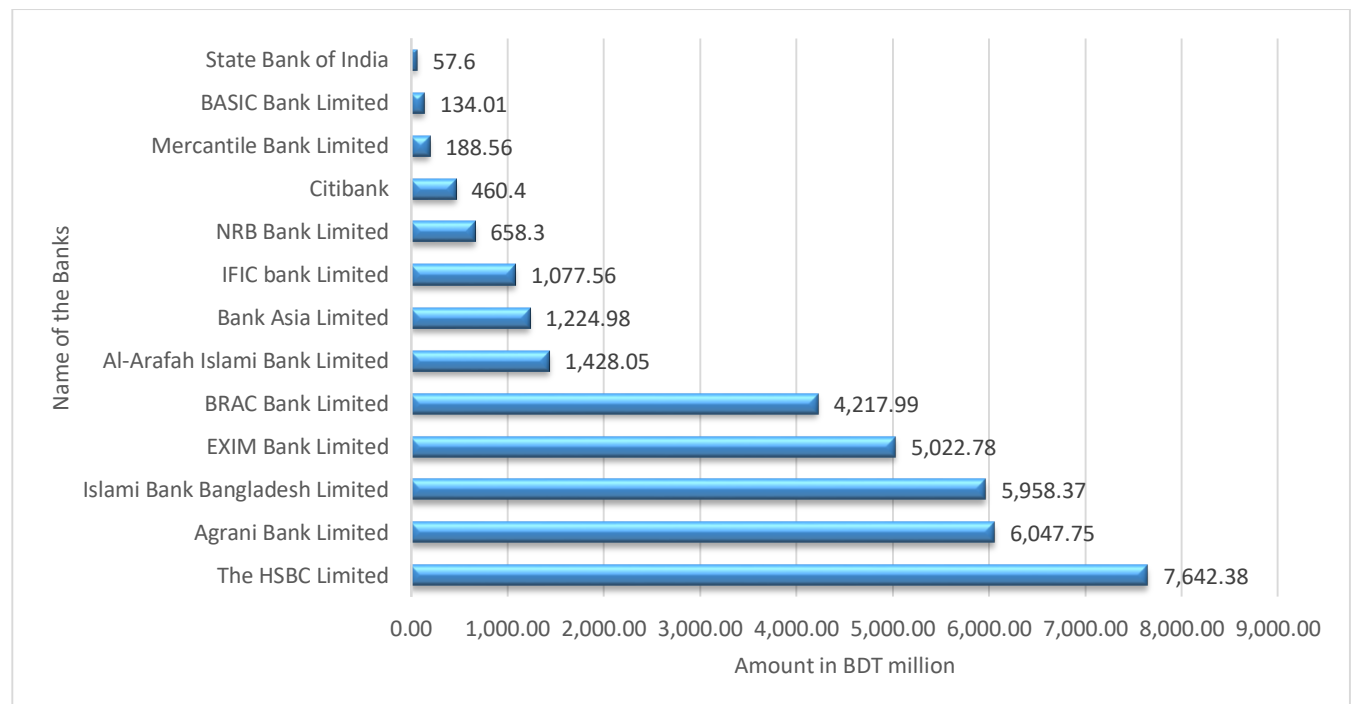
Banks	Particular	RE	EE	AE	WM	RRP	GBM	GE	Others	Total
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<b>SOCBs</b>	Before the Pandemic	7.91	0	0	416.25	320.8	183.49	439.85	8.02	1376.32
	During the Pandemic	1831.46	225.36	0	935.56	807.41	506.68	5686.8	74.69	10067.96
	<b>Growth Rate (%)</b>	<b>230.54</b>	<b>-</b>	<b>-</b>	<b>1.25</b>	<b>1.52</b>	<b>1.76</b>	<b>11.93</b>	<b>8.31</b>	<b>6.32</b>
<b>SDBs</b>	Before the Pandemic	6.98	0	0	0.01	0	0	0	1.59	8.58
	During the Pandemic	6.42	0.00	0.00	0.00	0.00	11.00	0.00	1.90	19.32
	<b>Growth Rate (%)</b>	<b>-0.08</b>	<b>-</b>	<b>-</b>	<b>-1.00</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>0.19</b>	<b>1.25</b>
<b>PCBs</b>	Before the Pandemic	2493.54	5347.98	13.44	8219.64	8396.79	8714.88	29538.12	3129.01	65853.4
	During the Pandemic	1500.16	10341.11	37.94	7117.8	10724.97	7079.49	35365.05	1417.7	73584.22
	<b>Growth Rate (%)</b>	<b>-0.40</b>	<b>0.93</b>	<b>1.82</b>	<b>-0.13</b>	<b>0.28</b>	<b>-0.19</b>	<b>0.20</b>	<b>-0.55</b>	<b>0.12</b>
<b>FCBs</b>	Before the Pandemic	514.89	381.84	0	1454.86	4.6	0	36113.93	35.59	38505.71
	During the Pandemic	138.41	1008.47	0	554.37	3.4	0	19693.88	462.39	21860.92
	<b>Growth Rate (%)</b>	<b>-0.73</b>	<b>1.64</b>	<b>-</b>	<b>-0.62</b>	<b>-0.26</b>	<b>-</b>	<b>-0.45</b>	<b>11.99</b>	<b>-0.43</b>

Note: RE, renewable energy; EE, energy efficiency; AE, alternative energy; WM, waste management; RRP, recycling and recyclable product; GBM, green brick manufacturing; GE, green establishment.

### • Leading Banks in Green Financing During the COVID-19 Pandemic in Bangladesh

Figure 2 shows the top-performing banks and NBFIs with respect to green financing in Bangladesh during the COVID-19 pandemic, as of March 2021. The HSBC Limited, Agrani Bank Limited, Islami Bank Bangladesh Limited, EXIM Bank Limited, and BRAC Bank Limited were top-five performing banks in terms of green financing during the pandemic, as they had committed more than 10% of their total loan disbursement to green finance, as indicated in Figure 4.



**Figure 2:** Leading Banks in Green Finance during the COVID-19 Pandemic, as of March 2021.

### • The Number of Borrowers from the Green Finance of Banks and NBFIs

The number of borrowers from the banks and NBFIs' green finance during the period of COVID-19 are shown in Table 7. The main borrowers from the green financing scheme of banks

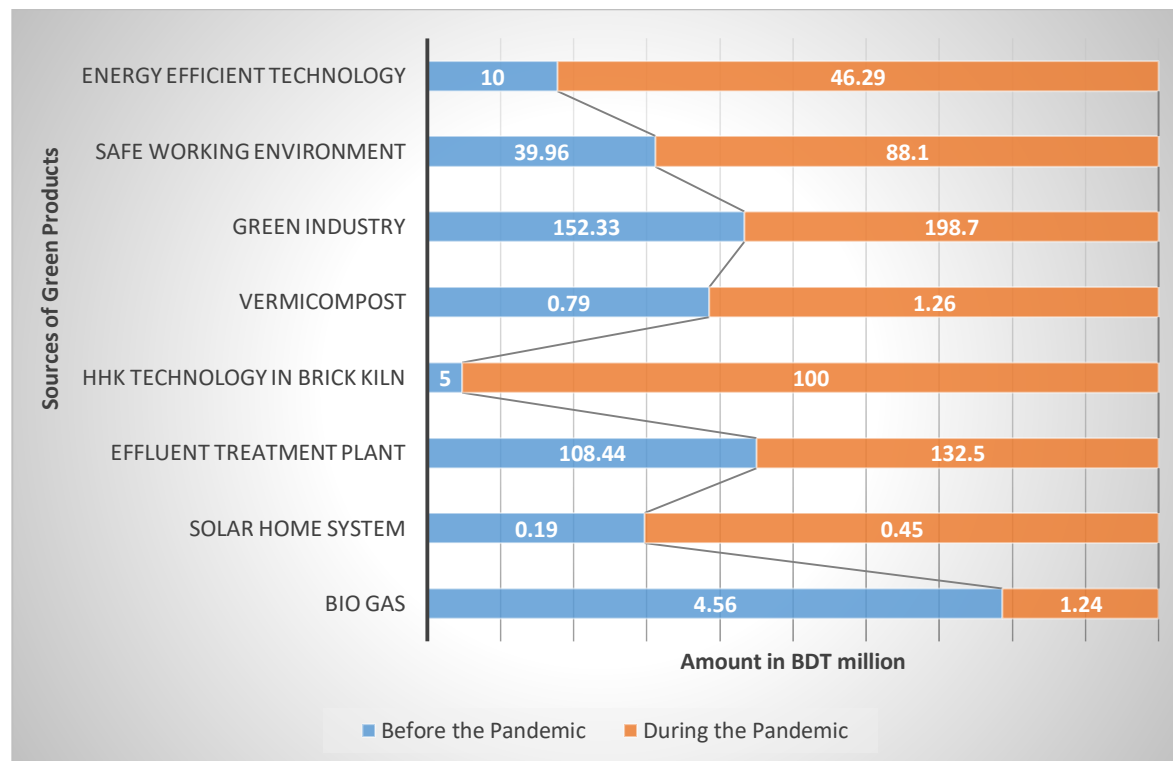
and NBFIs include large, cottage and micro, small and medium businesses, and other enterprises. The empirical findings showed that the number of borrowers from the green finance increased by 23% for the banking institutions, while nearly 3% decrease was observed for the NBFIs during the pandemic.

**Table 7:** The Number of Borrowers from Green Finance

Business	Banks			NBFIs		
	Before the Pandemic	During the Pandemic	Growth Rate (%)	Before the Pandemic	During the Pandemic	Growth Rate (%)
Large	413	324	-21.55	39	32	-17.95
Cottage & Micro	65	93	43.08	-	-	-
Small & Medium	1036	1423	37.36	20	25	25.00
Others	5	24	380.00	-	-	-
<b>Total</b>	1519	1864	22.71	59	57	-3.39
Source: Annual reports of sample banks and sustainable finance department of Bangladesh Bank (2021). For more details, see <a href="http://www.bb.org.bd">www.bb.org.bd</a> .						

- **The BB Refinance Scheme for Green Product/Initiatives**

In 2009, BB developed an initial refinancing scheme of BDT 2.0 billion and subsequently increased it to BDT 4.0 billion to promote green goods or initiatives at a lower interest cost. The BB refinancing scheme for the green products/initiatives of banks and NBFIs during the period of COVID-19 are presented in Figure 3. The empirical results indicated that BB refinancing scheme for various green products such as biogas, solar home system, HHK technology in brick kiln, effluent treatment plant, vermicompost, green industry, safe working environment, and energy efficient technology grew by 76.97% during the pandemic compared to the pre-pandemic. Therefore, BB can be said to play a vital role in increasing investments in eco-friendly products to promote green banking for the development of the country's green economy during the pandemic.



**Figure 3:** The BB Refinance Scheme for Green Product/Initiatives During the periods 2019/20 and 2020/21.

- **Non-Performing Loans (NPLs) Under Investment and Green Finance**

Table 8 shows the comparison between the NPLs of banks and NBFIs under the total investment as well as green financing before and during the COVID-19 pandemic. The research findings showed that the total outstanding and classified loans within the green finance investment decrease for both banks and NBFIs. In contrast, an increment was observed in the total outstanding and classified loans under the Environmental and Social Due Diligence (ESDD) investment of both banks and NBFIs during the COVID-19 pandemic. Therefore, the expansion of banks and NBFIs' NPLs during the pandemic presents an uncertainty to the future of the banking sector in Bangladesh.

**Table 8:** Comparison Between the NPLs of Banks and NBFIs Before and During the COVID-19 Pandemic in Bangladesh

Issue	Banks			NBFIs		
	Before the Pandemic	During the Pandemic	Changes in Direction	Before the Pandemic	During the Pandemic	Changes in Direction
Outstanding loan/investment under green finance	10802393.10	285296.61	<i>Decreased</i>	667712.92	32213.16	<i>Decreased</i>
Classified loan/investment under green finance	954337.98	5744.17	<i>Decreased</i>	65360.21	2911.87	<i>Decreased</i>
Total outstanding loans/ investment	2251068.46	11410865.22	<i>Increased</i>	145097.81	659506.37	<i>Increased</i>

Total classified loans/ investment	70139.01	954658.89	<i>Increased</i>	12249.83	103945.97	<i>Increased</i>
Outstanding loans/investment under ESDD	259578.31	2459780.71	<i>Increased</i>	30918.00	133810.62	<i>Increased</i>
Classified loans/investment under ESDD	6325.61	65611.56	<i>Increased</i>	2869.46	13512.85	<i>Increased</i>
Source: Sustainable Finance Department of Bangladesh Bank (2021). For more details, see <a href="http://www.bb.org.bd">www.bb.org.bd</a> .						

## 4.2 Comparative Scenario of Green Banking Activities During the COVID-19 Pandemic.

### • The Bangladesh Bank's In-house Environmental Management

Table 9 exhibits the in-house green practices of BB during the COVID-19 period. In order to make its home operations environmentally sustainable, energy-efficient and technologically advanced, the empirical findings highlighted that the BB had undertaken significant steps towards green practices during the pandemic, such as rooftop solar power system and chiller-based air conditioning; online documentation and leave management system; online/office order and electronic pass for visitors; carbon footprint measurement and e-recruitment; and enterprise resource planning (ERP) and online account statement; etc.

**Table 9:** The Bangladesh Bank's In-house Green Practices During the COVID-19

SL	In-house green practices
1	Rooftop solar power system & chillar-based air conditioning
2	Online documentation & leave management system
3	Online/office order & electronic pass for visitors
4	Enterprise Data Warehouse (EDW) system
5	Bangladesh Electronic Fund Transfer Network (BEFTN)
6	Carbon footprint measurement & e-recruitment
7	Enterprise Resource Planning (ERP) & online account statement
8	LAN/WAN computer network among all BB offices
9	Bangladesh Automated Cheque Processing System (BACPS)
10	Credit Information Bureau (CIB)
Source: SFD, BB (2021). For more details, see <a href="http://www.bb.org.bd">www.bb.org.bd</a> .	

### • The Banks and NBFIs' In-House Environmental Management

The banks and NBFIs' in-house environmental management during the COVID-19 pandemic are presented in Table 10. The empirical results showed that the total number of banks' branches powered by solar energy increased by 2.01% during this pandemic, while it remained unchanged for the NBFIs. With respect to ATM booths of banking institutions, a 5% increase was observed during the pandemic. Furthermore, the total number of banks' ATM booths powered by solar energy diminished by a staggering 58% during the pandemic, compared to the past year. However, there is a substantial expansion in the number of banks' agent outlets and outlets powered by the solar energy during the COVID-19 pandemic. Therefore, it can be concluded that

the overall banks and NBFIs' in-house environmental management generally improved except for the number of solar-powered ATM booths, which contracted during the pandemic.

**Table 10:** The In-House Environmental Management of Banks and NBFIs

Issue	Banks			NBFIs		
	Before the Pandemic	During the Pandemic	Changes (%)	During the Pandemic	During the Pandemic	Changes (%)
No. of branches	10,545	10,596	0.48	284	280	-1.41
No. of solar-powered branches	598	610	2.01	3	3	-
No. of ATM booths	7,431	7,823	5.28	-	-	-
No. of solar-powered ATM booths	76	32	-57.89	-	-	-
Number of agent outlets	26,637	30,851	15.82	-	-	-
Number of solar-powered agent outlets	5	16	220.00	-	-	-

Source: SFD, BB (2021). For more details, see [www.bb.org.bd](http://www.bb.org.bd).

- **The In-House Environmental Management of PCBs, SOCBs and FCBs.**

Table 11 shows the in-house environmental management of PCBs, SDBs, SOCBs and FCBs during and before the outbreak. The results revealed that the PCBs and SOCBs' in-house environmental management improved during the pandemic except for the number of number of branches for PCBs, which decreased by 0.04% compared to the pre-pandemic. Furthermore, in-house environmental management of FCBs rose throughout the outbreak compared to before the pandemic, with the exception of the number of ATM booths, which declined by 90.91 %. Therefore, the overall in-house environmental management of PCBs, SOCBs and FCBs were satisfactory during the pandemic, indicating the substantial adoption of green banking initiatives by the banking institutions in Bangladesh.

**Table 11:** The In-House Environmental Management of PCBs, SDBs, SOCBs and FCBs.

Banks		No. of branches	No. of solar-powered branches	No. of ATM booths	No. of solar-powered ATM booths	Number of agent outlets	Number of solar-powered agent outlets
PCBs	Before the Pandemic	5283	512	7046	63	26437	5
	During the Pandemic	5281	705	8595	263	36641	20
	Growth rate (%)	-0.04%	37.70%	21.98%	317.46%	38.60%	300%
SDBs	Before the Pandemic	1421	6	6	0	0	0
	During the Pandemic	1500	0	7	0	0	0
	Growth rate (%)	5.56%	-100.00%	16.67%	-	-	-
SOCBs	Before the Pandemic	3777	76	240	2	200	-
	During the Pandemic	3804	81	343	2	396	0
	Growth rate (%)	0.71%	6.58%	42.92%	0.00%	98.00%	-
FCBs	Before the Pandemic	64	5	139	11	0	0
	During the Pandemic	72	5	137	1	0	0

	Growth rate (%)	12.50%	0.00%	-1.44%	-90.91%	-	-
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### • Progress of Online Banking During the COVID-19 Pandemic

Table 12 shows the green banking activities of PCBs, SDBs, SOCBs, and FCBs in Bangladesh during the COVID-19 pandemic. The empirical findings indicated that the total number of branches with an online coverage increased by 4.55%, 0.6%, and 1.54% for PCBs, SOCBs and FCBs, respectively, during the pandemic. Furthermore, the number (percentages) of online branches increased slightly for the all sample banks during the pandemic, while that of SDBs remained unchanged. Hence, the level of automation of banking institutions' services toward online banking in Bangladesh can be deemed satisfactory.

**Table 12:** The level of Automation Towards Green Banking in Bangladesh

Banks	Issue	No. of total branches	No. of branches with online coverage
PCBs	Before the Pandemic	5083	5080
	During the Pandemic	5321	5311
	<b>Growth Rate (%)</b>	<b>4.68%</b>	<b>4.55%</b>
SDBs	Before the Pandemic	1421	1421
	During the Pandemic	1421	1113
	<b>Growth Rate (%)</b>	<b>0.00%</b>	<b>153.53%</b>
SOCBs	Before the Pandemic	3758	3688
	During the Pandemic	3788	3716
	<b>Growth Rate (%)</b>	<b>0.80%</b>	<b>0.76%</b>
FCBs	Before the Pandemic	65	65
	During the Pandemic	66	66
	<b>Growth Rate (%)</b>	<b>1.54%</b>	<b>1.54%</b>

Source: SFD, BB (2021). For more details, see [www.bb.org.bd](http://www.bb.org.bd).

## 5. Discussion and Conclusion

This main purpose of the study is to identify the impact of COVID-19 on the green financing of banks and NBFIs during the pandemic using a secondary data. In addition, this study also highlights the green banking activities of the banks and NBFIs during the COVID-19 outbreak. Consequently, the empirical findings revealed that total green finance growth by all banks and NBFIs increased during the pandemic compared to the pre-pandemic period. In terms of sector-wise green finance by banks and NBFIs, the findings revealed that green financing in various projects such as renewable energy, alternative energy, energy efficiency, waste management, and so on decreased for NBFIs during the COVID-19 pandemic compared to before the pandemic, with the exception of the 'others' sector, which increased by more than 100%. On the other hand, the growth rate of sector-wise green financing for all sample banks witnessed an increasing trend for renewable energy, energy efficiency, alternative energy, and recycling and recyclable product. Similar findings have been reported in recent studies (Khairunnessa et al., 2021; G. Zheng et al., 2021). Hence, it can be said that banks primarily support renewable energy, alternative energy, energy efficiency, recycling, and recyclable

product sectors during the COVID-19 epidemic, thereby contributing to the country's long-term development.

Furthermore, the results from the dependent t-test statistics indicated that during the COVID-19 pandemic, the increase of green finance for all banks and NBFIs was greater than before the epidemic. This means that the overall green financing growth rate of all banks and NBFIs was higher during the pandemic than before the epidemic, and that the pandemic had no negative impact on the total green finance growth of all banks and NBFIs. On the other hand, bank-wise growth in green financing by SOCBs, SDBs, and PCBs was higher during the pandemic than before it, while FCBs saw a decline in green financing during the COVID-19 epidemic. This means that the expansion of green finance by SOCBs, SDBs, and PCBs was unaffected by the COVID-19 pandemic, as opposed to the growth of green financing by FCBs. The present study is the first to investigate the impact of COVID-19 on the green financing in the banking sector of Bangladesh using a dependent t-test analysis; therefore, partial endorsement of our results can be found in the previous study of G. Zheng et al. (2021). Moreover, the empirical findings showed that category-wise green financing of PCBs increased by 0.12% during the pandemic, while SOCBs' sector-wise green financing witnessed 6.32% increase during the same period. The results further revealed that FCBs' green financing during the pandemic decreased by 0.43% during the pandemic compared to the pre-pandemic period. Therefore, our findings are in line with the earlier studies (Hoque et al., 2019; Khairunnessa et al., 2021; G. W. Zheng et al., 2021). As a result, during the pandemic, Bangladeshi financial institutions can be said to be contributing to the development of the green economy by financing various eco-friendly projects.

The research findings also showed that during the pandemic in Bangladesh, both banks and NBFIs regressed in term of the total outstanding and classified loans within their investment under green finance. Thus, it can be observed from the outputs that green financing of different ecofriendly projects by the banks and NBFIs in Bangladesh is more productive than the traditional financing during the COVID-19 pandemic. On the other hand, the total outstanding and classified loans under the investment and the investment under Environmental and Social Due Diligence (ESDD) for both banks and NBFIs increased during the pandemic. This findings is in agreement with the recent studies (Barua & Barua, 2021; Ghosh & Saima, 2021; Hosen et al., 2020), which revealed that Bangladeshi banking system had been severely affected by the increasing levels of NPLs due to the global COVID-19 crisis. Rapidly rising NPLs often create doubts in the depositors' minds and reduces customers' confidence in depositing money into banks, resulting in a liquidity crisis for banks. Therefore, there is a growing concern for the future of banking sector in Bangladesh, as the NPLs of banks and NBFs had greatly increased during the pandemic.

Generally, the improvement in the green banking activities of PCBs, SOCBs and FCBs in Bangladesh had been substantial during the pandemic period. Thus, the empirical findings showed that the total number of branches with an online coverage increased by 4.55%, 0.6%, and 1.54% for PCBs, SOCBs, and FCBs, respectively, during the pandemic. Furthermore, the number (percentages) of online branches increased slightly for the all sample banks during the pandemic, while that of SDBs remained unchanged, which is consistent with the outcomes of the past studies (Akter et al., 2018; Hoque et al., 2019; Khairunnessa et al., 2021; G. W. Zheng et

al., 2021). These studies highlighted that the green banking in Bangladesh had improved in recent years, especially in terms of green funding and in-house risk management, which is largely promoted by the BB in a bid to green the Bangladeshi banking system. Therefore, it can be concluded that the automation of banking services towards green banking in Bangladesh was satisfactory particularly during the COVID-19 pandemic.

## **6. Implications for the Green Economic Recovery**

### ***6.1 Implications for the Government***

During the COVID-19 pandemic, major economic activities of global financial institutions were halted, making a global recession imminent. By adopting and developing appropriate policy guidelines, the effect of the pandemic on the economy, the banking sector and other industrial sectors could be reduced to some degree. Consequently, the government of Bangladesh had undertaken various initiatives to lessen the impact of the pandemic on the country's economy. Besides, the outcomes of this study also present some useful green recovery measures to revive the country's economy and cushion the adverse effects of the pandemic towards attaining SDGs. First, the financial sector in Bangladesh had suffered from the poor management of NPLs, which could further increase after the pandemic. This has presented the banks and NBFIs with risk of huge liquidity crisis, which will affect the economy of the country. Therefore, to strengthen the banking sector, the main economic driver in Bangladesh, the government should undertake necessary steps to reduce the NPLs of banks and NBFIs through strong monitoring, establishment of proper policy guidelines and provision of funds with lower interest rates to mitigate the liquidity crisis faced during the pandemic. Second, the government of Bangladesh should consider green recovery measures including grants, loans and tax reliefs for green banking activities; green transport; clean energy development; and circular economy to create more jobs, reduce unemployment, and stimulate economic activity through banks and NBFIs. In addition, the government can support positive environmental results and facilitate the attainment of sustainable development in the country during the pandemic by striking balance between green and non-green expenditure. Also, the government can encourage innovation, implement a wider spectrum and systemic change in key sectors, accelerate existing environmental policies and use green pipelines for their projects. Besides, the new perspective of a relatively low oil price offers a great opportunity to increase carbon prices and reform fossil fuel subsidies. To conclude, green economic recovery measures are essential to address the immediate and interconnected problems of climate change and loss of biodiversity.

### **6.2 Implications for the Banks and Financial Institutions**

The empirical findings of this study has some useful implications for researchers, banking institutions, managers, and policy makers of emerging economies like Bangladesh to lessen the adverse effects of the COVID-19 pandemic on the green banking and financing of banks and NBFIs towards the attainment of sustainable development of the country. To date, banking and financial sectors in Bangladesh including BB had taken several initiatives to mitigate the negative impacts of the COVID-19 pandemic. However, further recovery steps should also be considered in addition to the formation of a contingency team with clear tasks of achieving the

strategic objectives of a sustainable future in Bangladesh's banking sector. First, our results suggest that NPLs had risen enormously for banks and NBFIs during the pandemic, creating a liquidity problem for the banks. Thus, BB should take a radical measure to reduce NPLs in the banking sector, while policy guidelines should be drawn up to revive the country's financial system. Besides, it is high time for the manager of each bank to evaluate and revalue its total lending portfolios, as well as monitor their investment. Second, banks and financial institutions may raise funds by issuing green bonds to mitigate the liquidity crisis faced during the COVID-19 pandemic. Third, the COVID-19 may be utilized as an avenue to help clients and affected communities via green banking activities, and in turn boost the banks' credibility and brand. The banks and NBFIs can improve their daily operations during the pandemic by adopting green banking activities such as online payments, online banking, remote deposits, green credit card, and funding of ecofriendly projects to support the government in its effort to achieve the SDGs. Finally, the findings showed that the overall green banking activities including green financing, in-house environmental management, and social and environmental risk rating of green projects financed by the banks and financial institutions in Bangladesh during the COVID-19 pandemic were satisfactory. Therefore, banks and financial institutions of the Bangladesh should continue to embrace green banking to sustain the revival of the economy from the negative impacts of the pandemic. Besides, BB may also reinforce this habit by ensuring proper monitoring, establishing proper guidelines and providing training, education, and seminar to the employees of the banks and financial institutions to ensure the sustainable banking in the future.

## 7. Study Limitations and Future Research

Although the present study provides some insightful theoretical and practical implications for the effect of COVID-19 on the green banking activities of banks and NBFIs in Bangladesh, it is not bereft of some limitations, which present the scope for further research. First, this study relied only on secondary data obtained from the central bank of Bangladesh and other sample banks and NBFIs during the period 2019–2021. Since this is an ongoing situation, all of the information obtained from the secondary sources is subject to changes at all times. Therefore, the future research could improve the study by expanding the study duration and collecting primary data using survey methods to identify the impact of the COVID-19 pandemic on the environmental performance of banks. Second, the study analyzed the impact of COVID-19 on the green banking activities including green financing of banks and NBFIs in Bangladesh using a systematic review approach. Therefore, subsequent study could consider measuring the COVID-19 pandemic impact on the banks' profitability and liquidity using a panel data set. Third, we utilized simpler analysis namely descriptive statistics, dependent t-test analysis, percentage changes and varying graphs and tables to achieve our study objectives. However, tangible results can be obtained in the future study by using stronger statistical techniques such as regression analysis, Data Envelopment Analysis (DEA), and AMOS-based Structural Equation Modelling (SEM) to identify the impact of the pandemic on the green banking and financing of banks and financial institutions.

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## Appendices

**Table A1:** Major Initiatives of Banks and NBFIs During the COVID-19 Pandemic

Name of Banks and FIs	Initiatives
Al-Arafah Islami Bank Limited (AIBL)	In an attempt to reduce the effects of the novel coronavirus, AIBL contributed US\$0.59 million (BDT 5 crore) to the Prime Minister's Relief and Welfare Fund (PMRWF). In addition, all AIBL staffs also supported the PMRWF with a-day income of their salary, which amount to a total of \$0.10 million (BDT 83.18 lakh).
IDLC Finance Limited	On April 2020, the IDLC Finance Limited initiated the donation of essential foodstuffs to low-income and daily wage earners. This program was implemented by five well-recognized local development and volunteer organizations. Ovizatrik Foundation, Sajeda Foundation, CSR Window Bangladesh and Shomvabona & Alokito Shishu are affiliate organizations, covering a total of 12 districts that have been neglected, including several slums in Dhaka & Chittagong.
Meghna Bank Limited (MBL)	Workers of the MBL expressed their support to those affected by the COVID-19 pandemic by taking care of them and their families. The staff of the Bank also allocated a-day pay of their salary to support those affected by the outbreak.
Mutual Trust Bank Ltd. (MTB)	The MTB contributed US\$ 0.59 million (BDT 50 million) to the PMRWF to help combat the COVID-19 pandemic.
Mercantile Bank Limited (MBL)	The MBL donated a total amount of US\$ 0.59 million (BDT 50 million) to the PMRWF against the COVID-19 outbreak.
BRAC Bank Limited (BBL)	The BBL donated a check of US\$ 0.59 million (BDT 50 million) to the PMRWF through the Bangladesh Bank Association to support the government struggle against the deadly virus.
Eastern Bank Ltd (EBL)	The EBL contributed US\$ 0.59 million (BDT 50 million) to the PMRWF to help fight the pandemic.
Premier Bank Limited (PBL)	The PBL offered US\$ 0.59 million (BDT 5 crore) to the PMRWF to curb the spread of the coronavirus.
United Commercial Bank Limited (UCBL)	The UCBL contributed US\$ 0.59 million (BDT 5 crore) to the PMRWF to aid the battle against the viral outbreak.
NRB Commercial Bank Limited (NRBCBL)	The NRBCBL donated US\$ 23,548 (BDT 20 lakh) to the PMRWF and also set up a US\$0.32 million (BDT 2.75 crore) fund to support the poor, destitute and frontline workers during the crisis.
EXIM Bank Limited	The bank supplied personal protection equipment (PPE), testing/respiratory equipment to the health care industry and

	provided financial support to the needy and the COVID-19 patients. In addition, EXIM Bank donated US\$ 0.59 million (BDT 50 million) to PMRWF.
Agrani Bank Limited (ABL)	In order to fight the COVID-19 pandemic, ABL donated \$0.15 million (BDT 1.25 crore) to the PMRWF. Also, the bank supported the same relief and welfare fund with 5,000 pieces of PPE.
Sonali, Rupali, and Janata Bank Limited	In response to the government's campaign against the deadly coronavirus, Sonali, Rupali, and Janata jointly donated US\$ 0.44 million (BDT 3.75 crore) to the PMRWF.
The IFIC Bank Limited (IFICBL)	In support of the effort to curb the spread of the COVID-19 virus, the IFIC Bank donated US\$ 0.59 million (BDT 50 million) to PMRWF.
HSBC	The HSBC announced a range of actions to help its customers in textiles and clothing industries overcome the economic impact of the pandemic. The bank offered a special short-term credit of up to one year with a four-month moratorium to be utilized to cover payroll bills and payments of utilities. According to an HSBC Bangladesh press release, the Bank also allowed three months of moratorium on current term loans from textile and garment companies. During the period, the customer is not obliged to pay any installments, while the lender is also not allowed to demand any repayment. The Bank of Bangladesh had encouraged other banks to emulate similar initiative to fund companies.
The Standard Chartered Bangladesh (SCB)	The SCB agreed to support its customers with a range of measures to help them cope during the pandemic period. As a measure, the bank gave the general customers a three-month payment break, while the company's customer also received their loans within 30 days. The bank also promised to waive the customers' penalty interest, late payment charges as well as the company's late payment fee via credit card.
Source: Bank Websites, (2021)	

**Table A2:** Sector-Wise Green Financing of all Banks and NBFIs before (2019/20) and during the pandemic (2020/21)

Sources of Green Finance (amount in BDT million)	All Banks			NBFIs		
	Before the Pandemic	During the Pandemic	Remarks	Before the Pandemic	During the Pandemic	Remarks
Renewable Energy	3023.32	3476.45	Increased	1346.97	490.13	Decreased
Energy Efficiency	5729.82	11574.94	Increased	2882.97	1044.36	Decreased
Alternative Energy	13.44	37.94	Increased	6.00	0.00	Decreased
Waste Management	10090.76	8607.73	Decreased	290.00	39.69	Decreased

Recycling & Recyclable Product	8722.19	11535.78	Increased	322.69	0.35	Decreased
Green Brick Manufacturing	8898.37	7597.17	Decreased	789.18	262.10	Decreased
Green Establishment	66091.90	60745.73	Decreased	610.00	300.00	Decreased
Others	3174.21	1956.68	Decreased	233.00	508.80	Increased