Exploring the Economic Impact of Green Financing: A Case Study of Bangladesh's Loan Disbursement Initiatives

Tanjida Nur Mostafa

Faculty of Business Administration, Jahangirnagar University, Dhaka, Bangladesh

DOI: https://dx.doi.org/10.47772/IJRISS.2025.915EC0018

Received: 05 February 2025; Accepted: 13 February 2025; Published: 15 March 2025

ABSTRACT

Bangladesh has increasingly adopted green financing initiatives, yet their impact on economic growth remains unclear. Despite regulatory efforts, the effectiveness of green financing in influencing GDP growth requires further exploration. This study investigates the relationship between green finance loan disbursement and economic performance by analyzing secondary data from 2019 to 2023. The study focuses on loan disbursements from four types of financial institutions: state-owned commercial banks, specialized banks, private commercial banks, and financial institutions. GDP data is sourced from the Bangladesh Bureau of Statistics. The research employs panel data analysis using the random effect model to determine the relationship between green financing and GDP growth. Various statistical tests, including the Breusch-Pagan/Cook-Weisberg test for heteroskedasticity and the Breusch-Godfrey LM test for autocorrelation, were conducted to validate the findings. The results indicate that green financing initiatives, in general, have an insignificant impact on economic growth. However, among the financing initiatives, green agriculture exhibits a significant positive impact on GDP, whereas other sectors, such as renewable energy and CMSME, show either weak or negative relationships. The findings highlight the complexity of linking green financing to economic growth and emphasize the need for targeted interventions to enhance its effectiveness. The study recommends increasing investment in green agriculture, reassessing financing strategies for ineffective sectors, and adopting an integrated approach that combines different green financing initiatives to maximize economic benefits. Future research should address multicollinearity among independent variables, incorporate long-term trend analysis, and expand the scope beyond financial institutions to capture the full impact of green financing on economic development.

Keywords: Green Financing, Economic Growth, GDP, Loan Disbursement, Bangladesh Bank, Panel Data Analysis, Random Effect Model, Green Agriculture, Renewable Energy, CMSME, Heteroskedasticity

INTRODUCTION

The idea of "green banking" has become well-known in modern finance as an example of moral behavior in the financial sector, guiding investment choices toward social and environmental responsibility. Bangladesh, which is overcoming a difficult combination of environmental and socioeconomic obstacles, has become a leader in this field. Initiatives related to Green Financing have exploded in the vast field of Green Banking, speeding up sustainability projects and reducing the dangers associated with climate change. These programs including waste management, renewable energy, eco-friendly agriculture, Green Cottage, Micro, Small &Medium Enterprises (CMSME), and Green Solid Recovered Fuel (SRF) highlight the country's steadfast commitment to sustainable development. Green Banks also promote social responsibility by funding initiatives that enhance social welfare, such as education, affordable housing, and healthcare (Hasan, 2022).

The G20 Green Finance Study Group provides a convincing definition of green finance: it is the funding of projects that promote sustainable development objectives and have a beneficial environmental impact. These activities cover a wide range of projects to reduce pollution, improve energy efficiency, and tackle the complex issues brought on by climate change. This term is implicit in the attempt to internalize environmental

externalities and reframe risk perceptions to encourage ecologically friendly investments while discouraging environmentally detrimental ones.

The publication of thorough and transparent information about social and environmental performance to prioritize transparency, accountability, and regulatory compliance, is at the heart of the Green Banking philosophy. Investments in green banking initiatives seek to build stakeholder confidence by lowering ecological footprints via the use of energy-efficient equipment and responsible resource management techniques. Thus, green banking emerges as a powerful catalyst for promoting fair, sustainable practices and promoting moral investment decisions (Hadi, 2023).

Green financing has an impact on economic development dynamics and profitability. Green finance programs prioritize social and environmental concerns while attempting to strike a balance between GDP growth and the demands of environmental sustainability. Investing in green projects improves productivity and human capital in addition to supporting social welfare and the growth of green markets. Green finance also stimulates economic growth and innovation by fostering stakeholders' confidence and trust, assuring economies' long-term resilience and sustainability via adopting eco-friendly practices and technology.

Having many facets, the impact of loan disbursement in green financing initiatives on economic growth involves sustainability and profitability. By prioritizing social and environmental responsibilities, green financing enhances both GDP growth and a healthy environment. To flourish employment possibilities, investment in green initiatives that raise green entrepreneurship and green market increases production and efficiency across a range of companies and sectors. Moreover, financing programs that advance social welfare-like healthcare and education -contributes to the growth of human capital, raising worker productivity and GDP as a whole. Eco-friendly practices and energy-saving technology not only reduce operation costs but also minimize the hazards associated with environmental degradation.

Bangladesh, a low-lying country on the Ganges-Brahmaputra Delta, suffers significant climate change risks for its dense population and riverine landscape. With 75% of its territory below 10 meters, the country is urged to invest in green finance for climate-resilient and renewable energy projects, addressing the country's vulnerability. Bangladesh Bank created the green banking laws in 2011 to put "Green banking" into practice. The first central bank in the world with a comprehensive understanding of green banking is Bangladesh Bank (Lalon, 2015). Millat et al (2012) reported that Bangladesh Banks have enthusiastically reacted to the Bangladesh Bank's guidelines for green Banking.

Purpose of the Study

The goal of this study will focus on Bangladeshi PFI (Participating Financial Institutions) 1) State-owned commercial banks (SOCBs), 2) Specialized banks (SDBs), 3) Private commercial banks (PCBs), 4) Financial Institutions (FIs) that wish to participate in Environment-Friendly Projects and the potential for economic growth through Green Financing initiatives. The research will focus on providing insights into the potential outcomes of the interaction between Green Financing Initiatives and Economic growth (GDP).

Objectives of the Study

1) To Analyze the effect that loan disbursements in green financing initiatives have on Bangladesh's GDP growth, examining how the main variables affect the growth separately and collectively.

2) To evaluate the contribution of participating financial institutions in adopting and promoting green financing initiatives, and their influence on economic growth.

3) To Examine the potential long-term advantages and risks associated with green financing initiatives for Bangladesh's sustainability and financial development.

Limitations of the Study

The study aims to investigate significant perspectives on the scope and consequences of Green Financing

Initiatives in Bangladesh and how their implications affect GDP. Yet, some limitations in the research design and methodology should be acknowledged:

1. **Sampling and Sources**: The study relies on the reports from Banks/financial institutions, but Investment Companies, NGOs, and other Corporate firms also play a role in Green Financing. As a result, findings may not fully represent the diversification among the key variables. The study's timeframe is too short to measure long-term trends as green financing takes time to make an influence toward the economy and environment.

2. **Data Availability and Reliability**: As mentioned in the literature some banks present only a general statement without detailed information. So the study may create biases and may have gaps in the dataset.

3. **Boundaries of Scope**: The study only focuses on the economic implications of Green Financing Initiatives; other socio-cultural, political, or technological factors that may influence green financing adoption are fully ignored.

4. **Multicollinearity among variables**: The study finds a high multicollinearity among the variables but it is not resolved in regression analysis due to the shortage of time.

LITERATURE REVIEW

Economic Impact of Green Financing

The relationship between Green Financing (GF) as a subsector of GB and the banks' profitability is complex and highly correlated as there are both immediate and long-term benefits associated. Although renewable energy or green technologies may incur short-term costs, research suggests that GF initiatives can measure substantial long-term advantages. For example, the European Banking Federation found that funding for eco-friendly products can have a beneficial long-term impact on financial institutions' financial performance over time, since these investments increase efficiency, reduce expenses, and strengthen risk management (Park & Kim, 2020). Additionally, implementing GB practices can positively influence a bank/financial institution's reputation, which is very essential for drawing customers' attention and maintaining profitability over the long run (Mir & Bhat, 2022). Financial institutions can differentiate themselves from the competition and win over more environmentally sensitive customers by showcasing their dedication to environmental sustainability. Positive reputations can therefore result in increased potential market share, brand recognition, and consumer loyalty (Ansari et al, 2022). Furthermore, GF activities may lead to lower compliance costs and regulatory risks. It is expected that financial institutions would have a strategic advantage in managing changing regulatory environments and avoiding fines if they proactively adopted sustainable practices. By that governments and international organizations are giving environmental preservation and climate change mitigation top priority, this strategic foresight is extremely relevant (Prabu et al., 2021). The long-term advantages of putting green banking (GB) ideas into practice outweigh the upfront costs. These consist of increased output, lower expenses, better risk management skills, an improved reputation, and compliance with regulations. In the end, these benefits not only increase a bank's profitability but also promote economic expansion and raise public awareness of environmental issues (Vijayalakshmi et al., 2021).In addition, banks can reduce operational costs as a result of GB practices. For example, promoting energy efficiency can save a lot of money on energy costs for buildings and operations. Additionally, by integrating environmental risk assessment into financial decisions, banks can avoid financing risky projects that may cause environmental damage and related costs. (Sangeetha et al., 2021). GB has a favorable impact on financial performance, especially when it comes to cost reduction. These results indicate that GB methods can help banks reduce costs and advance profitability (Charles and Nairobi, (2016).

Green Financing Initiatives can also increase customer loyalty and trust. According to studies conducted by Ibe-enwo et al. (2019), green banking (GB) has a beneficial effect on a company's reputation and increases customer loyalty. Furthermore, GB practices are important for drawing in and keeping clients by showcasing a

commitment to environmental sustainability, according to a study by Charles & Nairobi (2016), which also implies that GB develops customer loyalty through the mediation of green trust. Furthermore, for banks participating in Green Financing efforts, the increasing demand for sustainable financial goods and services offers new market and economic prospects (Bukhari et al., 2019). One way to create opportunities in the quickly growing renewable energy market is to finance renewable energy projects. In a similar vein, encouraging sustainable company practices can draw clients that value ethical behavior and sustainability in their dealings with businesses. Jatana and Jain (2020) found that GB practices in India are still in their infancy, but there is potential for significant growth in the future. These findings have led to a knowledge that GB practices can help banks exploit new market and business opportunities and maintain sustainability.

Bangladesh Bank has taken the lead in ensuring green banking practices among the scheduled commercial banks of Bangladesh. As part of that drive and initiative, a policy guideline was issued and developed for the scheduled banks in February 2011, NBFIs in August, and new banks in September 2013. Green Microfinance in Bangladesh has the potential to empower marginalized communities, improve livelihoods, and enhance protective measures against climate change impacts (Khan et al., 2019). Similarly, budget distributions in green infrastructure sectors have been lessening unemployment, stimulate local communities and creating social well-being (Alam et al., 2021).

Challenges for Implementation and Collaboration

Green Financing, despite its numerous potential advantages, encounters various challenges. A significant obstacle revolves around the limited comprehension and awareness of Green Banking (GB) practices among both bankers and customers. Many financial institutions lack the necessary expertise and resources to develop and execute sustainable policies and practices, while customers may remain uninformed about the benefits of GB and the accessibility of sustainable financial products and services (Usman & Amran, 2015). Moreover, the absence of government support and policy may impede the advancement of Green Financing initiatives, compounded by the substantial initial costs associated with implementing green projects, which could pose difficulties for certain banks (Khairunnessa et al., 2021).

Nevertheless, the green banking practice in Bangladesh is below the level. The banking sector is at an early stage of understanding and practicing green banking and it lags far behind its counterparts in developed countries (Masukuzzaman and Akhtar, 2014). They noted that very few commercial banks work on internal environmental management at volume and scale, significantly contributing to sustainable finance. Some sample banks presented only a general statement without detailed information including specific quantitative information (Hussain & others, 2016). According to studies like (Azim & Islam 2009), (Sobhani, Amran, & Zainuddin, 2009), and (Khan, Halabi, & Sami,2009), Bangladeshi corporations disclose less about their social and environmental practices than companies worldwide. Most of the manifestations were qualitative (Azim, Ahmed, & Islam,2009). The following factors account for the low disclosure levels: "profit focus, lack of legal requirements, lack of knowledge and awareness, and negative fears propaganda (Hossein, 2014).

Research Gap and Formulation of Hypothesis

There is not a single research that look at Bangladesh's Green banking practices in-depth. Almost all the studies developed their methodology taking some samples from a few banks instead of considering all the Banks and NBFIs (Haque & Nazmul, 2019). Thus, this research will focus on investigating the scope of Green Financing Initiatives by including all the Banks and FIs in Bangladesh. Based on the objectives and the existing literature, the following hypotheses are proposed:

H01: There is no significant positive relationship between loan disbursement in green financing initiatives and GDP growth in Bangladesh

H02: Participating Financial institutions' involvement in green financing initiatives does not have a significant impact on economic growth.

Description of the Variables

Dependent Variable

Gross Domestic Product: The fundamental economic term that is influenced by the independent variables, reflecting the change in trade, consumption, investment, expenditure and provides information on the overall state of the economy and its growth trajectory. Green Financing encourages energy efficiency infrastructure, renewable energy, and sustainability all of which assist in the economy's transition to a low-carbon one (Prabu et al., 2021). These investments flourish economic activity, create employment opportunities, enhance productivity, and thereby GDP growth.

Independent Variable

Renewable Energy (RN): The adoption of renewable energy sources such as solar, wind, and hydroelectric power diversifies the energy mix, lowering the dependency on fossil fuels, fostering energy security, and in the long run contributing to GDP growth (Hossain et al., 2020). Consumption of renewable energy is related to GDP growth by promoting economic activity, employment, and productivity (Adnan et al., 2019).

Energy Efficiency (EE): GDP is favorably impacted by cost savings, productivity improvements, and increased competitiveness that result from increasing energy efficiency in the commercial, residential, and industrial sectors (World Bank, 2020). By freeing up resources for investment and consumption, investments in energy-efficient technology and practices cut production costs, use less energy, and promote economic development (Asian Development Bank, 2018).

Alternative Energy (AE): By encouraging innovation, generating job opportunities, and lowering environmental externalities, the development and use of alternative energy sources, such as geothermal energy and biofuels, contribute to GDP growth (International Renewable Energy Agency, 2021). According to the Global Green Growth Institute (2019), the growth of alternative energy sectors contributes to technical improvement, economic diversity, and foreign investment, all of which drive GDP increase.

Liquid Waste Management (LWM): Good LWM techniques reduce pollution to the environment, safeguard public health, and improve quality of life—all of which are indirectly linked to GDP growth (World Health Organization, 2018). Infrastructure improvements for wastewater treatment enhance GDP development by generating jobs, increasing demand for products and services, and raising overall productivity (United Nations Environment Programme, 2020).

Recycling Manufacturing of Recyclable Products (RMRP): Recyclable product manufacturing and recycling limit waste production, preserve raw resources, and lessen resource depletion— all of which have a beneficial effect on GDP (European Commission, 2019). In order to provide income streams, lower manufacturing costs, and boost GDP, the recycling business gathers, processes, and resells recycled materials. This creates economic value (Ellen MacArthur Foundation, 2021).

Environment-Friendly Brick Production (EFBP): This term refers to methods of producing bricks that are not harmful to the environment, such as using energy-efficient kilns and alternative materials. These methods also improve resource efficiency, lower production costs, and lessen environmental pollution—all of which contribute to GDP growth (International Labour Organization, 2020). Infrastructure investments for environmentally friendly brick manufacturing increase building activity, open up job possibilities and promote economic growth, all of which have a beneficial impact on GDP (Asian Growth Bank, 2019).

Green Environment-Friendly Establishment (GEF): By encouraging resource efficiency, boosting competitiveness, and drawing investment, green establishments that place a high priority on environmental sustainability—such as eco-friendly companies and green-certified enterprises—contribute to GDP growth (United Nations Conference on Trade and Development, 2020). The growth of environmentally friendly businesses stimulates consumer demand for sustainable goods and services, encourages innovation, and fortifies the economy's resilience, all of which increase GDP (Organization for Economic Co-operation and Development, 2018).

Green Agriculture (GA): By boosting agricultural productivity, enhancing food security, and encouraging rural development, sustainable agricultural methods including organic farming and agroecology contribute to GDP growth (Food and Agriculture Organization, 2021). Green agriculture investments increase soil fertility, preserve water resources, and reduce the risks associated with climate change—all of which have a beneficial impact on GDP growth (International Fund for Agricultural Development, 2019).

Green CMSME (GCMSME): By promoting entrepreneurship, generating job opportunities, and propelling innovation in sustainable business practices, green cottage, micro, small, and medium-sized companies (GCMSMEs) boost GDP growth (United Nations Industrial Development Organization, 2020). Financial incentives, capacity-building programs, and market access measures that support green CMSMEs improve economic inclusion, advance social welfare, and quicken GDP growth (World Bank Group, 2017).

Green SRF (GSRF): By producing renewable energy, decreasing reliance on landfills, and valorizing waste materials, the development of green solid recovered fuel (GSRF) boosts GDP growth (European Environment Agency, 2021). Investments in GSRF infrastructure assist GDP growth by generating value from waste streams, boosting the recycling industry's economy, and enhancing energy security (International Energy Agency, 2020).

RESEARCH METHODOLOGY OF THE STUDY

This section provides an overview of the research methodology adopted to investigate the impact of loan disbursement in green financing initiatives on gross domestic product (GDP). It gives a general βoutline including research design, data collection, analysis techniques, and statistical methods used to examine the relationship between the variables.

Research design

A quantitative study is adopted to establish relationships and test hypotheses between dependent and independent variables. A panel data design has been employed for the examination. A common form of statistical study can be represented as:

$\gamma = \mathbf{f(P)} + \varepsilon$

Where

Y = Gross Domestic Product, P = Loan Disbursement in Green Financing Initiatives, f (P) = Functional Relationship between Y and P

ε = error term

Miscellaneous data from 2019 and 2020 are considered as a proxy to Green SRF as the independent variable. Therefore, the proposed study initially uses the following equation for running the regression model:

$$\gamma\mathbf{(GDP)} = \alpha\mathbf{0} + \beta\mathbf{1RN} + \beta\mathbf{2\ EE} + \beta\mathbf{3\ AE} + \beta\mathbf{4\ LWM} + \beta\mathbf{5\ RMRG} + \beta\mathbf{6\ EFBP} + \beta\mathbf{7\ GEFE} + \beta\mathbf{8GA} + \beta\mathbf{9\ GCMSCE} + \beta\mathbf{10\ GSRF} + \varepsilon$$

Where

β1, β2 ..... β10 represents coefficients of parameter estimates, indicating the change of GDP for a single change of the independent variable.

α remains constant

ε is the error element, The unexplained elements that the model does not take into consideration.

Dependent Variable

γ **:** Gross Domestic Product

Independent Variable

β_1**RN :** Renewable Energy (RN)

β_2**EE :** Energy Efficiency (EE)

β_3**AE :** Alternative Energy (AE)

β_4**LWM :** Liquid Waste Management (LWM)

β_5**RMRG :** Recycling Manufacturing of Recyclable Product (RMRP)

β_6**EFBP :** Environment Friendly Brick production (EFBP)

β_7**GEFE :** Green Environment Friendly Establishment (GEF)

β_8**GA :** Green Agriculture (GA)

β_9**GCMSCE :** Green CMSME (GCMSME)

β_{10}**GSRF :** Green SRF (GSRF)

Complete Expression of the Variables

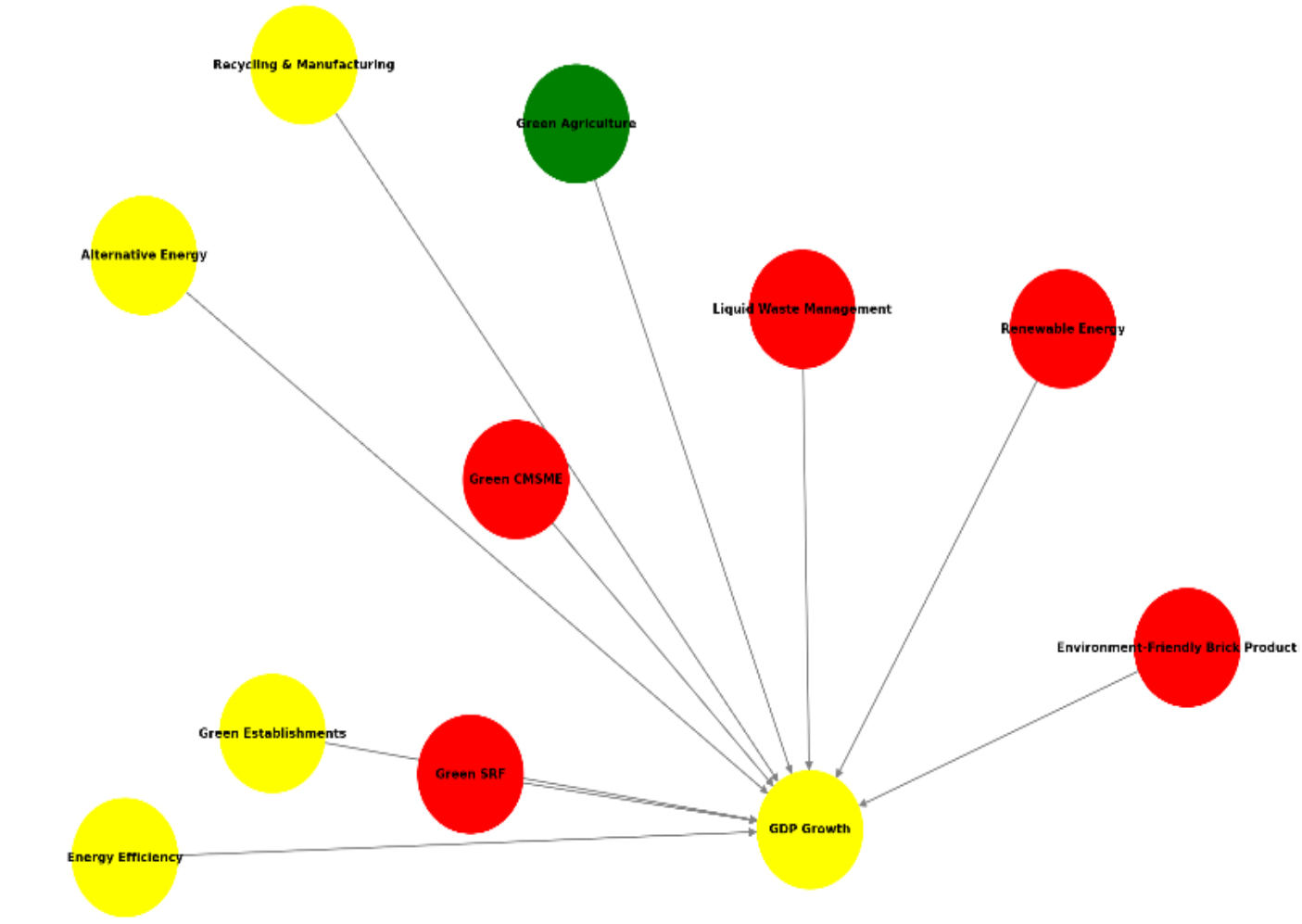

Fig 01: Conceptual Framework of Green Financing Initiatives and Their Impact on GDP Growth

The variations in the framework reflect the differing impacts of green financing initiatives on GDP growth. Green Agriculture is the only sector with a significant positive impact, indicating its strong contribution to

economic growth. Energy Efficiency, Alternative Energy, Recycling & Manufacturing, and Green Establishments show insignificant positive impacts, suggesting potential benefits that are not yet statistically significant. In contrast, Renewable Energy, Liquid Waste Management, Environment-Friendly Brick Production, Green CMSME, and Green SRF exhibit insignificant negative impacts.

Data Collection

The data used in the research are secondary in nature, sourced from the Sustainable Finance department and the Bangladesh Bank, measuring the period from 2019-2023. Loan disbursement in Green Financing Initiatives on 4 types of participating financial institutions (PFI) such as 1) State-owned commercial banks (SOCBs), 2) Specialized banks (SDBs), 3) Private commercial banks (PCBs), 4) Financial Institutions (FIs) are the independent variables. Quarterly reports from the Sustainable Finance department have been taken for the independent variables, which are then summed up annually since research has shown a yearly relationship. Five years' GDP directly from the Bangladesh Bureau of Statistics.

Analysis Technique

Numerous statistical analyses have been done to measure the hypothesis such as descriptive analysis, correlation matrix, and OLS (Ordinary Least Squares) regression analysis. Quantitative data has been analyzed using STATA 14, SPSS Version 25, and Microsoft Excel. This analysis helps to identify the significant impact on GDP of loan disbursement in green financing initiatives.

Empirical Results & Discussions

The findings of each analysis and the interpretations are discussed in this section

Summary of Descriptive Statistics

Table- 01: Summary of Descriptive Statistics

Variable Name	Total Observations	Mean	Standard Deviation	Min	Max
GDP	25	36100000	5499569	29500000	44400000
Renewable Energy (RN)	25	873.2724	1172.462	0	3633.02
Energy Efficiency (EE)	25	5217.2	10291.64	0	40438.4
Alternative Energy (AE)	25	17.8516	32.84179	0	131.45
Liquid Waste Management (LWM)	25	2690.854	5308.425	0	19021.55
Recycling Manufacturing of Recyclable Product (RMRP)	25	2114.662	4385.958	0	14264.36
Environment Friendly Brick production (EFBP)	25	3696.66	8230.676	0	35524.82
Green Environment Friendly Establishment (GEF)	25	7757.661	13956.57	0	42233.11
Green Agriculture (GA)	25	497.9636	790.0114	0	3338.53
Green CMSME (GCMSME)	25	567.2936	955.9497	0	4355.41
Green SRF (GSRF)	25	1014.043	3653.132	0	18429.84

Source: Using Stata 14, the Authors' own Estimation

The summary table of descriptive statistics, examines the mean, standard deviation, minimum, and maximum across 25 observations. The Mean GDP shows nearly 3.61 billion, where the standard deviation is 5499569, referring to moderate variability among the observations.

Analysis of Correlation among the Variables

Table- 02: Correlation Matrix

	GDP	RE	EE	AE	LWM	RMRG	EFBP	GEFE	GA	GCMSME	GSRF
GDP	1										
RE	0.049	1									
EE	0.168	.628**	1								
AE	0.095	.442*	.489*	1							
LWM	-0.037	.741**	.654**	.622**	1						
RMRG	-0.097	.816**	.655**	.522**	.930**	1					
EFBP	-0.360	0.275	.452*	0.335	.495*	.431*	1				
GEFE	0.033	.724**	.509*	0.379	.654**	.761**	0.138	1			
GA	.631**	0.380	.620**	0.188	0.238	0.185	-0.150	0.330	1		
GCMSME	.550**	0.345	.657**	0.323	0.245	0.191	-0.143	0.365	.943**	1	
GSRF	0.354	0.258	.728**	0.166	0.244	0.272	-0.035	.421*	.793**	.853**	1
**. Correlation is significant at the 0.01 level (2-tailed).											
*. Correlation is significant at the 0.05 level (2-tailed).											

Source: SPSS 25, the Authors' own estimation

The table depicts the correlation among all the variables studied in the research. The GDP and the following independent variables: LWM, RMRG, and EFBP show a weak correlation. There may not be strong linear links between GDP and the parameters, as these correlations are not statistically significant and negative. This suggests that GDP decreases somewhat as those predictors increase. GDP and GEFE show a weak and statistically insignificant positive relationship. GCMSME and GA show significant positive associations with GDP. The statistical significance of these relationships suggests a positive link between GDP and increased levels of loan disbursement in GA, and GCMSME. The rest of the variables display positive but insignificant impact.

Apart from these, some significant strong correlation is detected among the independent variables. For example, RE shows a significant correlation with the following variables: RMRG, and GEFE. Furthermore, EE and GSEF are highly correlated, whereas LWM and RMRG also predict a substantial relationship. GA, GCMSME, and GSRF have also depicted considerable correlation among themselves.

Consequently, including all of these linked variables into a single model may lead to a multicollinearity issue and skewed result estimate. A test has been developed given in Appended part-Table 06 to see whether multicollinearity exists in this problem.

Collinearity statistics, tolerance, and Variance Inflation Factor (VIF) are used to assess multicollinearity among independent variables in a regression model. Tolerance values close to 1 indicate low multicollinearity, while VIF values above 10 indicate significant multicollinearity. Here VIF is above 10 for the following variables: EE, LWM, RMRG, GA, GCMSME, GSRF and tolerance is low. So these variables prove high multicollinearity.

OLS Regression Model

After examining OLS regression, it can be reasonably declared that the independent variables have a significant positive linear relationship with the dependent variable (GDP) as R squared for the data accounts for 57.6%. Here adjusted R Squared value is less than R squared, though it indicates that the explanatory power of the extra independent variable may not be very high. Because of the high standard error, there is variability along the regression line. The study employs ANOVA to assess the statistical significance using 25 data points. Keeping all other variables constant, the coefficient displays the estimated impact of each independent variable on GDP. Here with a p-value of .044, Green Agriculture depicts a significant impact on GDP, whereas a unit change in Alternative Energy will make an increase of approximately 44600.183 units in GDP though it proves

an insignificant impact. Renewable Energy, Liquid Waste Management, Environment-friendly Brick Production, Green CMSME, and Green SRF have insignificant negative impacts as the relationship is statistically significant at the level of 0.05 level.

Table 03: Summary of OLS Regression Model

Multiple R Square			0.75895161		
R Square			0.57600755		
Adjusted R Square			0.27315581		
ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	10	4.1812E+14	4.1812E+13	1.90194562	0.13176449
Residual	14	3.0777E+14	2.1984E+13		
Total	24	7.2589E+14			
		Coefficients	*Standard Error*	*t Stat*	*P-value*
Renewable Energy		-1811.4013	2087.51011	-0.8677329	0.40017026
Energy Efficiency		98.2662557	305.839151	0.32130045	0.75272926
Alternative Energy		44600.183	49610.9878	0.89899808	0.3838556
Liquid Waste Management		-178.77197	667.75395	-0.2677213	0.79281775
Recycling & Manufacturing of Recyclable Goods		168.045013	1047.72904	0.16038976	0.87486531
Environment Friendly Brick Production		-198.02947	195.469059	-1.0130988	0.32820273
Green/Environment Friendly Establishments		35.6983961	139.444711	0.25600395	0.80167104
Green Agriculture		9932.0353	4499.27804	2.20747311	0.04447266
Green CMSME		-3435.7168	4854.25535	-0.7077742	0.4907014
Green SRF		-585.41885	882.383968	-0.6634514	0.51781794

Source: Using Excel, the Authors' own Estimation

Panel Data Analysis

In this section, "Random Effect Model", and "Fixed Effect Model" Regressions are used to analyze the panel data set. These models are used in panel data analysis to account for unobserved heterogeneity or individual-specific features that may affect the dependent variable. The fixed effect model is only interested in analyzing the impact of variables that vary over time, as time-variant characteristics are unique to the individual company and may not be correlated. The random effect model suggests that the variation across entities is random and uncorrelated with the independent variables. In this study, it will be investigated which model is appropriate. This approach is highly appreciated by the study (Nusrat and Yousuf, 2023)

Random Effect Model

The result of the random effect model is given in the Appended part Table 01. From the model, a significant positive impact is noticed, as Prob> chi2 =0.0400 which is below 5%. Here GA has a positive significant impact, whereas EE, AE, and GEFE have an insignificant but positive impact. The rest of the variables are noticed to be insignificant and also negative.

The Breusch and Pagan Lagrangian multiplier test for random effects

This test has been undertaken to measure which is better, the OLS regression model or the Random effect model. The result of Breusch and pagan Lagrangian test provided in the Appended part Table 02 proves the null hypothesis is accepted, indicating there is no heteroscedasticity present in the data, as the result, chibar2(01) = 0.00 and prob>chibar2= 1.000. It suggests that the (OLS) regression model may adequately account for the variance in the data. Still, this doesn't mean that OLS is better than random; it indicates no significant heteroscedasticity, which could affect the reliability of OLS estimates. So in this situation, it is better to test the Fixed Effect Model.

Fixed Effect Model

The outcome given in Appended part Table 03 of this model is insignificant. The probability of every variable is above 5% and some of those are positively insignificant.

Hausman Specification Test

The summary of the Hausman Specification Test is displayed below in Table, which measures between random and fixed models which is appropriate for the study. Here alternative hypothesis will be accepted if fixed is appropriate and null will be accepted if random is appropriate.

Table 04: Result of Hausman Specification Test

Coefficients				
	(b)fixed	(B)random	(b-B)Difference	sqrt(diag(V_b-V_B))
Renewable Energy	419.4786	−1811.401	2230.88	2970.183
Energy Efficiency	102.305	98.26626	4.038749	389.5234
Alternative Energy	36139.78	44600.18	−8460.4	28745.6
Liquid Waste Management	−270.2619	−178.772	−91.48992	395.2879
Recycling & Manufacturing of Recyclable Goods	69.37843	168.045	−98.66658	818.8408
Environment Friendly Brick Production	−134.5213	−198.0295	63.50815	235.2936
Green/Environment Friendly Establishments	18.75094	35.6984	−16.94745	202.2904
Green Agriculture	9143.931	9932.035	−788.6444	4688.101
Green CMSME	−1565.666	−3435.717	1870.051	3652.366
Green SRF	−767.5603	−5885.4189	−182.1414	535.7737

Test: H_0: difference in coefficients not systematic Chi^2 (10) = 1.36

Prob>chi^2 = 0.9993

Source: Using Stata 14, the Authors' own Estimation

Here the output depicts that the chi-square value is 1.36 and the probability is 0.9993 which is above 5%. So it can be noted that the null hypothesis is accepted, which means the random effect model is appropriate. To reach a final decision, it is necessary to check some other tests such as the heteroskedasticity test and autocorrelation test.

Breusch-Pagan/ Cook-Weisberg test for heteroskedasticity

According to the test the result given in the Appended part Table 04 it is noticeable that Prob>chi^2 = 0.9738 which refers to the acceptance of the null hypothesis.

Breusch-Godfrey LM test for autocorrelation

The outcome of this test is chi^2 = .591 and Prob> chi^2 =.4418, provided in the Appended part Table 05. The result denotes that the probability is above 0.05 and it rejects the alternative hypothesis and the null hypothesis has no serial correlation.

KEY FINDINGS, RECOMMENDATIONS AND CONCLUSION

This section will provide a summary of the study's main findings, will provide recommendations where needed and give a conclusion.

Findings

As the analysis found The Random Effect Model is appropriate, the null hypothesis is accepted it Indicates that

there is no statistically significant relationship or effect between the variables studied. From the result of the Random Effect Model given in Appended Part Table 01, the findings can be described as follows;

Table 05: Summary of the Findings

Variable Type	Factors	Outcome	Magnitude Level
Dependent Variable	Gross Domestic Product	-	-
Independent Variable	Renewable Energy	Insignificant Negative	−1811.401
	Energy Efficiency	Insignificant Positive	-
	Alternative Energy	Insignificant Positive	-
	Liquid Waste Management	Insignificant Negative	-
	Recycling & Manufacturing of Recyclable Goods	Insignificant Positive	-
	Environment Friendly Brick Production	Insignificant Negative	−198.0295
	Green Environment Friendly Establishments	Insignificant Positive	-
	Green Agriculture	Significant	9932.035
	Green CMSME	Insignificant Negative	−3435.717
	Green SRF	Insignificant Negative	−585.4189

Source: Using Stata 14, the Authors' own Estimation

According to the analysis the study can reach into following findings:

1. Among the variables Renewable Energy, Liquid Waste Management, Environment- Friendly Brick Production, and Green CMSME have had very worst impact. This implies that these variables have no effects on economic expansion rather investment in those initiatives may cause negative results.
2. Nevertheless, the result reveals four factors as Energy Efficiency, Alternative Energy, Recycling & Manufacturing of Recyclable Goods, and Green Environment-Friendly Establishments that have a negligible impact on GDP, which indicates that these programs have positive effects on the economy, they may not result in significant economic expansion.
3. However, the only factor that has a substantial impact on GDP, suggests that investments and policies focused on encouraging ecologically sustainable agriculture methods may greatly contribute to economic development.

Recommendations

1. **Highlight the importance of investing in Green Agriculture:** Since Green agriculture on GDP has shown a noticeable impact so sustainable farming methods, organic farming as well as the use of renewable energy in farming can be promoted.
2. **Reevaluate strategies:** It is important to reassess the factors which have insignificant impact. These can include identifying obstacles that hinder their participation. Moreover, increasing support and incentives, raising awareness to environment- friendly technology, and improving waste management protocols in the brick manufacturing industry.
3. **Encourage an integrated approach:** Instead of focusing on any project solely, it is important to adopt a whole green sustainable environment. For instance, promoting green agriculture alongside sustainable waste management practices or renewable energy solutions in CMSME operations may be fruitful.

Conclusion

This research provides valuable significant knowledge about the correlation between green financing initiatives and economic growth in Bangladesh. The findings indicate some initiatives have insignificant positive impacts, others show insignificant negative impacts on GDP, while Green Agriculture demonstrates a promising potential. Moreover, the study emphasizes further evaluation and improvement related to investment in green financing. In summary, although complexities of this relationship, it provides a foundation for informed decision-making and policy formulation aimed at fostering inclusive and environmentally sustainable economic growth in Bangladesh.

REFERENCES

1. Ansari, M.A., Parveen, S., Odongo, J.O., Nomani, M.Z.M., Salahuddin, G., Hasan, M.F., & Pallathadka, L.K. (2022). Evaluating the role of environment management system based on artificial intelligence. Materials Today: Proceedings, 56(4), 2240-2244. https://doi.org/10.1016/j.matpr.2021.11.571.
2. Hadi, M.R., Hasan, D.M.F., Flayyih, H.H., & Hussein, M.K. (2023). Green Banking: A Literature Review on Profitability and Sustainability Implications. Ishtar Journal of Economics and Business Studies, 4(2). https://doi.org/10.55270/ijebs.v4i2.27.
3. Lalon, R. M. (2015). Green banking: Going green. International Journal of Economics, finance and management sciences, 3(1), 34-42.
4. Park, H., & Kim, J. D. (2020). Transition towards green banking: role of financial regulators and financial institutions. Asian Journal of Sustainability and Social Responsibility, 5(1), 1- 25.
5. Mir, A. A., & Bhat, A. A. (2022). Green banking and sustainability–a review. Arab Gulf Journal of Scientific Research, 40(3), 247-263.
6. Prabu, S., Tripathi, A., Kaur, K., Krishna, M. M., Bora, A., & Hasan, M. F. (2021, December). A Comprehensive Study of Internet of Things and Digital Business on the Economic Growth and its Impact on Human Resource Management. In 2021 International Conference on Computing Sciences (ICCS) (pp. 91-94). IEEE.
7. Vijayalakshmi, S., Priyadarshini, M. S., Verma, V., Hasan, M. F., Durga, S., & Podile, V. (2021). WITHDRAWN: Strategic evaluation of local ethics and culture in shaping entrepreneurial economic development in various businesses and its impact on finance management during COVID-19 outbreaks.
8. Sangeetha, M., Hoti, A., Bansal, R., Hasan, M. F., Gajjar, K., & Srivastava, K. (2022). Facilitating artificial intelligence supply chain analytics through finance management during the pandemic crises. Materials Today: Proceedings, 56, 2092-2095.
9. Masukujjaman, M. D., & Aktar, S. (2013). Green banking in Bangladesh: A commitment towards the global initiatives. Journal of Business and Technology (Dhaka), 8(1-2), 17-40.
10. Hossain, D. M., Bir, A. T. S. A., Sadiq, A. T., Tarique, K. M., & Momen, A. (2016). Disclosure of green banking issues in the annual reports: a study on Bangladeshi banks. Middle East Journal of Business, 11(1), 19-30.
11. Ibe-enwo, G., Igbudu, N., Garanti, Z., & Popoola, T. (2019). Assessing the relevance of green banking practice on bank loyalty: The mediating effect of green image and bank trust. Sustainability, 11(17), 4651.
12. Bukhari, S. A. A., Hashim, F., Amran, A. Bin, & Hyder, K. (2019). Green Banking and Islam: two sides of the same coin. Journal of Islamic Marketing, 11(4), 977–1000.
13. Usman, A. B., & Amran, N. A. B. (2015). Corporate social responsibility practice and corporate financial performance: evidence from Nigeria companies. Social Responsibility Journal, 11(4), 749–763.
14. Khairunnessa, F., Vazquez-Brust, D. A., & Yakovleva, N. (2021). A review of the recent developments of green banking in Bangladesh. Sustainability (Switzerland), 13(4), 1–21. https://doi.org/10.3390/su13041904
15. Khan, M. M. (2014). An assessment of the green microcredit projects in Bangladesh: livelihood and environmental sustainability. University of Manitoba (Canada).
16. Ahmed, S., Meenar, M., & Alam, A. (2019). Designing a Blue-Green Infrastructure (BGI) network: Toward water-sensitive urban growth planning in Dhaka, Bangladesh. Land, 8(9), 138.
17. Hoque, N., Mowla, M., Uddin, M. S., Mamun, A., & Uddin, M. R. (2019). Green banking practices in Bangladesh: a critical investigation. International Journal of Economics and Finance, 11(3), 58-68.
18. Islam, A., Al-Tabatabaie, K. F., Karmaker, A. K., Hossain, M. B., & Islam, K. (2022). Assessing energy diversification policy and sustainability: Bangladesh standpoints. Energy Strategy Reviews, 40, 100803.
19. Sarker, S., Wang, S. & Adnan, K. (2019). Energy Consumption and Economic Growth Nexus in Bangladesh. Journal of Systems Science and Information, 7(6), 497-509. https://doi.org/10.21078/JSSI-2019-497-13

APPENDED PART

Table 01: Summary Result of Random Effect Model

Random-effects GLS regression — Number of obs = 25
Group variable: ID — Number of groups = 5

R-sq:
within = 0.0000
between = 0.0000
overall = 0.5760

Obs per group:
min = 5
avg = 5.0
max = 5

Wald chi2(10) = 19.02
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0400

GDP	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
RenewableEnergy	-1811.401	2087.51	-0.87	0.386	-5902.846	2280.043
EnergyEfficiency	98.26626	305.8392	0.32	0.748	-501.1675	697.7
AlternativeEnergy	44600.18	49610.99	0.90	0.369	-52635.57	141835.9
LiquidWasteManagement	-178.772	667.7539	-0.27	0.789	-1487.546	1130.002
RecyclingManufacturingofRec	168.045	1047.729	0.16	0.873	-1885.466	2221.556
EnvironmentFriendlyBrickProdu	-198.0295	195.4691	-1.01	0.311	-581.1418	185.0828
GreenEnvironmentFriendlyEstab	35.6984	139.4447	0.26	0.798	-237.6082	309.005
GreenAgriculture	9932.035	4499.278	2.21	0.027	1113.612	18750.46
GreenCMSME	-3435.717	4854.255	-0.71	0.479	-12949.88	6078.449
GreenSRF	-585.4189	882.384	-0.66	0.507	-2314.86	1144.022
_cons	3.46e+07	1454238	23.78	0.000	3.17e+07	3.74e+07
sigma_u	0					
sigma_e	5150003.4					
rho	0	(fraction of variance due to u_i)				

Source: Using Stata 14, Authors' own estimation

Table 02: The Breusch and Pagan Lagrangian multiplier test for random effects

Breusch and Pagan Lagrangian multiplier test for random effects

GDP[ID,t] = Xb + u[ID] + e[ID,t]

Estimated results:

	Var	sd = sqrt(Var)
GDP	3.02e+13	5499569
e	2.65e+13	5150003
u	0	0

Test: Var(u) = 0
chibar2(01) = 0.00
Prob > chibar2 = 1.0000

Source: Using Stata 14, Authors' own estimation

Table 03: Summary of Fixed Effect Model

```
Fixed-effects (within) regression               Number of obs      =        25
Group variable: ID                              Number of groups   =         5

R-sq:                                           Obs per group:
     within  = 0.6346                                         min =         5
     between =      .                                         avg =       5.0
     overall = 0.4730                                         max =         5

                                                F(10,10)           =      1.74
corr(u_i, Xb)  = -0.5046                        Prob > F           =    0.1987
```

GDP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
RenewableEnergy	419.4786	3630.383	0.12	0.910	-7669.52	8508.477
EnergyEfficiency	102.305	495.2434	0.21	0.840	-1001.166	1205.776
AlternativeEnergy	36139.78	57337.24	0.63	0.543	-91615.56	163895.1
LiquidWasteManagement	-270.2619	775.9819	-0.35	0.735	-1999.257	1458.733
RecyclingManufacturingofRec	69.37843	1329.751	0.05	0.959	-2893.49	3032.247
EnvironmentFriendlyBrickProdu	-134.5213	305.8941	-0.44	0.669	-816.0959	547.0532
GreenEnvironmentFriendlyEstab	18.75094	245.6954	0.08	0.941	-528.6925	566.1943
GreenAgriculture	9143.391	6497.83	1.41	0.190	-5334.676	23621.46
GreenCMSME	-1565.666	6074.831	-0.26	0.802	-15101.23	11969.9
GreenSRF	-767.5603	1032.306	-0.74	0.474	-3067.681	1532.56
_cons	3.26e+07	3256790	10.02	0.000	2.54e+07	3.99e+07
sigma_u	2804976.5					
sigma_e	5150003.4					
rho	.22878148	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(4, 10) = 0.40                     Prob > F = 0.8038
```

Source: Using Stata 14, Authors' own estimation

Table 04: Breusch-Pagan/ Cook-Weisberg test for heteroskedasticity

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of GDP

         chi2(1)      =     0.00
         Prob > chi2  =   0.9738
```

Source: Using Stata 14, Authors' own estimation

Table 05: Breusch-Godfrey LM test for autocorrelation

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	0.591	1	0.4418

H0: no serial correlation

Source: Using Stata 14, Authors' own estimation

Table 06: Collinearity Statistics

Model		Tolerance	VIF
1	RE	0.155	6.460
	EE	0.093	10.730
	AE	0.348	2.871
	LWM	0.073	13.638
	RMRG	0.043	23.043
	EFBP	0.352	2.840
	GEFE	0.244	4.098
	GA	0.074	13.578
	GCMSME	0.043	23.149
	GSRF	0.088	11.309
a. Dependent Variable: GDP			

Source: SPSS 25, the Authors' own estimation