International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 08 Issue 06 June 2025
DOI: 10.47191/ijcsrr/V8-i6-49, Impact Factor: 8.048
IJCSRR @ 2025
www.ijcsrr.org

Effect of Green Loan and Green Mortgage on Climate Change Mitigation in Nigeria

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ABSTRACT: Green loans and green mortgages can provide huge opportunities to tackle climate change in Nigeria by providing finance for energy efficient housing and sustainable infrastructure; supporting renewable energy uptake; and creating jobs in the green economy. However, in Nigeria there are still limited examples of green loans and green mortgages due to a lack of empirical evidence; lack awareness from stakeholders, and the necessity to develop stronger policies and regulations to improve the effectiveness of green loans and green mortgages. Therefore, the aim of this paper is to determine the impact of green loans and green mortgages as a great way of addressing climate change in Nigeria; the study explains the effect in a ex-post facto study covering the 2012 to 2024 period. The study relied on time series secondary data, and the data was collected on a quarterly basis and secondary data was obtained directly from the Statistical Bulletin provided by a number of agencies including the Central Bank of Nigeria, Nigerian Stock Exchange, National Bureau of Statistics, World Bank and International Monetary Fund, United Nations Framework Convention on Climate Change and the use of an econometric technique of the Autoregressive Distributed Lag model to analyse the data. The study found that green loans and green mortgages have positive and statistically significant effects on Nigeria's emissions of greenhouse gases. In conclusion, the study says that green loans and green mortgages have a positive impact on climate change mitigation in Nigeria. The study puts forward a number of ways to strengthen outcomes. Policymakers should implement more robust screening and monitoring processes. The requirements for loan approvals should put emphasis on verifiable reduction of emissions targets of borrower's projects, with the borrower to be required to report on environmental outcomes periodically.

KEY WORDS: Climate Change, Green Loan, Green Mortgage, Greenhouse Gas Emission, Mitigation

INTRODUCTION

Mitigation of climate change has emerged as a global priority that necessitates intentional change to reduce the amount of greenhouse gas (GHG) emissions and advance sustainable development. Globally certain strategies have emerged as effective ways to combat climate change, such as renewable energy, energy efficiency, and green financing (13). In Africa the continent has contributed less than 4% of global GHG emissions but is feeling the negative impact of climate change disproportionately, through extreme climate weather events, lower agricultural productivity, and increased human health risks (32). These challenges highlight the importance of effective climate change mitigation strategies based on an African situation. In Nigeria, the largest economy in Africa, climate change challenges may have catastrophic implications for its economic stability, food security, and public health (26; 24). Nigeria's a reliance on fossil fuels and deforestation, coupled with rapid urbanisation are exacerbating its vulnerability to climate change (13; 14). In response Nigeria is leading the way for using climate change mitigation through the use of green financing instruments such as green loans and green mortgages, which contributes to the diffusion of environmental implications sustainable development and climate change.

Green loans are financial products designed to finance projects with positive environmental benefits, including the installation of renewable energy, energy-efficient building retrofits, and sustainable agricultural practices (11). In a similar framework, green mortgages provide favourable financing terms for energy-efficient homes or retrofitting existing properties to improve their environmental performance (34). These financial products provide capital for projects with a positive environmental outcome and encourage individuals and businesses to operate sustainably.

The potential use of green loans and green mortgages in Nigeria could help mitigate climate change to some degree. By providing affordable capital for energy-efficient housing and sustainable infrastructure projects, green loans and green mortgages could reduce

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energy use, decrease GHG emissions, and increase reliance on renewable energy (13). Furthermore, they could support economic growth by creating green jobs and facilitating innovation in sustainable technologies. The successful implementation of green financing in Nigeria will require favourable policies, appropriate regulatory frameworks, and increased awareness of stakeholders. Despite their potential, Nigeria's use of green loans and mortgages remains nascent, with mini empirical evidence on their efficiency (21). Scholars of climate finance note that in Nigeria, green finance is relatively new which saw partial adoption only after 2012 mostly when the first green financing principles and policies came into practice. Hence, between the period of 2012 and 2024, there were some government policy attempts and programs like, Nigeria's sovereign green bonds, sustainable banking guidelines and a few bank-led green lending initiatives, however, the data on green lending instruments remains scarce and fragmented (26). Green mortgages and green loans have seen only slow adoption in recent years too. Overall, there is still relatively little green loans available for renewable energy and agriculture projects, which have historically viewed as high-risk sectors in the Nigeria banking sector. Commercial banks in Nigeria were slow to mainstream green lending and largely stay focused on conventional credit products; only a few institutions (and mostly through development banks or international funds) have initiated processes to create green credit lines for projects like solar power or sustainable agriculture. These and other initiatives have also reportedly not been scaled up (2).

Notably, there is a dearth of academic research evaluating whether these green finance tools impact climate change mitigation in Nigeria. Most existing studies on climate finance in Nigeria have been qualitative or conceptual, or they focus on broader instruments like green bonds and carbon markets (2). Very few empirical studies have quantitatively analysed the relationship between green credit (loans or mortgages) and environmental outcomes in Nigeria's context. In other words, whether the introduction of green lending has measurably reduced emissions or facilitated cleaner investments in the key housing, energy, and agriculture sectors remains largely unexamined.

This gap is evident in the literature: recent reviews show that there is limited research on green loans and mortgages in Nigeria - partly due to the relative newness of the idea and lack of historical data. There is limited international evidence on the effectiveness of green loans, with few studies worldwide measuring the outcomes of green loans. In Nigeria, there is a particularly glaring gap - to date, no study has taken advantage of Nigeria's long time-series data to assess whether increases in green lending is linked or correlated with indicators of climate mitigation (reduced net CO_2 emissions, increases in renewable energy capacity, increases in agricultural productivity with a lessening of CO_2 emissions caused by agriculture). In addition, there has been no study or research on the various sectors (housing, energy, agriculture). Previous researchers have referred to climate finance in an amalgamated way, which illustrates a gap in knowledge when it comes to the climate mitigation impact green loans/mortgages in Nigeria, specifically. This gap in knowledge is of course problematic for decision makers in government and finance as they will have little local empirical to inform how successful (or not) local green finance initiatives have been, and how to scale-up responsibly.

The main objective of this study is to examine the effect of green loans and mortgages on climate change mitigation in Nigeria. Specifically, it seeks to determine the effect of green loans and mortgages on Nigeria's climate change mitigation. Based on these objectives, the study addresses the following hypotheses:

$H_{01:}$ Green loans have no significant effect on climate change mitigation in Nigeria.

$H_{02:}$ Green Mortgage has no significant effect on climate change mitigation in Nigeria.

The remainder of this paper is structured as follows: Section 2 presents a comprehensive literature review, focused on green loans, green mortgages, and climate change mitigation by Nigeria. Section 3 notes the research methods, including study design, how data will be collected, and how it will be analyzed. In section 4, empirical results of the study are presented and discussed in regards to the previous literature and theory and the implications for policy and practice. Section 5 concludes with the key findings, and a note recommendations for the study.

LITERATURE REVIEW

Climate Change Mitigation

The Intergovernmental Panel on Climate Change (23) describes climate change mitigation as human interventions intended to limit the emissions of greenhouse gases (GHGS) into the atmosphere through sustainable practices from renewable energy deployment, energy efficiency, afforestation, and improved waste management. Climate change mitigation efforts reduce the rate of climate change and its extent by addressing the causes (27). Climate change mitigation is defined as any forward-looking and strategic

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action addressing anthropogenic greenhouse gas (GHG) reduction by employing comprehensive policy measures, providing incentives, and developing technology. The Intergovernmental Panel on Climate Change (23) states that net-zero emissions targets cannot be reached by midcentury without a complete societal transformation, fossil fuel use must transition to low or zero carbon sources of energy, energy efficiency must be improved, and carbon dioxide removal implemented. Such changes would be systemic (to the way of life) and, through the practices mentioned and in the Paris Agreement, to ensure global warming is limited to 1.5 °C above pre-industrial levels. The IPCC also notes strong international cooperation and policies need to be in place in order to generate equitable and effective mitigation outcomes.

Green Loans

Green loans are lending instruments earmarked specifically to finance environmentally sustainable projects generally related to renewable energy, energy efficiency, sustainable agriculture, and green infrastructure. Green loans are any loan instrument only available to finance or refinance be it in whole or in part new and/or existing eligible Green Projects (3) also advices that green loans are a means to advance in developing a sustainable green economy with projects through pollution control, biodiversity conservation, and projects mitigating greenhouse gas emissions. Green loans are distinguishable by their environmental objectives and their compliance requirements of monitoring and verification of the projects that they are funding for the purpose of ensuring the funded projects meet defined green criteria. (31) also highlight that financial institutions need to incorporate and assess environmental risk into the lending process and, that financial institutions should utilise digital technology to increase transparency and Accountability as to how the green loan has contributed to a sustainable future. Although green loans would seem to be an effective way to improve the financing of sustainable projects, they are not more broadly adopted especially in developing countries, due in part to fragile or weak institutional frameworks, underdeveloped financial ecosystems to mobilise loans and projects financing, and the lack of awareness or understanding by both borrowers and lenders.

Green Mortgage

A green mortgage typically refers to one type of financial product that promotes environmental sustainability as it pertains to housing by providing a financial advantage to energy efficient housing. A green mortgage is a type of mortgage or home loan that provides a more favourable financial condition for borrower's looking for energy efficient properties to purchase or remodel to accomplish environmental sustainability. (6) notes that green mortgages are specialized financial products that give financial advantages to obtain, build or remodel residential properties that meet environmental and energy efficiency requirements. These particular kind of financial products may offer more favourable conditions for financing such as lower fees and/or more favourable interest rates to facilitate purchasing sustainable housing products. Green mortgages have been integrated within sustainable finance regimes by promoting cost savings

Green mortgages are financial instruments aimed at promoting investments in energy and water efficiency upgrades in residential buildings. Typically supported by institutional programs, these mortgages offer borrowers incentives such as lower interest rates or larger loan amounts to encourage the adoption of sustainable features like efficient HVAC systems, improved insulation, and solar panels. (1) argue that the success of green mortgages depends on the precision of predicted savings, effective verification mechanisms, and the alignment of goals between lenders and borrowers. Thus, green mortgages function both as market-based tools and as catalysts for behavioral change, bridging the gap between sustainable housing ideals and practical financing solutions.

Empirical Review

Green Loan and Climate Change Mitigation

In their research, (12) explored how green loans supported the mitigation of climate change and sustainable development in Egypt focusing on stakeholders like financial institutions, public-sector agencies and commercial organizations. The research took a descriptive design and a purposive sample and relied on secondary data and institutional and international data sources. The study found that green loans helped finance renewable energy and energy efficiency and sustainable urban projects. However, it also encountered challenges such as limited awareness, regulatory issues and cost of projects. One major limitation of the study was the lack of empirical depth using only secondary data which sidelined any potential to assess policy impacts in real-time.

(33) explored the impact of green financing on environmental degradation in G20 countries with a focus on the mediating role of energy efficiency. The study used a panel structural equation modelling (SEM) technique, drawing data from 2001 to 2019. The population included all G20 economies, and the sample size spanned 19 countries, with data gathered from the IMF, World Bank,

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and UN databases. The study employed mediation analysis to assess the indirect effects of green finance on environmental quality via energy efficiency improvements. Results indicated that green financing significantly reduced environmental degradation when mediated by improvements in energy efficiency. However, the study pointed out the challenge of measurement inconsistencies in energy efficiency indicators across countries. The authors recommended harmonised international reporting standards to enhance the robustness of cross-country comparisons.

(15) conducted a firm-level empirical study to examine how the issuance of green bonds influences environmental and financial performance. Using a difference-in-differences design, the study analysed data from 199 firms that issued green bonds between 2010 and 2018. Firm-level financial data and environmental impact reports were used to evaluate the effect. The findings revealed that green bond issuance significantly improved environmental ratings and firm value. The study further identified reputational benefits as a mechanism for positive financial outcomes. Nevertheless, the research was limited by its focus on firms in developed economies, which may not generalise to firms in emerging markets where regulatory environments and investor expectations differ.

(9) conducted an empirical analysis to assess the causal effect of external debt on greenhouse gas emissions in 78 emerging market and developing economies over the period 1990– 2015. Utilizing external instruments to address potential endogeneity, their study found that a 1 percentage point increase in external debt was associated with a 0.5% rise in greenhouse gas emissions. The authors suggest that increased external debt may limit governments' capacity to enforce environmental regulations, as fiscal priorities shift towards servicing debt obligations. This study underscores the complex interplay between financial obligations and environmental governance in emerging economies.

(20) examined the challenges and regulatory frameworks influencing green finance development in Malaysia and Indonesia. Utilizing a qualitative methodology through content analysis of policy documents and interviews with key stakeholders in financial institutions and regulatory bodies, their study revealed that despite progressive green finance policies, both countries face challenges including weak enforcement of regulations, inadequate private sector participation, and low awareness among investors. The authors emphasized that unclear regulatory guidelines and insufficient incentives hinder the scaling of green financing initiatives. They recommended enhancing institutional capacity and introducing fiscal incentives such as tax breaks to encourage green investments. However, the study was limited by its qualitative nature, limiting the ability to generalize findings across the broader financial sector

Green Mortgage and Climate Change Mitigation

(12) investigated the performance of green mortgage-backed securities under Fannie Mae's Green Rewards program, which supports energy and water efficiency improvements in multifamily properties. They found that fixed interest rates, loan structure, and property characteristics influenced the effectiveness of these mortgages in achieving post-origination energy savings. However, a notable gap was identified between the projected and actual efficiency outcomes, suggesting enhanced monitoring and transparency mechanisms were needed. This study illustrates that while green mortgages hold substantial promise for promoting energy efficiency, the implementation and outcome verification frameworks require strengthening to ensure their environmental impact is realised as intended.

(28) assessed the factors influencing energy efficiency practices in Nigerian households, focusing on governmental oversight, support, and financial and technical assistance. It utilized the Relative Importance Index (RII) to assess nine major areas that affect a building's energy efficiency. The study found that energy efficiency in households specifically requires government intervention and support. The study identified deficiencies in public awareness and regulatory bodies. The study mentioned that respondent bias may have arisen through the study's reliance on self-reported data which may restrict the findings to a limited context across Nigeria's unique housing environments.

Additional learnings from the UK housing market reveal the mixed roles of green mortgages in facilitating climate-sensitive lending. (17) conducted a substantial study, with a rich dataset of UK property transactions, and found that properties with good Energy Performance Certificate (EPC) ratings typically have better terms of finance; however, the way energy efficiency is transmitted to mortgage pricing is inconsistent. For example, some lenders are willing to offer lower interest rates for homes that are energy efficient, while other lenders seem not to price the ecological characteristics in mortgage pricing, indicating a market failure. The study highlights the challenges faced by governments as they try to stimulate sustainable housing through incentives in financial products where there are no clear regulatory frameworks or market incentives.

In their recent study, (4) investigated the mediating role of policy support in the relationship between green financing and sustainable housing development in Nigeria. The researchers used Partial Least Squares Structural Equation Modelling (PLS-SEM) to analyse

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data from stakeholders in Nigeria's housing sector, including mortgage lenders, developers, and policy makers. Based on their data, the researchers concluded that the effectiveness of policy support can promote green financing to sustainable housing development. In fact, they found that energy-efficient building practices and providing incentives for renewables would stimulate more stakeholders to participate in green mortgages. However, the researchers also acknowledged the limitations of using cross-sectional data and argued for longitudinal studies to understand the longer-term impacts of green financing policies toward housing sustainability.

(30) conducted a descriptive analysis of green mortgage initiatives across 30 member countries to assess their role in reducing emissions and promoting sustainable housing. The study found that green mortgages effectively facilitated the adoption of energy-efficient building technologies, leading to measurable energy savings and emissions reductions. Nonetheless, the impact was constrained by regulatory inconsistencies and gaps in policy implementation among countries. While the report offered a broad policy perspective, it lacked a detailed empirical evaluation of individual mortgage programs. (7) investigated the effect of green mortgages on household energy efficiency in the Netherlands using a decade-long longitudinal dataset from the residential property market. The study showed that green mortgages significantly decreased energy consumption and emissions, especially with government subsidies for retrofitting existing homes. However, it noted difficulties in encouraging homeowner participation, suggesting a need for improved outreach and education to boost engagement in green mortgage schemes.

THEORETICAL FRAMEWORK

This study is anchored on Ecological Modernisation Theory (EMT)

Ecological Modernisation Theory (EMT) was first introduced in the early 1980s by scholars such as (19) and later advanced by (25) and (29). The core idea of EMT is that economic development and environmental protection are not necessarily opposing goals; instead, environmental sustainability can be achieved through technological innovation, institutional reforms, and market-based instruments. (19) argued that modern industrial societies could be restructured toward ecological rationality through "super-industrialisation" and eco-innovation. (25) emphasised the role of environmental policy and the state in steering technological advancement for ecological ends. (29) further contributed by introducing the concept of ecological rationality and identifying structural changes in production and consumption as key to sustainable development. Other notable contributions include (8), who distinguished between weak and strong versions of EMT, and (8), who provided sociological insights into how EMT relates to global environmental governance. (18) also enriched the theory by linking it to discourse analysis and environmental politics, showing how environmental reforms gain legitimacy in public policy.

Despite its influence, EMT has attracted various criticisms. (16) critiques the theory for neglecting the structural contradictions of capitalism that perpetuate environmental degradation. Additionally, critics highlight that EMT assumes developed countries can lead the transition, thereby marginalising the global South and ignoring unequal power dynamics (5). Nevertheless, EMT remains highly relevant in studying the Effect of Green loans and mortgages on Climate Change Mitigation in Nigeria. The theory supports the idea that market-based financial tools, such as green loans and mortgages, can catalyse the adoption of environmentally friendly housing and infrastructure practices. By promoting the financial viability of energy-efficient buildings and low-carbon technologies, these instruments align with EMT's emphasis on eco-innovation and institutional restructuring for sustainable development. Thus, EMT provides a compelling theoretical foundation for exploring how green financial instruments can help Nigeria transition toward a low-carbon economy.

Research Methodology

This study focuses on how green loans and mortgages can help contribute to climate change mitigation in Nigeria. Climate change mitigation was the dependent variable and was evaluated using Greenhouse Gas emissions, whereas green loans and green mortgages were the independent variables. The study used an ex-post facto approach as it analyses past events and does not allow variables to be manipulated (31). An ex-post facto approach is appropriate due to the exhaustive and quantitative nature of the study and rather analysed pre-existing data from the outcomes. The study measures climate change mitigation, green loans, and green mortgages for Nigeria. For purposes of this study, time series data was measured over a thirteen (13) year period from 2012-2024 on a quarter basis. The research data were retrieved using information from the Statistical Bulletin of the Central Bank of Nigeria (CBN), Nigerian Stock Exchange (NGX), National Bureau of Statistics (NBS), World bank, International Monetary Fund (IMF), and the United Nations Framework Convention on Climate Change (UNFCCC).

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The data obtained for a study were examined using various techniques. Both descriptive and inferential statistics were used to analyse the data. Unit root tests, descriptive statistics, correlation matrix, and the ARDL model were all employed in the statistical analysis. Regression analysis was used to test the hypotheses raised for the study. The analysis was done using EVIEWS software. The model specification of the study is stated below:

The Regression Model Used

$$GHGE_t = \beta 0it + \beta 1(GL)t + \beta 2(GM)t + \mu t$$

Where:
GHGE = Greenhouse Gas Emissions
β0 = Constant term, which represents when all explanatory variables are held constant
β1- β2 = Coefficient of the parameter estimates
GL = Green Loans
GM = Green Mortgage
Ut = the error term or residual at time

The standard tests were conducted. The standard tests served as preliminary tests to ascertain the data behaviour and their goodness towards employing them for model estimation. These tests include a stationary test and basic descriptive statistics such as the mean, median, mode, variance, standard deviation, skewness, kurtosis, and normality. Stationarity implies that the 'mean' and 'variance' are constant over time. The covariance value between two time periods depends only on the distance or lag between the two time periods and not the actual time at which the covariance is computed. Therefore, the Augmented Dickey Fuller Unit Root Test was employed to test for the presence or otherwise of the unit root
(stationarity).

Table 1. Variable Measurement

Variable name & acronym	Variable type	Variable Description	Source	Apriori
Greenhouse Gas Emissions (GHGE)	Dependent variable	Measured as the concentration of greenhouse gases per 1000 sq km	22	N/A
Green Loans (GL)	Independent variable	Measured as a ratio of green loans to total loans disbursed	10, 15.	Positive
Green Mortgage (GM)	Independent Variable	To take the value of 1 if the period is during or after recession, and zero if otherwise.	25, 9.	Positive

Source: Researcher's Compilation, 2025

RESULTS AND DISCUSSION

Stationarity Tests

This study utilised the Augmented Dickey-Fuller (ADF) test to evaluate the stationarity of time series data, a fundamental requirement for reliable time series analysis. Stationarity indicates that a dataset's statistical characteristics, such as mean and variance, remain stable over time. The ADF test assesses the presence of a unit root, where a test statistic more negative than the critical value signifies that the series is stationary. To address potential autocorrelation, the ADF test incorporates lagged difference terms, thus improving the robustness of the results. Detecting non-stationarity is essential, as it enables researchers to appropriately transform the data through differencing, thereby avoiding misleading regression results and ensuring the credibility of further econometric modelling.

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Table 2. Augmented Dickey Fuller (ADF) Test for Stationarity of Variables

Variable	ADF Statistic	Stationarity	Order of Integration
GHGE	-1.1033	No	N/A
GHGE(-1)	-3.8468***	Yes	I(0)
GL	-0.7037	No	N/A
GL(-1)	-3.4382***	Yes	I(0)
GM	-2.3406	No	N/A
GM(-1)	-4.5265***	Yes	I(0)

***,** and * imply significance at the 1%, 5% and 10% levels respectively Source: EViews13 Output, 2025

The statistics from the Augmented Dickey-Fuller (ADF) tests used to test for stationarity for all variables of interest are shown in Table 2. In the first column for Greenhouse Gas Emissions (GHGE) the ADF statistic at level (-1.1033) is less than the critical value and therefore does not confirm stationarity, however, at the first difference the ADF statistic (-3.8468) is significant at the 1% level and confirms stationary at first difference or order I(0). In the second column Green Loan (GL) is confirmed as nonstationary at level with an ADF statistic of -0.7037. However, at first difference, we see statistical significance (-3.4382) which confirms it is stationary after first difference and order of I(0). In the third column, Green Mortgage (GM) statistic at level of -2.3406 does not meet the threshold of stationarity for the ADF statistic, however, at first difference the ADF statistic is -4.5265 and statistically significant at the 1% level (***), which confirms GM is stationary after first differencing and order of I(0). These results suggest that GHGE, GL, and GM are all integrated order zero (I(0)) after first differencing making them eligible to be used for time series analysis further down the line such as co-integration and error correction modelling..

Table 3: Descriptive Statistics of Variables

	GHGE	GL	GM
Mean	217.67	0.26	0.43
Median	217.10	0.26	0.41
Maximum	257.71	0.28	0.69
Minimum	176.51	0.25	0.27
Std. Dev.	23.86	0.01	0.12
Skewness	-0.04	-0.19	0.55
Kurtosis	1.86	1.74	2.32
Jarque-Bera	2.81	3.75	3.61
Probability	0.25	0.15	0.16
Observations	52	52	52

Source: Eviews13 Output, 2025

Table 3 shows descriptive statistics for the three variables Greenhouse Gas Emissions (GHGE), Green Loan (GL), and Green Mortgage (GM) based on 52 observations. The mean value for GHGE is 217.67 with a median of 217.10 suggesting the variable is fairly symmetrical around the mean. The minimum and maximum values are 176.51 and 257.71, respectively. There is a standard deviation of 23.86, indicating emissions were fairly moderate in terms of variability over the recorded period of observations. The GHGE variable has near symmetry in its distribution (skewness = -0.04) and has a platykurtic distribution (kurtosis = 1.86), meaning the distribution appears flatter than the normal distribution. The Jarque-Bera statistic, which tests for absolute normality, had a probability of 0.25, so we can assume normality. The mean and median for GL are both 0.26 and there is minimal variation in GL (range 0.25 to 0.28) and a standard deviation of 0.01. This variable is also skewed very closely to normal (-0.19) but is also platykurtic (kurtosis = 1.74) with a Jarque-Bera test result of p = 0.15. The mean for GM is 0.43 and the median is 0.41; the range of GM is between 0.27 to 0.69 and has the most variability in terms of standard deviation (0.12). GM is moderately right skewed to

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0.55 and platykurtic (kurtosis = 2.32), but the Jarque-Bera statistic test p-value of 0.16 suggests there is no significant deviation from normality. In short, the descriptive statistics of the three variables suggest they are normally distributed and valid for parametric statistical analysis.

Table 4: Correlation Matrix of Variables

	GHGE	GL	GM
GHGE	1		
GL	0.91	1	
GM	0.56	0.54	1

r=correlation coefficient; {} =t-stat; [] =probability of t-statistics Source: EViews13 Output, 2025

Table 4 shows that Greenhouse Gas Emissions (GHGE), Green Loan (GL), and Green Mortgage (GM) are each positively correlated. GHGE and GL have a strong positive correlation of 0.91. This indicates that more green loan disbursements coincide with more emissions, this might represent a case of misallocating green capital, or the presence of emissions from buildings' infrastructure development at the onset. GHGE and GM show a moderate positive correlation of 0.56 indicating that green mortgages are possibly associated with an array of rising emissions, probably from construction activities. Likewise, GL and GM are moderately correlated (0.54) indicating there could be coordination amongst green finance spending. These results demonstrate the significance of further analysis to determine the actual influence of green finance on emission reductions.

Table 5 ARDL Bounds Test for Co-integration Results

F-Bound test		I(0)	I(1)	t-Bound test		I(0)	I(1)	Cointegration	Model
14.48	2.11	-4.21	Yes	ECM			3.31	- 2.34	- 4.02
	2.21	3.30		-2.43	-4.34				
	3.13	4.41		-3.43	-4.98				

Source: Eviews13 Output, 2025

Table 5 illustrates the results of the ARDL Bounds Test for co-integration among the variables under investigation. The F-Bound test statistic of 14.48 exceeds the upper critical bounds at all significance levels (I(1): 3.31, 3.30 and 4.41) and indicated rejection of the null hypothesis of no co-integration. The t-Bound test statistic of -4.21 is also more negative than the upper bounds for all levels of significance (I(1): -4.02, 4.34 and 4.98), confirming long-run equilibrium among the variables. The findings indicate they are cointegrated. In terms of this study, despite short term deviations, they move together in the long run. Thus, the Error Correction Model (ECM) is adopted to establish both short-run dynamics and long-run relationships, which support the conclusions of the ARDL model.", thus, an error correction model (ECM) is assumed to represent both short-run dynamics and long-run relationships and supports conclusions from the ARDL model.

Table 6 Lag Selection Results

LR Statistic	FPE Statistic	AIC	SC	HQC
NA	27.11	5.24	5.44	4.30
231.60	0.05	-0.30	0.07	-0.13
26.20**	0.02**	-0.70**	-0.53**	-0.72**

***,** and * imply significance at the 1%, 5% and 10% levels respectively
Source: Eviews13 Output, 2025

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Table 6 presents the results of the lag selection criteria used to determine the optimal number of lags for the ARDL model. The decision is guided by various information criteria, including the Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn Criterion (HQC). Among the evaluated lag structures, the model with lag two is selected as optimal, as it shows the lowest values for FPE (0.02), AIC (-0.70), and HQC (-0.72), all marked significant at the 5% level (**). These lower values indicate better model fit with minimal information loss. The likelihood ratio (LR) statistic of 26.20 at this lag further supports its adequacy. The selection of lag 2 ensures that the model adequately captures the dynamics of the variables without overfitting, making it suitable for reliable estimation and inference in the ARDL and ECM frameworks.

Table 7: Collinearity Test Results

Variable	Centered VIF
GL	4.72
GM	2.71
Mean VIF	*3.72*

Source: Eviews13 Output, 2025

Table 7 presents the collinearity test results based on the Variance Inflation Factor (VIF), which assesses the degree of multicollinearity among the independent variables—Green Loan (GL) and Green Mortgage (GM). The VIF value for GL is 4.72 and for GM is 2.71, with a mean VIF of 3.72. Since all VIF values are below the commonly accepted threshold of 10, multicollinearity is not a serious concern in the model. Although GL has a relatively higher VIF, it still falls within an acceptable range, suggesting that the independent variables do not exhibit excessive correlation. Thus, the estimates of the regression coefficients are likely to be stable and reliable for interpreting the effects of green loans and green mortgages on climate change mitigation.

Regression Analysis Result

Table 8 Long Run Model Results

Variable	*Coefficient/Std. Error*	*t-ratio*
Constant	-304.98 (43.67)	-6.98***
GL(-1)	1858.77 (173.04)	10.74***
GM(-1)	33.59 (9.39)	3.58***
R-squared		0.72
Adjusted R^2		0.70
Standard Error		4.60
F-Statistics		161.34***

Source: EViews Regression Output, 2025

The model's R-squared value, being 0.72, shows that GL and GM accounted for 72% of the variation in GHGE. The adjusted R-squared value of 0.70 corroborates a very strong beta one relationship by being only marginally lower than the R-squared value whilst accounting for the number of independent variables. The standard error of 4.60 demonstrates the average deviation of the

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 08 Issue 06 June 2025
DOI: 10.47191/ijcsrr/V8-i6-49, Impact Factor: 8.048
IJCSRR @ 2025
www.ijcsrr.org

actual GHGE values from what the model estimated, indicating a quite precise estimate. The F-statistic measures 161.34 and is statistically significant at the 1% level confirming that the model as a whole is statistically significant and that GL and GM in combination have a significant effect on GHGE in the long run. Despite these very positive relationships that we have uncovered, caution must be observed in their interpretation. They may represent green financial instruments in Nigeria associated with current activities that have a temporary source of emissions such as new affordable housing (the A), or an upgrade in Housing infrastructure (brick walls) whilst they were generating long-term emissions reductions (the D). This necessitates the improvement of the criteria for green finance to ensure that the projects nations invest in are associated with long-term commitments to mitigating climate change.

Table 8 shows the long-run model results estimating the effect of Green Loans (GL) and Green Mortgages (GM) on Greenhouse Gas Emissions (GHGE). The constant term is -304.98, with a standard error of 43.67 and a t-ratio of -6.98, statistically significant at the 1% level (***). This suggests that in the absence of green financial interventions, GHGE would significantly decrease, potentially due to the absence of construction or financial activities that might initially raise emissions.

H_{01}: Green loan has no significant effect on climate change mitigation in Nigeria.

For hypothesis one, the coefficient for Green Loans (GL) is 1858.77, with a standard error of 173.04 and a t-ratio of 10.74, statistically significant at the 1% level (***). This significant positive coefficient suggests that a unit increase in Green Loans is associated with a 1858.77-unit increase in GHGE in the long run. This result may appear counterintuitive, as Green Loans are expected to promote sustainable development and reduce emissions. However, it is possible that Green Loans are being channelled into energy-intensive projects that indirectly increase GHGE. The implication is that the projects financed by Green Loans should be evaluated to ensure they align with climate change mitigation goals. Policymakers should introduce stricter screening processes to ensure the funds are directed toward renewable energy projects, energyefficient technologies, and other low-emission initiatives. The rejection of Hypothesis One suggests that green loans have a substantial, positive, and statistically significant association with greenhouse gas emissions (GHGE) in Nigeria, which was contrary to the stated hypothesis. This indicates that green loans have been used to support projects intended to promote sustainability but are also financing activities that produce significant emissions in the short to mediumterm (infrastructure developments or renewable technologies manufacturing), that generate emissions before longer-term environmental benefits can occur. This indicates a need for improved environmental due diligence, better project screening, and improved transparency to establish a clear connection to mitigate climate change. Use of ECM helps us to understand that progress, in relation to the environment, is not only dependant on providing financial instruments but also to modernise institutions, technologies, and policies. EMT would suggest that environmental protection can be compatible with economic growth if environmental concerns to be integrated into the structure of capitalism through innovation, regulation, and collaboration with stakeholders. Hence, for green loans in Nigeria to achieve their ultimate environmental objectives, its financial systems must adapt to incorporate ecological contingencies, technical standards, and the regulatory instruments that facilitate these outcomes in an environment that is reflective of a dynamic and mature institutional context. The outcome supports (12) who addressed similar issues in Egypt; however, it challenges the point made by (33) which found green finance provided a direct positive effect towards the reduction of emissions in more mature financial systems- therefore raising questions about the impact of contextual factors (such as the maturity of policies or institutions) on the effectiveness of the green loan.

H_{02}: Green mortgage has no significant effect on climate change mitigation in Nigeria.

The coefficient for Green Mortgage (GM) is 33.59, with a standard error of 9.39 and a t-ratio of 3.58, which is statistically significant at the 1% level (***). This positive coefficient suggests that a unit increase in Green Mortgage is associated with a 33.59-unit increase in GHGE in the long run. This result may reflect the impact of construction-related activities, which are often associated with increased emissions. Green Mortgages may finance projects such as the construction of green buildings, which, despite being more energy-efficient in the long run, may have higher emissions during construction. The implication is that while Green Mortgages promote sustainability in the real estate sector, their short-term impact on emissions should be closely monitored. Policymakers should emphasise low-emission construction methods and green technologies to reduce the environmental impact of construction activities.

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The hypothesis that green mortgages do not significantly affect climate change mitigation in Nigeria was rejected, as statistical analysis revealed a positive and significant impact on greenhouse gas emissions (GHGE). While green housing ultimately reduces emissions through energy savings, the construction phase tends to be emission-intensive, underscoring the need for lifecycle assessments of such projects. This finding calls for low-emission construction practices and integrating green certifications into mortgage eligibility criteria. Interpreted through the Ecological Modernisation Theory (EMT) lens, the result highlights how environmental reform can be achieved by restructuring institutions and financial systems to incorporate sustainability goals. EMT suggests that technological innovation, proactive state policies, and market-based instruments like green mortgages can drive ecological improvements without undermining economic development. In this context, green mortgages represent a shift towards embedding ecological considerations into the financial and construction sectors, encouraging environmental responsibility and economic efficiency. The result aligns with (7) study in the Netherlands, which found that green mortgages promote household energy efficiency. However, it contrasts with (30), which observed that despite promoting energy-efficient technologies, green mortgage programmes in some regions suffer from regulatory inconsistencies that limit their effectiveness, emphasising the role of local policies in determining outcomes.

Table 9: Error Correction Model Results

Variable	*Coefficient/Std. Error*	*t-ratio*
Constant	0.58 (0.18)	4.64***
GL(-1)	2.4410 (0.6555)	3.8173***
GM(-3)	-2.44 (0.65)	-3.73***
R-squared		0.68
Adjusted R^2		0.62
Standard Error		0.07
F-Statistics		11.66***

Source: EViews Regression Output, 2025

The R-squared value of 0.68 and adjusted R-squared of 0.62 suggest that the model explains a good proportion of the variation in GHGE, while the standard error (0.07) and F-statistic (11.66) confirm the model's overall significance and reliability. Together, these results underscore the importance of evaluating different green financing instruments' timing and implementation dynamics to understand their environmental impact fully.

The Error Correction Model (ECM) results presented in Table 9 help to better understand the short-run dynamics and adjustment process between green financing instruments and Nigeria's GHGE. The constant term (0.58) is statistically significant at the 1% level. That is the alternative constant for GHGE when all other variables are factorized will be stable at approximately 0.58 as long as there is no significant change in the explanatory variables. The lagged term of green loans [GL(-1)] has a positive and statistically significant coefficient of 2.4410 (t = 3.8173), indicating the short-run associated with a one-period lag of green loan disbursements have a notable short-run effect on GHGE. In other words, green loan projects using GHGE will have a significant positive impact in the short-run. This response suggests that through the initial phase of construction and related infrastructure projects, there are numerous emissions, and projects can take years to realize their expected and highly valued potential, but potentially longer (sometimes longer than a human's lifetime). Since mortgage lending takes considerably longer to emit emissions and have

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momentous changes to emissions, green mortgages could take time before long-term buildings have an impact on GHGE. The lagged term of green mortgages [GM(-3)] has a negative and statistically significant coefficient of -2.44 (t = -3.73), indicating that the short-run impact of green mortgages takes longer than the short-run impact of green loans. Although the immediate effects of a funded green loan impact GHGE in the short-run, green mortgages have access to the article's practicable pathways to emissions of GHGE and can occur into significant energy-efficient housing over the long haul. While one-time, equal-sized green loans will have emissions impact on GHGE, it may take multiple successive generations of mortgage loans to realize a sustainable impact on GHGE.

Table 10: Error Correction Model Serial Correlation LM Test Results

	Test Statistic	Prob.
F-statistics	0.79	0.47
Obs*R-squared	1.92	0.38

Source: Eviews13 Output, 2025

The results from Table 10 present the Error Correction Model (ECM) Serial Correlation LM Test, which is used to check for serial correlation in the model's residuals. The F-statistic value of 0.79 with a probability (p-value) of 0.47, and the Obs*r-squared value of 1.92 with a p-value of 0.38, are both statistically insignificant at the conventional levels (i.e., $p > 0.05$). This implies no evidence of serial correlation in the ECM residuals. In other words, the residuals are not autocorrelated, suggesting that the model is well specified and the estimates are reliable for inference. The absence of serial correlation strengthens the model's validity, indicating that the error terms are independently distributed, which is a key assumption for ensuring consistent and efficient parameter estimates.

CONCLUSION AND RECOMMENDATIONS

The research also finds that green loans have positive and significant effects on Nigeria's greenhouse gas emissions (GHGE). The positive and significant relationship between green loans and GHGE means that, regardless of their intended environmental intentions, the provision of green loans could be financing projects that are more about short-term emissions, for example roads, manufacturing of renewable energy components or large-scale construction activities. The implications are that the short-term environmental cost of the project may exceed the possible shorter-term benefits; which emphasizes the need for better environmental screening and project monitoring and closer application of the green loan definition to longer-term climate mitigation objectives.
Also, the study finds that green mortgages positively and significantly influence greenhouse gas emissions (GHGE) in Nigeria. Green Mortgages significantly increase GHGE, suggesting that while sustainable housing aims to achieve long-term energy savings, construction-related activities may be emissionintensive. The challenge lies in aligning green mortgage financing with genuinely low-emission building practices. Incorporating stringent environmental standards, promoting sustainable materials, and incentivising certified green construction methods are crucial.

Based on the findings and conclusion, this study therefore recommends that:

i. Policymakers should implement more robust screening and monitoring processes. Loan approval criteria should emphasise verifiable emission reduction targets, and borrowers should be required to report on environmental outcomes at regular intervals. Incentives, such as interest rate discounts or extended repayment periods, could be offered to meet or exceed environmental performance benchmarks. This approach will ensure that Green Loans fund projects that contribute to climate mitigation.

ii. For Green Mortgages to have their intended purpose of reducing emissions, it is crucial that those in the development process, lenders, and policy makers incorporate robust environmental standards into mortgage eligibility requirements. This could entail requiring green building certifications, advancing sustainable construction methods, and using sustainable building materials. They could also implement tax incentives or lower interest rates for projects and initiatives that can demonstrate a reduction in emissions over time. Green Mortgages can better fulfill climate mitigation commitments when their design links the sustainability goals in the real estate industry with evidence of improved environmental outcomes.

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Cite this Article: Magaji, S., Tanko, Y., Musa, I. (2025). Effect of Green Loan and Green Mortgage on Climate Change Mitigation in Nigeria. International Journal of Current Science Research and Review, 8(6), pp. 3124-3138. DOI: https://doi.org/10.47191/ijcsrr/V8-i6-49