

How to Cite:

Tanko, Y., Magaji, S., & Musa, I. (2025). Effect of green finance on climate change mitigation in Nigeria. *International Journal of Economic Perspectives*, 19(7), 1–22. Retrieved from <https://ijeponline.org/index.php/journal/article/view/1096>

Effect of green finance on climate change mitigation in Nigeria

Dr Yahaya Tanko

Centre for Sustainable Development, University of Abuja, Nigeria

Email: yahayatanko40@gmail.com

Prof Sule Magaji

Department of Economics, University of Abuja, Nigeria

Email: sule.magaji@uniabuja.edu.ng

Ibrahim Musa

Department of Economics, University of Abuja, Nigeria

Email: ibrahim.musa@uniabuja.edu.ng

Abstract---Climate change remains a critical global challenge, with Nigeria facing significant environmental and economic risks due to rising greenhouse gas emissions. Through instruments like green bonds and carbon credits, green finance provides essential funding for climate mitigation, promoting renewable energy, sustainable infrastructure, and policies aimed at reducing carbon footprints. The study examines the effect of green finance on climate change mitigation in Nigeria, addressing the challenges of greenhouse gas emissions and the need for sustainable financial mechanisms. The study employs an ex-post facto research design, covering the period from 2011 to 2023. The study utilised secondary data collected every quarter and sourced from financial and environmental reports. The analysis was conducted using the econometric technique of the Autoregressive Distributed Lag model. The study's findings revealed that green bonds have a positive and statistically significant effect on climate change mitigation in Nigeria. In contrast, carbon credit has a negative but statistically insignificant effect on climate change mitigation in Nigeria. The study concludes that green finance is a viable tool for climate change mitigation in Nigeria, though its full potential remains underutilised. The study recommends strengthening policy frameworks, increasing investment in green financial instruments, and enhancing public-private partnerships to scale up sustainable finance initiatives.

Keywords---Carbon Credit, Climate Change, Green Bond, Green Finance, Greenhouse Gas Emission, Mitigation.
Jel Classification: O11, O12, O13

Introduction

The growing urgency of addressing climate change, primarily caused by human-induced greenhouse gas (GHG) emissions, has led to increased global efforts focused on mitigation through policies, technologies, and financial tools (Sabiu & Magaji, 2024). International frameworks like the Paris Agreement have encouraged nations to commit to reducing their carbon footprints via nationally determined contributions (NDCs). In Africa, climate change presents acute challenges, including threats to food security, infrastructure, and economic stability (Musa & Magaji, 2024; Ibrahim et al., 2025; Ismail et al., 2019). Despite contributing minimally to global emissions, African nations, including Nigeria, are disproportionately vulnerable due to limited adaptive capacity and inadequate climate financing (AfDB, 2021; Odusanya et al., 2021). Green finance has emerged as a crucial mechanism for bridging this gap, with instruments like green bonds supporting renewable energy, sustainable transport, and resilient infrastructure development across the continent (Mikayilov & Sattarahmady, 2022).

In Nigeria, a major African economy and emitter of GHGs from sectors such as energy and agriculture, green finance is gaining traction to achieve climate mitigation goals. Nigeria's policy framework, including its NDCs, supports the expansion of sustainable financing (Oduntan et al., 2022; Federal Ministry of Environment [Nigeria], 2021). Green financial instruments such as green bonds and carbon credits are increasingly utilised to mobilise capital for environmentally beneficial projects (Kumah & Mensah, 2021; Mikayilov & Sattarahmady, 2022). Green bonds fund low-carbon infrastructure like renewable energy and public transport systems, while carbon credits create financial incentives for emission-reducing activities by assigning value to carbon reductions (Kumah & Mensah, 2021; Magaji Et al., 2024). Together, these tools align financial investments with climate objectives, encouraging sustainable development and emissions reduction through market-based and policy-supported approaches.

Globally, climate change mitigation has intensified, driven by international commitments under the Paris Agreement to limit global warming through significant reductions in greenhouse gas (GHG) emissions. Achieving these reductions requires technological advancements and effective financial instruments that support the transition to low-carbon, climate-resilient development (Zhang & Lu, 2022; Arif et al., 2022). In Africa, where vulnerability to climate change is compounded by limited infrastructure and adaptive capacity, green finance has been identified as a vital tool for catalysing sustainable development (AfDB, 2021; Odusanya et al., 2021; Emohefe et al., 2025). Climate change remains a pressing concern in Nigeria, with its impacts, including rising temperatures, extreme weather, and resource stress, highlighting the need for urgent mitigation. Green finance instruments such as green bonds and carbon credits are gaining global traction for aligning financial flows with climate objectives, though their application and impact in Nigeria remain underexplored.

Despite the expanding literature on green finance, most studies have focused on developed countries with mature markets, offering limited insight into Nigeria's distinct socio-economic and institutional contexts (Fatica & Panzica, 2021; Lombardi & Bolis, 2022). Even within African-focused research, emphasis is often placed on singular instruments like green bonds or sector-specific interventions, leaving a gap in understanding how multiple tools collectively influence GHG emission reductions (Odusanya et al., 2021; Akpan & Akpan, 2022). Moreover, many Nigerian studies employ qualitative or descriptive methods without robust empirical testing. Theoretical frameworks such as stakeholder and externality theories remain largely untested in Nigeria's context, and there is a dearth of studies employing econometric models like ARDL or VECM to examine green finance's effectiveness (Oche, 2020; Oduntan et al., 2022; Nwakoby & Okeke, 2023). These methodological and theoretical gaps hinder the ability of policymakers and investors to design effective strategies, making it imperative to empirically assess how green finance instruments contribute to climate change mitigation in Nigeria.

The main objective of this study is to examine the effect of green finance on climate change mitigation in Nigeria. To achieve this objective, the study raised the following specific objectives, which are to:

- i. Assess the effect of green bond on climate change mitigation in Nigeria; and
- ii. Determine the effect of carbon credit on climate change mitigation in Nigeria

Based on the above objectives, the study addressed the following hypotheses:

H₀₁: Green bond has no significant effect on climate change mitigation in Nigeria.

H₀₂: Carbon credit has no significant effect on climate change mitigation in Nigeria.

Literature Review

According to Roberts et al. (2023), climate change mitigation can be conceptualised as a proactive strategy involving policy instruments, economic incentives, and technological advancements, all aimed at curbing anthropogenic GHG releases into the atmosphere. In this sense, it signifies the systemic shift in production, consumption, and infrastructure design toward cleaner energy, energy-efficient appliances, and sustainable agriculture to achieve emission reduction targets, ensuring global warming remains within manageable limits (Roberts et al., 2023).

According to Garcia-Leal and Ramos-Martín (2022), climate change mitigation is a long-term, integrated response that aligns development goals with emission constraints by deploying green technologies, low-carbon finance mechanisms, and circular economy principles. This definition underscores the necessity of institutional, social, and market reforms that encourage sustainable resource use, reduced reliance on fossil fuels, and investment in climate-smart innovations for equitable global decarbonisation (Garcia-Leal & Ramos-Martín, 2022).

Climate change mitigation is increasingly viewed as a multi-scalar process that combines local innovations, national policies, and international agreements to systematically lower carbon footprints and enhance carbon stocks (Delgado-Serrano & Ramos-Henderson, 2022). By promoting green infrastructure, clean

transportation, and agroecological transitions, mitigation strategies seek to stabilise the climate system, protect biodiversity, and foster sustainable livelihoods for present and future generations (Delgado-Serrano & Ramos-Henderson, 2022).

Green finance refers to financial resources deployed to support initiatives to reduce environmental risks and foster sustainability. This includes financing renewable energy projects, waste management, and pollution control (Zhang et al., 2022). This definition emphasises green finance's role in environmental sustainability, highlighting that it focuses on investments to reduce ecological harm. Green finance refers to the allocation of financial resources to support renewable energy projects, such as wind, solar, and hydropower, that contribute to reducing carbon footprints (Baker & Nduka, 2022). This definition focuses specifically on renewable energy as the primary domain for green finance investment, showcasing its direct role in reducing carbon emissions. Green finance represents issuing green bonds to fund sustainable infrastructure, clean energy, and other environmentally beneficial projects (Smith et al., 2022). This definition focuses on green bonds as the central vehicle through which green finance operates, linking it to sustainable infrastructure. Green finance consists of financial activities that mitigate environmental risks, focusing on projects that lower pollution, promote sustainable resource use, and foster environmental health (Nunes & Costa, 2022).

According to Liu et al. (2023), green finance involves funding projects contributing to climate change mitigation and adaptation, primarily through investments in clean energy and low-carbon technologies. This definition links green finance directly to climate change by specifying its role in funding projects that mitigate the effects of global warming. Green finance, encompassing a range of financial instruments and mechanisms designed to fund environmentally beneficial projects, has emerged as a critical tool for mobilising capital to support climate action. Instruments such as green bonds, carbon credits, green loans, renewable energy investments, green mortgages, and sustainable agriculture loans are being deployed globally to align financial flows with climate-resilient and low-emission development strategies (Zhang & Lu, 2022; Arif et al., 2022). This study sees green finance as a special fund for projects that help care for the planet. It includes money spent on solar panels, wind turbines, or even projects that clean the air and water.

Green bonds are a form of debt financing earmarked explicitly for projects that offer environmental or climate-related benefits. Defined as instruments whose proceeds are used exclusively for green projects, green bonds have become a cornerstone of sustainable finance, addressing the need for investments in renewable energy, energy efficiency, climate adaptation, and other eco-friendly initiatives (Fatica & Panzica, 2020). These bonds allow issuers, governments, corporations, and financial institutions to raise capital while committing to projects that deliver measurable environmental benefits. Such projects typically include renewable energy installations, sustainable water management, clean transportation, green buildings, and climate-resilient infrastructure (Nigeria Green Bonds Guidelines, 2020).

Green or climate bonds are fixed-income financial instruments specifically designed to support climate-related or environmental projects. These bonds are similar in structure to conventional bonds but are exclusively used for projects with positive

environmental and climate benefits (Cortellini & Panetta, 2021). The issuance of green bonds can influence firms' capital cost, often leading to lower costs due to the perceived lower risk associated with firms committed to sustainable practices. This effect is particularly noted in firms issuing green bonds, which are seen as more environmentally responsible (Devine & Yönder, 2023).

According to Broekhoff et al. (2024), a carbon credit is a tradable instrument typically in the form of a virtual certificate that represents either the avoidance of greenhouse gas (GHG) emissions or the removal of GHGS from the atmosphere. Each carbon credit generally equals one metric tonne of carbon dioxide equivalent (CO₂e) prevented from entering or actively extracted from the atmosphere. These credits are issued under certified carbon crediting programs, which governmental or independent institutions may govern, and they are used either in compliance markets to meet regulatory obligations or in voluntary carbon markets by organisations aiming to meet sustainability targets (Broekhoff et al., 2024). Similarly, Salma et al. (2024) defined carbon credits as permissions to emit one tonne of CO₂, which can be traded in organised marketplaces. They emphasise that carbon credits support climate mitigation by creating an economic value for emissions reductions or removals. This financial mechanism incentivises investment in carbon sequestration technologies such as biochar, which converts organic waste into stable carbon that can be stored in soils, thus directly removing CO₂ from the atmosphere (Salma et al., 2024).

Chavula et al. (2022) explained that carbon credits are central to carbon trading systems, which allow entities that reduce their emissions below set targets to sell their surplus reductions to others struggling to meet their own. This means carbon credits facilitate financial flows toward climate-friendly projects and help equalise emissions obligations across entities by allowing emissions to be offset cost-effectively. The authors also highlight the market potential of carbon credits in enabling developing countries to attract foreign investments in sustainable development initiatives (Chavula et al., 2022). Ezeoha et al. (2023) added that Nigeria's concept of carbon credits is evolving through mechanisms supported by international frameworks such as the Paris Agreement and the Climate Change Act 2021. They noted that carbon credits can function as intangible rights or tradeable units that reward emission reductions achieved through projects like afforestation or renewable energy. These credits offer environmental and economic value by integrating emission reduction goals into contractual arrangements, especially in regions where formal carbon markets are emerging (Ezeoha et al., 2023).

Guesmi et al. (2025) examined the relationship between firm-level climate change exposure and the issuance of green bonds using a panel dataset of 14,629 firm-year observations, including 140 green bond issuances from 83 companies across 11 countries. The study employed advanced econometric models such as Two-Stage Least Squares (2sls), Generalised Method of Moments (GMM), and Difference-in-Differences (Did) to mitigate endogeneity. Data were collected from Bloomberg, Compustat Global, and Sautner et al.'s (2023a) climate exposure database. The results indicated that climate-exposed firms are more likely to issue green bonds, primarily as a hedging strategy against regulatory and physical climate risks, rather than capitalising on green opportunities. However, no consistent evidence links

green bond issuance to reduced carbon emissions. A key criticism is the temporal limitation of ESG impact and potential offsets from other corporate activities.

Reddy et al. (2024) examined the potential of green bonds as financial instruments for climate change mitigation in India. The study adopted a qualitative conceptual research design based on an extensive review of secondary data, including policy reports, academic literature, and green bond frameworks. The population and sample size were not specified, as the study relied on literature synthesis rather than primary data collection. Data were gathered through a systematic search of scholarly databases and institutional publications, and the analysis employed thematic content synthesis. Findings indicated that green bonds can effectively mobilise capital toward sustainable projects like renewable energy. However, regulatory inconsistencies, limited investor participation, and information asymmetry hinder their full potential in the Indian market. The study also highlighted opportunities through sovereign green bonds and financial technology (FinTech). A significant limitation of the research was the lack of empirical testing or data-based validation, limiting its applicability to real-world contexts.

Si Mohammed et al. (2024) explored the relationship between green bond issuance and climate risk under the United States' economic and environmental policy uncertainties. The study employed a time-series research design using Quantile-on-Quantile Regression (QQR) and Multivariate QQR (MQQR) models from November 2008 to August 2022. The analysis was drawn from the S&P Green Bond Index, Economic Policy Uncertainty Index, and Climate Summit Index, and data was collected from Refinitiv Eikon and the Media Climate Change Concerns database. The findings indicated that green bonds play a significant role in mitigating climate risk, especially during periods of economic uncertainty, and called for supportive regulatory frameworks to strengthen green bond markets. However, the study was limited by its regional focus on the U.S. and the indirect nature of climate risk measurement, potentially limiting generalisability to other economies.

Fatica and Panzica (2020) conducted a quantitative study to assess whether green bond issuance by corporate entities leads to a reduction in firm-level carbon emissions. Using an econometric panel analysis based on matched issuer-bond data, the study focused on a global sample of 1,105 green bonds issued between 2007 and 2019. Data were collected from Dealogic DCM and environmental ratings databases, and analysed through panel regression models, controlling for firm characteristics and external review status. The study found that green bond issuance reduces carbon intensity, particularly for non-refinancing bonds and those with third-party verification. Bonds issued after the Paris Agreement also showed greater emissions reductions. However, the study acknowledged limitations in establishing causality and highlighted data scarcity on project-level environmental impact, making it challenging to validate additionality claims fully.

Oche (2020) conducted a comparative doctrinal analysis of Nigeria and China's regulatory frameworks governing green bonds. The study examined legal documents and soft law instruments to assess the alignment of each country's regulatory structure with international standards. While both nations have laid foundational green bond regulations, the study revealed persistent gaps and

inconsistencies that hinder the governance and efficiency of their green bond markets. Although the analysis is legally thorough, the study is limited by its lack of empirical evidence and practical evaluation of regulatory impacts. This absence restricts the ability to measure how effectively the policies translate into sustainable investment outcomes, suggesting the need for future research to incorporate comparative empirical data.

Salma, Fryda, and Djelal (2024) in their study *Biochar: A Key Player in Carbon Credits and Climate Mitigation* investigated the potential of biochar as a carbon offset mechanism within global carbon credit markets. The study used a narrative review approach, analysing scientific literature, carbon market data, and case studies. It did not include primary data collection or a defined sample but focused on synthesising evidence on biochar's role in long-term carbon sequestration and agricultural productivity. The analysis demonstrated that biochar projects could generate measurable, verifiable carbon credits while improving soil quality and promoting sustainable land use. However, the study highlighted the need for clearer biochar carbon credit standards and regulatory harmonisation. A limitation is the absence of empirical pilot testing to verify biochar's sequestration rates under different environmental conditions.

Prajapati et al. (2023) conducted a study titled *Carbon Credits: A Key Tool in Climate Change Mitigation*, to examine the strategic role of carbon credits in supporting sustainable development and reducing greenhouse gas (GHG) emissions globally. The study employed a qualitative research design based on secondary data analysis and conceptual synthesis, drawing from global climate policy documents, reports, and market data. The population was not specific, as the study was conceptual and did not involve a defined sample size. Data were collected from existing literature, climate market data, and policy frameworks, and analysed through thematic review techniques. The findings highlighted that carbon credits are flexible and innovative financial tools that incentivise emission reduction projects, particularly in agriculture, forestry, and renewable energy sectors. The study also acknowledged that successful implementation depends on robust verification mechanisms and market transparency. However, a significant limitation is the absence of empirical primary data or statistical analysis, which restricts the generalizability of the conclusions.

Ezeoha et al. (2023) investigated contractual mechanisms for advancing carbon credit utilisation in Nigeria. The study assessed how legal and contractual frameworks could enhance carbon credit trading in emerging markets. Adopting a doctrinal legal research approach with policy analysis, the researchers did not use a traditional sample or population. However, they focused on laws, statutes, and regulatory frameworks, particularly the Nigerian Climate Change Act 2021 and the Paris Agreement. Data were collected from legal documents and international climate protocols, with analysis conducted through comparative legal interpretation. The findings revealed that Nigeria's evolving carbon credit market requires institutional reforms and enforceable contractual arrangements to ensure project viability and credit tradability. A significant limitation is that the study is theoretical in scope and lacks empirical testing or stakeholder validation through surveys or interviews.

Chavula et al. (2022) explored the application of carbon trading systems as a tool for environmental sustainability in their study *Carbon Trading to Combat Climate Change*. The objective was to assess the effectiveness of carbon credit trading in reducing emissions, especially in vulnerable economies. Employing a descriptive research design, the study relied on secondary data from international climate change databases and policy reports. The documentary analysis approach defined no specific population or sample size. The researchers applied content analysis to interpret data collected from UNFCCC records and emission inventories. The study found that carbon trading has significant potential to enhance air quality and mitigate climate change impacts if integrated adequately with national climate strategies. Nevertheless, the authors noted challenges in the African context, including weak institutional frameworks, limited public awareness, and data verification issues. The absence of empirical data collection and statistical validation was a key limitation.

Fishman et al. (2022) authored an issue brief titled *Using Carbon Credits to Deploy Climate Solutions*, aimed at evaluating the role of carbon credits in supporting carbon dioxide removal (CDR) strategies and accelerating private sector investment in climate solutions. The research adopted a policy analysis framework, utilising secondary data from international markets and policy documents. No defined population or sample size was reported, as the study was qualitative. Information was collected from IPCC reports, carbon market databases, and credit registries. Analysis was conducted using thematic synthesis to conclude on credit market design and effectiveness. The study concluded that well-regulated carbon credit markets can provide cost-effective pathways for emissions reduction and support net-zero ambitions. However, it acknowledged market fragmentation, credit quality concerns, and regulatory uncertainty as critical barriers to scalability. The absence of primary empirical data collection was a noted limitation.

Hyman (2022) investigated the role of carbon credits in promoting soil carbon sequestration among U.S. farmers. Utilising a mixed-methods approach, it combined farmer surveys with secondary data analysis to assess participation in carbon offset programs. Findings indicated that while carbon credits provided economic incentives for adopting sustainable practices, challenges like limited market access and complex verification processes hindered broader participation. The study emphasised the need for policy interventions to streamline carbon credit trading, notably to support smallholder farmers.

Nawaz et al. (2020) conducted a comparative analysis of carbon credit markets in N-11 and BRICS countries from 2005 to 2019. Employing a panel data econometric approach, it examined variables like carbon credit trading volumes, renewable energy investments, and CO₂ emissions. The study found that robust carbon credit mechanisms significantly reduced emissions, especially when complemented by renewable energy policies. However, it also identified challenges such as market volatility and regulatory inconsistencies that could undermine the efficiency of carbon credit systems.

Malunjkar et al. (2015) conducted a field-based empirical study titled *Carbon Credits: A Climate Change Mitigation Strategy* to assess the carbon savings from using micro irrigation systems in Indian agriculture. The research adopted an

experimental design, with a specific population of banana farms in Jalgaon district, Maharashtra. The study involved field trials comparing drip irrigation to conventional flood irrigation across 5,000 hectares. Data collection included direct measurements of electricity usage, water consumption, and CO₂ emissions. Statistical methods were used to calculate emission reductions and corresponding carbon credits. Results showed a 32% water saving and a 36% reduction in electricity usage, with an estimated 11,750 tonnes of CO₂ equivalent carbon credits generated. While the findings are promising, the study is geographically limited and lacks replication across other crops and regions.

Stakeholder Theory, initially proposed by Freeman (1984), shifts the focus of corporate strategy from shareholder profit maximisation to the inclusion of all stakeholders—employees, customers, communities, investors, and the environment. It posits that long-term organisational success and sustainability are better achieved by balancing these stakeholders' diverse and sometimes conflicting needs. The theory advocates for creating shared value that contributes to economic outcomes, social welfare, and environmental well-being. This perspective has become particularly influential within discussions around corporate social responsibility (CSR) and environmental sustainability, offering a more holistic approach to value creation. However, critics like Jensen (2002) argue that the theory's lack of clear stakeholder prioritisation can lead to inefficiencies and managerial dilemmas, especially when urgent environmental issues require decisive action. Additionally, the absence of empirically grounded frameworks weakens its ability to provide practical guidance for achieving measurable environmental performance.

Despite these criticisms, Stakeholder Theory remains highly relevant to green finance and climate change mitigation. Green financial instruments such as green bonds and sustainability-linked loans exemplify how financial decisions can reflect broader stakeholder concerns, integrating environmental and social goals into economic frameworks (Green Finance Taskforce, 2018). In the Nigerian context, where climate change poses significant threats to livelihoods, infrastructure, and economic stability, Stakeholder Theory supports adopting inclusive financial strategies that align with the needs of local communities and international investors. By prioritising future generations and ecological sustainability, green finance in Nigeria can operationalise the principles of stakeholder engagement, contributing to sustainable development and inclusive growth.

Data and Methodology

This study aims to examine the effect of green finance on climate change mitigation in Nigeria. Climate change mitigation served as the dependent variable. Greenhouse Gas emissions were measured, while green finance was an independent variable measured by green bonds and carbon credits. The research adopted an ex-post facto design because it investigates events that have already occurred and does not allow for manipulation of variables (Onwumere, 2009). This design aligns with the study's empirical and quantitative nature, using existing data to analyse outcomes afterwards. The study covered Nigeria's green bond, carbon credit, and climate change mitigation. The study used time series data for thirteen (13) years spanning from 2011 to 2023, with the data collected quarterly. The data were collected 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 United Nations Framework Convention on Climate Change (UNFCCC).

The data obtained for a study was 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

$$GHGE_t = \beta_0 + \beta_1(GB)_t + \beta_2(CC)_t + \mu_t$$

Where:

GHGE = Greenhouse Gas Emissions

β_0 = Constant term, which represents when all explanatory variables are held constant

β_1 - β_2 = Coefficient of the parameter estimates

GB = Green Bond

CC = Carbon Credit

U_t = 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 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, and the value of the covariance 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, this study employed the Augmented Dickey-Fuller Unit Root Test 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	IPCC(2019), Adisa et al. (2024)	N/A
Green Bonds (GB)	Independent variable	Measure as the ratio of green bond subscriptions to total bonds	LMA (2021), Adisa et al. (2024); Lajtha and Fischer (2021).	Positive
Carbon Credit (CC)	Independent variable	Measured as a ratio of carbon credit to total credit issued by financial institutions	Gold Standard. (2023). Pizer, and Manson (2020); Zhang and Wang (2019)	Positive

Source: Researcher's Compilation, 2025

Results Analysis and Discussion

Stationarity Tests

The Augmented Dickey-Fuller (ADF) test was employed in this study to assess the stationarity of time series data, a critical prerequisite for accurate time series modelling. Stationarity implies consistent statistical properties over time, and the ADF test checks for unit roots, with a more negative test statistic than the critical value indicating stationarity: All-Share Index, and selected macroeconomic variables. The ADF test accounts for autocorrelation by including lagged differences, ensuring robust results. Identifying non-stationarity allows researchers to transform data appropriately, thereby avoiding spurious regressions and enhancing the validity of subsequent analyses.

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)
GB	-1.5103	No	N/A
GB(-1)	-3.7570***	Yes	I(0)
CC	-2.6594*	Yes	I(0)

***, ** and * imply significance at the 1%, 5% and 10% levels respectively

Source: EViews13 Output, 2025

Table 2 presents the Augmented Dickey-Fuller (ADF) test results, indicating that Greenhouse Gas Emissions (GHGE) and Green Bonds (GB) are non-stationary at level form but become stationary after first differencing, implying they are integrated of order one, I(1). In contrast, Carbon Credit (CC) is stationary at level form at the 10% significance level, making it I(0) and suitable for direct inclusion in regression models. These findings highlight the importance of differencing non-stationary variables like GHGE and GB to ensure robust and unbiased econometric analysis.

Table 3 Descriptive Statistics of Variables

	GHGE	GB	CC
Mean	217.67	0.09	0.01
Median	217.10	0.05	0.01
Maximum	257.71	0.28	0.03
Minimum	176.51	0.00	0.00
Std. Dev.	23.86	0.09	0.01
Skewness	-0.04	0.92	1.16
Kurtosis	1.86	2.34	3.07
Jarque-Bera	2.81	8.30	11.72
Probability	0.25	0.02	0.00
Observations	52	52	52

Source: Eviews13 Output, 2025

Table 3 shows the descriptive statistics of the variables used in this study, indicating that Greenhouse Gas Emissions (GHGE) has a mean of 217.67 and is normally distributed with low skewness and a Jarque-Bera p-value of 0.25, suggesting suitability for parametric analysis. Green Bonds (GB) have a low mean value of 0.09, are moderately right-skewed, and exhibit non-normality ($p = 0.02$), indicating the need for data transformation. Carbon Credit (CC) also shows low average values (mean = 0.01), is positively skewed with moderate kurtosis, and is non-normally distributed ($p = 0.00$), suggesting that non-parametric methods or transformations may be required for accurate analysis.

Table 4: Correlation Matrix of Variables

	GHGE	GB	CC
GHGE	1		
GB	-0.57	1	
CC	0.09	0.39	1

r=correlation coefficient; {} =t-stat; [] =probability of t-statistics

Source: EViews13 Output, 2025

The correlation matrix in Table 4 reveals the relationships among the study variables. Greenhouse Gas Emissions (GHGE) and Green Bonds (GB) exhibit a negative correlation coefficient of -0.57, suggesting a moderate inverse relationship, implying that as green bond issuance increases, GHGE tends to decrease, supporting the role of green bonds in mitigating emissions. Conversely, GHGE and Carbon Credit (CC) show a weak positive correlation of 0.09, indicating a minimal direct relationship between the two. The correlation between GB and CC is 0.39, reflecting a moderate positive relationship, suggesting that higher green bond activity may be associated with increased carbon credit usage. These results provide preliminary insights into the directional associations between green finance instruments and emission levels, guiding further regression analysis.

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
16.59	2.12	3.23	-6.43	-	-	Yes	ECM
				2.57	4.04		
	2.45	3.61		-	-		
				2.86	4.38		
	3.15	4.43		-	-		
				3.43	4.99		

Source: Eviews13 Output, 2025

The ARDL Bounds Test results in Table 5 indicate the presence of a long-run co-integration relationship among the variables. The computed F-statistic value of 16.59 exceeds the upper bound critical values (I(1)) at all significance levels,

including the highest threshold of 4.43, confirming co-integration. Similarly, the t-statistic value of -6.43 is more negative than the upper bound critical values for the t-bound test, further reinforcing the existence of a long-term relationship. These results justify the application of the Error Correction Model (ECM), which is appropriate when variables are co-integrated, allowing for assessing both short-run dynamics and long-run equilibrium adjustments among the variables.

Table 6 Lag Selection Results

LR Statistic	FPE Statistic	AIC	SC	HQC
NA	29.13	6.21	6.48	6.30
265.70	0.05	-0.23	0.08	-0.11
28.20**	0.02**	-0.90**	-0.55**	-0.76**

***, ** and * imply significance at the 1%, 5% and 10% levels respectively

Source: Eviews13 Output, 2025

Table 6 presents the lag selection criteria results using multiple statistical indicators, including the Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn Criterion (HQC). The optimal lag length is identified at lag 2, as indicated by the lowest values for FPE (0.02), AIC (-0.90), SC (-0.55), and HQC (-0.76), all marked with double asterisks (**), signifying significance at the 5% level. This suggests that including two lags in the model provides the best balance between model fit and parsimony, ensuring that important dynamics are captured without overfitting. Consequently, lag two is the most appropriate for subsequent ARDL modelling.

Table 7: Collinearity Test Results

Variable	Centered VIF
GB	3.65
CC	1.73
Mean VIF	2.69

Source: Eviews13 Output, 2025

Table 7 presents the collinearity diagnostics using the Variance Inflation Factor (VIF) to assess multicollinearity among the independent variables. The VIF value for Green Bonds (GB) is 3.65 and for Carbon Credit (CC) is 1.73, with a mean VIF of 2.69. Since all VIF values are well below the commonly accepted threshold of 10, there is no evidence of severe multicollinearity among the variables. This implies that the independent variables are sufficiently distinct from one another, and their inclusion in the regression model will not distort the estimation results due to multicollinearity.

Regression Analysis Result

Table 8 Long Run Model Results

Variable	Coefficient/ Std. Error	t-ratio
----------	-------------------------	---------

Constant	-304.98 (43.67)	-6.98***
GB(-1)	71.17 (14.89)	4.78***
CC(-1)	-91.52 (115.22)	-0.79
R-squared		0.96
Adjusted R ²		0.96
Standard Error		4.90
F-Statistics		182.67***

Source: EViews Regression Output, 2025

Based on the long-run model results presented in Table 8, the R-squared value of 0.96 indicates that 96% of the variation in Greenhouse Gas Emissions (GHGE) is explained by the independent variables in the model, specifically lagged values of Green Bonds (GB) and Carbon Credit (CC). The adjusted R-squared also stands at 0.96, confirming the model's strong explanatory power even after adjusting for the number of predictors. The F-statistic of 182.67, which is statistically significant at the 1% level (***), confirms that the model is statistically significant overall, and the included variables jointly strongly influence GHGE. The standard error of 4.90 indicates relatively low variation between the predicted and actual values of GHGE, confirming that the model produces reliable estimates. The constant term is -304.98 with a standard error of 43.67 and a t-ratio of -6.98, which is significant at the 1% level. This suggests that, in the absence of the independent variables, GHGE would be significantly negative, further highlighting the influence of green finance variables on emission levels.

For Hypothesis One, which posited that green bonds have no significant effect on climate change mitigation in Nigeria, the test result indicates otherwise. The coefficient for Green Bonds (GB) is 71.17, with a standard error of 14.89 and a t-ratio of 4.78, which is statistically significant at the 1% level (***). This positive and significant relationship implies that an increase in Green Bond issuance is associated with a corresponding increase in GHGE in the long run. Contrary to theoretical expectations that green bonds should reduce emissions, this finding suggests that the projects funded through green bonds may not effectively contribute to emission reduction, possibly due to poor project selection, energy-intensive infrastructure development, or weak monitoring mechanisms. Therefore, Hypothesis One is rejected.

This finding aligns with Oche (2020), who identified inconsistencies in Nigeria's Green Bond regulatory framework, reinforcing the need for robust oversight and more precise project qualification criteria. In contrast, the result contradicts Fatica and Panzica (2020), whose study in more developed markets found that Green Bonds reduced emissions, highlighting contextual differences in regulatory strength and market maturity. Practically, the finding underscores the urgent need for stronger monitoring, accountability, and transparent project evaluation mechanisms in Nigeria's Green Bond market to prevent misallocation of funds and

ensure alignment with climate goals. Theoretically, through the lens of Stakeholder Theory, the result reflects a disconnect between stakeholder expectations and project implementation, calling for more inclusive stakeholder engagement and alignment of green finance initiatives with environmental sustainability objectives.

For Hypothesis Two, which posited that carbon credits have no significant effect on climate change mitigation in Nigeria, the result supports the null hypothesis. The coefficient for Carbon Credit (CC) is -91.52, with a standard error of 115.22 and a t-ratio of -0.79, indicating that the relationship is negative but not statistically significant. While the direction of the coefficient aligns with theoretical expectations that carbon credits should reduce GHGE, the lack of statistical significance suggests that their actual impact may be negligible or inconsistent. This could be due to limited market penetration, poor enforcement, or insufficient participation by major polluters. As a result, Hypothesis Two is accepted, and the findings imply that more robust policy interventions and regulatory frameworks are required to enhance the effectiveness of carbon credit systems in achieving tangible climate mitigation outcomes in Nigeria.

The acceptance of Hypothesis Two, which states that carbon credits have no significant effect on climate change mitigation (greenhouse gas emissions) in Nigeria, highlights the challenges in translating theoretical frameworks into practical outcomes. Despite the intended role of carbon credits in incentivising emission reductions, their impact in Nigeria appears minimal, potentially due to factors such as inadequate enforcement, limited market participation, and challenges in implementing effective carbon pricing mechanisms. This aligns with findings from Hyman (2022), who examined the U.S. agricultural sector. Hyman's study highlighted that while carbon credits incentivise farmers to adopt practices enhancing soil health and carbon sequestration, challenges such as limited market access and complex verification processes persist, hindering the full realisation of these benefits. Similarly, in Nigeria, operational hurdles like inadequate enforcement and limited market participation may contribute to the minimal practical impact of carbon credits on GHG emission reduction. Conversely, Nawaz et al. (2020) conducted a comparative analysis of carbon credit markets in N-11 and BRICS countries, revealing that robust carbon credit mechanisms, especially when complemented by renewable energy policies, can lead to significant reductions in emissions. This contrast suggests that the effectiveness of carbon credit systems is highly context-dependent, relying on factors such as market maturity, regulatory frameworks, and stakeholder engagement. Therefore, for carbon credits to effectively contribute to climate change mitigation in Nigeria, it is imperative to address these operational challenges and strengthen the institutional frameworks governing carbon markets. From a Stakeholder Theory perspective, the limited impact of carbon credits in Nigeria may reflect a misalignment between the design of carbon trading mechanisms and the interests and engagement of key stakeholders, including government entities, businesses, and local communities. Addressing these challenges requires enhancing stakeholder participation, improving regulatory oversight, and ensuring that carbon credit initiatives are tailored to Nigeria's specific socio-economic and institutional contexts.

Table 9: Error Correction Model Results

Variable	Coefficient/Std. Error	t-ratio
Constant	0.69 (0.14)	4.82***
GB(-3)	2.31 (0.70)	3.30***
CC(-2)	5.83 (2.20)	2.65**
R-squared		0.92
Adjusted R ²		0.86
Standard Error		0.09
F-Statistics		13.86***

Source. EViews Regression Output, 2025

The model's R-squared value of 0.92 and Adjusted R-squared of 0.86 suggest that the model explains approximately 92% of the variability in GHGE, indicating a strong fit. The standard error of 0.09 reflects a relatively low level of unexplained variation, enhancing the model's reliability. The F-statistic of 13.86, significant at the 1% level, confirms the overall significance of the model. These results underscore the importance of considering time lags in policy implementation and the need to continuously monitor green finance instruments to ensure their effectiveness in mitigating climate change.

The Error Correction Model (ECM) results presented in Table 9 offer insights into the short-term dynamics and long-term equilibrium relationships between Green Bonds (GB), Carbon Credits (CC), and Greenhouse Gas Emissions (GHGE) in Nigeria. The constant term has a coefficient of 0.69 with a standard error of 0.14 and a t-ratio of 4.82, indicating statistical significance at the 1% level. This suggests that, holding other factors constant, there is a positive baseline effect on GHGE. The lagged value of Green Bonds at three prior periods (GB(-3)) has a coefficient of 2.31, a standard error of 0.70, and a t-ratio of 3.30, which is also significant at the 1% level. This implies that increases in Green Bond activities have a delayed positive impact on GHGE, potentially due to the time lag between bond issuance and project implementation. Similarly, the lagged value of Carbon Credits at two periods prior (CC(-2)) shows a coefficient of 5.83, a standard error of 2.20, and a t-ratio of 2.65, significant at the 5% level, indicating that Carbon Credit mechanisms also have a delayed positive effect on GHGE.

Table 10: Error Correction Model Serial Correlation LM Test Results

	Test Statistic	Prob.
F-statistics	0.88	0.12
Obs*R-squared	1.61	0.13

Source: Eviews13 Output, 2025

The Breusch-Godfrey Serial Correlation LM Test results in Table 10 assess serial correlation in the Error Correction Model (ECM) residuals. The F-statistic is 0.88

with a corresponding p-value of 0.12, and the Obs*r-squared statistic is 1.61 with a p-value of 0.13. Since both p-values exceed the conventional significance levels (e.g., 0.05), we fail to reject the null hypothesis of no serial correlation. This indicates that the residuals are not significantly autocorrelated, suggesting that the ECM is well-specified regarding error independence. Consequently, the model's estimates are reliable, and there is no immediate need for corrective measures such as adding lagged variables or adjusting the model structure.

Conclusion and Recommendations

The study concludes that in Nigeria, Green Bonds have a positive and statistically significant impact on greenhouse gas emissions (GHGE), contrary to their intended purpose of reducing emissions. This unexpected outcome suggests that the proceeds from Green Bonds may not be effectively allocated to environmentally beneficial projects, potentially due to weak governance, inadequate project selection criteria, and insufficient oversight mechanisms. As a result, the anticipated environmental benefits of Green Bonds are not being realised, highlighting the need for more stringent regulatory frameworks and transparent monitoring systems to ensure that funds are directed toward genuine green initiatives.

Conversely, the study finds that Carbon Credits have a negative but statistically insignificant effect on GHGE in Nigeria. While Carbon Credits are conceptually designed to incentivise emission reductions, their practical implementation in Nigeria faces challenges such as low market participation, weak enforcement of carbon pricing mechanisms, and underdeveloped market structures. These factors undermine the effectiveness of Carbon Credits as a tool for climate change mitigation, emphasising the necessity for policy reforms, capacity building, and the establishment of robust carbon market infrastructures to enhance their impact.

This study therefore recommends, based on the findings and conclusion, that:

- i. Policymakers and financial institutions should strengthen the governance framework and introduce stricter project eligibility criteria for Green Bonds to ensure they finance genuinely low-emission activities. This can be achieved through rigorous environmental due diligence, increasing transparency in project selection, and establishing clear guidelines on what constitutes a “green” initiative, which can help realign Green Bonds with their intended purpose. Regular monitoring and impact assessments should be conducted, and violators of green investment standards should face penalties, ensuring that Green Bonds effectively contribute to reducing GHGE over the long term.
- ii. To enhance the effectiveness of Carbon Credits, policymakers should focus on improving market structures, enforcement mechanisms, and stakeholder engagement. This could involve strengthening the regulatory framework for carbon trading, expanding participation in carbon markets, and investing in capacity-building initiatives for emitters and regulators. By ensuring that carbon credits are reliably traded, verified, and enforced, these measures can help translate the theoretical benefits of carbon pricing into tangible emission reductions.

References

- Adisa, A. A., Olatunji, O. C., & Okafor, L. E. (2024). Green finance and greenhouse gas emissions in emerging economies: Evidence from panel data analysis. *Journal of Sustainable Finance & Investment*, 14(1), 65–84. <https://doi.org/10.1080/20430795.2023.2225814>
- African Development Bank (AfDB). (2021). *Climate change in Africa: A call for action*. AfDB.
- African Development Bank (AfDB). (2021). *Climate change in Africa: A call for action*. AfDB.
- Akpan, G. E., & Akpan, U. S. (2022). Green finance and climate change mitigation in Nigeria: Opportunities and challenges. *Journal of Sustainable Finance & Investment*, 12(3), 458–475.
- Arif, M., Hussain, R., & Rehman, M. (2022). Green finance and sustainable development: A global perspective. *Journal of Environmental Management*, 314, 115–126.
- Baker, R., & Nduka, E. C. (2022). Financing renewable energy for sustainable development: The role of green finance in emerging economies. *Renewable Energy and Sustainable Development Review*, 9(1), 54–68. <https://doi.org/10.1016/j.resdr.2022.01.005>
- Broekhoff, D., Gillenwater, M., Colbert-Sangree, T., & Cage, P. (2024). *Securing climate benefit: A guide to using carbon credits* (2nd ed.). Stockholm Environment Institute & Greenhouse Gas Management Institute. <https://www.offsetguide.org>
- Chavula, P., Alemu, B., Ntezimana, M. G., & Kazekula, E. M. (2022). Carbon trading to combat climate change. *International Journal of Academic and Applied Research (IJAAR)*, 6(9), 55–61. <https://www.ijeais.org/ijaar>
- Cortellini, G., & Panetta, I. C. (2021). Green bond: A systematic literature review for future research agendas. *Journal of Risk and Financial Management*, 14(12), 589. <https://doi.org/10.3390/jrfm14120589​>
- Delgado-Serrano, M. M., & Ramos-Henderson, J. A. (2022). Multi-scalar governance in climate mitigation: Linking local innovation and global frameworks. *Sustainability Science*, 17(4), 1015–1030. <https://doi.org/10.1007/s11625-022-01120-3>
- Devine, A., & Yönder, E. (2023). Impact of environmental investments on corporate financial performance: Decomposing valuation and cash flow effects. *The Journal of Real Estate Finance and Economics*, 66(4), 778–805. <https://doi.org/10.1007/s11146-021-09872>.
- Emohefe, O I., Mohammed, S., & Magaji, S. (2025) From Fuelwood and Fossil Fuels to the Future: An Economic Exploration of Cooking Energy Choices in Delta State, Nigeria
- Ezeoha, M., Umeodinka, I., & Nwaeze, G. (2023). Advancing carbon credit utilisation through contractual mechanisms in Nigeria. *Unpublished manuscript*.
- Fatica, S., & Panzica, R. (2020). Green bonds as a tool against climate change? (JRC Working Papers in Economics and Finance No. 2020/10). Luxembourg: Publications Office of the European Union. <https://doi.org/10.2760/24092​>

- Fatica, S., & Panzica, R. (2021). Green bonds and public institutions: A critical review. *Journal of Financial Regulation and Compliance*, 29(1), 66–83.
- Federal Ministry of Environment (Nigeria). (2020). Nigeria Green Bond Guidelines. <https://environment.gov.ng/green-bonds/​>.
- Federal Ministry of Environment [Nigeria]. (2021). Nigeria's Updated Nationally Determined Contributions (NDCs).
- Fishman, X., Broberg, D., Jantarasami, L., & Normile, C. (2022). *Using carbon credits to deploy climate solutions*. Bipartisan Policy Center.
- Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Boston: Pitman.
- Garcia-Leal, D., & Ramos-Martin, J. (2022). Climate change mitigation and sustainable development: A systemic policy approach. *Journal of Cleaner Production*, 367, 132967. <https://doi.org/10.1016/j.jclepro.2022.132967>
- Gold Standard. (2023). *Annual impact report: Advancing climate and development goals through carbon markets*. <https://www.goldstandard.org>
- Green Finance Taskforce. (2018). *Accelerating green finance: A report to the Government by the Green Finance Taskforce*. HM Government.
- Guesmi, K., Makrychoriti, P., & Pyrgiotakis, E. G. (2025). Climate change exposure and green bonds issuance. *Journal of International Money and Finance*, 152, 103281. <https://doi.org/10.1016/j.jimonfin.2025.103281>
- Hyman, R. (2022). *Farmer perspectives on carbon markets incentivising agricultural soil carbon sequestration*. npj Climate Action, 2(26). <https://doi.org/10.1038/s44168-023-00055-4>
- Ibrahim, M., Olusola, A. T., & Magaji, S (2025) Effects of Climate Change on Environmental Security among Vulnerable Groups in Zango Kataf Local Government Area of Kaduna State
- Intergovernmental Panel on Climate Change (IPCC). (2019). *Climate change and land: An IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*. <https://www.ipcc.ch/srccl/>
- Ismail, A., Musa, K. B., & Magaji, S. (2019). Socioeconomic and cost-effective on deforestation compliance policies as opposed to pure deterrence model of regulatory compliance *European Scientific Journal*
- Jensen, M. C. (2002). Value maximisation, stakeholder theory, and the corporate objective function. *Business Ethics Quarterly*, 12(2), 235–256. <https://doi.org/10.2307/3857812>
- Kumah, A., & Mensah, J. T. (2021). Green bonds and carbon credits: Innovative tools for climate finance. *Journal of Sustainable Finance & Investment*, 11(4), 345–361.
- Lajtha, B., & Fischer, P. (2021). Green bonds as financing instruments for sustainability: Evidence from developed markets. *Sustainable Finance Review*, 3(2), 119–136. <https://doi.org/10.1016/j.sfr.2021.100024>
- Liu, Y., Zhao, X., & Chen, L. (2023). Green finance and climate change: A systematic review of the literature. *Climate Policy*, 23(1), 1–18. <https://doi.org/10.1080/14693062.2023.2163120>
- Loan Market Association (LMA). (2021). *Green bond principles: Voluntary process guidelines for issuing green bonds*. <https://www.icmagroup.org/green-social-and-sustainability-bonds/green-bond-principles/>
- Loka: *Journal Of Environmental Sciences* 2 (1), 169-191
- Lombardi, M., & Bolis, S. (2022). The role of green finance in emerging economies: A focus on climate resilience. *Finance Research Letters*, 48, 102886.

- Magaji, S., Musa, I. (2024) Analysis of Farmers' Awareness on the Effect of Climate Change on Food Security in Nigeria. *International Journal of Humanities, Social Science and Management*, 4 (3) , 439-454
- Magaji. S., Ahmad, A.I., Sabiu, S. B., Abdullahi A. Y. (2024). From Deforestation to Pollution: Unraveling Environmental Challenges in Nigeria and Pakistan. *International Journal of social science and management*. 4(2), 805-814
- Malunjkar, V. S., Deshmukh, S. K., & Balakrishnan, P. (2015). Carbon credits: A climate change mitigation strategy. *International Journal of Scientific and Research Publications*, 5(3), 1–5. <http://www.ijsrp.org>
- Mikayilov, J. I., & Sattarahmady, H. (2022). Exploring the role of green bonds in financing climate change mitigation: Evidence from emerging markets. *Renewable and Sustainable Energy Reviews*, 160, 112263.
- Nawaz, M. A., Iqbal, S., & Ali, M. (2020). Nexus between green finance and climate change mitigation in N-11 and BRICS countries: Empirical estimation through difference in differences (DID) approach. *Environmental Science and Pollution Research*, 28(6), 6504–6519. <https://doi.org/10.1007/s11356-020-10920-y>
- Nunes, P. A. L. D., & Costa, L. C. (2022). The environmental role of green finance: Definitions, dimensions, and policy implications. *Ecological Economics*, 195, 107365. <https://doi.org/10.1016/j.ecolecon.2022.107365>
- Nwakoby, N. P., & Okeke, M. N. (2023). Green finance, governance, and policy implementation in Nigeria: Bridging the gap. *African Journal of Economic Policy*, 30(1), 110–125.
- Oche, P. A. (2020). Environmental governance and green finance in Nigeria: Theory and practice. *Journal of Environmental Economics and Policy*, 8(4), 389–405.
- Oche, P. A. (2020). Green bonds regulation in Nigeria and China: A comparative analysis. *Journal of Environmental Law and Policy*, 8(2), 145–163.
- Oduntan, T., Ajayi, T., & Bello, R. (2022). Climate change mitigation in Nigeria: The role of green finance. *African Journal of Environmental Economics and Management*, 10(2), 78–91.
- Oduntan, T., Ajayi, T., & Bello, R. (2022). Climate change mitigation in Nigeria: The role of green finance. *African Journal of Environmental Economics and Management*, 10(2), 78–91.
- Odusanya, I. A., Yusuf, S. A., & Okon, I. E. (2021). Vulnerability and adaptation to climate change in Africa: Financing challenges and options. *Climate Policy Review*, 9(1), 33–48.
- Odusanya, I. A., Yusuf, S. A., & Okon, I. E. (2021). Vulnerability and adaptation to climate change in Africa: Financing challenges and options. *Climate Policy Review*, 9(1), 33–48.
- Pizer, W. A., & Manson, N. (2020). Carbon markets and climate finance: Assessing the role of carbon credits in global climate strategies. *Resources for the Future Discussion Paper 20-28*. <https://www.rff.org/publications>
- Prajapati, S. K., Singh, S., & Singh, G. (2023). Carbon credits: A key tool in climate change mitigation, strategies and approaches for a sustainable future. Retrieved from <https://www.researchgate.net/publication/371445112>
- Reddy, K. M., Srinivas, C., & Devi, P. U. M. (2024). Green bonds and climate change mitigation: A conceptual study of financial instruments in India. *International Journal of Financial, Accounting, and Management*, 6(3), 461–475. <https://doi.org/10.35912/ijfam.v6i3.2476>
- Roberts, T. J., Kim, S., & Omotayo, A. O. (2023). Climate change mitigation and the sustainability transition: Integrating policies, technologies, and behavioural

- change. *Environmental Policy and Governance*, 33(2), 115–132. <https://doi.org/10.1002/eet.2001>
- Sabiu, S.B., & Magaji, S (2024). [Effect of Oil Exploration and Climatic Change on the Niger Delta Region of Nigeria](#). *Journal of Development and Society* 6 (1), 36–49
- Salma, A., Fryda, L., & Djelal, H. (2024). Biochar: A key player in carbon credits and climate mitigation. *Resources*, 13(2), 31. <https://doi.org/10.3390/resources13020031>
- Si Mohammed, K., Serret, V., & Urom, C. (2024). The effect of green bonds on climate risk amid economic and environmental policy uncertainties. *Journal of International Financial Markets, Institutions and Money*, 85, 101981. <https://doi.org/10.1016/j.intfin.2024.101981>
- Smith, J. M., Adeyemi, O., & Khan, H. (2022). Green bonds and sustainable infrastructure: A financial instrument for environmental progress. *Journal of Sustainable Finance & Investment*, 12(4), 701–717. <https://doi.org/10.1080/20430795.2022.2034573>
- The Journal of Environment & Development*. Online
- Zhang, D., & Lu, W. (2022). Aligning finance with sustainability: The role of green financial instruments. *Environmental Science and Policy*, 135, 53–63.
- Zhang, D., & Lu, W. (2022). Aligning finance with sustainability: The role of green financial instruments. *Environmental Science and Policy*, 135, 53–63. <https://doi.org/10.1016/j.envsci.2022.01.003>
- Zhang, Y., & Wang, D. (2019). Carbon credit pricing: Insights from market behaviour and economic modelling. *Journal of Environmental Economics and Management*, 98, 102256. <https://doi.org/10.1016/j.jeem.2019.102256>
- Zhang, Y., Zhao, L., & Wei, Y. (2022). Green finance and environmental sustainability: Current evidence and future perspectives. *Sustainable Development*, 30(5), 1123–1135.