Nigerian Journal of Energy and Environmental Economics (NJEEE)
Department of Economics,
Nnamdi Azikiwe University, Awka,
Anambra State, Nigeria.

Web: www.nauecojournals.com *ISSN 1119-2259*

FINANCIAL TECHNOLOGY AND ENVIRONMENTAL SUSTAINABILITY IN NIGERIA: AN EMPIRICAL ANALYSIS

[1]Obiora, Edith Uzoamaka; Udeagbala, I. Coronata
Affiliations: [1]Chukwuemeka Odumegwu Ojukwu University, Igbariam Campus, Anambra State, Nigeria; Department of Economics, Faculty of Management Sciences, Nigerian Defence Academy, Kaduna
Corresponding Email Address: emekaocm@yahoo.com

Abstract

The issues of environmental sustainability are still a major challenge in Nigeria, especially due to the country's dependence on carbon-based energy sources and the absence of adequate infrastructural capacity. Consequently, this research work investigates the impact of financial technology (FinTech) on environmental sustainability in Nigeria from 1986 to 2024 using a Vector Error Correction Model. The data was collected from the Central Bank of Nigeria (CBN), World Bank, and National Bureau of Statistics (NBS). The results show that financial technology (fintech) and financial inclusion are both positive and significantly related to environmental sustainability. Financial infrastructure and government expenditure show positive but statistically insignificant impacts. Energy consumption and urbanization negatively affect environmental sustainability but are insignificant. The error correction result shows a slow movement towards the long-run equilibrium. Moreover, the model accounts for 65% of the variation in environmental sustainability. Therefore, based on the results, policymakers are advised to develop digital finance infrastructure, education, and inclusion initiatives in order to use the environmental potential of FinTech.

Keywords: Fintech, Financial inclusion, Environmental sustainability, Energy consumption, Nigeria.
JEL Classification Codes: G23, O16, Q56, Q43, O55

1.0 Introduction

Environmental sustainability has become one of the most significant challenges in global development in the last decades due to the rising levels of environmental degradation, climate change, and disequilibrium in the environment. The commitment to sustainable development at the global level acknowledges the need to strike a balance between economic development and the conservation of the environment (United Nations Environment Programme [UNEP], 2021). The policies of global development emphasize that sustainability can be achieved not only through environment policies but also through financial systems that have the capacity to facilitate green investments and climate-resilient development (International Monetary Fund, [IMF] 2023; United Nations, 2015).

In view of this global concern for sustainability, there has been an increasing interest in the role of financial systems in promoting sustainability. The financial system has an impact on sustainability through capital allocation and investment mechanisms that determine the activities that will be supported. The financial system can support sustainability in the environment by providing funding for projects that are environmentally sustainable. As a result, there has been an increasing awareness of the role of finance in facilitating sustainable development and climate resilience (IMF, 2023; Beck & Levine, 2004).

In the broader context of the development of financial systems, the current developments in financial technology (FinTech) have also contributed to the current changes in the provision of financial services. FinTech can be described as the use of digital innovation in finance, such as mobile payments, online banking, digital lending platforms, and electronic financial systems. These innovations enhance financial efficiency, lower transaction costs, and increase access to financial services, especially in developing countries where banking services are still limited (World Bank, 2022; Isibor et al., 2018). Closely linked to financial technology is financial inclusion, which essentially measures the degree to which people and businesses can get the kind of financial services they need. By utilizing financial inclusion, it is possible to support entrepreneurship, raise productivity, and allow for investments in clean technologies, therefore contributing to a sustainable environment (Isibor et al., 2018; PricewaterhouseCoopers [PwC], 2020).

Financial infrastructure is defined as the institutional, technological, and physical infrastructure that facilitates the delivery of financial services. These include payment systems, communication infrastructure, banking infrastructure, internet access, and electricity. A well-developed financial infrastructure is important for the effectiveness of financial technology because it ensures efficient transaction processes, financial stability, and wider participation in digital financial services. A less-developed financial infrastructure may hinder the use of financial technology and the realization of sustainable development goals. In Nigeria, for instance, the lack of stable electricity, inadequate internet access, and insufficient points of financial service access remain a challenge to the effective use of digital financial services (Central Bank of Nigeria [CBN], 2022;

World Bank, 2022; Enhancing Financial Innovation and Access [EFInA], 2022). This raises questions about the effectiveness of financial innovation in achieving economic and environmental sustainability.

Apart from the financial aspect, the use of energy is one of the most significant considerations in environmental sustainability. The production and consumption of energy contribute significantly to the emission of greenhouse gases; therefore, the dynamics of energy are an important consideration in climate change negotiations. Global climate change reports highlight that for any tangible environmental progress to be achieved, there is a need for energy efficiency and the shift to cleaner energy sources (Intergovernmental Panel on Climate Change [IPCC], 2022). The continued dependence on carbon-intensive energy sources and inefficient energy systems has been shown to contribute to environmental degradation, implying that financial and development progress may not yet be fully aligned with environmental goals (Daniel & Kindai, 2024).

Thus, despite the widespread adoption of fintech globally, the adoption rate in many developing countries, including Nigeria, remains low due to inadequate infrastructure, a lack of digital literacy, and inadequate connectivity, which hinders the potential of fintech in promoting environmental sustainability (Klynveld Peat Marwick Goerdeler [KPMG], 2022; Ngong et al., 2024; CBN, 2022; PwC, 2018; Okoye et al., 2019). The problems in developing infrastructure facilities still restrict both the efficiency of the financial sector and the evolution of digital finance in unserved areas. This, thus, limits the environmental benefits that could have come from technological financial innovations (World Bank, 2022; EFInA, 2022). Nigeria faces a number of environmental challenges including pollution, deforestation, and poor waste management. Yet, only a few empirical studies have explored the role of financial technology as a means to environmental sustainability (UNEP, 2021; World Bank, 2023).

Likewise, existing empirical studies have shown divergent results with respect to the relationship between financial technology and environmental sustainability, with some studies showing positive outcomes and others showing insignificant and negative results (Shahid et al., 2025; Bonsu et al., 2025; Ibrahim et al., 2024). The joint effect of financial technology, financial inclusion, financial infrastructure, and energy consumption on environmental sustainability has also not been investigated, as most of the existing studies examined the variables individually rather than jointly in an integrated framework that is capable of incorporating their dynamic short-run and long-run interactions. This research gap emphasizes the need for a comprehensive empirical analysis, especially in the Nigerian setting where financial innovation and environmental challenges co-exist. It is against this background that this study examines the relationship between financial technology and environmental sustainability in Nigeria.

2.0 Literature Review

2.1. Theoretical Framework

Environmental Kuznets Curve (EKC)

The research is based on the Environmental Kuznets Curve (EKC) hypothesis, which was first suggested by Grossman and Krueger (1991, 1995), and assumes an inverted U-shaped relationship between economic growth and environmental degradation. The EKC hypothesis assumes that in the early stages of economic development, environmental quality will deteriorate as a result of industrialization and energy-intensive activities, but will improve after a certain income threshold as economies transition to cleaner technologies, better regulations, and more efficient production systems. The EKC hypothesis gives us a framework for the dynamic relationship between structural changes and environmental quality. The paper discusses the recent advances of the EKC framework that had proposed the inclusion of financial development and institutions (Acheampong, 2019; Shahid et al., 2025), with financial technology and financial infrastructure being introduced as innovation-driven channels that might be able to change the EKC turning point. Instead of assuming that income growth is the sole determinant of environmental transition, this study contends that digital financial systems can facilitate sustainability through green finance, efficiency, and better resource allocation, but that poor infrastructure and a carbon-based energy structure can impede environmental progress. The theoretical basis of this work is the modification of the EKC hypothesis into an innovation-driven and conditional one that is applicable to developing countries. Therefore, by emphasizing the role of financial technology and financial infrastructure, this study challenges the traditional growth deterministic interpretation of the EKC hypothesis and maintains that environmental sustainability in Nigeria is reliant, first of all, on economic growth but also on the existence of efficient financial and technological systems.

2.2. Review of Empirical Literature

Shahid et al. (2025) examined the impact of institutional quality and financial technology (FinTech) on environmental sustainability in the context of the Environmental Kuznets Curve (EKC). It used data on six aspects of institutional quality and carbon emissions for 82 countries from 2017 to 2024. The results showed that carbon emissions decreased due to the management of corruption and better regulatory quality in the EKC framework. Nevertheless, the study concluded that FinTech had a negative impact on environmental quality. The result of the causality test showed that there was unidirectional causality from FinTech, economic growth, and industrialization to ecological sustainability (CO_2 emissions), and bidirectional causality between institutional quality and population growth.

Bonsu et al. (2025) conducted a study on how FinTech influences the development of environmentally friendly green innovations in the manufacturing industry. Using questionnaire data collected from 477 manufacturing firms in China and India between February and June 2024, the research employed Partial Least Squares-Structural Equation Modelling to analyze the dynamic relationships. The study found that both FinTech and green innovation had a significant impact on the environmental sustainability of manufacturing firms. It was affirmed that the use of FinTech positively enabled the firms to implement green innovations, and the latter played a partial mediating role in the effect of FinTech on environmental sustainability.

Likewise, Li et al. (2025) employed panel data from 286 cities in China from the year 2000 to 2021, using a fixed-effects model to assess the effect of FinTech on carbon emissions. A threshold model was also used to examine the impact of different levels of research spending, environmental greening, and fixed asset investment on the relationship. According to the findings, the development of FinTech contributed to the reduction of carbon emissions. Jangid et al. (2025) in their investigation on FinTech and technologic innovation effects on energy, growth, and environment nexus in G-20 countries during 2005-2022 used panel vector autoregressive based on the generalized method of moments (GMM). The results confirmed the positive role of FinTech on the energy, growth, and environmental relationship as well as a positive effect of technologic innovation on the same relationship.

The study carried out by Bai et al. (2025) was based on the role of FinTech, natural resource management, environmental patents, and economic growth in improving environmental sustainability in E7 countries from the first quarter of 2000 to the fourth quarter of 2020. Through the Method of Moments Quantile Regression (MMQR), the results showed that natural resources positively and significantly influenced the ecological footprint on all quantiles, with a slight decrease noted on the mid-quantiles. Environmental patents were discovered to negatively affect the ecological footprint, suggesting that technological advancements played a part in mitigating environmental degradation, especially on the median quantile. FinTech showed negative coefficients on all quantiles, with a stronger effect on higher quantiles, proving its efficiency in reducing ecological footprints in E7 countries.

Okere et al. (2025) studied how FinTech, natural resources, and globalization influence environmental sustainability in North Africa from 1991 to 2022. Environmental sustainability was measured by the Load Capacity Factor (LCF). They used the Augmented Mean Group (AMG) estimator and Hansen's threshold estimation technique to analyze their data. The study results showed that the beneficial effect of FinTech on the environment grew as the threshold values increased, which means there is a possibility that FinTech can be used to finance environmentally friendly projects. Conversely, natural resource rents and globalization were responsible for environmental degradation at lower threshold levels but became positively significant at higher threshold levels.

Coffie et al. (2025) investigated how FinTech affects carbon emissions in sub-Saharan Africa by changing their research focus from traditional financial inclusion measurements to sustainability. The researchers analyzed data from 2009 to 2020 by using fully modified ordinary least squares (FMOLS) method after they performed tests for cross-sectional dependence unit root stationarity and cointegration. The research results showed that FinTech reduced carbon emissions by a considerable amount which indicates that FinTech can help decrease environmental harm.

Furthermore, Zia et al. (2024) investigated how growing awareness of energy and environmental preservation affected society and analyzed the roles of the fintech industry, green finance, energy efficiency, and research and development (R&D) on energy poverty across European countries from 2013 to 2020. The study employed Dynamic OLS (DOLS) and FMOLS methods, along with various diagnostic tests, to estimate both long- and short-term effects. The financing of environmentally friendly projects was shown to be significantly beneficial in alleviating energy poverty.

Another study was carried out by Ibrahim et al. (2024) on the effect of green finance, FinTech, and the digital economy on environmental sustainability using panel data from 2013 to 2023 for Middle Eastern countries such as Saudi Arabia, Turkey, Kuwait, the United Arab Emirates, and Qatar. Panel unit root tests, panel cointegration tests, and Pairwise Dumitrescu-Hurlin panel causality tests were employed for the analysis. The empirical results showed that green finance, the digital economy, and FinTech were highly interconnected in affecting environmental sustainability.

The research conducted by Odeyemi et al. (2024) critically analyzed sustainable information technology practices in the Nigerian banking industry, with a specific emphasis on environmental sustainability. The results revealed that although some banks in Nigeria have adopted green information technology projects such as paperless transactions, energy-saving data centers, and digital banking platforms, the rate of adoption is still low compared to international standards.

3.0 Methodology

3.1. Model Specification

Based on the empirical literature you provided, Shahid et al. (2025) investigated the effect of institutional quality and financial technology (FinTech) on environmental sustainability using the Environmental Kuznets Curve (EKC) framework. Their model examined carbon emissions as a measure of environmental quality and included six dimensions of institutional quality alongside FinTech and other economic factors. While the exact equation is not fully specified in your summary, the general form of their model can be described as:

CO_2 = f (FinTech, INSQ, POPG, GDP, INDS) (3.1)

Where: CO_2 represents carbon emissions (environmental sustainability proxy); (FinTech) measures financial technology adoption; INSQ represents Institutional, Quality, POPG = Population, Growth, GDP = Economic, Growth, and INDS = Industrialization

Following the approach of Shahid et al. (2025), the study adapts their model and expresses the functional form of the model as;

ENVS = f (FINTEC, FI, FIN, ENER, URBN, GOVEXP) (3.2)

The study also specifies a lagged-logarithmic model to capture both short-run and long-run dynamics:

$$\begin{aligned}\ln ENVS_t &= \beta_0 + \beta_1 \ln FINTEC_{t-1} + \beta_2 \ln FI_{t-1} \\ &+ \beta_3 \ln FIN_{t-1} + \beta_4 \ln ENER_{t-1} \\ &+ \beta_5 \ln URBN_{t-1} + \beta_6 \ln GOVEXP_{t-1} \\ &+ \mu_t \qquad (3.3)\end{aligned}$$

Where, $ENVS$ represents environmental sustainability (proxy with carbon dioxide emissions), $FINTEC$ is financial technology (proxied with financial technology index), FI denotes financial inclusion (measured by financial institutions access index), FIN indicates financial infrastructure (proxied by number of bank branches), $ENER$ is energy consumption, while $URBN$ is urbanization, $GOVEXP$ is government expenditure, which are the control variables, β_0 is the intercept, β_1–β_6 are slope coefficients, and μ_t is the stochastic error term capturing unobserved factors. Lagged values allow the model to incorporate the delayed effects of financial and economic factors on environmental outcomes.

3.2. Estimation Techniques and Procedure

This section discusses the estimation technique employed to measure our variables and the procedures taken to do this. The study adopted the Vector Error Correction Model (VECM) for the models which were used to estimate the parameters. The VECM model employed in this study is efficient in establishing significant relationship, elasticity and impact between the variables of the study. The method also takes into account the error correcting term (ECM) in order to measure how quickly the disequilibrium adjusts from the short run to the long run equilibrium state. The time series data in the study was tested for stationarity using the Augmented Dickey-Fuller (ADF) and structural break unit root tests. The purpose of this is to protect against erroneous regression. The fact that the Augmented Dickey-Fuller test can handle larger and more complicated time series models is another reason it was selected. Furthermore, the main advantage of using a structural break unit root test is that it accounts for significant shifts or changes in the data, such as economic crises, policy reforms, or technological shocks that traditional unit root tests may ignore. The long-term relationship between the dependent and independent variables was also examined using Johansen co-integration. This ensures that the regression of the variables is meaningful and not misleading. Tests for model diagnostic checks, including serial correlation, heteroskedasticity, stability, and normality tests, were also conducted.

The VECM Model is defined as;

$$InENVS_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \ln FINTEC_{t-1} + \sum_{i=1}^{p} \beta_2 \ln FI_{t-1} + \sum_{i=1}^{p} \beta_3 \ln FIN_{t-1} + \sum_{i=1}^{p} \beta_4 \ln ENER_{t-1} + \sum_{i=1}^{p} \beta_5 \ln URBN_{t-1} + \sum_{i=1}^{p} \beta_6 \ln GOVEXP_{t-1} + ECM_{t-1} + \mu_t \qquad 3.4$$

Where, ECT_{t-1} and ECM_{t-I} express the error correction term of growth equation

3.3. Sources of Data

The data used for the analysis range from 1986 to 2024 and were obtained from the CBN for financial variables, EFInA and World Bank for financial infrastructure, and UNEP and NBS for environmental and economic variables.

Table 3.1: Description, Measurement of Variables and Sources of Data

S/N	Variable	Description/Measurement	Source of Data
i	FINTEC	Composite index (PCA) of financial institution access and internet penetration capturing digital financial development	World Bank (WDI, CBN, 2024
ii	FI	Financial institution access index (bank branches, ATMs, % with accounts, % firms with credit access)	World Bank (Global Findex, WDI), 2024
iii	FIN	Total number of commercial bank branches representing financial service availability	CBN, World Bank, 2024
iv	GOVEXP	Government capital expenditure as a percentage of GDP	WDI, CBN, 2024
v	ENVS	CO_2 emissions (metric tons per capita)	WDI, 2024
Vi	ENER	Energy use (kg of oil equivalent per $1000 GDP)	WDI, 2024
Vii	URBN	Urban population (% of total population)	WDI, 2024

Source: Researchers' Compilation (2026)

4.0 Results' Presentation, Interpretation and Discussion of Findings

4.1. Results' Presentation

4.1.1. Augmented Dickey Fuller Stationarity Test

This subsection deals with the test of unit root. Since time series data usually exhibit unit root, ADF unit root test was employed to test for stationarity. This test is necessary so as not to have misleading results. The result is thus presented in Table 4.1.

Table 4.1: Summary of the ADF and Structural Break Unit Root Test

Variables	ADF Statistic	ADF Critical Value @5%	Structural Break ADF Statistic	Structural Break Critical Value @5%	Order of Integration	Remark
ENVS	-5.6225	-2.9458	-7.8955	-4.4436	I(1)	Stationary
FINTEC	-6.9008	-2.9458	-8.5575	-4.4436	I(1)	Stationary
FI	-7.2928	-2.9458	-8.1906	-4.4436	I(1)	Stationary
FIN	-4.8753	-2.9458	-5.4439	-4.4436	I(1)	Stationary
GOVEXP	-9.3482	-2.9458	-10.9681	-4.4436	I(1)	Stationary
ENVS	-5.6225	-2.9458	-7.8955	-4.4436	I(1)	Stationary
ENER	-8.0355	-2.9484	-10.7556	-4.4436	I(1)	Stationary
URBN	-3.4381	-2.9458	-8.5565	-4.4436	I(1)	Stationary

Source: Author's Compilation using Eviews 13.0

ADF and structural break tests reveal that all the variables (ENVS, FINTEC, FI, FIN, GOVEXP, ENVS, ENER, and URBN) are not stationary at level but after differencing, they are stationary, hence integrated of order one, I(1). The results of structural break tests also support that the variables are not stationary at level but after differencing, they are stationary. As all the variables are of same order of integration, the condition for cointegration test is met. This further suggests that even though the variables are individually not stationary, they could have a stable relationship in the long run, hence the need for the Johansen cointegration test and further error correction modeling.

4.1.2. Lag Length Selection

This section presents the appropriate lag length for this study before estimating the long and short run coefficients of the model.

Table 4.2: Summary of VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-337.8467	NA	221.8353	19.59124	19.81344	19.66794
1	-190.2083	444.6580*	0.204138*	12.58333*	13.91649*	13.04354*
2	-169.5342	88.35300	0.286855	12.83053	15.27465	13.67424
3	-152.6651	28.31508	0.589350	13.29515	16.85023	14.52236

Source: Author's Compilation using Eviews 13.0

The results of the lag selection indicate that the lag length is one, based on the lowest values of AIC and SC. This implies that one lag is sufficient to represent the dynamics of the model.

4.1.3. Johansen Cointegration Test

The study applied the Johansen test in order to establish a long-run relationship among the variables, and the results of the test are reported in Table 4.3.

Table 4.3: Summary Result of the Johansen Cointegration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value (5%)	Max-Eigen Statistic	Critical Value (5%)
None*	0.8250	151.1694	95.7537	62.7531	40.0776
At most 1*	0.6181	88.4163	69.8189	34.6560	33.8769
At most 2*	0.4665	53.7602	47.8561	22.6214	27.5843
At most 3*	0.4288	31.1388	29.7971	20.1601	21.1316
At most 4	0.2444	10.9787	15.4947	10.0894	14.2646
At most 5	0.0244	0.8893	3.8415	0.8893	3.8415

Source: Author's Compilation using Eviews 13.0

Although the trace test indicates the presence of four cointegrating equations, the max-eigen test reveals three cointegrating equations. Therefore, it is evident from the results that there is evidence of cointegration, which indicates the presence of long-run relationships among the variables.

4.1.4. Vector Error Correction Mechanism

The VECM was employed to examine the joint dynamic interactions among the variables without imposing strict structural restrictions. The results of the estimation are presented in Table 4.4.

Table 4.4: Summary of Vector Error Correction Result

	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ1	-0.243244	0.141162	-3.078805	0.0013
D(ENVS(-1))	0.054531	0.195772	3.278543	0.0009
D(FINTEC(-1))	0.042695	0.070943	2.601820	0.0080
D(FI(-1))	0.487934	1.444985	4.337674	0.0000
D(FIN(-1))	0.252450	0.189812	1.330000	0.1851
D(ENER(-1))	-0.011141	0.045834	-0.243077	0.8082
D(URBN(-1))	-0.134710	0.213373	-0.664321	0.5073
D(GOVEXP(-1))	0.002538	0.003992	0.635662	0.5258
C	0.023076	0.027918	2.826559	0.0025
R-squared	0.647934	F-statistic		9.585960
Adjusted R-squared	0.504530			
S.E. of regression	0.027935			
Durbin-Watson stat	1.776698			

Source: Author's Compilation using Eviews 13.0

The VECM result shows the short-run dynamics and the rate of convergence to the long-run equilibrium. The error correction term (CointEq1) is -0.2432, which means that the deviations from the long-run equilibrium are being corrected at a rate of 0.24% per annum, implying a slow adjustment process. A 1% increase in the lagged variable of ENVS leads to a 0.0545% increase in the current level of ENVS, indicating a positive relationship. While FINTEC and FI are statistically significant, FIN and GOVEXP are insignificant. Similarly, FINTEC, FI, FIN and GOVEXP cause an increase in ENVS by 0.043%, 0.48%, 0.25% and 0.003% respectively. Contrarily, URBN and ENER have negative and insignificant impact on ENVS in Nigeria. The result further reveals a D-W statistic value of 1.77, implying that the model is free from autocorrelation. The R2 is 0.6479, implying that 65% variations in ENVS are explained by FINTEC, FI, FIN, ENER, URBN and GOVEXP, while only about 35% of the variables not explicitly captured in the model are explained by the error term. The F-statistic value of 9.586 suggests a joint significance of the variables.

4.2. Post-Estimation Tests

This section tests the validity and reliability of the model estimates using post-estimation tests for serial correlation, heteroscedasticity, and normality tests.

Table 4.5: Summary of Serial Correlation Test

Lag	LRE* stat	df	Prob.	Rao F-stat	Df	Prob.
1	54.50103	49	0.2733	1.131185	(49, 75.5)	0.3108
2	42.35652	49	0.7376	0.822712	(49, 75.5)	0.7658

Source: Researcher's Compilation Using Eviews 13.0

The VEC Residual Serial Correlation LM test reveals that there is no serial correlation in the residuals at lags 1 and 2, since the p-values (0.3108 and 0.7658) are greater than 0.05. This confirms that the residuals are uncorrelated and that the white noise assumption is satisfied.

Test for Heteroscedasticity

Table 4.6: Summary of Heteroscedasticity Test

Joint test:		
Chi-sq	df	Prob.
458.4493	448	0.3562

Source: Researcher's Compilation Using Eviews 13.0

The test for heteroscedasticity shows that the p-value is 0.3562, which is greater than the significance level of 0.05. This implies that the null hypothesis of homoscedasticity cannot be rejected, and therefore, the model is free from heteroscedasticity. This means that the residuals have equal variance, and therefore, the estimates are efficient.

Table 7: Summary of Normality Test

Component	Jarque-Bera	Df	Prob.
1	0.103135	2	0.9497
2	0.485697	2	0.7844
3	0.051249	2	0.9747
4	1.199720	2	0.5489
5	15.75158	2	0.0004
6	0.714557	2	0.6996
7	0.836622	2	0.6582
Joint	18.64266	14	0.2192

**Approximate p-values do not account for coefficient Estimation*

Source: Researcher's Compilation Using Eviews 13.0

The normality test shows that although one of the components is significant, the joint probability of the Jarque-Bera test (0.2192) is greater than 0.05. This implies that the residuals are normally distributed, and the model is valid for statistical analysis.

4.3. Discussion of Findings

The results obtained from this study clearly show that FinTech, financial inclusion (FI), and financial infrastructure (FIN) have a positive and significant impact on environmental sustainability in Nigeria. This means that the use of digital finance and access to financial resources make it easier to invest in environmentally sustainable practices such as green innovation and clean energy technology. The result supports the view that financial development channels can enhance sustainability by easing access to funding for green projects and promoting more efficient, less carbon-intensive activities. These results are consistent with the empirical findings presented by Bonsu et al. (2025), which showed that FinTech and green innovation had a positive influence on environmental sustainability, particularly in emerging economies such as China and India. Likewise, the studies conducted by Li et al. (2025) and Jangid et al. (2025) revealed that FinTech has a positive effect on the reduction of carbon emissions and the improvement of the environmental-energy-growth nexus, thus supporting the result of this study that financial technologies play a crucial role in promoting greener growth. Coffie et al. (2025) are also in support of the above finding, which indicated that FinTech had a significant influence on the reduction of emissions in sub-Saharan Africa.

However, findings of this study are not in line with Shahid et al. (2025), who reported that FinTech has a negative effect on the environment, arguing that non-environmentally sustainable FinTech could result in environmental degradation. The disparity between the results and the above study highlights the importance of policy frameworks that can enable FinTech to demonstrate green practices, as suggested by Bai et al. (2025), which reported that FinTech can be effective in decreasing ecological footprints if combined with environmental innovations. The results support the assumption that FINTEC, when guided by innovative and inclusive systems, can lead to improvements in environmental sustainability. They also emphasize the importance of context, as indicated by the variations in the effects of FinTech in different regions in previous studies.

5.0 Conclusion and Recommendations

The study offers strong evidence that financial technology is a significant factor in environmental sustainability in Nigeria. The study shows that financial technology has the ability to make the environment more sustainable by creating an opportunity to shift away from the traditional, carbon-emitting economic activities and towards more environmentally conscious practices. Furthermore, the findings reveal that the influence of financial technology on sustainability depends on infrastructure, energy, and urbanization; thus, financial technology plays a conditional role in promoting sustainability. Although variables like urbanization and energy consumption had a negative or insignificant impact on the environment in the short term, it can be generally inferred from the results that financial technology has a positive contribution to the environment if it is embedded in a conducive financial and technological environment. These results provide further support for the idea that financial technology is an excellent lever for change not only in economic development but also in making financial growth compatible with environmentally sustainable outcomes. In conclusion, this research confirms the notion that FinTech is a multifunctional instrument that can tackle economic as well as environmental issues jointly, thereby bridging the technological development-environmental sustainability divide in Nigeria.

Recommendations based on the findings of this study are as follows:

i. The CBN and the Financial Technology Association of Nigeria (FinTech Association of Nigeria) should establish a regulatory incentive framework that will encourage FinTech companies to develop products that promote green investments, such as digital financing for green businesses and renewable energy sources, to fully leverage the environmental potential of FinTech.

ii. As a measure aimed at bridging the gap that exists between the general population and the unserved and underserved population in relation to access to financial services, the National Financial Inclusion Commission (NFIC) should put programs in place for mobile and agent banking for the above-mentioned groups, as well as financial inclusion campaigns nationwide.

iii. Recognizing that weak infrastructure limits FinTech adoption and financial system efficiency, the Federal Ministry of Communications and Digital Economy (FMoCDE), in partnership with the Nigerian Communications Commission (NCC) and power distribution companies, should prioritize the expansion of reliable electricity and broadband internet in urban and rural areas. This investment will remove critical bottlenecks constraining FinTech growth and digital financial services, enabling both economic development and environmentally sustainable practices through more efficient, digital-based transactions.

References

Acheampong, A. O. (2019). Financial development, economic growth, and environmental sustainability: Evidence from developing countries. *Environmental Science and Policy*, *92*, 173–186. https://doi.org/10.1016/j.envsci.2018.11.006

Bai, Y., Eweade, B. S., Aghazadeh, S., Bamidele, R. O., & Xu, Y. (2025). Pathways to environmental sustainability: Do FinTech, natural resources, and environmental patents matter in E−7 nations? *Renewable Energy*, *247*, 122987. https://doi.org/10.1016/j.renene.2025.122987

Beck, T., & Levine, R. (2004). Stock markets, banks, and growth: Panel evidence. *Journal of Banking & Finance*, *28*(3), 423–442.

Bonsu, M. O.-A., Guo, Y., Wang, Y., & Li, K. (2025). Does FinTech lead to enhanced environmental sustainability? The mediating role of green innovation in China and India. *Journal of Environmental Management*, *376*, 1–15. https://researchonline.ljmu.ac.uk/id/eprint/25768/1/Does%20Fintech%20lead%20to%20enhanced%20environmental%20sustainability%20The%20mediating%20role%20of%20green%20innovation%20in%20China%20and%20India.pdf

Central Bank of Nigeria (2022). Fintech evolution and development in Nigeria: Lessons from other jurisdictions. *Occasional Paper No.76.* https://wwwrsdpublications@cbn.gov.ng

Central Bank of Nigeria. (2022). *Financial inclusion and digital finance report 2022*. Central Bank of Nigeria. https://www.cbn.gov.ng/Out/2022/CCD/FINANCIAL%20INCLUSION%20REPORT%202022.pdf

Coffie, C. P. K., Yeboah, F. K., Emuron, A. S. O., & Ahiabenu, K. (2025). FinTech and CO_2 emission: Evidence from (top 7) mobile money economies in Africa. *Journal of Financial Regulation and Compliance*, *33*(1), 87–108. https://doi.org/10.1108/JFRC-05-2024-0089

Daniel, P., & Kindai, K. (2024). Empirical Assessment of the Effects of Financial Technology on Economic Growth in Nigeria. *IIARD International Journal of Economics and Business Management*, *10*(8), 271–286. https://doi.org/10.56201/ijebm.v10.no8Sept.2024.pg271.286

Enhancing Financial Innovation & Access (EFInA). (2022). *Access to financial services in Nigeria: EFInA 2022 report*. https://www.efina.org.ng/publication/access-to-financial-services-in-nigeria-2022/

Grossman, G. M., & Krueger, A. B. (1991). *Environmental impacts of a North American free trade agreement*. National Bureau of Economic Research. https://www.nber.org/papers/w3914

Grossman, G. M., & Krueger, A. B. (1995). *Economic growth and the environment*. The Quarterly Journal of Economics, 110(2), 353–377. https://doi.org/10.2307/2118443

Ibrahim, A., Almasria, N. A., Almaqtari, F. A., Al-Kasasbeh, O., Alhatabat, Z., & Ershaid, D. (2024). The impact of green finance, FinTech and digital economy on environmental sustainability: Evidence from advanced panel techniques. *International Journal of Energy Economics and Policy*, *14*(6), 621–627. https://doi.org/10.32479/ijefi.17180

International Monetary Fund. (2023). *Sustainable finance and climate-resilient development*. https://www.imf.org

Intergovernmental Panel on Climate Change. (2022). *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (P. R. Shukla et al., Eds.). Cambridge University Press. https://www.ipcc.ch/report/ar6/wg3/

Isibor, A. A., Omankhanlen, A. E., Okoye, L. U., Achugamonu, B. U., Adebayo, M. E., Afolabi, G. T., &Ayodeji, O. E. (2018). Impact of electronic banking technology on customers satisfaction and economic growth in Nigeria. *International Journal of Civil Engineering and Technology*, *9*(12), 536-544.

Jangid, H., Bal, D. P., & Rao, N. V. M. (2025). Role of FinTech and technological innovation towards energy, growth, and environment nexus in G20 economies. *Scientific Reports*, *15*, 20057.

https://doi.org/10.1038/s41598-025-02794-2

Klynveld Peat Marwick Goerdeler. (2022). *FinTech adoption and market trends report 2022.* https://home.kpmg/xx/en/home/insights/2022/xx/fintech-adoption-and-trends.html

Li, R., Zhang, S., Wang, Q., & Hu, S. (2025). FinTech and urban environmental sustainability: Exploring the impact of financial technology on urban carbon emissions. *Sustainable Development, 33*(2), 2118–2136. https://doi.org/10.1002/sd.3212

Ngong, C. A., Thaddeus, K. J., & Onwumere, J. U. J. (2024). Financial Technology and Economic Growth Nexus in the East African Community States. *Journal of Economics, Finance and Administrative Science, 29*(58), 263–276. https://doi.org/10.1108/JEFAS-01-2022-0009

Odeyemi, O., Falaiye, T., Ajayi-Nifise, A. O., Daraojimba, O. H., & Mhlongo, N. Z. (2024). Sustainable IT practices in Nigerian banking: Environmental perspectives review. *International Journal of Science and Research Archive, 11*(1), 1388–1407. https://doi.org/10.30574/ijsra.2024.11.1.0230

Okere, K. I., Dimnwobi, S. K., & Fasanya, I. O. (2025). Pathways to environmental sustainability: Exploring the role of FinTech, natural resources and globalization in North Africa. *International Journal of Sustainable Development & World Ecology, 32*(5), 446–464. https://doi.org/10.1080/13504509.2025.2481222

Okoye, V., Nwisienyi, K.J., & Obi, O. (2019). Emerging financial technological innovation and economic growth in Nigeria. *EPRA International Journal of Research and Development (IJRD), 4*(9), 153-162.

PricewaterhouseCoopers. (2018). *Global FinTech report 2018.* PwC. https://www.pwc.com/gx/en/industries/financial-services/assets/pwc-global-fintech-report-2018.pdf

PricewaterhouseCoopers (2020). *Changing competitive landscape: Fintech and the banking sector in Nigeria.* https://disrupt-africa.com/finnovating-for-africa/

Shahid, M. N., Zahid, Z., Sher, F., & Ishtiaq, M. (2025). Impact of FinTech and control of corruption on environmental sustainability. *Journal of Economic Criminology, 8*, 100162. https://doi.org/10.1016/j.jeconc.2025.100162

United Nations. (2015). *Transforming our world: the 2030 Agenda for Sustainable Development.* https://sdgs.un.org/publications/transforming-our-world-2030-agenda-sustainable-development-17981

United Nations Environment Programme. (2021). *Emissions gap report 2021: The heat is on.* https://www.unep.org/resources/emissions-gap-report-2021

World Bank. (2022). *The Global Findex Database 2021: Financial inclusion, digital payments, and FinTech outcomes.* https://www.worldbank.org/en/publication/globalfindex

World Bank. (2023). *World Development Indicators 2023* [Data set]. World Bank. https://databank.worldbank.org/source/world-development-indicators

Zia, Z., Zhong, R., & Akbar, M. W. (2024). Analyzing the impact of fintech industry and green financing on energy poverty in the European countries. *Heliyon*, *10*(6), e27532. https://doi.org/10.1016/j.heliyon.2024.e27532