

IMPACT OF GREEN FINANCING ON THE SUSTAINABILITY OF NIGERIA'S ECONOMY

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Abstract

Economic sustainability is pivotal to a nation's growth and development, yet it faces several challenges including Green Prevention Costs, Green Evaluation Costs, and green Internal Failure Costs. This study examined the impact of green financing on the sustainability of Nigeria's economy from 2009 to 2023. Specifically, it evaluates the effects of green prevention costs, green evaluation costs and green internal failure costs on Nigeria's economic sustainability, using the dependent variable and measured by Real Gross Domestic Product (RGDP). Trade Openness (TROP) was used as a control variable. Secondary data were sourced from the World Bank's Pollution Management database and Central Bank of Nigeria Statistical Bulletins, with analysis conducted employing Robust Least Squares (RLS) in E-Views 10. The findings indicate that both GNPC and GNIC had a significant positive effect on economic sustainability, while GNEC had an insignificant effect. The study recommends that there is a need for increased funding for Green Internal Failure Costs and re-assess the emphasis on Green Evaluation Costs.

Keywords: Green Financing, Economic Sustainability, Green Prevention Costs, Green Evaluation Costs, Green Internal Failure Costs.

Introduction

The world is facing significant challenges related to climatic stabilization due to climate change, global warming, and environmental degradation. Major contributors include greenhouse gas emissions, the burning of hydrocarbons, deforestation, and industrial emissions, all of which damage the ozone layer. These activities lead to flooding, power shortages, economic losses, health crises and food scarcity. Hence the shift to Green Financing to enhance green investment to achieve

sustainable development and climate change. One of the contemporary issues in finance is green finance or Sustainable Finance, which is a product of sustainable development goals (SDGs). Sustainable finance deals with financial tools that serve environmental and social goals, while green finance is completely integrated and concerned with environmental objectives. Both green finance and sustainable are expected to promote creations and technological innovations and serve as catalysts for business opportunities for the financial industry through the creations of new financial product (such as green bonds or sustainable bonds), financial tools, and financial services. The transition aims to reduce carbon emissions and advocate for renewable energy sources. Recent publications indicate that global efforts to address climate change have intensified the focus on green finance (Enejo & Idoko, 2023). Implementing the Paris Climate Agreement and the United Nations Sustainable Development Goals represents significant commitments to long-lasting environmental sustainability (Bergugli et al., 2021). Green Finance goes beyond merely pursuing investment returns; it encompasses a dual objective of profit generation while enhancing human welfare and environmental sustainability. In light of the growing financial challenges associated with Climate Change, it is vital to explore green financing alternatives (Applegaronye et al., 2023). Since climate change affects both financial and non-financial sectors, green financing is essential in mitigating these risks by encouraging investments in environmentally sustainable projects. This approach can significantly lower greenhouse gas emissions (GHG) other pollutants, positively influencing economic stability and fostering sustainable development (Chen et al., 2019). Sustainable development and climate change adaptation cannot be achieved without the necessary financial means being available to the relevant sectors and actors, which could lead to the transformation of the global economy in an environmentally friendly manner. Those clamouring for sustainable finance as against the traditional approach argue that it is not possible to separate the environment from society because society depends on the environment for its existence, and human society has a major impact (both positive and negative) on the environment.

Green finance encompasses all the initiatives taken by private and public agents (e.g., businesses, banks, governments, and international organizations) in developing, promoting, implementing and supporting projects with sustainable impacts through financial instruments (Cizelj, 2021). In addition, Diwan and Khawas (2023) assert that green financing activities can be disaggregated into three main areas: (i) sustainable infrastructure, notably the transition of energy systems to reduce the use of fossil fuels, (ii) adaptations and resilience, including the use of nature-based solutions, and (iii) agriculture and the transformation of land use, including the need for biodiversity conservation.

The following are the objectives of the study:

- To evaluate the impact of green financing on the economic sustainability of Nigeria.

- To examine the impact of Green Evaluation Cost (GNEC) on the economic sustainability of Nigeria.
- To investigate the effect of Green Internal Failure Cost (GNIC) on the economic sustainability of Nigeria.

The following research questions are formulated to guide in this study:

- i. What to what extent does Green Prevention Cost (GNPC) have an A A A impact on economic sustainability of Nigeria?
- ii. How does Green Evaluation Cost (GNEC) have an A A A impact on economic sustainability of Nigeria?
- iii. How does Green Internal Failure Cost (GNIC) have an A A A impact on economic sustainability of Nigeria?

The following hypotheses are propounded in their null form:

H01: Green Prevention Cost (GNPC) has no significant impact on RGDP.

H02: Green Evaluation Cost (GNEC) does not have a positive relationship with economic sustainability.

H03: Green Internal Failure Cost (GNIC) Finance has no significant impact on Nigeria's RGDP.

Review of Related Literature

Conceptual Framework

Overview of Green Financing and Economic Sustainability

Green Financing refers to financial investments and services that support environmentally friendly projects, businesses, and initiatives. It aims to promote sustainable development by providing funding for projects that reduce environmental impact, mitigate climate change, and conserve natural resources. Green financing involves channelling funds from public, corporate, and non-profit sectors into sustainable development activities. Similarly, green finance, also known as environmental finance, is just an investment in the environment through the use of eco-friendly methods that are intended to protect the immediate environment. As a result, it falls under the category of sustainable finance. Given its current relevance, it is spreading around the world (Lang, 2020). It is pertinent to note that green finance initiatives or GFI, can be supported by nations

modifying their GFI laws and standardizing public financial incentives, which will raise the economy's degree of competitiveness (Enikad & Priscilla, 2023).

Sustainable development embodies a forward-thinking strategy prioritising advantageous social, economic, and environmental transformations. Yunkai and Sopi and (2023) identify the primary objectives of sustainable development as economic progress, environmental conservation, and social justice. This notion is based on essential pillars: "economic sustainability, social sustainability, and environmental sustainability" (Ilyi, Glavič, 2021) provides a historical perspective and an analysis of Sustainable Development (Goal 12), which promotes sustainable consumption and production methods. Economies are established through markets where transactions occur.

Economic sustainability, a crucial aspect of sustainable development, guarantees that economic progress does not jeopardise environmental and social well-being (Onojir et al., 2018). This involves creating robust, equitable, sustainable, and attainable economic systems through diverse tactics and frameworks. The System of Environmental-Economic Accounting (SEEA), established by the United Nations as a crucial framework for economic sustainability to fulfil the obligations set at the Rio Conference in 1992. In justification of the emergence of Green Finance, which gained international focus, according to Lee, So, Tang, Lan, and Cheng (2020), world leaders have reached a consensus on Climate Change through the 2015 Paris Agreement within the United Nations Framework Convention on Climate Change (UNFCCC) whose objective is to limit global temperature increase to well below 2.0°C and towards 1.5°C above pre-industrial levels by adopting advanced technologies to reduce greenhouse gas (GHG) emissions.

As a subset of sustainable finance, green financing focuses on preserving the environment through environmentally friendly practices. The key components of sustainable development include:

- i. The expenses involved in preventing manufacturing waste that could harm the environment before it is formed. "Green Prevention Costs" (GNPCs). The company ensures that any operations that pose a risk to the environment in which it operates are either completely avoided or minimized. The costs of conducting research on environmentally-employees/training and product recycling are all included in GNPCs.
- ii. These are the expenses incurred in relation to the actions or operations of the organization to track how its operations affect the environment in which it operates. This is known as "Green Evaluation Costs (GNEC)" (Adebayo & Ogunraku, 2019).
- iii. Green Internal Failure Costs (GNIC) are expenses related to the actions that an organization is supposed to take when it produces trash and toxic but does not discharge them into the environment. GNICs involve installing equipment to reduce gaseous emissions and guarantee public health by minimizing harm. Their non-compliance

might be impacted by these emissions from the Company's operations (Lee, Park & Tian, 2021). The aforementioned study made succinctly evident that green financing proves to be a key instrument available to economic policymakers to sustain the Nigerian economy. According to Eniedu (2023), economic sustainability is essentially the capacity of an economy to remain stable in the face of economic fluctuations.

Major Aspects of Green Financing

- i. **Renewable Energy:** Investing in solar, wind, hydro, and other renewable energy sources.
- ii. **Energy Efficiency:** Funding projects that reduce energy consumption and promote energy-efficient technologies.
- iii. **Sustainable Infrastructure:** Investing in green buildings, sustainable transportation, and eco-friendly infrastructure.
- iv. **Climate Change Mitigation:** Supporting projects that reduce greenhouse gas emissions and adapt to climate change impacts.
- v. **Environmental Conservation:** Funding initiatives that protect and restore natural ecosystems, such as forests, wetlands, and oceans.

Benefits of Green Financing

- i. **Reduced Environmental Impact:** Green financing supports projects that minimize harm to the environment.
- ii. **Economic Growth:** Green investments can create jobs, stimulate local economies, and attract new industries.
- iii. **Increased Energy Security:** Investing in renewable energy reduces dependence on fossil fuels, enhancing energy security.
- iv. **Improved Public Health:** Green financing can support projects that improve air and water quality, benefiting public health.

Green Financial Products | Instruments

Some of the financial products and instruments that are labeled as green that are currently in existence include among others, the following:

- i. **Green Bonds:** A green bond is an investment vehicle of choice for the private and public sectors to finance projects with environmental benefits. In particular, low-carbon transport,

- clean power and energy, and efficient buildings have made this financing available (KPMG, 2001).
- ii. **Impact Investing:** Investments made with the intention of generating both financial returns and positive environmental impact.
 - iii. **Sustainability-Linked Bonds:** These are used by companies in carbon-intensive sectors such as oil and gas or heavy industry, where green bonds may not be accessible due to specific criteria (KPMG, 2001).
 - iv. **Green Equity:** According to KPMG (2020), a green equity fund is a structured investment vehicle that selects investments based on a commitment to a green investment strategy.
 - v. **Green Loans:** Loans specifically designed for environmentally-friendly projects. It is aimed at advancing environmental sustainability and are similar in nature to green bonds.
 - vi. **Green Securitization:** The bundling of green loans into securities can unlock additional capital to finance the transition to a decarbonized and climate-resilient economy. This instrument enables the aggregation of multiple small-scale loans and helps to attract a different investor base.

Theoretical Review

This study is anchored on the Sustainable Development Theory of Green Financing, which emphasizes the need to balance economic, social, and environmental considerations when making financial decisions. It suggests that green financing should promote economic growth, protect the environment by reducing environmental degradation, and also improve social well-being, by contributing to social welfare and equity (Iro, Hurley, Brundtland, Chair of the World Commission on Environment and Development, known for the Brundtland Report (1987) popularized the concept of sustainable development.

The theory suggests that firms should consider green financing to contribute to the sustainability of their country's economy.

The Sustainable Development Theory in essence stresses a holistic approach where financial investments are made to achieve economic returns while also ensuring environmental protection and social benefits. The goal is to meet current needs without compromising the ability of future generations to meet their own needs (Oztli, 2024).

According to Ozili (2024), who further elaborated the Sustainable Development Theory into 4 resource-resilient world theory of Sustainable Development, he opined that the resources which are been depleted today are the same resources that will be needed to combat the internal and

external shocks or threats affecting the world today and in the future. Therefore, there is a need to preserve these resources and use them to build defences against present and future shocks or threats. This is the stand of this study.

Empirical Review

Mohanty et al. (2024) investigated the influence of green finance in advancing sustainable development goals in India's tourist sector, basing on data from 5-40 participants and employing structural equation modelling via SPSS and AMOS software. The findings revealed that adoption of green finance coupled with incentives, initiatives, and technological advancement essentially enhance green sector.

Majeed and Mazhar (2021) examined the impact of trade ecological footprint across a sample of 20 high-income nations, 26 middle-income countries, and 20 low-income countries from 1991–2018. The Fully Modified Ordinary Least Squares (FMOLS) analysis indicates that trade improves environmental conditions in both high- and low-income nations; however, it adversely affects the environment in middle-income nations.

Ramzani et al. (2024) examined the influence of AI-driven green finance techniques on advancing the renewable energy sector in Germany and Denmark. The study analysed the impact of these techniques on renewable energy investments in 2019 and 2020, employing Analysis of Variance (ANOVA), paired sample t-tests, and regression analysis. The findings revealed that AI-driven green finance solutions substantially advanced renewable energy, with Denmark demonstrating significant development and Germany displaying a high association between AI-tactics and sustainable financial practices. The paper advocates for a worldwide implementation of AI-driven green finance policies to foster sustainable development and tackle climate change issues.

Kane et al. (2020) investigated Nigeria's knowledge of green banking, its obstacles and sustainability. The results show that although Nigerian banks offer a range of green banking solutions, their employees know very little about green finance. The study further revealed that illiteracy, age, lack of basic ICT skills, and poor educational attainment have a detrimental impact on Nigerians' awareness of and use of green banking instruments. Using a thorough research methodology,

Tiawon and Miar (2023) examined the impact of renewable energy generation, energy efficiency, and green finance on promoting sustainable economic development in Indonesia. The research, utilizing time-series data from 1990–2019 and adopting the Auto-regressive Distributed Lag (ARDL) model, demonstrated that these factors significantly contribute to economic growth and the reduction of carbon emissions. The authors recommended the adoption of energy efficiency measures, synchronising growth objectives with climate change mitigation, and augmentation of investments in renewable energy and green finance programs.

Research Methodology

This study adopts an ex-post facto research design and secondary data were utilized. The study's population and sample size are Nigeria, using a Census Sampling approach. Data were collected from the World Bank's Pollution Management database and the Central Bank of Nigeria (CBN) Statistical Bulletins. The time frame spans from 2009 to 2023 and focused on aspects such as green finance including Green Prevention Costs, Green Evaluation Cost, Green Internal Failure Costs, Trade Openness on economic sustainability of Nigeria.

The Robust Regression Analysis was used, preceded by Pre-estimation tests including Variance Inflation Factors (VIF), Ramsey Reset-Test (RRT), and Heteroskedasticity Test (HET). The green financing variables include GNPC, GNEC, and GNIC, while RGDP serves as the dependent variable. The study employed Econometric Views (E-views) 9.0 widely recognized software for panel data analysis.

Model Specification:

The model functional relationship between sustainable development and green finance is defined as follows:

$$RGDP = f(GNPC, GNEC, GNIC, TROP) = 3.1$$

Therefore, the econometric form of the equation becomes:

$$RGDP = B_0 + B_1GNPC + B_2GNEC + B_3GNIC + B_4TROP + \mu_t = 3.2$$

Where:

RGDP = Real Gross Domestic Product (Economic Sustainability)

GNPC = Green Prevention Costs measured by the volumes of GNPC

GNEC = Green Evaluation Costs measured by the volumes of GNEC

GNIC = Green Internal Failure Costs measured by the volumes of GNIC

TROP = Trade Openness measured by the sum of total imports and exports

B_0 = Constant term

μ = error term

t = Time

$B_1 - B_5$ = Coefficients of the Variables

Results and Discussions

This section is divided into descriptive statistics, correlation analysis, pre-estimation tests (Variance Inflation Factors (VIF), Ramsey RESET Test (RRT), and Heteroskedasticity Test (HET)), result estimation, and discussions. These steps ensure the model's suitability for prediction.

Table 1: Descriptive Statistics

| Variables | Mean | Maximum | Minimum | Std. Dev | Jarque Bera | Prob | Obs |
|-----------|----------|----------|----------|----------|-------------|----------|-----|
| RGDP | 45189.39 | 156543.8 | 17456.56 | 28297.33 | 3.997234 | 0.134110 | 45 |
| GNPC | 85932.88 | 394600.0 | 13221.00 | 74327.52 | 30.29331 | 0.000023 | 45 |
| GNEC | 214520.5 | 845762.0 | 2742.420 | 198802.8 | 6.364239 | 0.025542 | 45 |
| GNIC | 170974.9 | 436122.0 | 7113.000 | 132928.2 | 4.662430 | 0.051365 | 45 |
| TROP | 39.46733 | 64.31500 | 10.36490 | 10.22810 | 0.221927 | 0.939237 | 45 |

Note: Values are presented in Million

Source: E-views 10 Output (2025)

The descriptive statistics in Table 1 show 45 observations. The mean values for RGDP, Green Prevention Costs (GNPC), Green Evaluation Costs (GNEC), Green Internal Failure Costs (GNIC), and trade openness are N85,932.88,

N214,520.50, N170,974.90, N39.60%, respectively. The standard deviations are N28,297.33, N74,327.52, N198,802.80, N132,928.20, and 10.33%, respectively, indicating low variability across the variables. This suggests that these variables follow a nearly normal distribution. The highest values recorded were N156,543.80 for RGDP, N394,600.00 for GNPC, N845,762.00 for GNEC, and N436,122.00 for GNIC, while the minimum values were N17,456.56, N13,221.00, N2,742.42, and N7,113.00, respectively.

Table 2: Correlation Analysis

| | RGDP | GNPC | GNEC | GNIC | TROP |
|-------------|---------|--------|--------|---------|--------|
| RGDP | 1.0000 | | | | |
| GNPC | 0.7823 | 1.0000 | | | |
| GNEC | 0.8519 | 0.0658 | 1.0000 | | |
| GNIC | -0.5479 | 0.0222 | 0.1349 | 1.0000 | |
| TROP | 0.6465 | 0.3498 | 0.1239 | 0.02398 | 1.0000 |

Source: E views 10 Output (2025)

Table 2 presents correlation statistics. The GNPC has a strong positive correlation (0.7823) with RGDP, meaning that an increase in GNPC contributes significantly to Nigeria's economic sustainability. GNEC also shows a positive and strong relationship with RGDP. However, GNIC is inversely related to RGDP, meaning that higher GNIC is associated with lower economic sustainability in Nigeria.

Diagnostic Tests

Several diagnostic tests were performed, including VIF, Ramsey RESET Test (RRT), and Heteroskedasticity Test (HET), as shown in tables 3 and 4 below:

Table 3: Multicollinearity Test

| Variables | VIF | 1/VIF |
|-----------|--------|--------|
| GNPC | 3.9851 | 0.2509 |
| GNEC | 1.3640 | 0.7331 |
| GNIC | 2.6923 | 0.3714 |
| TROP | 1.7490 | 0.5717 |
| Average | 2.4476 | 0.4085 |

Source: E views 10 Output (2025)

The results in table 3 indicate the VIF values for GNPC, GNEC, GNIC, and trade openness (TROP) are 3.9851, 2.6923, 1.7490, and 2.4476, respectively, indicating no issues with multicollinearity. Thus, the model is appropriate for forecasting and the study variables do not suffer from multicollinearity, confirming that the model is suitable for prediction.

Table 4: Ramsey RESET and Heteroskedasticity tests

| | | | | |
|-------------------------|-------------|--------|----------------|--------|
| Ramsey Reset Test | F-statistic | 1.6254 | (1, 34) | 0.1835 |
| Heteroskedasticity Test | F-statistic | 0.3487 | Prob. F (4,27) | 0.8743 |

Source: E views 10 Output (2025)

Table 4 shows that both the Ramsey RESET and Heteroskedasticity tests confirm the model is correctly specified and that its variance is homogenous, as evidenced by p-values greater than the 5% significance level.

Regression Results

Table 5: RLS Estimates

| Variable | Coefficient | Std. Error | z-Statistic | Prob. |
|--------------------------|-------------|------------|-------------------------|----------|
| C | 0.622764 | 0.212443 | 4.746536 | 0.0011 |
| GNPC | 0.873972 | 0.257349 | 3.722878 | 0.0012 |
| GNEC | 0.055424 | 0.146615 | 0.437185 | 0.5944 |
| GNIC | 0.776771 | 0.272874 | 3.281947 | 0.0032 |
| TROP | 0.129479 | 0.322987 | 0.138710 | 0.8391 |
| Robust Statistics | | | | |
| R-squared | 0.512213 | | Adjusted R-squared | 0.501437 |
| Rw-squared | 0.611449 | | Adjust Rw-squared | 0.601231 |
| Rn-squared statistic | 10.61243 | | Prob. (Rn-squared stat) | 0.013286 |
| Akaike info | 5.712753 | | Schwarz criterion | 5.021672 |
| Hannan-Quinn | 10.60116 | | Durbin-Watson stat | 2.082219 |

Source: E views 10 Output (2025)

An R Square value of 0.512213, an Adjusted R-squared value of 0.501437, a Rw-squared value of 0.611449, and an Adjust Rw-squared value of 0.601231 were reported by the RLS Estimate in Table 5. This indicates the great predictive (explanatory) power of the studied variables. The Prob. (Rn-squared stat.) value of 0.013286, on the other hand, indicates that green finance had a significant statistical impact on Nigerian economic sustainability. This suggests that Nigerian economic sustainability is greatly enhanced by green finance. In the meantime, the Durbin Watson Test unequivocally shown that there is no auto (serial) correlation in the model. Based on this assumption, the following research hypotheses are examined:

Table 6: Summary of Test Hypothesis Testing

| Testable Form | Coefficient | Prob. | Conclusion |
|-------------------|-------------|--------|-------------------|
| <i>GNPC * RGD</i> | 0.873972 | 0.0012 | <i>ENP = RGD</i> |
| <i>GNEC * RGD</i> | 0.055424 | 0.5944 | <i>ENEC ≠ RGD</i> |
| <i>GNIC * RGD</i> | 0.776771 | 0.0032 | <i>ENIC = RGD</i> |

Source: E views 10 Output (2025)

The RLS estimates indicate that GNPC has a positive coefficient of 0.873972, suggesting that increased spending on Green Prevention contributes to greater economic sustainability, assuming trade openness remains favorable. This aligns with prior research and expectations, particularly those of Lee, Park, and Tian (2021), Tang (2020), Adebayo and Oguntuase (2019), and

Mohammed and Kaushal (2018), who found that green finance is essential for sustainable development. However, the study contrasts with the findings of Kanu et al. (2020), who noted that green financing may harm economic sustainability. (sustainability)

Additionally, while higher spending on Green Evaluation Costs (GNEC) positively impacts economic sustainability, the effect is statistically insignificant, suggesting that such costs only modestly influence Nigerian

Conclusion

This study explored the impact of green financing on Nigeria's economic sustainability, driven by the need for countries to align their economic activities with global best practices. The RLS estimates revealed that both GNPC and GNIC significantly affect Nigeria's economic sustainability. However, GNEC showed a direct but statistically insignificant impact. Nigeria has a number of governmental policy and strategy frameworks that offer a platform for enlisting private sector funding for climate change and green growth.

Policy Recommendations

Based on the study findings, the following policy recommendations are suggested:

4. Government should improve green grants and debt policies, institutional capacity, green technological innovation as well as public-private partnerships to be able to achieve sustainable economic development.
5. To put these policies and strategies into practice, the government needs to create an implementation framework. In order to address the issue of climate change and promote green growth, it will also be possible to establish a synergy between sector-specific mandates and the general development agenda by aligning these policies and initiatives with Vision 2050.
6. The ETP offers challenging goals, including funding for reaching the net zero transition. The ETP's costing gives private investors, both domestic and foreign, a clear indication of the resources required to support Nigeria's goals for green growth and climate change. Stronger governance and institutional accountability systems would guarantee that private sector financing goes to relevant sectors with the largest resource needs and potential to generate the expected and maximum impact for green growth. Nevertheless, it is crucial that the authorities closely monitor and update the costs and indicator targets and ensure close alignment across all sectors outlined in the ETP, namely energy, transportation, housing, and infrastructure.

7. The issue of green bonds indicates that Nigeria's financial industry is sufficiently complex and reasonably dynamic to manage green finance products. To encourage market innovation and guarantee that advancements in green finance align with legal requirements, the supervisory and regulatory environment must be updated on a regular basis.
8. By investing in non-oil and green economic sectors, encouraging private enterprise, removing growth barriers (energy, finance, infrastructure, and regulations), and using resource rents to support green economic sectors through national tools like the Sovereign Wealth Fund, it is imperative to accelerate economic diversification.
9. There is a need for increased funding for Green Internal Failure Costs, which has a strong positive effect on economic sustainability.

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