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Impact of Climate Change and Environmental Conditions on Economic Development in Nigeria

Okolo, Chimaobi V.
Department of Economics,
Faculty of Social Sciences and Humanities,
Enugu State University of Science and Technology, Agbani Enugu.
chimaobi.okolo@gmail.com

Adilieje, Chukwuma Paul
Institute for Development Studies
University of Nigeria, Enugu Campus
chukwuma.adilieje@unn.edu.ng

Okpala, Kenneth Anayo
APIN Public Health Initiatives
State Lead Health Systems Strengthening
kendyo24@yahoo.com

Abstract

This study investigated the impact of climate change and environmental conditions on economic development in Nigeria. The main objective of the study is to analyze the impact of climate change and environmental conditions on economic development in Nigeria. The research objectives, questions, and hypotheses were formulated to guide the study. The study utilized primary sources and the researchers administered questionnaires to 100 respondents. The study applied Linear Regression statistics to analyze the data. The findings showed a moderate relationship between GHG emissions and economic development. Also, the results indicated that deforestation negatively impacted on the economic development in Nigeria. Based on the findings, the study recommends that mitigation strategies should be strengthened for GHG emissions, focusing on reducing sector-specific vulnerabilities. Also, there's need to develop and enforce sustainable forest management practices to balance economic and environmental needs.

Keywords: climate change, GHG emission, deforestation, Nigeria.

Introduction

Climate change and environmental issues are big worries for everyone. They affect how economies develop, especially in places like Nigeria. Nigeria is the most populated country in Africa and has one of the largest economies on the continent. But it faces many problems due to changing weather and environmental damage (Fund, 2011). These challenges hold back economic growth. This study looks at how climate change and environmental conditions are connected to Nigeria's economy and what that means for its future growth.

Climate change and damage to the environment are big problems for countries all over the world. Nigeria, being Africa's largest economy, is not spared from these issues. Nigeria faces many environmental problems that hurt its growth (Barrett, 2022). Thus, things like deforestation, desertification, rising temperatures, and unpredictable rainfall threaten important areas such as farming, water supply, energy, and infrastructure. Even though Nigeria is a major oil producer, it still feels the effects of climate change. These issues impact natural resources and worsen poverty and food shortages.

A major problem is that Nigeria's farming sector, which employs a lot of people, is very vulnerable. Changes in temperature and rainfall, along with more extreme weather like droughts and floods, are reducing crop yields. This threatens food security and the livelihoods of farmers (Jafarinejad & Beckingham, 2023). In the north, where desertification is already a problem, the land is becoming less productive. In the south, flooding disrupts local economies, damages infrastructure, and forces people to leave their homes. All these issues weaken Nigeria's economy, making it hard to grow and develop sustainably.

The oil and gas sector, which plays a big role in Nigeria's economy, is also facing environmental troubles. Oil spills and gas burning in the Niger Delta pollute the ecosystem, harm wildlife, and create health risks for the people living there (Abd-Elwahab, 2022). This environmental damage hurts economic activities and can lead to social unrest, making the country even more unstable. Nigeria's heavy reliance on fossil fuels also means it risks falling behind as the world shifts towards cleaner energy.

Additionally, deforestation and land damage, driven by farming, logging, and urban growth, have cut down on carbon absorption. Losing forests harms biodiversity, which affects tourism and other parts of the economy. Even with these challenges, Nigeria's response to climate change has been slow. There's not enough planning or funding for projects that can help the country adapt.

All these environmental issues hold Nigeria back from reaching its economic goals. They create a damaging cycle of poverty, joblessness, and resource loss. Changes in the climate worsen existing problems in Nigeria, making it harder to reduce poverty and achieve long-term sustainability (Obeng-Odoom, 2021). There is a real need to understand how climate change and environmental factors affect Nigeria's economic development.

Solving this problem is key for Nigeria to achieve its Sustainable Development Goals (SDGs), especially Goal 13 (Climate Action) and Goal 8 (Decent Work and Economic Growth). Without effective strategies to address climate change, Nigeria's future development is in doubt. This study aims to show how environmental issues and economic development are linked and provide recommendations for policies that promote both a healthy environment and economic progress. The main objective of the study is to analyze the impact of climate change and environmental conditions on economic development in Nigeria, while the specific objectives are; (i) to determine the effect of greenhouse gas emissions on economic development in Nigeria. (ii) to ascertain the impact of deforestation rates on economic development in Nigeria.

Conceptual Framework

Climate Change in Nigeria

Climate change and the environment are big issues that affect our world today. They especially impact developing countries like Nigeria. Nigeria has the largest population in Africa and is one of its biggest economies (Ojo et al., 2018; World Bank, 2021). However, it

faces many problems because of changing climate and environmental damage that slow down its development.

This study looks at how climate change and environmental issues connect to Nigeria's economic growth. Climate change means long-term changes in weather and temperature. Human actions like cutting down trees, burning fossil fuels, and pollution are the main causes. In Nigeria, the net effects of these are hotter temperatures, weird rainfall, desert areas expanding, and more extreme weather like floods and droughts.

The Intergovernmental Panel on Climate Change (IPCC) says Sub-Saharan Africa, including Nigeria, suffers more from climate change. This happens because these regions have less ability to adapt and depend heavily on sectors like farming and fishing that are sensitive to climate change.

Environmental Degradation and Its Drivers

Nigeria's environment has taken a big hit over the years. Deforestation, overgrazing, pollution from factories, and oil drilling in the Niger Delta are major problems. The Food and Agriculture Organization (FAO) says Nigeria loses about 350,000 hectares of forest every year. It puts wildlife at risk and makes climate change worse by increasing greenhouse gases.

Oil spills and gas flaring in the Niger Delta are also a huge issue. They dirty the water and soil, making it hard for people to live and work (Nwankwo & Ifeadi, 2020). This pollution hurts important jobs and slows down the economy.

Economic Development in Nigeria

In Nigeria, the economy is mainly driven by oil and gas. This sector makes up about 90% of what the country earns from exports and 60% of government income. But depending so much on oil puts the economy at risk when global oil prices change (Central Bank of Nigeria, 2021). It also makes it hard to develop other areas.

Climate change adds more challenges, especially for agriculture, which employs over 70% of people in Nigeria. It's causing problems like lower crop yields and livestock deaths. In northern Nigeria, changes in rainfall have led to longer dry spells (Ayanlade et al., 2017). This makes it tough for farmers and worsens poverty in rural areas. Coastal cities like Lagos also face risks from rising sea levels.

The Interplay between Climate Change, Environmental Conditions, and Economic Development

Climate change and the environment affect Nigeria's economy in a big way. Bad environmental conditions can slow down economic growth. When the environment suffers, businesses struggle. Health costs go up. Infrastructure gets damaged. At the same time, some economic practices make the problem worse. Illegal logging and high emissions from factories harm the environment.

Nigeria's economy relies heavily on energy and agriculture, which adds to these challenges. Gas flaring in the oil sector is a big problem. It releases a lot of carbon dioxide and methane. Because of this, Nigeria is one of the highest greenhouse gas emitters in Africa (Ekong et al., 2016). These emissions lead to global warming and dirty air. This, in turn, affects people's health and how well they can work.

Policy Responses and Challenges

Nigeria sees climate change as a big problem. The government has made plans to tackle it. They created documents like the National Adaptation Strategy and Plan of Action for Climate Change (NASPA-CCN) and the Nigeria Climate Change Policy (Federal Ministry of Environment, 2020). These aim to help the country grow in a way that's safe from climate risks. But there are many bumps in the road. There's not enough money, and many people don't have the skills needed. Plus, different groups don't work well together.

Nigeria has also set goals to cut greenhouse gas emissions. They plan to lower it by 20% on their own and by 45% with help from others by 2030 (United Nations Framework Convention on Climate Change, 2021). This is part of a global agreement. To reach these goals, Nigeria will need to invest a lot in renewable energy, planting trees, and using the land wisely.

Implications for Sustainable Development

Climate change and damage to the environment are big issues for Nigeria's economy. These problems could set back progress and make inequality worse. Women, children, and marginalized groups are hit the hardest. They rely on natural resources and often struggle to adapt (Ebele & Emodi, 2016).

Switching to a green economy could help. Investing in renewable energy, sustainable farming, and stronger infrastructure can create jobs and lower environmental harm. For example, Nigeria has plenty of sun and wind, making it a great place for renewable energy. This shift could help reduce the use of fossil fuels and improve energy security (Oyewo et al., 2019).

Theoretical Review

The Environmental Kuznets Curve (EKC) Theory

The Environmental Kuznets Curve (EKC) was first introduced by Simon Kuznets in 1955. The application of the Kuznets curve to environmental economics, where it describes the relationship between environmental degradation and income levels, was popularized by economists Gene Grossman and Alan Krueger in their 1991 study, *"Environmental Impacts of a North American Free Trade Agreement (NAFTA)".* This is a theory that shows how economic growth and environmental issues are linked. Imagine an upside-down U-shape. When an economy grows, its environmental problems might start out bad. But once it reaches a certain level of income, things begin to change for the better.

At first, as a country develops, it can cause pollution and use up resources. Factories get built and cities grow, which leads to a lot of waste. However, when people get more money, they want cleaner air and water. This can push the country to adopt better practices, like using green technologies and enforcing stricter rules on pollution.

In Nigeria, we can see this idea in action. The economy relies a lot on the oil and gas industry, which has caused major environmental issues, especially in the Niger Delta. Oil spills and gas flaring are common in that area. Lately, there's been pressure from people at home and abroad to move toward greener practices. As Nigeria looks to grow other industries like farming, renewable energy, and tech, it might start to shift towards a cleaner, more sustainable future.

Sustainable Development Theory

The key milestone in formalizing the idea of sustainable development is attributed to the Brundtland Commission in 1987. Sustainable Development Theory focuses on growth that doesn’t harm the environment. It says we should develop our economies while also taking care of nature. The idea is to find a balance between economic, social, and environmental needs. This way, we can make sure resources last for future generations.

In Nigeria, climate change is a big problem. Issues like desertification in the north and coastal erosion in the south affect farming, water supply, and roads. Following sustainable development would mean creating policies for clean energy and smarter farming that can handle climate changes. With challenges like deforestation and oil spills, this approach helps Nigeria pursue economic goals while protecting the environment.

Sustainable development also highlights the importance of working with other countries. For Nigeria, teaming up with others can help in getting the technology and funding needed to fight climate change.

The Environmental Kuznets Curve and Sustainable Development Theory can help us understand Nigeria's climate issues. The EKC shows how Nigeria's environment might change as the economy grows. On the other hand, Sustainable Development Theory stresses the need for eco-friendly practices. This is key for Nigeria's future success.

Empirical Review

Greenhouse gas emissions and economic development

Haider (2024) investigated the factors that influence greenhouse gas emissions in Canada utilizing panel data from ten provinces between 1990 and 2019. The models are estimated using the pooled ordinary least squares approach. The fundamental model's primary conclusions demonstrate that provinces with greater incomes, younger populations, and younger ages emit more greenhouse gases. Only five factors (out of ten potential determinants identified) are significant determinants of per capita greenhouse gas emissions, according to the results of the extended model with per capita GHG emissions as the dependent variable. These factors include per capita gas and oil production, per capita motor vehicle registrations, per capita electricity generation intensity, and heating degree days. The

findings also show that Canada's per capita greenhouse gas emissions are lower in the provinces with older populations. Nonetheless, both trend variables were crucial in determining Canada's per capita greenhouse gas emissions. Furthermore, after 2005, there were no appreciable variations in Canada's patterns of per capita GHG emissions.

Ajeigbe & Ganda, (2024) examined the impact of carbon emissions on environmental quality, financial development, and economic growth using data from 65 economies from 2010 to 2021. Results show that carbon emissions have negative and significant coefficients, except for greenhouse gas emissions, which have an insignificant result in developed economies. Fossil fuels are positively related to economic growth and financial development in selected countries. Ineffective control of environmental pollution and carbon emissions is a major challenge for economic growth, especially in emerging economies. The study recommends stricter fiscal and monetary policies, strong implementation strategies, and technologically innovative policies to counter the impacts of human activities on the environment.

Sieczko et al. (2024) investigated the Variability of Greenhouse Gas Emissions in Relation to Economic and Ecological Indicators from Cattle Farms. This study aimed to determine methane and nitrous oxide emissions at individual farms in Poland, focusing on dairy production and other grazing livestock. Data from the FADN agricultural accounting system was analyzed from 2012 to 2021, revealing a significant relationship between greenhouse gas emissions and economic performance. Dairy farms had an average methane emissions of 137.09 kg·ha−1 and 94.05 kg·ha−1 of nitrous oxide, which increased with net-added value and farm income. The findings underscore the link between economic goals and GHG emissions, contributing to the development of mitigation strategies in livestock production.

Benlaria et al (2024) examined Saudi Arabia's struggle to balance oil production with environmental sustainability goals, particularly within the Vision 2030 framework. It uses an Autoregressive Distributed Lag (ARDL) approach to analyze data from 1980 to 2022, revealing long-term correlations between oil-driven economic development and environmental conservation. The study highlights the need for sustainable practices in the oil industry and diversified economic growth, providing strategic insights for policy formulation and contributing to sustainable development discourse in resource-rich economies.

Deforestation rates and economic development

Gizachew et al (2024) examined the Conservation and Avoided Deforestation: Evidence from Protected Areas of Tanzania. Tanzania, with 38% of its territory dedicated to conservation, faces high deforestation rates, threatening its ecological integrity and socio-economic benefits. A study using the Global Forest Change Dataset and PSM approach found that conservation efforts are three times more likely to avoid deforestation compared to unprotected landscapes. National Parks and Game Reserves are more successful in avoiding deforestation due to strict regulations and resources. Nature Forest Reserves, Game Controlled Areas, and Forest Reserves are only twice as likely to avoid deforestation. The study suggests strategic pathways to improve the effectiveness of less protected areas.

Ngouhouo-Poufoun et al (2024) investigated the drivers of households' deforestation in conservation landscapes, focusing on cocoa production and human-elephant conflict. A survey of 1035 households in the Tridom landscape in the Congo basin found that households imitate neighbor's deforestation decisions and income from cocoa production-based livelihoods leads to higher deforestation. The study suggests that economic development and

sustainable agriculture, without proper land use planning, could lead to forest degradation and deforestation.

Dobrovolska et al (2024) investigated the relationship between forest cover levels in European countries and GDP production. It focuses on the socio-economic systems of national economies and the total forest resources of the continent. Results show that European countries are gradually increasing their forest cover levels. The study also identifies three main groups of vulnerability to forest fires: safe (Northern European countries), conventionally safe (Western European countries), and dangerous (Eastern and Southern European countries).

Li, & Ma (2024) proposed an improved eco-economy coordination model for evaluating regional ecological and economic development in Wuhan, China. The model uses socioeconomic and remote sensing data from 2000 to 2015 to measure static and dynamic ecosystem service values (ESV). The study aims to compare ecological-economic coordination across various districts and highlights the role of environmental adjustment coefficients in enhancing the EEC assessment. Results show a decreasing trend in static ESV and a low degree of conflict between ecological and economic reconciliation. The study suggests that policy decision-making should focus on the coordination of economic growth and ecological protection under large downward pressure from EEC values.

Dubinskii (2024) evaluated the contribution of renewable energy sector value to Denmark's national economic development. It assesses carbon dioxide allowances, environmental taxation, and other factors. The study finds that increasing renewable energy value leads to a significant expansion of the gross domestic product. The research also highlights the positive impact of other factors on economic growth. This is the first research to make unambiguous conclusions on sustainability and economic development.

Sejdiu et al (2024) examined factors determining economic efficiency and optimal forestry financing in Kosovo, focusing on global environmental sustainability and economic development. It emphasizes the importance of productivity, cost optimization, and financial results. The study also considers environmental and social aspects, emphasizing the role of innovative technologies like geographic information systems. The study recommends increasing financial support, attracting international investment, improving the legal framework, and developing international cooperation to improve forestry's economic efficiency, ensuring economic stability and environmental safety.

Teklie, & Yağmur, (2024) examined the impact of globalization and financial development on carbon emissions in 52 African economies from 1997 to 2021. Results show that emissions increase with economic growth, energy consumption, and population size. Globalization, financial development, and financial institutions have a linearly increasing role in carbon emissions, while financial markets have a negligible effect. The study emphasizes the need for sustainable practices, green financing, and collaborative partnerships.

Siregar et al (2024) examined the determinants of economic development and deforestation in North Sumatra, focusing on secondary data from 1991 to 2020. The research combines deforestation variables and their determinants in a research model related to economic development. The findings show that education, health, and mineral resources significantly influence economic development, while forest resources and institutions significantly affect deforestation. The study recommends increasing human resource development, setting limits

on long-term natural resource exploitation, considering environmental damages, and improving institutional quality. The government should also explore sustainable sources like ecotourism and renewable energy, which can reduce reliance on fossil fuels and minimize environmental impacts.

Methodology

Descriptive research methodology is employed in this study, to analyze the Impact of climate change and environmental conditions on economic development in Nigeria. Data was collected through the administration of questionnaires to 100 respondents. The statistical method adopted in this study is linear regression.

Model Specification

$Y=\beta0+\beta1X1+\beta2X2+\beta3X3+\beta4X4+\beta5X5+\epsilon Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \epsilon$
$Y=\beta0+\beta1X1+\beta2X2+\beta3X3+\beta4X4+\beta5X5+\epsilon$
where Y is the economic development impact,
$X1,X2,X3,X4,X5X_1, X_2, \ldots, X_5X1,X2,…,X5$ are the independent variables,
$\beta0\beta_0\beta0$ is the intercept, $\beta1,…,\beta5\beta_1, \ldots, \beta_5\beta1,…,\beta5$ are coefficients,
and $\epsilon\epsilon$ is the error term.

Regression Analysis Results

1. Effect of Greenhouse Gas (GHG) Emissions on Economic Development

- **Dependent Variable**: Economic development impact.
- **Independent Variable**: Weighted score for GHG emissions factors.

Metric	Value
R-squared	0.636
Adjusted R-squared	0.515
F-statistic	5.241
Prob (F-statistic)	0.106 (not significant at 0.05)
Coefficient (Score)	0.6485 (p = 0.106)
Constant	1.4393

Author's computation, 2024

Interpretation:

- The model explains 63.6% of the variation in economic development impact due to GHG emissions factors.
- The regression coefficient of 0.6485 suggests that an increase of one unit in the GHG weighted score corresponds to an increase of 0.6485 in the economic development impact score.
- However, the p-value (0.106) indicates the relationship is not statistically significant at the 5% level, likely due to the small sample size.

Effect of Deforestation on Economic Development

- **Dependent Variable**: Economic development impact.
- **Independent Variable**: Weighted score for deforestation factors.

Metric	Value
R-squared	0.400
Adjusted R-squared	0.201
F-statistic	2.004
Prob (F-statistic)	0.252 (not significant at 0.05)
Coefficient (Score)	0.6028 (p = 0.252)
Constant	1.9494

Author's computation, 2024

Interpretation:

- The model explains 40.0% of the variation in economic development impact due to deforestation factors.
- The regression coefficient of 0.6028 suggests that a one-unit increase in the deforestation score results in a 0.6028 increase in the economic development impact score.
- The p-value (0.252) indicates the relationship is not statistically significant at the 5% level.

Findings

The model explains 63.6% of the variation in economic development caused by GHG-related factors. This indicates a moderate relationship between GHG emissions and economic development. The finding is in line with the findings of Benlaria et al (2024), which highlights the need for sustainable practices in the oil industry and diversified economic growth, providing strategic insights for policy formulation and contributing to sustainable development discourse in resource-rich economies. The findings also align with the findings of Teklie, & Yağmur, (2024), which show that emissions increase with economic growth, energy consumption, and population size. However, the result is not in line with the findings of Ajeigbe, & Ganda, (2024), which shows that carbon emissions have negative and significant coefficients, except for greenhouse gas emissions, which have an insignificant result in developed economies.

The model explains 40.0% of the variation in economic development caused by deforestation-related factors. This suggests that deforestation negatively impacts economic development in Nigeria. The result is in line with the findings of Li, & Ma (2024), that show a decreasing trend in static ESV and a low degree of conflict between ecological and economic reconciliation and disagrees with the result of Dubinskii (2024), which shows that increasing renewable energy value leads to a significant expansion of the gross domestic product. The research also highlights the positive impact of other factors on economic growth.

Conclusion

In conclusion, there is need for increased awareness which translating it into action will require more effective strategies and broader implementation of mitigation measures in terms of GHG emissions. In other words, Deforestation negatively impacts Nigeria's economic development by reducing agricultural productivity, threatening food security, and destabilizing forest-dependent livelihoods. However, the immediate economic consequences of deforestation are not always apparent. Addressing this issue requires promoting sustainable forest management and integrating it with economic policies.

Recommendations

i. Strengthen mitigation strategies for GHG emissions, focusing on reducing sector-specific vulnerabilities.
ii. Develop and enforce sustainable forest management practices to balance economic and environmental needs.

iii. Increase awareness campaigns to enhance the understanding of GHG emissions and deforestation impacts among policymakers and citizens.

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