THE NEXUS BETWEEN ECONOMIC DEVELOPMENT AND ENVIRONMENTAL SUSTAINABILITY IN NIGERIA

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ABSTRACT

The study examined the relationship between Economic Development and Environmental Sustainability in Nigeria. The study uses the Auto-regression Distributed Lag (ARDL) Bound Test for Co-integration of data to investigate the relationship between environmental sustainability and economic growth in Nigeria. Data from annual time series were used from 2000 to 2022. The result shows that there was a long-term correlation between economic growth and CO2 per capita, which is a gauge of environmental sustainability. Regression analysis shows that, when carbon dioxide emissions are used as a stand-in for environmental sustainability, economic expansion has a long-term positive influence on the environment, paving the way for sustainable development. Stated differently, the long term coefficients demonstrate a positive and statistically significant association between economic growth and environmental sustainability. This study further shows that there is a statistically significant negative correlation between the corruption index and environmental sustainability in Nigeria. The findings also confirm that the Environmental Kuznets Curve (EKC) exists. The framework that illustrates the policy lesson from the findings demonstrates the significant effects that economic development and growth have on environmental sustainability. In order to promote environmental entrepreneurship and sustainable economic development, the study recommends among other things that opportunities in green house, renewable energy, sustainable agriculture, recycling, and green financing all of which are impacted by Nigeria's deteriorating environment be taken advantage of. While Nigeria's unstable power supply needs to be fixed as well, less self-power generators that burn fossil fuels and produce a lot of CO2 should be used.

KEYWORDS: Economic development, environmental sustainability, Auto-regression Distributed Lag (ARDL) and Nigeria.

1. INTRODUCTION

Nigeria is a vast country in Africa with abundant natural, material, and human resources. Nigeria has a vast reservoir of natural and human resources, but its potential for environmental sustainability and sustainable development is still unrealized, and the country's declining economic standing and environmental degradation are impeding its future. Degradation of the environment refers to harm done to the biosphere overall as a result of the hazardous and evil actions of human beings. This happens when the environment is harmed irreversibly by pollution, when natural resources are being depleted more quickly than they can be replenished, or when human development destroys ecosystems (Ndubuisi-Okolo, Anekwe & Ekwochi, 2020).

Reviewing the economic growth tenets is necessary because it can have a negative impact on life quality. For example, it was once thought that the path to economic prosperity could not be reached unless people were put under the necessary pressures; these pressures would accelerate economic growth, but they would also have negative health effects on both the environment and people. According to Brown et al. (2015), there is typically a greater cost associated with environmental pollution than gain, especially in light of present economic growth. The need for eco-balance stems from these expenses, which include the quick depletion of natural resources, urban issues like traffic and noise pollution, and rural issues like deforestation.

Todaro and Smith (2011) state that in almost all emerging economies around the globe, development planning has come to be seen as a crucial tool for directing and expediting economic progress, and as such, it has taken center stage in development narratives. The planning process can be categorized as comprehensive or focused on important economic sectors that are thought to have significant positive linkages or spillover effects on other economic sectors. Planning for development is primarily focused on enhancing the economic prospects and standard of living of the populace while keeping sustainable development in mind. Economic planning models typically place a high priority on developing human capital through training, education, and healthcare spending.

According to the literature on economic development, planning is crucial because it is a tool that may be used to efficiently accomplish significant socioeconomic goals that appear impossible to reach through free market competition.

The Nigerian ecosystem has been experiencing an increasingly intense and rapid pace of disequilibrium since the civil war ended in 1970. This is mostly because of the increased demand for other natural resources like food, water, fiber, and wood, as well as the increased exploration and exploitation of crude oil. It is also partially because of appropriate development planning.

These national resources undoubtedly made a considerable contribution to social progress and economic expansion, but their overuse resulted in irreparable losses of the biological diversity of the world and ecosystem services. Further cause for concern is the rebasing of Nigeria's gross domestic product (GDP), which places the country as the largest economy in Africa and the twenty-fourth largest in the world. However, Nigeria also has the highest rate of unemployment in Africa, almost complete power outages, dysfunctional health and education systems, and a rising rate of poverty well over sixty percent (Ndubuisi-Okolo., Anekwe & Ekwochi, 2020).

The rapid, drastic, and irreversible changes brought about by this unsustainable resource exploitation have serious ramifications for human well-being. The Niger Delta, desertification, and overgrazing in the North, as well as erosion, deforestation, and surface water pollution in the South, all pose threats to the survival of numerous communities. Of course, this hasn't helped the deteriorating living conditions of many Nigerians, particularly those who reside in rural areas on the periphery (Ugochukwu, Ertel, and Schmidt, 2008). Understanding that the environment and economic development are complementary, interconnected, and eventually mutually reinforcing is the first step toward sustainable economic development (Salami, 2021).

The intricate nature of this relationship explains why it has proven challenging to operationalize the idea of sustainable economic development or to develop workable policy guidelines for its implementation, despite evidence of unwarranted demands being placed on the ecosystem's already fragile state and scarce natural resources. As a result, the environment had persisted in showing the effects of poor management, including surface water pollution, erosion, deforestation, overgrazing, and desertification. Quality of life is endangered in this condition, and often it is difficult, if not impossible, to reverse these effects. (Salami, 2021).

A paradigm change toward the sustainable consumption and production (SCP) program will protect the environment while also creating new trade and investment opportunities. This will promote green growth and, in turn, sustainable development, which will support Nigeria's green economy framework. Nigeria has serious problems with deforestation, desertification, water scarcity, pollution, and climate change when it comes to environmental sustainability. Irresponsible logging techniques have resulted in massive deforestation across the nation, increasing carbon emissions and causing biodiversity loss.

PWC (2021) predicts that unless progressive policies and initiatives are put into place, such as investing in alternative energy sources, inspecting car exhaust emissions, strictly enforcing environmental regulations, and implementing pollution abatement systems, controlling pollution will continue to be a challenge for the government. In addition to examining the relationship between environmental sustainability and economic growth in Nigeria between the years 1980 and 2022, this study aims to highlight the most important tactics for achieving environmental sustainability in Nigeria. It also looks at environmental sustainability, development planning, and economic growth in Nigeria.

2. LITERATURE REVIEW
The Concept of environmental sustainability
The idea of environmental sustainability is still controversial in many domains, including economics, governance, and other professions. "We saw our planet from space for the first time in the middle of the 20th century," according to the Brundtland Report (1987). From orbit, we observe a tiny, delicate ball dominated by a pattern of

clouds, oceans, vegetation, and soils rather than by human activity or buildings. The incapacity of humanity to adapt its actions into that pattern is radically altering planetary systems. Dangers to life are present in several of these developments. It is necessary to acknowledge and cope with this new reality, from which there is no way out. This provides a visual representation of the critical role that the environment plays in ensuring human survival.

Although there are three components to the phrase sustainability—environmental, social, and economic—its definition is being abused. It is impossible to define the phrase, and there are no recognized standards or test procedures to quantify it (Morelli, Greenwood, Lockwood & Portillo, 2010). An environment is a place where both living things and non-living ones coexist. The term ecology refers to the idea of elements within a system being interdependent, and this is where the word environment differs from it (Morelli, 2011). Thus, ecological sustainability is the exclusive domain of environmental sustainability, which is actually a subset of it.

According to Morelli (2011), "environmental sustainability" is the state of balance, resilience, and interconnectedness that permits human society to meet its needs without surpassing the ability of the ecosystems that support it to continue regenerating the services required to meet those needs or by causing biological diversity to be diminished through human actions. This definition places restrictions on the expansion of economic activity without endangering the environment's ability to support life.

The ability of entrepreneurs at all levels to sustain ecosystems is in jeopardy if limits are not placed on the rate at which natural resources are used. Compared to the Brundtland Report (1987), which defined it as "meeting the needs of current generation without compromising the ability of future generation to meet their needs," this definition is more accurate and useful. The concept of sustainability provided by the Brundtland Report is broad and encompasses environmental, economic, and social factors.

"The two fundamental environmental services—the sources and sink functions—must be maintained unimpaired during the period over which sustainability is required," according to Goodland (1995). The two essential environmental services are essential to sustainable development, and Goodland's formulation is more applicable to all economies. The source relates to environmental inputs used in the production process; whether these resources are renewable or non-renewable will dictate how far they can be explored.

The sink function, on the other hand, deals with consuming the output that the source function produces; waste absorption of consumption should be within the environment's capacity to absorb it. Therefore, while environmental sustainability is an environmental concern, it also has a significant impact on human and other species' social and economic well-being and is essential to their continued survival. Therefore, the study of preserving both living and non-living things within their environment while human activity continues there without causing damage to them can be classified as environmental sustainability.

Environmental Kuznets Curve (EKC)
According to the Environmental Kuznets Curve (EKC) hypothesis, pollution levels and per capita income have an inverted U-shaped connection; that is, environmental pressure rises until a certain point and then falls as income rises. In actuality, an EKC shows how a scientifically defined indicator of environmental quality shifts in tandem with a nation's economic conditions. A sizable body of literature on EKC has emerged recently. The assumption that environmental quality declines during the early phases of economic development or expansion and then improves during later stages is the common thread running through all of the studies.

Put differently, during the early phases of development, environmental pressure rises more quickly than income, and at higher income levels, it slows down in relation to GDP growth. According to the proposal (Ekperiware, Olatayo, and Egbetokun, 2017), there is an inverted U-shaped relationship between income per capita and environmental degradation, meaning that growth eventually lessens the environmental impact of economic activities.

The relationship between several measures of environmental deterioration and per capita income is theorized to be represented by the environmental Kuznets curve (EKC). Early economic expansion is characterized by increased pollution and degradation of the environment; however, the tendency reverses at high income levels, with environmental improvement leading to economic growth up to a certain level of per capita income, which will vary depending on many factors. This suggests that the relationship between income per capita and the environmental impact indicator is an inverted U.

Usually, the indicator's logarithm is represented as a quadratic function of the income logarithm. Figure 1 in the appendix provides an estimate of an EKC for the Nigerian economy. The EKC bears the name of Kuznets (1955), who postulated that as economic development advances, income disparity will initially increase and later decline.

With Grossman and Krueger's (1991) groundbreaking analysis of the possible effects of NAFTA, the EKC notion first surfaced in the early 1990s. The 1992 World Bank Development Report (IBRD, 1992) further popularized the idea. If the EKC hypothesis were correct, economic growth would eventually lead to environmental improvement rather than endangering the environment as previously claimed by the environmental movement and related scientists (e.g., Meadows, Meadows, Randers, & Behrens, 1972) (Dasgupta, Laplante, Wang & Wheeler, 2012)

The World Commission on Environment and Development (1987) introduced the concept of sustainable economic development in "Our Common Future," signaling the beginning of this shift in perspective. Many found it appealing to "have our cake and eat it" when it came to the potential of attaining sustainability without making a big departure from business as usual (Rees, 1990). Although the majority of the EKC research is econometrically weak, the EKC is fundamentally an empirical phenomenon. Specifically, there has been minimal or no focus on the statistical characteristics of the data utilized, such as time-series stochastic trends or serial dependency, and less attention has been given to model adequacy concerns, such as the potential for bias from omitted variables. Most studies make the assumption that an EKC link exists if the regression coefficients are nominally significant either separately or collectively and have the anticipated signs. But one of the primary goals of econometrics is to determine which apparent correlations—also known as "stylized facts"—are real and which are not.

3. METHODOLOGY

The econometrics method was used in the research investigation. This section is occupied with the study technique by formulating models to capture the relationship between environmental sustainability, development planning, and economic growth variables. These models are based on the evaluated literature and the theoretical framework. Environmental sustainability (measured by carbon dioxide (CO_{2t}) emissions) is the dependent variable, and the development planning, corruption index (CI), and RGDP from 2000 to 2022 are the independent variables.

Hoffmann et al. (2005) address the usage of the CO_{2t} as a proxy for environmental sustainability. To determine the order of stationarity of the variables utilized in the study, the stationarity qualities of the variables were examined using the Augmented Dickey Fuller (ADF) unit root test. Using the ARDL, the dynamic long- and short-term link between environmental sustainability and economic growth was evaluated.

The model is explicitly stated as:
$$CO_{2t} = \beta_0 + \beta_1 RGDP + \beta_2 CI + \varepsilon t \ldots \ldots \ldots \ldots (1)$$
Where:

CO_{2t}	=	Carbon dioxide emissions per real GDP (to proxy environmental sustainability)
RGDP	=	Real gross domestic product
CI	=	Corruption Index
β_0	=	Autonomous function of total carbon dioxide emissions per real GDP
β_1	=	Parameter estimate representing total impacts of GDP growth rate in the first Period on environmental sustainability in Nigeria
β_2	=	Parameter estimate representing total impacts of corruption on environmental sustainability in Nigeria
ε_t	=	Error term

In a more explicit form, the model can be written in a log-linear form to transform the variables into the same unit and base. Thus:

$$InCO_{2t} = \beta_0 + \beta_1 RGDP + \beta_2 CI + \varepsilon_t \ldots \ldots \ldots \ldots (2)$$

The theoretical expectations for the model are as follows:
Positive sign in β_1, given the direct relationship between $InCO_{2t}$ and $RGDP_t$ and negative sign in β_2.

4. RESULTS PRESENTATION AND ANALYSIS

In order to check the time series properties of the data used in the estimation of the model, both the stationarity and co integration tests were conducted to avoid spurious regression results.

The results of the unit root test are presented in table 1. The ADF results indicate that only RGDP was found to be stationary at first difference I (1) at 5% critical value while CO_2t and CI are stationary at levels. The test was considered at both intercept and trend.

Table 1: The Unit Root Test for Stationary

Variable	ADF T-Stat	Critical Value 5%	Order of Integration	Included in the Test Equation
$InCO_{2t}$	-6.2218	-4.9127	I(0)	Intercept & Trend
$InRGDP_t$	-3.9269	-3.2571	I(1)	Intercept & Trend
$lnCI_t$	-3.9871	-3.4064	I(0)	Intercept &Trend

Source: Author's computation using Eviews 10 econometric soft ware

The long run relationship among the variables was also examined using Johansen co integration framework. The co integration test from both the trace statistic and maximum Eigen value indicate that there are two (2) co integrating vector equation that exists in the system at 5% level. It can then be inferred that a long run relationship can be found between carbon dioxide emission and its determinants in the system. The Johansen Co integration test results are reported in table 2.0 below.

Table2.: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.910462	76.39976	47.85613	0.0000
At most 1 *	0.595425	30.55094	29.79707	0.0409
At most 2	0.354845	13.35748	15.49471	0.1023

Trace test indicates 2cointegratingeqn(s) at the 0.05 level

Source: Authors Computation, 2024

Bounds Test for Co-Integration

To test the long run relationship between external debt and economic growth in Nigeria, the bound test for cointegration technique proposed by Pearson, Shin & Smith (2001) was applied. Since there is a mixture of I (0) and I (1) variables as regressors, that is, the order of integration in the unit root result the Johanson cointegration is not applicable. This study applied the appropriate cointegration method which is the bounds test. Given the hypothesis:

H_0 $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ (no long run relationship)

Against the alternative hypothesis

H_1 $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$ (a long run cointegration exists)

Table 4: Bounds test Result

Test Statistic	Value	Significance	I(0)	I(1)
F-Statistic	7.922236	10%	2.2	3.09
K	5	5%	2.56	3.49
		2%	2.88	3.87
		1%	3.29	4.37

Source: Eviews output, 2024

Table 4 shows the results of the bound test. It demonstrated that the null hypothesis as against its alternative is easily rejected at the 5% significance level. The computed F-statistic of 7.922236 is greater than the lower and upper critical bound value at 10%, 5% and 1%, respectively, thus indicating the existence of a long run relationship among the variables under study, the long run model of error correction model is estimated. Having carried out the bound co-integration test, the study in which long run relationship exist between the variables, there is need to carry out ARDL and the results are presented in table 4.

The study noted that because there was cointegration which confirms the existence of a unique long-run relationship among variables; the ARDL was considered more appropriate for use in this study.

ARDL LONG RUN ESTIMATED RESULT
The ARDL and Long Run Coefficients are shown in table 5 below:

Table 5: ARDL and Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGDP	3.38E-07	4.99E-07	0.677843	0.0165
CI	-0.001982	0.050958	-0.038891	0.0094
C	4.669280	21.70710	0.215104	0.8321

EC = CO2 - (0.0000*RGDP -0.0020*CI + 4.6693)
Source: Eviews 10 output, 2024

The results in table 5 shows the long run relationship between environmental sustainability and economic growth in Nigeria over the period under study. The long run coefficients show that gross domestic product (economic growth) exhibited a positive (coefficient =3.38) and statistically significant relationship giving the probability value of 0.0165. This means that a 1% increase in economic growth will lead to a 3.38% increase in environmental sustainability. The table also revealed that the coefficient of corruption index is negative (-0.001982) and statistically significant with probability value of 0.0094. This means that there is a and inverse relationship between corruption index and environmental sustainability in Nigeria within the study period. The implication here is that a 1% increase in corruption will lead to a 0.001982% decrease in environmental sustainability.

5. CONCLUSION AND RECOMMENDATIONS

This paper's main goal is to investigate the connection between Nigeria's economic growth and environmental sustainability, as well as how the environment can be preserved for development given that all environment economies around the world take steps to preserve their development for future generations. This study's premise is that, in the Nigerian economy, development planning and economic growth have an impact on environmental sustainability.

Regression analysis shows that, when carbon dioxide emissions are used as a stand-in for environmental sustainability, economic expansion has a long-term positive influence on the environment, paving the way for sustainable development. Stated differently, the long term coefficients demonstrate a positive and statistically significant association between economic growth and environmental sustainability. This is known as the gross domestic product. Additionally, during the study period, it was shown that there is a statistically significant negative correlation between Nigeria's corruption score and environmental sustainability.

The results are consistent with the Socio-Technical System Theory, which contends that environmental vitality should be incorporated as an indicator in evaluating GDP rather than just recalibrated economic goals such measuring GDP as a measure of economic performance and social advancement. As a result, goal direction can support environmental sustainability.

The theory that states that environmental sustainability will promote sustainable economic development and that economic growth and planning have significant effects on environmental sustainability is supported by all of the data.

The paper makes the following recommendations in light of the findings mentioned above: policymakers should take advantage of opportunities in green building, renewable energy, sustainable agriculture, recycling, and green financing that arise from Nigeria's deteriorating environmental conditions in order to engage in environmentally friendly activities. It is recommended that stakeholders and policy makers implement regulations that limit the use of carbon-intensive products. To counteract the rising emissions caused by human activity, institutions must also be improved to guarantee proper abatement measures and widespread adoption of cleaner technology. This is necessary for sustainable development.

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