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Impact of urbanization size and deforestation environmental degradation on economic growth in Nigeria

Adaora Rose Okafor [1,*], Ogbonna Samuel Onyeisi [2] and Godson Okoro Ogbuagu [2]

[1] *Department of Business Administration and Management, Federal School of Statistics, Amaechi Ulor Enugu State Nigeria.*
[2] *Department of Economics. Enugu State University of Science and Technology Enugu, Nigeria.*

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Abstract

The study examined the impact of urbanization size and deforestation environmental degradation on economic growth in Nigeria. Specifically, the study sought to: determine the impact of urban population size environmental degradation on the economic growth in Nigeria and ascertain the impact of deforestation environmental degradation on the economic growth in Nigeria. This study made use of ex post-facto research design. The method of data analysis was Autoregressive distributive Lag model. The data of the study were real gross domestic product (RGDP), total deforestation (FOREST), urban population size (UPS), non-renewable energy consumption carbon emission (NREC), industrial sector carbon emission (ISC), electricity generation carbon emission (EGC) and were sourced from on-line World Bank Data indicators over the period of 1991 to 2022. The empirical results show that: urban population size environmental degradation has 22% negative and insignificant impact on economic growth in short run (Probability value of 0.7660 > 0.05) and deforestation environmental degradation has 49 % positive and insignificant impact on economic growth in short run (Probability value of 0.7660 > 0.05). The study government should provide farmers with farm inputs and extension services to educate rural peasant farmers on latest local techniques for maximum output. Farmers should engage in bush fallowing to allow unfertile land to regenerate after some reasonable number of years before putting the land into use.

Keywords: Urbanization size; Deforestation; Environmental Degradation; Economic Growth

1 Introduction

Mankind's activities on the environment in his quest for development have resulted in a continuous and serious degradation of the ecosystem, thus pose a threat to both his present and future living. Human beings use the environment in three basic ways: as a resource bank the environment supplies them with raw materials needed to maintain their existence, and their social and technological structures; as a habitat - people require more space per individual than any other species and as sink for wastes- human beings produce more waste than other species (Wajiw, 2020). Human activities, climate change coupled with rural poverty have led to increased deforestation in the rural areas of Nigeria. Given the low productivity of the soil in the tropics to which Nigeria belongs, the poor state of the farmers and subsistence nature of agriculture in Nigeria, green environment may be difficult to sustain. There is therefore the need to better understand the constraint and challenges of deforestation especially in Nigeria (Aliyu, Modibbo, Medugu & Ayo, 2014).

Globally, issues around environmental degradation have taken the centre stage in qualitative and quantitative studies attributable to the recent challenge of climate change. Air, water pollution and global warming are mostly traced to unpredictable activities of man at various economic development stages, such as, the pre-industrial, industrial and services-driven stages (Ejuvbekpokpo, 2014). It is a common place to attribute environmental degradation to fossil fuel

* Corresponding author: Adaora Rose Okafor

or carbon emission, otherwise known as CO_2. Sulaiman, Mazlan and Mohd, (2017) viewed carbon emissions as organic matters that stem from fossil fuel and manufacturing activities' combustion. Half of the world's fossil fuel escape into the atmosphere, thereby responsible for the increase in global temperature, while the natural land and ocean carbon reservoirs had absorbed the other half (Putman et al, 2016). Many scholars as Radoine, Bajja, Chenal and Ahmed, (2022) have considered rapid urbanization development as determinant of environmental degradation because of collective efforts of numerous urban population size engaged in large energy consumption in form of combustible renewable waste from land, water and air transportation, industrial waste, deforestation, coastal water pollution, water and land littering, land runoff pollution. Rapid urbanization, rising energy consumption in the manufacturing sector, and high economic growth are all contributing factors to the world's environment being degraded as a result of rising global warming and climatic changes.

1.1 Statement of the Problem

Rapid population growth and urbanization is of great concern to the sustainability of cities, the more people are there on the earth, the greater the impact on the environment and pressures on resources. As such, the unwise use of the natural environment due to ignorance, poverty, overpopulation and greed amongst others has led to the deforestation and degradation of the environment. Currently, deforestation constitutes one of the global development challenges. Specifically, it is the most serious long term environmental problem facing the world and Nigeria is not an exception. Okeke, (2021) and Ogunwale, (2015), opined that poor living conditions and illiteracy are causes as well as consequences of environmental degradation. The high level of poverty and illiteracy in Africa directly linked to the current level of environmental pollution and degradation in the continent.

The poor and the illiterate are often more interested in issues related to their daily survival than environmental management; this lack of interest and awareness often lead to more reckless environmental behaviour which in tum breeds more environmental problems and leads to a vicious cycle of poverty. The growing concerns about the environmental unsustainability of economic growth patterns and increased awareness of a potential forest degradation crisis have made it clear that the environment and the economy can no longer be considered in isolation. At the same time, financial and economic crisis has provided the opportunity for policy interventions aimed at discouraging deforestation of the environment and renewed growth on more environmentally and socially sustainable grounds. A strategic vision is necessary to ensure that policies that governments will implement are the most appropriate from an economic efficiency, environmental integrity and social equity point of views, as well as coherent policy at the national level. Against this backdrop, the paper is investigating the impact of urbanization size and deforestation environmental degradation on economic growth in Nigeria.

1.2 Objectives of the Study

The broad aim of the study was to examine the impact of urbanization size and deforestation environmental degradation on economic growth in Nigeria. The specific objectives were to:

- Determine the impact of urban population size environmental degradation on the economic growth in Nigeria.
- Ascertain the impact of deforestation environmental degradation on the economic growth in Nigeria.

1.3 Significance of the Study

This study is very importance and beneficial to environmental policy-maker, government and researchers. Outcome of the study could offer novel opportunities for policy makers to formulate and implement an effective trade openness, development, urbanization and energy policy for the environmental quality in these study countries.

The outcome of this study will be beneficial to researcher because empirical findings of the study are capable of adding new insights to present knowledge in the field. Thus, would be an additional reference material to students.

2 Conceptual Literature

2.1 Environmental Degradation

Environmental degradation is the deterioration of the environment through human activities resulting in the depletion of resources, contamination of air, water, and soil, the destruction of the ecosystems and the extinction of flora and fauna (wildlife). This could also be any change or disturbance capable of producing harmful effects on the environment i.e social, economic, technological and institutional activities, and consequently producing results that are undesirable for present and future generations. It occurs when earth's natural resources (water, air, soil) are depleted (Okeke, 2021).

Some factors that could affect the environment are urbanisation, population growth, economic growth and activities, intensification of agricultural activities, increase in the use of energy and transportation. Land, air and water are compromised when people exhaust and waste resources or release harmful chemicals. Deforestation also adds to the decay of a safe environment and the effects of environmental degradation are not farfetched as they stare us right in the face (Ogboru & Anga, 2015). Naradd, Kuruppuge and Haq, (2017) contended that economic growth had predictive ability of carbon emissions. Carbon emission is regarded as a greenhouse emission that causes global warming and indirectly, environmental degradation.

2.2 Economic Growth

Generally, the concept of economic growth are jointly used together to mean a positive change in the standard or quality of life of the people. Rangongo & Ngwakwe, (2019), postulates growth is a steady process which involves raising the level of output of goods and services in the economy. Jhingan (2005), further explained that growth is related to a quantitative sustained increase in a country's per capita output accompanied by an expansion in manpower and volume of trade. This implies that economic growth is the sustained increase in an economy's output followed by other factors that influence growth such as infrastructural development, technological advancement as well as human capital development. Economic growth is the increase in the inflation-adjusted market value of the goods and services produced by an economy over time; it is measured as the percentage rate of increase in the real gross domestic product (IMF, 2012). In the same vein the World Bank (1993), identified economic growth as more rapid output and productivity in growth; and by growth, it, therefore, implies the expansion of a country's potential GDP.

2.3 Contextual Literature

2.3.1 Urbanization Environmental Degradation

Urbanization has also been seen as a necessary factor that affects the level of pollution (Adu, & Denkyirah, 2017; Nhung & Nguyen, 2018). Putman, Ott, Darmenov & daSilva, (2016) suggested urbanization increases pollution in Europe; however, population does not affect CO2 emissions in Malaysia (Xie, Fang & Liu, 2017). The Malaysian study may require further probing to authenticate its veracity against contrasting results (Sanglimsuwan, 2018). Enjema, Molem, Dobdinga, Afuge, and Ngoe, (2020) that investigated the relationship between urbanization and environmental sustainability in Cameroon using time series data from 1991 to 2018, Results indicated that urbanization and trade openness had positive and significant effects on environmental sustainability in the long-run but negative in the short-run, thus, supporting an inverted U-shaped EKC. Ozoemena, Ozor, Okekpa and Agu (2018) conducted a study to investigate impact of environmental degradation on macroeconomic space in Nigeria. The empirical results show that there is an N-shaped relationship between economic growth and the pollution in Nigeria in the midst of other Macroeconomic variables. Akorede & Afroz, (2020) explored the relationship between urbanization, CO2 emissions, economic growth and energy consumption in Nigeria for the period of 1970-2017. The results show that in the short run, energy consumption and the previous lag of economic growth have a positive and significant impact on carbon dioxide emission in Nigeria. Only urban population has a negative but significant impact on CO2 emission in Nigeria. In the long run however, urbanization is still statistically significant but negative while energy consumption and economic growth still has a positive and significant impact on CO2 emission.

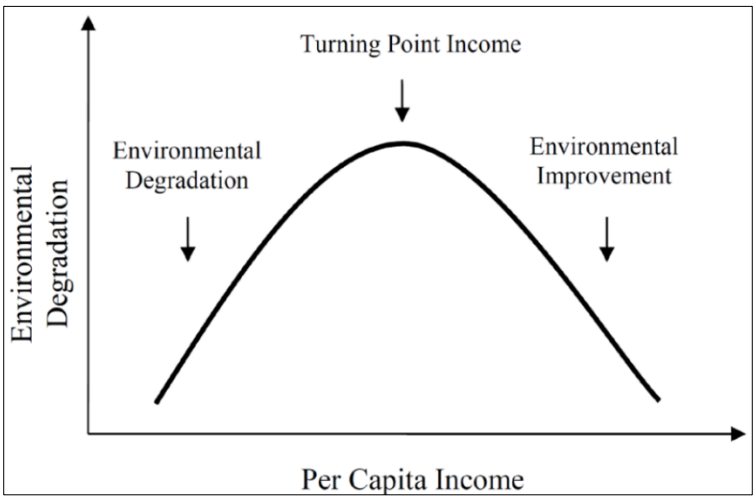
2.3.2 Deforestation Environmental Degradation

Deforestation simply put is the clearing away of forests. It is the process by which an area is deprived of existing natural forest vegetation and resources. This can be brought about by systematic felling, indiscriminate logging or total clearing of existing vegetation for arable farm or industrial purposes. It usually results in destabilization of forest ecosystems and the surrounding environment (Oyetunji, 2019). However, deforestation is generally associated with the clearing out of forests area in order to accommodate new land for farming, infrastructural development and urbanization. Ogunwale, (2015) opined that deforestation as the process by which an area is deprived of existing natural vegetation resources. Wajiw, (2020) also gave his own definition of deforestation as any activities that disrupts the natural ecology of forests as a result of agricultural, social and economic activities carried out in the name of development Deforestation is caused by a number of factors; Need for new land to support farming activities; industrialization also constitutes another factor responsible for deforestation (Egbejule, 2021). Another cause of deforestation is urbanization. Large expanse of forests area are cleared out on an annual basis to accommodate new homes due to the expansion of the urban areas. The causes of deforestation mentioned above are considered to be brought about by man, they are therefore referred to as the man made causes of deforestation. There are however other causes of deforestation. These are regarded as natural causes of deforestation, they include: damage to trees by other plants, climatic factors, damages to trees by mammals and decay of trees. Deforestation leads to increased human encroachment upon wild areas, increased resource extraction, threat to biodiversity, soil degradation and extinction of species (Aliyu, Modibbo, Medugu & Ayo, 2014).

2.4 Theoretical Literature

2.4.1 Environmental Kuznet Curve Theory

The Environmental Kuznets Curve Theory was created based on the hypothesis by Kuznets (1995) concerning the income inequality and economic development and was named after it. The Environmental Kuznets Curve considers the relation between different indicators reflecting environmental pollution and per capita income. Although environmental pollution increases in the first stages of economic growth, when higher levels of income are reached, economic growth provides environmental improvement. So the Environmental Kuznets Curve hypothesis proposes a relation between GDP and environmental pollution that appears to be an inverted U shape (Stern, 2003). There is an inverted U relationship or a turning point is reached when EKC hypothesis is accepted. The ekc is accepted if there is a positive relationship between GDP and CO2 on the short run and a negative relationship between CO_2 and GDP on the long run.



Source: Yandle, Bhattarai and Vijayaraghavan, (2004).

Figure 1 Environmental Kuznets Curve

The Curve is represented by an inverted U curve. In other words, the theory suggests that as a nation is going through industrialization, and mechanization of agriculture – the nation's economy will naturally move towards cities. Inequality is expected to decrease when rural populations move towards urban. The Environmental Kuznets Curve adheres to the same idea of the hypothesized relationship between equality and development. The difference is that it looks at environment equality. Before the Environmental Kuznets Curve hypothesis, it was generally assumed that rich economies destroyed the environment at a faster pace than poorer countries. However, with the Environmental Kuznets Curve, the relationship between the environment's health and the economy has been reanalyzed. The idea is that as economic development growth occurs, the environment will worsen until a certain point where the country reaches a specific average income. Then money is invested back into the environment, and the ecosystem is restored. Critics argue that economic growth doesn't always lead to a better environment and sometimes the opposite may actually be true.

2.5 Empirical Literature

Adekunle, et al. (2022) conducted a study to analyse of environmental degradation and its determinants in Nigeria: new evidence from ARLD and Causality approaches. Specifically, the study sought to investigate impact of carbon emissions and intensity, transportation infrastructure, population size, technical progress, energy intensity, urbanization level, trade openness, industrial structure on economic growth in Nigeria covering 1977 to 2015. The methods of data analysis were ARDL model estimation and Granger causality test. The empirical result of the study shows that there is a positive relationship between economic growth and environmental degradation (measured by carbon emission). A positive relation was also established between energy consumption and carbon emission. Similarly, this study reported a positive relationship between transport services in the import and export sectors and carbon emission. Through the Granger causality test, the study established a unidirectional causality running from carbon emission to economic growth. Similarly, there was a unidirectional causality running from economic growth to transport services in the export sector. The study recommended that there is an increasing need for the authorities to regulate economic activities that directly and indirectly contribute to systematic environmental degradation in Nigeria.

Ezenwa, Nwatu and Gershon (2021) examined the impact of renewable energy consumption shocks on CO2 Emissions and Economic Growth of Nigeria. The specific objectives were to examine the nexus among economic growth, renewable energy consumption and CO2 pollution in Nigeria on the annual data for the period 1990-2015. The methods of data analysis were study Johansen co-integration technique, Granger causality test and vector error correction model (VECM). The results indicate a bi-directional causality between renewable energy consumption (REC) and economic growth (GDP). REC positively granger causes GDP in both short-run and long-run, while GDP has an adverse effect on REC in the short run. This is as a result of inefficient renewable technologies during the period. However, there is persistent and positive influence of REC on economic growth in the period between 2009 and 2015. The study suggests environmental and tax policy instruments, as well as, effective governance to enhance environmental quality and encourage sustainable/green economic growth. The key instruments include: grants, feed-in-tariffs (FIT), production tax credits, renewable portfolio standards (RPS), and loans to enable industrial sector invest in renewable energy.

Iyabo, Lawal, Olayinka and Akinsola, (2021) explored impact of carbon emissions and economic growth in Nigeria. This study tests the environmental kuznet curve (EKC) hypothesis to find evidence of an inverted-U relationship between carbon emissions and economic growth in Nigeria from 1980-2016. Annual time series data was gotten from world development index (WDI). The methods of data analysis were ADF Fisher Chi-square test, Pedroni's co-integration test, Toda Yamamoto Causality Test and Auto-regressive distributive Lag Model ARDL. The ekc is accepted if there is a positive relationship between GDP and CO2 on the short run and a negative relationship between CO2 and GDP on the long run. The findings show that Nigeria has not reached a turning point in its level of carbon emissions as economic growth increases. Nigeria is still at the initial stage of growth where carbon emissions accelerate as growth increases. The study recommended that there is need for policies that will broaden the use of renewable energy such as solar, wind energy as energy sources in meeting the energy needs of the fast growing population in Nigeria.

Oghenekaro and Ifurueze (2021) investigated the association between environmental degradation and the economic growth in Nigeria using sample from 2011 to 2020. Specifically the study sought to evaluate the effect of foreign direct investment, per capita GDP and population density on the carbon dioxide emission. Ex post factor research design was adopted and time series data was generated from the World Development Indicators. Augmented Dickey Fuller (ADF) test was used to test the stationarity of the data, and when they were proved to be stationary, Johansen Co-integration test was used to test the long run relationships between the response and exogenous variables. The data analytical technique was Autoregressive Distributive Lag Model. The result shows that per capita GDP and population density have significant effect on environmental degradation but foreign direct investment shows no significant effect on the environmental depletion as was measured by carbon dioxide. The study suggested that policy formulation should follow consumption of natural or environmental resources so as to have reservation for the need of the same environmental resources for the future.

Akorede and Afroz (2020) explored the relationship between urbanization, CO2 emissions, economic growth and energy consumption in Nigeria. The main objective is to examine the trend analysis of the relationship between energy consumption, carbon dioxide, CO2 emission and economic growth for the period of 1970-2017. The methods of data analysis were Granger causality and autoregressive distributed lag (ARDL) test approach. The results show that in the short run, energy consumption and the previous lag of economic growth have a positive and significant impact on carbon dioxide emission in Nigeria. Only urban population has a negative but significant impact on CO2 emission in Nigeria. In the long run however, urbanization is still statistically significant but negative while energy consumption and economic growth still has a positive and significant impact on CO2 emission. The major reason is that the bulk of the country's energy consumption is from non-renewable means. Thus, the study recommend appropriate measures and mitigation policies needs to be put in place to reduce the damage on the environment and to prevent further destruction.

Awosusi and Demet (2020) conducted a study to examine determinants of environmental degradation in Nigeria. The study aims to reinvestigate the impact of economic growth in relation with trade openness, financial development, energy consumption and foreign direct investment on environmental degradation in Nigeria for the years from 1971 to 2015. The data analytical techniques were augmented Dickey-Fuller (ADF), the Phillips-Perron (PP) and method of data analysis was Auto-regressive distribution lag model (ARDL) and bounds co-integration model. The ARDL bound techniques confirm a cointegration relationship between the dependent variable (CO2 emissions) and independent variables (economic growth, energy consumption, trade openness, FDI and financial development indicators) in Nigeria. Estimated results indicate that GDP per capita, which is economic growth indicator, positively influences CO2 emissions both in the short and long run. In the long run, energy consumption stimulates CO2 emissions positively. CO2 emissions are negatively affected by FDI. The study recommended that levels of government in Nigeria should embark on a system of taxation, whereby any commercial, industrial and residential outlets that exceed or financial levy for those the standard level of environmental pollution should be taxed.

Mfonobong, Okoye and Nweze (2020) explored **s**ectoral contributions to carbon dioxide equivalent emissions in the Nigerian Economy. Specifically, the study examine impact of emissions level (GHG), Activity data (AD), IPCC emission factors (EF), Emission factor for category T animals (EFT), Number of heads for animal in category (NT), Animal category (T). The methods of data analysis were multivariate Vector Error Correction (VECM) Approach and Toda-Yamamoto Test. Results revealed that, fugitive emissions from oil and gas accounted for the highest contribution to CO2-eq emissions with about 75.27% when compared to other sectors. This is due to increased gas flaring employed to dispose of associated gas in major petroleum/oil producing areas in the country. This sector pollutes because of their technology, the remaining sectors were identified as important sectors because of the weight they have on the economy. The study suggests the need for Nigerian government to ensure the security of fuel source for power generation by mandating oil companies to channel their flared gases to power plant.

Oyetunji, (2019) conducted a study to examine the effects of forests on economic growth in Nigeria (1990 – 2015). This study empirically examines the impact of total forest area (FOR), capital (K), labour (L), exchange rate (EXR), foreign direct investment (FDI), inflation rate (INF), government expenditure (GOV) on GDP per capita (GDP). Unit root tests were carried out using the Augmented Dickey Fuller (ADF) test, while the Bounds cointegration test was used to establish a long run relationship between the forests and other independent variables and economic growth. An Error Correction Model (ECM) was also employed to determine the nature of the long run relationship. The findings show that forests have a positive effect on economic growth, however, this is not statistically significant. The study recommends that Nigerian government should discourage illegal felling of trees and the importation of timber products, as well as engage and develop the rural communities to reduce the pressure on forest resources and ensure sustainable use.

Usenobong and Agbai (2019) explored relationship between economic growth and Environmental Degradation in Nigeria. The specific objectives of the study were carbon dioxide emission (CO2), trade openness, manufacturing GPD, Agriculture GDP and real GDP per capita under a period of 1980 to 2018. The data analytical techniques were Autoregressive Distributed Lag (ARDL), bound testing approach for cointegration and error correction based Granger causality test. The empirical result show there is our findings do not support the existence of the EKC hypothesis. Rather our results show that Nigeria's situation when confronted with data is exemplified by an N-shaped relationship with a turning point at $77.27 that lies below the data set used for the study. Based on these findings, the paper posit that the hypothesized EKC serves as a dangerous policy guide to solving environmental problems in Nigeria. The conclusion is that to ensure sustainability, there exist an urgent need to look beyond the EKC by adopting courageous policy measures of environmental preservation in Nigeria irrespective of the country's level of income.

3 Methodology

This study made use of ex post-facto research design. The pre-estimation and post-estimation tests were descriptive statistics, Augmented Dickey-Fuller Unit Root test statistic, Johansen Co-integration test, serial correlation Lagrange Multiplier test Ramsey Reset test, Breuch-Godfrey Serial Correlation LM Test respectively. The method of data analysis was Autoregressive distributive Lag model. The data of the study were sourced from on-line World Bank Data indicators. The covered a period of 1991 to 2022 as defined in our model specification. The study employed e-view version (9) statistical application software to analysis the data because it is user- friendly software.

3.1 Model Specification for the Study

RGDP =f (FOREST, UPS, NREC, ISC, EGC) …….. (3.1)

Where RGDP is real Gross domestic product (RGDP), FORESTI is total deforestation, UPS is urban population size (UPS), NREC is non-renewable energy consumption carbon emission, ISC is industrial sector carbon emission, EGC is electricity generation carbon emission. In a linear function, it is represented as follows:

$RGDP = \beta_0 + \beta_1 FORESTt + \beta_2 UPSt + \beta_3 NRECt + \beta_4 ISCt + \beta_5 EGCt + \mu t$ …….. (3.2)

Where: $\beta 0$ = Constant term, β_1 to β_5 = Regression coefficient, μt = Error Term and t is the period.

To reduce the outliers among the variables, all variables will be expressed in logarithmic form.

$LogRGDP = \beta_0 + \beta_1 LogFORESTt + \beta_2 LogUPSt + \beta_3 LogNRECt + \beta_4 LogISCt + \beta_5 LogEGC + \mu t$…….. (3.3)

Where: $\beta 0$ = Constant term, β_1 to β_6 = Regression coefficient, Ut = Error Term and t is the period.

3.2 Descriptive Statistics of the Variables

Table 1 Result of Descriptive Statistics

	RGDP	FOREST	UPS	NREC	ISC	EGC
Mean	221123.7	378918.7	1299949.	56.44548	33.96677	8.312903
Median	265379.1	106857.4	71685.40	63.10000	34.00000	9.800000
Maximum	678950.9	1613579.	4430132.	70.00000	56.21000	11.10000
Minimum	37474.95	1554.200	658.2000	0.900000	23.00000	4.200000
Std. Dev.	187144.2	556741.7	1726438.	13.90766	9.560438	2.540963
Skewness	0.680205	1.327233	0.830602	-2.193925	0.484447	-0.444440
Kurtosis	2.379315	3.044198	1.898005	9.138402	2.081413	1.436721
Jarque-Bera	2.888118	9.103854	5.133069	73.53873	2.302472	4.177184
Probability	0.235968	0.010547	0.076801	0.000000	0.316246	0.123861
Sum	6854835.	11746479	40298405	1749.810	1052.970	257.7000
Sum Sq. Dev.	1.05E+12	9.30E+12	8.94E+13	5802.692	2742.059	193.6948
Observations	32	32	32	32	32	32

Source: e-view's Result

The table shows descriptive statistics of the variables. In the model established in the study, there is one dependent variable and six independent variables. The descriptive statistics shows nature and position of the variables in form of mean, median, sum, number of observation, maximum, standard deviation.

3.3 Correlation Matrix of the Variables

Table 2 Result of Correlation Matrix

	RGDP	FOREST	UPS	NREC	ISC	EGC
RGDP	1.000000	-0.283960	-0.370896	-0.119637	-0.435550	-0.469814
FOREST	-0.283960	1.000000	0.915134	-0.156539	0.826294	0.561693
UPS	-0.370896	0.915134	1.000000	-0.070224	0.875696	0.634892
NREC	-0.119637	-0.156539	-0.070224	1.000000	0.160989	0.419484
ISC	-0.435550	0.826294	0.875696	0.160989	1.000000	0.817473
EGC	-0.469814	0.561693	0.634892	0.419484	0.817473	1.000000

Source: e-view's Result

This correlation matrix presents a table showing correlation coefficients between sets of variables. Each random variable (X_i) in the table is correlated with each of the other values in the table (X_j). This result of correlation matrix helps to identify which pairs of variables have the highest correlation. This test is to detect whether exact or perfect relationship exist among explanatory variables (multicollinearity). This test presented clear understanding on the assumption of ordinary least square that there is no perfect or exact linear relationship among explanatory variables. The result of correlation matrix showed that every explanatory variable in the study is linearly independent of each other.

Table 3 Results of Stationarity (unit root) test

Variables	Variables' Name	ADF- Statistic	5% Critical Value	Remark
RGDP	Real gross domestic product	-3.201355	2.963972	1 (0)
FOREST	Total deforestation	-4.713798	2.948404	1 (1)
UPS	Urban population size	-6.777885	2.948404	1 (1)
NREC	Non-renewable energy carbon emission	-3.374626	2.948404	1 (1)
ISC	Industrial sector carbon emission	-5.682503	2.948404	1 (1)
EGC	Electricity generation carbon emission	-4.543399	2.963972	1 (0)

Source: Author's computation from E-view 9

In the table 4.1.1, the variables that were tested with unit root are shown, the values for Augmented Dickey Fuller (ADF) statistics are presented, the lag level of each variable was identified. The Mackinnon critical values at 5% level of significant were pointed out. The order of integration of each variable was enumerated, and finally the stationarity position of each variable was also stated. The research work based the level of augment whether the variable was stationary or not stationary on 5 percent significance level. When Augmented Dickey Fuller statistic is greater than Mackinnon 5 percent critical value in absolute term, it is concluded that the variable is stationary. Eight variables were stationary at first difference while two variables were stationary at level. It is now referable to use Autoregressive Distributive Lag Model (ARDL) to estimate the parameters.

3.4 ARDL Bounds Co-integration Test Results

Since all the variables are integrated of order, 1 (1). It is necessary to determine the existence of long run equilibrium relationship between the variables. Separate co-integration tests were carried out on real gross domestic product (RGDP), total deforestation (FOREST), urban population size (UPS), non-renewable energy consumption carbon emission (NREC), industrial sector carbon emission (ISC), electricity generation carbon emission (EGC). Non-stationary time-series can be co-integrated if there are linear combinations of them that are stationary, that is, the linear combination does not have a stochastic trend. In other words, if two or more I(1) variables are co-integrated, they must obey an equilibrium relationship in the long-run, although they may diverge substantially from that equilibrium in the short run. The co-integration tests are based on the Johansen and Juselius (1989) test. Tables 4.3.1 present the co-integration test results.

Ho = There is no co-integration (no long run relationship among Variable)

Table 4 Bound Co-integration Test Results

ARDL Bounds Test		
Date: 07/04/23 Time: 14:59		
Sample: 1990 2020		
Included observations: 30		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	K
F-statistic	7.593626	9
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	1.88	2.99
5%	2.14	3.3
2.5%	2.37	3.6
1%	2.65	3.97

Source: Author's Computation from E-view 9

The co-integration result in table 4.3 for the model (RGDP, FOREST, UPS, NREC, ISC, EGC) reveals that there is a long-run relationship among the variables (RGDP, FOREST, UPS, NREC, ISC, EGC) since f-statistic (7.593626) was greater than 5% lower and upper bound critical value (3.30). We therefore reject the null hypothesis of no co-integration amongst the variables and accept the alternative hypothesis.

Table 5 ARDL Cointegrating And Long Run Form

ARDL Cointegrating And Long Run Form				
Dependent Variable: RGDP				
Selected Model: ARDL(1, 0, 0, 0, 0, 0)				
Date: 07/04/23 Time: 12:15				
Sample: 1991 2022				
Included observations: 31				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FOREST)	0.490010	0.541570	0.904795	0.5986
D(UPS)	-0.222076	0.737730	-0.301027	0.7660
D(NREC)	-0.001753	0.001802	-0.972645	0.3404
D(ISC)	0.003968	0.001480	2.680411	0.0131
D(EGC)	-0.039771	0.053078	-0.749291	0.4610
CointEq(-1)	0.029236	0.068660	0.425805	0.6740
Cointeq = RGDP - (-133.0572*FOREST + 0.0024*UPS + 0.0600*NREC				
-0.1357*ISC + 1.3604*EGC + 320681.1957)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
FOREST	0.387043	0.089925	4.304075	0.0005
UPS	0.309095	0.058590	5.275576	0.0005
NREC	0.553384	0.660951	8.372548	0.0002
ISC	0.184676	0.054218	3.406115	0.0005
EGC	0.416479	0.063969	6.510650	0.0003
C	0.320681	0.426368.	0.752122	0.4593

Source: Author's Computation using E-view 9

The result of the regression analysis represents the model for the impact of urbanization size and deforestation environmental degradation on economic growth in Nigeria. The empirical result shows that the coefficient of total deforestation (FOREST) has positive and in significant impact on real gross domestic product (RGDP) because its probability value of 0.5986 was greater than 0.05 in short run but it was positive and significant impact on real gross domestic product (RGDP) because its probability value of 0.0005 was greater than 0.05 in long run. The urban population size (UPS) has negative and insignificant impact on real gross domestic product (RGDP) its probability value of 0.7660 was greater than 0.05 but it was positive and significant impact on real gross domestic product (RGDP) its probability value of 0.0005 was less than 0.05 in long run. The non-renewable energy consumption carbon emission (NREC) has negative and insignificant impact on real gross domestic product (RGDP) because its probability value of 0.3404 was greater than 0.05 but it was positive and significant impact on real gross domestic product (RGDP) because its probability value of 0.0002 was less than 0.05. The industrial sector carbon emission (ISC) has positive and significant impact on real gross domestic product (RGDP) because its probability value of 0.0131 was less than 0.05 in short run but it was positive and significant impact on real gross domestic product (RGDP) because its probability value

of 0.0005 was less than 0.05 in long run. The electricity generation carbon emission (EGC) has negative and insignificant impact on real gross domestic product (RGDP) because its probability value of 0.4610 was greater than 0.05 in short run but it was positive and significant impact on real gross domestic product (RGDP) because its probability value of 0.0003 was less than 0.05 in long run.

3.5 Econometric /Second Order Test

The null hypothesis; there is Autocorrelation.

Table 6 Result of Breuch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	12.475385	Prob. F(1,19)	0.0000
Obs*R-squared	7.233752	Prob. Chi-Square(1)	0.0000
Test Equation:			
Dependent Variable: RESID			
Method: ARDL			
Date: 07/04/23 Time: 15:05			
Sample: 1991 2023			
Included observations: 31			
Presample missing value lagged residuals set to zero.			

Source: Author's Computation from E-view 9

The Breuch-Godfrey Serial correlation LM Test was used to identify whether the model suffers from autocorrelation problem. The autocorrelation problem violates ordinary least squares assumption that says there is no correlation among error terms of different observation. Breuch-Godfrey Serial correlation LM Test is a statistic that ensures that the assumption of ordinary least squares was not violated. The result of Breuch-Godfrey Serial correlation LM Test shows that there is no serial correlation problem because its f-statistic (12.475385) was greater than its P-value (0.0000). So, we reject the null hypothesis and accept the alternative hypothesis.

3.6 Result of Ramsey Reset Test

The null hypothesis; there is Specification Error.

Table 7 Result of Ramsey Reset Test

Ramsey RESET Test			
Equation: UNTITLED			
Specification: RGDP RGDP(-1) EGE HGE PSER SSRE TSER LIFE CMR			
EXCHR INFLA C			
Omitted Variables: Squares of fitted values			
	Value	df	Probability
t-statistic	6.316216	19	0.0003
F-statistic	8.099993	(1, 19)	0.0003
F-test summary:			
	Sum of Sq.	df	Mean Squares
Test SSR	2.27E+09	1	2.27E+09
Restricted SSR	4.34E+11	20	2.17E+10
Unrestricted SSR	4.32E+11	19	2.27E+10

Source: Author's Computation from E-view 9

This second order test checks whether the model of the study suffers model specification error. The null hypothesis; there is model specification error. From the results of the Ramsey Reset test, the probability values (0.0003) for Ramsey Reset's t-statistics was less than 0.05. So, we reject the null hypothesis and accept the alternative hypothesis. This implies that model include core variables in the model. It does not include superfluous variables. The functional form of the model is very well specified, there is no error of measurement in the regressand and regressors.

3.7 Test of Hypotheses

The results for the various hypotheses testing are presented in the section.

3.7.1 Test of Hypothesis one

H_{01} Urban population size environmental degradation has no significant impact on economic growth in Nigeria.

In testing this hypothesis, urban population size environmental degradation was regressed against real GDP (RGDP). The urban population size (UPS) has negative and insignificant impact on real gross domestic product (RGDP) its probability value of 0.7660 was greater than 0.05 but it was positive and significant impact on real gross domestic product (RGDP) its probability value of 0.0005 was less than 0.05 in long run. The empirical finding reveals that urbanization size environmental degradation has negative and insignificant impact on the economic growth in Nigeria.

3.7.2 Test of Hypothesis two

H_{02} Deforestation environmental degradation has no significant impact on the economic growth in Nigeria.

In testing this hypothesis, total deforestation (FOREST) was regressed against real GDP (RGDP). The empirical result shows that the coefficient of total deforestation (FOREST) has positive and in significant impact on real gross domestic product (RGDP) because its probability value of 0.5986 was greater than 0.05 in short run but it was positive and significant impact on real gross domestic product (RGDP) because its probability value of 0.0005 was greater than 0.05 in long run. The empirical finding reveals that total deforestation environmental degradation had positive and insignificant impact on the economic growth in Nigeria.

4 Summary of Findings

The following are the major findings of the study**:**

- Urban population size environmental degradation has 22% negative and insignificant impact on economic growth in short run (Probability value of 0.7660 > 0.05) but it was 30% positive and significant impact on economic growth in long run (Probability value of 0.0005 < 0.05). Urban population size environmental degradation has 22 percent negative and insignificant impact on economic growth in short run. A percent change in urban population size environmental degradation results to 22 percent increase in economic growth in short run. Again, urban population size environmental degradation has 30 percent positive and significant impact on economic growth in long run. A percent change in urban population size environmental degradation results to 30 percent significant increase in economic growth in long run.
- Deforestation environmental degradation has 49 % positive and insignificant impact on economic growth in short run (Probability value of 0.7660 > 0.05) but it was 49 % positive and significant impact on economic growth in long run (Probability value of 0.0005 < 0.05). A percent change in deforestation environmental degradation results to 49 percent increase in economic growth in short run. Again, deforestation environmental degradation has 38 percent positive and significant impact on economic growth in long run. A percent change in government education expenditure results to 38 percent significant increase in economic growth in long run.

5 Conclusion

This study concludes that urbanization size has positive and insignificant impact while deforestation environmental degradation has negative and insignificant impact on economic growth in Nigeria respectively. Deforestation, partly resulting from unsustainable agricultural practices and fuelwood exploitation are exacerbating problems of environmental degradation especially desertification and soil erosion and loss of biodiversity in the more humid guinea Savanna and rain forest regions. These environmental problems may ultimately result in soil impoverishment or outright loss of the productive topsoil with an attendant decline in vegetation cover of the areas. This will consequently

cause forest ecosystems to change in various ways, such as in animal and plant species distribution, changes in tree physiology and stability.

Urbanization usually occurs when people move from villages to cities for settlement either temporal or permanent in hope of better employment opportunities, higher standard of living, quality education and health facilities. This usually takes place in developing countries especially Nigeria. In rural areas, people also become victims of unpredictable weather conditions such as drought and floods which can adversely affect their livelihood. This mass exodus of people from rural to urban areas also constituted a lot of vices in the place of destination such as crime and insecurity, poverty and unemployment, ecological/environmental problems among several others. To some extent these problems push other people from their place of destination to their place of origin.

Recommendations of the Study

Based on the findings of this study, the following recommendations were made.

- Government should provide farmers with farm inputs and extension services to educate rural peasant farmers on latest local techniques for maximum output. Farmers should engage in bush fallowing to allow unfertile land to regenerate after some reasonable number of years before putting the land into use. Government should empower them with available and sustainable knowledge on forest management.
- The government should give more attention to the social plight of rural dwellers in order to reduce their mass exodus from the rural areas to urban areas. Government should established some of her agencies annexes at the rural areas so as to absorb the rural educated youths than leaving them migrating to the urban areas and make the urban areas congested. Securities network in the urban areas should be given more attention by the government to enable them arrest and prosecute criminals who are making some part of urban areas difficult place to live.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest among the authors.

Statement of informed consent

No statement of informed consent.

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