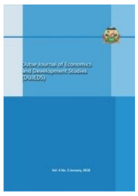

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ENVIRONMENTAL DEGRADATION AND THE NIGERIAN ECONOMIC GROWTH

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Abstract
Overtime, there has become an increasing environmental concern worldwide. The study investigates the effect of environmental degradation on economic growth in Nigeria for the period 1986-2016. To ascertain the relationship, a macroeconomic econometric model was formulated using Gross Domestic Product (GDP) as a proxy for economic development and the dependent variable while Forest Loss (FOL), Quantity of Gas Flared (QGF) and Quantity of Oil Spilt (QOS) were employed as a proxy for environmental degradation and the independent variables. Data for the study were sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin (various issues), the National Bureau of Statistics (NBS) and the Nigerian Meteorological Agency (NIMET). Johansen Co-integration test was employed to test for long run relationship among the variables while the ECM was also conducted to test for the short run relationship.; The Johansen Co-integration test revealed a long run relationship among the variables employed; the parsimonious ECM Test was rightly signed and showed that 32 percent disequilibrium is corrected annually. The study revealed that the coefficients of FOL and QOS were rightly signed, conforming to a priori expectations and statistically significant while QGF was rightly signed but not statistically significant. The stability test also revealed a long run stability of the variables employed and can therefore be used for policy analysis. Based on findings, the paper recommends that a sound environmental law or policy is needed to address the issue of water deterioration through oil spillage; also, check should be put to control land degradation mainly through forest loss.

Keywords: Degradation, Economic Growth, Unit Root Test, ECM
JEL Classification: Q56

Introduction

Overtime, there has become an increasing environmental concern worldwide. This has not been helped by the rapid pace of modernization and industrialization which has led to a depletion of natural resources due to economic and social transformation occasioned by the increase in population, increase in agricultural output, industrial production, capital accumulation etc. These have prompted environmentalists to be interested in the perceived relationship existing between economic growth and the quality of the environment. While economic growth is an important driver of the economy as it spurs consumption and advances production, Environment plays a key role in this growth through its provision of needed raw materials. It has thus been advocated that there exists a causal relationship between growth and the environment.

These relationships and impacts are often the subject of intense public and academic debates, such as the current issues bordering on global climate changes. The argument is often made by some that economic growth has led to environmental degradation, while others posit that environmental degradation hinders economic growth and development. Irrespective of posited views, environmental degradation has become an issue being faced by all economies worldwide in pursuance of sustainable growth and development.

According to Johnson, Ambrose, Bassett, Bowen, Crummey, Isaacson, Johnson, Lamb, Saul, and Winter-Nelson (1997), environmental degradation is seen as any change or disturbance to the environment perceived to be deleterious or undesirable. It is the deterioration of the environment through the consumption of environmental assets and has become one of the major issues being looked into in the world today. Environmental degradation can happen in a number of ways ranging from pollution and destruction of ecosystem to degraded fresh water supplies and arable land, desertification etc. Environmental degradation is often used as a major indicator for environmental quality, with positions that high environmental degradation will mean poor environmental quality.

It has been maintained that environmental degradation follows an inverse U-shaped path as a country grows over time regarded as the Environmental Kuznets Curve (EKC) hypothesis which suggests that economic development at first leads to a worsening of the environment, but after a certain level of economic growth, the economy begins to improve its relationship with the environment and levels of environmental degradation reduces (Grossman & Krueger, 1995). However, it has not been guarantee that economic growth will lead to an improved environment – in fact, the opposite is often the case. At the least, it requires a targeted policy and attitudes to make sure that economic growth is compatible with an improving environment.

It is pertinent to note that the livelihood of more than half of the economically active population in the developing economies directly depends in the whole or in part on the environment through agriculture, as well as animal husbandry, hunting, fishing, forestry, foraging, etc., as such environmental quality no doubt affects and is affected by economic activities (Todaro & Smith, 2011). This account gives credit to the 7^{th} millennium development goal; "to ensure environmental sustainability".

In developing economies like Nigeria there is a rising pressure on environmental resources like the air through gas flaring, the water resources through oil spillage, land degradation through forest lost etc. These have led to severe consequences for man's self-sufficiency, income distribution and future growth potential (UNEP,2012). Todaro & Smith (2011) opined that environmental degradation can detract the pace of economic development by imposing high costs on developing countries through health-related expenses and reduced productivity of resources. The poorest 20% of the poor in both rural and urban areas will suffer the consequences of environmental pollutions severely. Acute environmental degradation, due to population pressure on land, has led to a fall in farm productivity and per capita food production. Since cultivation of marginal land is predominantly the business of low income group, the losses are suffered mainly by the poor. The inaccessibility to sanitation and clean water by the poor has been blamed for the widespread of diseases all over the world, so it has a multiplier effect on the global population.

According to Dasgupta (1995), many developing countries have not achieved demographic transition. There is a high population growth rate, which increases the depletion of environmental resources and the deterioration of environmental quality. When this situation occurs, poverty, high fertility rates and environmental degradation can reinforce one another in a negative spiral and undermine future economic development. As environmental degradation has become a dire issue, there has been a large body of empirical researches and studies on the relationship between economic growth and environmental degradation. By using CO2 emissions level as a proxy of environment, some studies revealed that the deterioration of environment is associated with the economic growth of a country (Mladenovic, Sokolov-Mladenovic, Milovancevic, Markovic, & Simeunovic, 2016). The growing consumption need of the people in Nigeria has a serious implication such that there is the concern that the degradation through the destruction and burning of forests in Nigeria, the continuous gas flaring and CO_2 emission (from automobiles and generating sets), felling of trees for all sorts of wood need and consumption, unchecked dumping of toxic refuse, etc. has negated on the economy. It is against this backdrop that this study was conceived.

The study therefore investigated the nexus between environmental degradation and economic growth in Nigeria. To achieve this purpose, the paper has been structured into five sections with the introduction as section one. Section two dealt with empirical reviews of previous related studies. Section three discussed the methodology and estimation techniques employed in the study. Section four handled analysis of data and presentation of findings with regards the study while recommendations and conclusion are contained in section five.

Literature Review

Economic growth has been seen in different ways. It has been defined as a sustained annual increase in an economy's real national income over a long period of time. In other words, economic growth means rising trend of net national product at constant prices. Aigbokhan (1995) posited that economic growth means an increase in the average rate of output produce per person usually measured on a per annum basis. Ullah & Rauf (2013) noted that whenever there is increase in real GDP of a country, it will boost up the overall output and it is thus seen as economic growth. It thus appears to be that economic growth refers to a positive increase in the aggregate level of output within a given period of time in a country. However, these definitions have been seen as inadequate and subjected to criticism. According to them, when the population is increasing at a faster rate than total national income, total national income may be increasing and yet the standard of living of the people may be falling; hence, per capita income will fall (Egbulonu & Ajudua, 2017).

Since economic growth means more output, it implies that economic growth and development is universally measured both in terms of increase in overall Gross National Product (GNP) or Net National Product (NNP) and increase in per capita income. While Gross National Product (GNP) measures the total output of goods and services which an economy is capable of producing, per capita income measures how much of real goods and services which an average person of the community will have for consumption and investment, that is, average level of living of a citizen of a country. Measurement of growth is also done through measuring economic welfare. According to Okun and Richardson in Jhingan (2013), development is a sustained secular improvement in material well-being which involves increase in flow of goods and services. Basic needs availability is another means of measuring economic development. Social indicators measured through human development indices which include health, education, food, water supply, sanitation, shelter, etc. measures a country's growth and development level.

Sustained economic growth has been posited to lead to economic development. Benefits that accrue to economic growth are numerous. Economic growth leads to increase in output and an increase in output can improve living standards of people and give them access to more goods and services which will improve their living conditions and increase their life expectancy. In richer economies, people are likely to consume luxury products, have better health care, go for better education than in poor economies. And better education equips the citizen for better job, better output etc. In very poor countries, economic growth is essential to ensure that people have access to basic necessities. Higher output and incomes increase government tax revenue, making it easier for governments to finance measures to reduce poverty, increase health care provision and raise educational standards, without having to raise tax rates.

Higher output can increase pollution, lead to depletion of non--renewable resources and damage the natural environment. More factories and cars may increase carbon dioxide emissions. Rapid expansion of the furniture and fishing industries, for example, may result in deforestation and depletion of fishing stocks respectively. Construction of more factories, offices, roads and other infrastructure can also destroy wildlife habitats. Due to these risks, economists are increasingly emphasizing the need for check on environmental degradation.

It thus appears that economic growth seems to be the main driver of environmental degradation. According to Grossman and Krueger (1995), economic growth and development plays a key role in environmental quality through economic activities. The larger the scale of economic activities, other things being equal, the higher the level of environmental degradation such as pollution, forest loss, CO2 emission etc., since increased economic activity results in increased levels of resource use and waste generation. Rapid industrialization process, increase in energy consumption, waste generated due to increased pace of industrialization and urbanisation, etc., has led to pollution and degradation of air, water and land. Urbanisation leads to increase in consumption of natural resources. According to Mahadevia (1999) industrialisation in the developing countries have led to pollution due to disincentive to use clean technologies, uncompetitive industrial production system, lack of or faulty environmental legislation, lack of implementation or unwillingness to implement environmental legislation if any, rampant corruption in the system, inadequate institutional structure to democratise decision making and governance, and above all systemic inefficiency.

Theoretical Underpinnings

Due to lack of comprehensive theory to explain the relationship between environmental degradation and economic growth some scholars like Grossman and Krueger (1995), Shafik & Bundyopathyay (1992); Selden & Song, (1994); Lopez & Mitra, (2004) and Dinda (2004) examine the relationship with cross country effects, while others like Deacon & Norman, (2004), studied and developed within-country environmental effects. But to a large extent, the issue of environmental degradation and economic growth is built around the Environmental Kuznets Curve (EKC) hypothesis proposed by Simon Kuznets (1955). He suggested that in the early stages of economic growth, the distribution of income will tend to worsen; only at later stages will it improve. This observation came to be known as the "inverted U" Kuznets Curve. The Environmental Kuznets Curve has been rationalized with reference to stages of growth as posited by Rostow (1960). According to Rostow, the transition from underdevelopment to development can be described in terms of series of steps or stages through which all countries must proceed. He distinguished these stages of economic growth as; the traditional society; the pre-condition for take-off; the take-off, the drive to maturity, the age of high mass consumption (Jhingan, 2013). The traditional society and pre-condition for take-off stages signifies a clean agrarian economy with no pressure on the environment.

Based on economic growth path and as a developing economy, the Nigeria economy is perceived to be on the third stage of Rostow's growth transition (the take off stage). Described as an industrial revolution stage, the Nigerian economy today can be classified into three major sectors namely; the primary/agriculture and natural resources; the secondary-processing and manufacturing; and the tertiary/services sectors. The economy is characterized by structural dualism; the agriculture and industrial sector. The agricultural sector is composed of subsistence and modern mechanized farming, while the industrial sector comprises modern business enterprises especially manufacturing, mining (including crude petroleum and gas) and electricity generation which co-exist with a large number of micro-enterprises employing less than 10 persons mainly located in the informal sector. The large industrial sector contribution is being driven largely by crude production which has led to a rapid expansion of the economy due to rise in oil production and exportation. Over the years, economic growth has thus risen substantially, with annual average of 7.4 per cent in the last decade; the economy is therefore beginning to move from a traditional subsistence agricultural economy to a more modern, more urbanized and more industrially-diverse manufacturing and service economy. There is increase in investment rate, change in method of production, revolutionary change in both agriculture, industry and productivity increases, the desire to achieve economic growth to better the living standards dominates the society, urbanization and accompanied urban labour force increases

Furthermore, Environmental Kuznets Curve is a hypothesized relationship between various indicators of environmental degradation and in the early stages of economic growth, environmental degradation and pollution increase, but beyond some level of income per capita, the trend reverses. This implies that the environmental impact indicator is an inverted U-shaped function of income per capita. Panayotou (1993) supported the view that if there were no change in the structure or technology of the economy, growth in the economy will result in a proportional growth in pollution and other environmental degradation agents. Proponents of the environmental Kuznets curve (EKC) hypothesis suggests that at higher levels of developments, structural change towards information-intensive industries and services, coupled with increased environmental awareness, enforcement of environmental regulations, better technology and high environmental expenditures result in leveling off and gradual decline of environmental degradation.

Empirical Review

A number of empirical works on the relationship between environmental degradation and economic growth have been carried out using different estimation approaches. Shahbaz, Jalil & Dube, (2010) investigated the EKC in Portugal using an ARDL framework. Their findings revealed that the EKC exists and that environmental degradation increases with trade growth, urbanization and energy consumption and then eventually declines.

Shafik & Bandyopadhyay (1992) conducted a cross-country analysis by examining patterns of environmental quality for countries at different income levels. They discovered that income (National GDP) was the most significant indicator of environmental quality. However, the authors claimed that the relationship between environmental quality and economic growth was far from simple. They argued that some countries were able to tackle environmental degradation problems using economic growth; but they opined that the process was not necessarily automatic and that policies and investments were necessary to reduce degradation.

Stern (2003) critiques the EKC hypothesis by decomposing the degradation emissions and examining the statistical considerations of the hypothesis. He argues that urban ambient concentrations of some pollutant may follow the inverted U-shaped relationship with income; however, he claims that EKC is not likely a complete model of pollution emissions or concentrations.

Kamande (2007) investigated the relevance of the EKC for environmental conservation in Kenya using per capita carbon emissions, population growth, per capita GDP and technology variables. The study concluded that EKC does not exist in Kenya.

The effect of environmental degradation on sustainable development of the Nigeria economy was investigated by Ogboru & Anga (2015). The study revealed that a high number of cases of diseases such as cancer, tuberculosis, viral diseases etc. are as a result of environmental pollution which poses great challenge to sustainable economic development among others. Cases of floods, erosions and drastic drop in agricultural output as a result of environmental degradation were also identified. The study recommended that economic instruments and incentives are required to propel this development process in the desired direction.

Araoye, Ajayi, Olatunji & Aruwaji (2018) examined the trend of economic growth and the effect of environmental cost of pollution on economic growth for the period 2000 to 2014 and concluded from their findings that there was an insignificant impact of pollution cost on economic growth in Nigeria.

Omorede (2014) assessed the impact of oil and gas resource exploration on the environment of Delta State oil producing communities of Nigeria and concluded that oil spillage, retardation of vegetation growth, soil infertility, ill-health to members of the community, displacement of the people of the area, constant protestation of host communities, socio-economic deprivation, and perceived marginalization of the people are associated with oil resource exploration.

Methodology
Research Design
Environmental degradation in Nigeria is seen in form of gas flaring, oil spillage and forest loss that affect the people, the economy and economic growth. However, it should be noted that Nigerian rural economy depends heavily on agricultural activities like fishery, hunting, farming, etc. Adopting an ex-post facto research design due to the secondary nature of data employed, a single macro econometric linear equation was modeled to estimate the relationship between environmental degradation and the Nigerian economy. Dataset employed ranged from 1986 to 2016 and were sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin (various issues), the National Bureau of Statistics (NBS), the Nigerian Meteorological Agency (NIMET) and reliable data websites.

Model Specification
A mathematical relationship between dependent and independent variables employed in the study is specified thus;

$GDP_t = f(FOL_t, QGF_t, QOS_t)$ …………………. (1)

For econometric analysis and to avoid the problem of heteroskedasticity, the functional equation is transformed into a linear function thus;

$LnGDP_t = \lambda_0 + \lambda_1 LnFOL_t + \lambda_2 LnQGF_t + \lambda_3 LnQOS_t + \mu_t$…………………………………. (2)

Where:

GDP_t= Real Gross Domestic Product (total amount of goods and services produced in a country in particular year).

FOL_t= Forest Loss (Total amount of trees destroyed in the country in a particular year).

QGF_t= Quantity of Gas flared (Total amount of Gas flared by the multinationals in the country).

QOS_t = Quantity of Oil Spilt (Total tons of oil spilt in the country including petrol and gas tankers' incidences).

$\lambda_0, \lambda_1, \lambda_2, \lambda_3$ are the parameters of the equation and μ_t is the error term.

The non-stationary nature of time series data can lead to spurious regressions and misleading results when conventional empirical analysis is used. This give rise to the need for diagnostic tests so as to ascertain the stationarity properties of the variables employed. In order to smooth the dataset and have glimpse to the long run relationship among the variables, key pre-estimation tests were carried out which include; the Augmented Dickey Fuller unit root test used to check the stationarity level of all variables employed; the Co-integration test used to confirm the series are indeed having a long run relationship. The Error Correction Mechanism (ECM) which correct for all short run errors so as to achieve a better long run relationship while stipulating the duration of adjustment was employed. This was due to the fact that all included variables became linearly integrated at first difference, and they were equally cointegrated, implying that both the long run and short run model are relevant as all short run drift will eventually converge to long run equilibrium. Finally, the stability test was also carried out to enable us predict the dependent variable with a reasonable level of precision given the independent variables used in the analysis.
The apriori expectation is stated as; $\lambda_1 < 0$, $\lambda_2 < 0$, $\lambda_3 < 0$,

Analysis of Result

Unit Root Test

Table 1: Augmented Dickey-Fuller (ADF) Test

Variables	ADF Test Statistic	5% Critical Value	Prob	Remark
LnGDP	3.933209	– 2.954021	0.0233	I(1)
LnFOL	– 5.227053	– 2.954021	0.0012	I(1)
LnQGF	– 3.983044	– 2.954021	0.0160	I(1)
LnQOS	– 3.361226	– 2.954021	0.0275	I(1)

Source: Author's computation from output (2019)

As seen in Table 1, all variables became stationary at first differencing as indicated by the ADF test results. This is shown by ADF calculated statistics for all the variables, which is greater in absolute term than the ADF critical value at 5 percent level of significant. This imply that the variables in the model are all integrated of order one, denoted by I(1). The study further carried out a cointegration test, using both variant of the Johansen cointegration technique. This result is shown in Table 2a and 2b below.

Cointegration Test

Table 2a: Unrestricted Cointegration Rank Test (Trace)

Sample (adjusted): 1988 2016
Included observations: 29 after adjustments
Trend assumption: Linear deterministic trend
Series: LnGDP LnFOL LnQGF LnQOS
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.653119	50.69914	47.85613	0.0264
At most 1*	0.371922	33.99470	29.79707	0.0432
At most 2	0.183005	6.507061	15.49471	0.6356
At most 3	0.022014	0.645525	3.841466	0.4217

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 2b: Unrestricted Cointegration Rank Test (Maximum Eigen Value)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.653119	30.70445	27.58434	0.0192
At most 1*	0.371922	26.48764	21.13162	0.0404
At most 2	0.183005	5.861536	14.26460	0.6311
At most 3	0.022014	0.645525	3.841466	0.4217

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

As shown in Table 2a, the null hypothesis of no cointegration is rejected, as the trace test reveals two cointegrating equations among the variables at 5% level of significance. Similarly, Table 2b depicts the Max-Eigen rank cointegration test which is in tune with the trace rank test, it also indicates two cointegrated equations and thus the null hypothesis of no cointegration is rejected. Both results imply the existence of long-run relationship among the variables in the model. However, since the variables in the model are all integrated at first differencing (i.e. I(1)), then the error correction mechanism (ECM) is a possibility and it equally indicates that the long run static OLS is not spurious and meaningful since the short run dynamic model will at the end adjust to long run equilibrium after overcoming the short run drift.

$$LnGDP = \lambda_0 + \lambda_1 LnFOL_t + \lambda_2 LnQGF_t + \lambda_3 LnQOS_t \quad \ldots (3)$$

Error Correction Model

Table 3: Error Correction Test

Dependent Variable: D(LGDP)
Method: Least Squares
Sample (adjusted): 1986 2016
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.160300	7.973783	0.396336	0.6947
D(LNFOL)	-0.271957	0.272284	-2.998798	0.0259
D(LNFOL(-1))	-0.056012	0.028654	-2.029923	0.0533
D(LNFOL(-2))	-0.054320	0.032431	-1.433012	0.1674
D(LNQGF)	-2.671408	0.673073	1.968974	0.1204
D(LNQGF(-1))	-0.053032	0.033298	-2.210928	0.0744
D(LNQGF(-2))	-0.087653	0.044219	-2.034210	0.0661
D(LNQOS)	-1.070045	0.176414	-6.065520	0.0127
D(LNQOS(-1))	-0.023011	0.011298	-1.633901	0.1431
D(LNQOS(-2))	-0.023054	0.022298	-1.440911	0.1265
ECM(-1)	-0.321230	0.032209	-3.002414	0.0330

R-squared	0.628693	Mean dependent var	14.60162
Adjusted R-squared	0.591562	S.D. dependent var	2.134139
S.E. of regression	1.363910	Akaike info criterion	3.568720
Sum squared resid	55.80755	Schwarz criterion	3.748292
Log likelihood	-56.66824	Hannan-Quinn criter.	3.629959
F-statistic	16.93187	Durbin-Watson stat	1.832675
Prob(F-statistic)	0.003001		

Source: Author's computation from output (2019)

From table 3, the coefficient of determination shows that 63% variation in GDP is explained by all included independent variables, other factors outside the model explains 37% as captured by the error term. The Durbin – Watson value calculated is 1.832675 which tends towards 2 and as such there exist an absence of serial autocorrelation in the model. The overall model is significant at 5 percent level as seen from the probability value of the computed F- statistic which is less than 0.05%. Again, the coefficient of ECM is rightly signed and significant at 5 percent level. This means that the ECM can correct any deviation from the long-run equilibrium relationship at about 32 percent. That is, the speed of adjustment is 32 percent.

The result from the parsimonious model revealed that LnFOL and LnQOS are rightly signed and statistically significant at 5% level of significance as they both appeared with a negative sign and were significant at 5 percent level of significance indicating that an increase in forest loss (FOL) and quantity of oil spilt (QOS) will lead to a fall in economic growth through the degradation of the environment. It implies that a one percent increase in FOL and QOS will decline in growth by 0.27% and 1.07% respectively. Again LnQGF was rightly signed but not statistically significant, this could stem from the fact that gas flaring is a feature common mostly in oil producing areas of the country. Thus the impact/effect is not felt in the economy as a whole. Based on the result gotten, the paper rejects the null hypothesis implying that both in the long-run and short-run, environmental degradation has negated on growth in Nigeria.

Stability Test

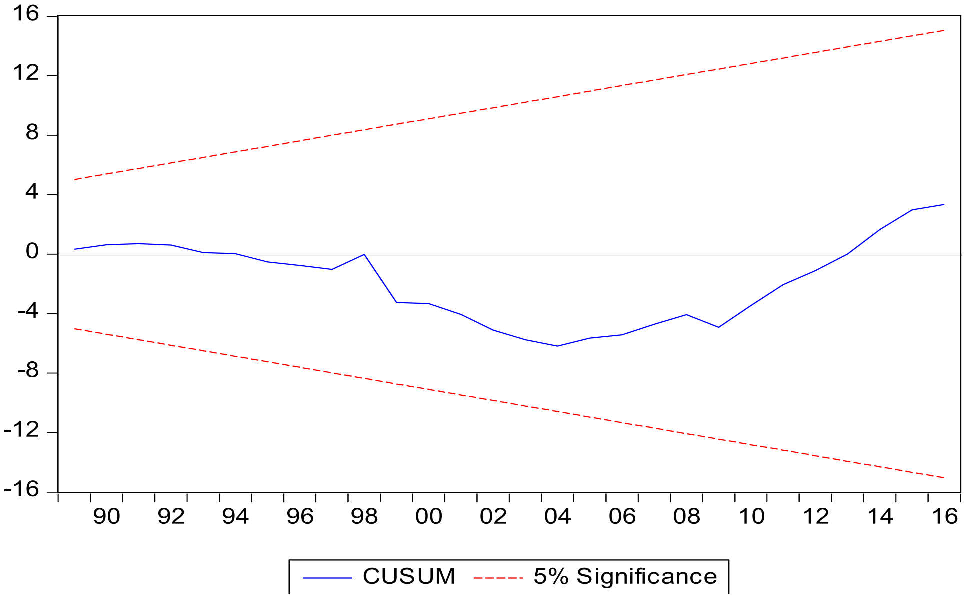

Fig. 1: Cusum Stability Test Result

Figure 1 shows that the plot of CUSUM fall within the five per cent critical bound as indicate by the two lines that bounded the trend curve. This corroborates the stability view and implies that the parameters of the model are stable, do not suffer from any structural instability over the period of study and are useful for policy decision.

Ramsey Linearity Test

The Ramsey Reset Test is conducted to test for linear relationship between the dependent and independent variables employed in a model. The null hypothesis is rejected at if the t and f statistic is significant at 5% level of significance.

Table 4: Ramsey Linearity Test

Ramsey RESET Test
Equation: UNTITLED
Specification: LNGDPLNFOL LNQGFLNQOS
Omitted Variables: Squares of fitted values

	Value	Df	Probability
t-statistic	0.457831	27	0.7045
F-statistic	0.311668	(1, 27)	0.5824
Likelihood ratio	0.456976	1	0.6006

Source: Author's computation from output (2019)

Table 5 shows the result of Ramsey Reset Test. The result indicates an acceptance of the null hypothesis. This is so because the t-statistics, the F-statistics and the likelihood ratio are not statistically significant at 5% level of significance.

Autocorrelation Test

To test for the existence of autocorrelation in the model, the Breusch-Godfrey Serial Correlation LM Test was employed. The null hypothesis is that there is no serial or autocorrelation

Table 5: Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.833161	Prob. F(2,26)	0.1800
Obs*R-squared	3.472181	Prob. Chi-Square(2)	0.1762

Source: Author's computation from output (2019)

The result in Table 7 shows absence of autocorrelation because the F-statistics is not significant at 5% level of significance. Therefore, we shall accept the null hypothesis of no serial correlation in the model.

The Breusch-Pagan-Godfrey serial heteroskedasticity test was employed to test for existence of interdependence of error terms across time in the model. The null hypothesis is that there is no heteroskedasticity

Heteroskedasticity Test

Table 6: Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.461646	Prob. F(3,27)	0.2471
Obs*R-squared	4.331156	Prob. Chi-Square(3)	0.2279
Scaled explained SS	3.326208	Prob. Chi-Square(3)	0.3440

Source: Author's computation from output (2019)

The result in Table 7 revealed that the F-statistics is not significant at 5% level of significance, thus the absence of heteroskedasticity. Therefore, we shall accept the null hypothesis of no serial correlation in the model.

Conclusion and Recommendations

The aim of the study was to ascertain the link between environmental degradation and the Nigerian economic growth. Employing secondary environmental degradation and GDP data from 1986 – 2016, the study revealed that the independent variables forest loss and quantity of oil spilt have impacted negatively on the environment and have adverse effect on economic growth. The study also showed that there exists a long run relationship between economic growth and environmental degradation. As a developing economy, findings from the study suggest that environmental protection policies and laws in Nigeria should be revisited in order to cushion the effect of degradation.

Since it will take a while for the developing Nigerian economy to move from one side of the EKC to the other thus from point of under development to take off stage to time of environmental improvement. The accumulated damage in the meantime may far exceed the present value of higher future growth and a cleaner environment especially due to higher discount rates of capital constraint on low-income in Nigeria. It is therefore recommended to have an active environmental policy to mitigate environmental degradation at the early stage of our development purely on economic ground. Also prevention at an early stage may be more cost effective than a future cure. Also, check policies is needed to address the issue of water deterioration through oil spillage while a check should be put to control land degradation mainly through forest loss.

References

Aigbokhan, B.E. (1995), *Macroeconomic: Theory Policy and Evidence*, Benin City Idenijies Publishers

Araoye, F. E., Ajayi, E. O., Olatunji, T. E., & Aruwaji, A. M. (2018). Environmental Cost accounting: effect of pollution on economic growth in Nigeria. *Journal of Accounting and Financial Management,* 4 (1), 19-31

Dasgupta, P. (1995). *An inquiry into well-being and destitution*. Oxford University Press on Demand.

Deacon, R. & Norman, C. S (2004). *Is the Environmental Kuznets Curve an Empirical Regulatory*? *Working Paper*, University of California, Santa Barbara

Dinda, S. (2004). Environmental Kuznets Curve hypothesis: A Survey Ecological Economics

Egbulonu, K.G. & Ajudua, E. I. (2017). Determinants of Economic Growth in Nigeria: A Macro- Econometric Approach. *International Journal of Innovative Finance and Economics Research* *5*(1):22-33, www.seahipaj.org, ISSN: 2360-896X

Grossman, G. M. & Krueger, A. B. (1995). Economic Growth and the Environment. *Quarterly Journal of Economics 110*(2), 353-377

Johnson, D. L., Ambrose, S. H., Bassett, T. J., Bowen, M. L., Crummey, D. E., Isaacson, J. S., ... & Winter-Nelson, A. E. (1997). Meanings of environmental terms. *Journal of environmental quality*, *26*(3), 581-589.

Jhingan, M. L. (2013), *The Economics of Development and Planning* (40th Edition), India: Vrinda Publications (P) Ltd.

Kamande, W. (2007). *Environmental Conservation as an Engine for Economic Growth: Testing the Validity of Environmental Kuznets Curve on Carbon Emissions for Kenya.* Unpublished MA Thesis, University of Dares Salaam.

Lopez, R. & Mitra, S. (2004). Corruption, Pollution and the Environmental Kuznets Curve" *Journal of Environmental Economics and Management*

Mehadavia, D. (1999). *Economic Growth and Environmental Degradation: Case of Gujarat*. Available from: https://www.researchgate.net/publication/313901024_Economic_Growth_and_Environmental_Degradation_Case_of_Gujarat [accessed Nov 21 2019].

Mladenovic I., Sokolov-Mladenovic, S., Milovancevic, M., Markovic, D., & Simeunovic, N. (2016). Management and estimation of thermal comfort, carbon dioxide emission and economic growth by support vector machine. *Renewable and Sustainable Energy Reviews*,*64*, 466-476. doi:10.1016/j.rser.2016.06.034

Ogboru, I. & Anga, R. A. (2015). Environmental Degradation and Sustainable Economic Development in Nigeria: A Theoretical Approach, *Journal of Economics 3* (6), ISSN 2347-8233 1 www.researchjournali.com

Omorede, C. K. (2014). Assessment of the Impact of Oil and Gas Resource Exploration on the Environment of selected communities in Delta State, Nigeria. *International Journal of Management, Economics and Social Sciences, 3(2), 79-99*

Panayotou, T. (1993). *Empirical Tests and Policy Analysis: Stages of Economic Development.* ILO Technology and Employment Program Working Paper (WP 238) Geneva

Selden, T.M & Song, D. (1994) Environmental Quality and Development: Is there a Kuznets Curve for Air Pollution Emission? *Journal of Environmental Economics and Management*

Shafik, N & Bandyopadhyay, S. (1992). Economic Growth and Environmental Quality" Working Paper, World Development Report

Shahbaz, M., Jalil, A., & Dube, S. (2010). *Environmental Kuznets Curve (EKC): Times Series Evidence from Portugal*, University, Islamabad, Pakistan, California State University, Sacramento (CSUS), Sacramento, CA, USA.

Stern D. L. (2003). *The Environmental Kuznets Curve*. Unpublished Manuscript, Renselar Polytechnic Institute

Todaro, M. P. & Smith, S. C. (2011) *Economic Development*. Pearson Education Limited, Harlow England, 11th Edition.

Ullah, Fand Rauf, A. (2013), Impacts of Macroeconomic Variables on Economic Growth: A Panel Data Analysis of Selected Asian Countries, GE-*International Journal of Engineering Research* available on line at www.gejournal.net

United Nations Environmental Programme (UNEP).2012 Report, Any Serious Plan to save our Environment.www.google.com