Sustainable Economic Development and Environmental Degradation: Evidence from Nigeria

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Abstract
This study examined the trade-off between economic growth and environmental degradation in Nigeria. This is against the postulation of Simon Kuznets' inverted-U hypothesis in 1955 that pollution and other environmental degradation first rises and then falls with increase in income per capita. The study adopted the Vector Auto Regressive (VAR) approach in addition to the granger causality test to estimate this relationship using time series data from 1986 to 2015. The findings of this study reveal that the Environmental Kuznets Curve (EKC) does not fit the Nigerian data and contradicts the inverted-U hypothesis. This implies that at low income levels, the environment improves while at high income levels, the environment worsens. The empirical results reveal that an increase in GDP per capita leads to a rise in CO2 per capita which denotes environmental degradation. Conversely, an increase in CO2 emissions does not contribute significantly to growth which is contradictory. The study concludes that there is no significant trade-off between economic growth and environmental degradation – as both variables do not meaningfully affect each other. The study recommends that unless a meaningful reconciliation is done between fostering economic growth and protecting the environment, the goal of sustainable development will continue to be impaired by the overlaps. Further studies are recommended on estimating the balance between sustained economic growth and environmental sustainability.

Keywords: *Economic Growth, Environmental Degradation, Kuznets Inverted-U Hypothesis, Sustainable Development*

1. Introduction

Since the 2000s, Nigeria has had overall growth in the range of 6.5–8.0% a year, reaching 7.3% in 2011–2012. But that growth has not translated into a strong diversified economy because economic management remains challenged by weak implementation capacity. This has aroused concerns on the sustainability of Nigeria's economic growth especially in a period when the country is witnessing economic recession. Domestic output has decelerated notably – declining from 6.22% in 2014 to 2.79% in 2015 and further to -0.36% and -2.06% in Q1 and Q2 in 2016 respectively (CBN, 2016). This is not surprising as the country failed to capitalise on the significant growth witnessed in the last decade to buffer its reserve, create employment and narrow its infrastructure deficit. What then is the way forward to propel the Nigerian economy back on the path of growth and sustainable development? Evidence (Khan & Agha, 2015) suggests that for sustainable development to be achieved, its main elements of economic growth and environmental preservation should be well coordinated.

According to Todaro & Smith (2010), the term sustainability reflects the need for careful balance between economic growth and environmental preservation. In recent years,

economists have increasingly focused on the important implications of environmental issues for the success of development efforts. This is because the environment supports the livelihood of more than half of the economically active population especially in the developing world through agriculture, animal husbandry, hunting, fishing and foraging. This accentuates the importance of the "ensuring environmental sustainability" as one of the Millennium Development Goals (MDGs). This implies that environmental quality affects economic development and in turn is affected by it. However, there seems to be a trade-off between economic growth and economic degradation. While environmental sustainability is an integral part of global goals, its protection and economic growth are often seen as competing aims.

There appears to be a trade-off between economic growth and environmental degradation because of the desire for high growth and excessive use of resources that cause environmental pollution. According to Awan (2013), poor people and poor countries depend on the soil for food, the rivers for water and forests for fuel. Because they need these resources desperately, they have little choice, without assets or income, than to overuse them and to destroy their natural environment simply to survive. Rising pressures on environmental resources in developing countries has imposed high costs on citizens through health related expenses, climate change, global warming and reduced productivity of resources. As population rises and incomes rise, net global environment is likely to worsen in Nigeria and in the world. This implies that some trade-off will be necessary to achieve sustainable development. What then is the level of trade-off that is necessary to exist for sustainable development to be achieved?

Simon Kuznets was the first to examine the empirical relationship between economic growth and the environment – popularly known as the Environmental Kuznets Curve (EKC) or the Inverted-U hypothesis. The environmental Kuznets curve is a hypothesized relationship between variousindicators of environmental degradation and income per capita (Stern, 2003). In the earlystages of economic growth degradation and pollution increase, but beyond somelevel of income per capita (which will vary for different indicators) the trendreverses, so that at high-income levels economic growth leads to environmentalimprovement. This implies that the environmental impact indicator is an invertedU-shaped function of income per capita. Several studies (as shown in review of related literature) have been carried out to empirically test and confirm the EKC – however the results have produced conflicting outcomes especially in Less Developed Countries (LDCs).

The question that comes to mind therefore is: does the Environmental Kuznets Curve hold for Nigeria? This study therefore seeks to examine empirically, first, the trade-off between economic growth and environmental degradation in Nigeria; second, the direction of causality between economic growth and environmental degradation in Nigeria; and third, to empirically examine if the Inverted-U hypothesis fits the Nigerian data. The rest of the paper is structured as follows. Section two reviews the related literature (cross-country and Nigeria evidence), presents the theoretical framework and examines the Nigerian Environmental Kuznets Curve. Section three is the methodology of the study. Section four presents the results and discussion alongside the analysis of the empirical data. Section five concludes the paper and attempts some policy recommendations.

2. Review of Related Literature

2.1 Theoretical Framework: Environmental Kuznets Curve (EKC)

Evidence suggests that the very poor cause considerable environmental destruction as a direct result of their poverty. This implies that increasing the economic status of the poorest group would provide an environmental windfall. However, as the income and consumption

levels of everyone in the economy rises, there is likely to be a net increase in environmental destruction. At one point it was widely believed that as per capita incomes rose, pollution and other forms of environmental degradation would rise first and then fall in an inverted-U pattern. This idea is referred to as the Environmental Kuznets Curve (EKC). The EKC is a graph reflecting the concept that pollution and other environmental degradation first rises and then falls with increase in income per capita.

There has been much controversy among economists over the issue of whether economic growth increases or decreases income distribution. Prof. Kuznets is the first economists to study this problem empirically. In his 1955 study, Kuznets utilised data in relation to three Less Developed Countries (LDCs) – India, Ceylon and Puerto-Rico and two Developed Countries (DCs) – the United Kingdom and the United States (Kuznets, 1955). Simon Kuznets 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 characterised by the "inverted-U" **Kuznets curve** because a longitudinal (time-series) plot of changes in the distribution of income (measured by Gini coefficient), when per capita GNI expanded seemed to trace out an inverted U-shaped curve in some of the cases Kuznets studied. Inequality might worsen during the early stages of economic growth due to the nature of structural change and in accordance with the Lewisian model, growth may be concentrated in the modern industrial sector, where employment is limited but wages and productivity are high. This is illustrated in a graph below.

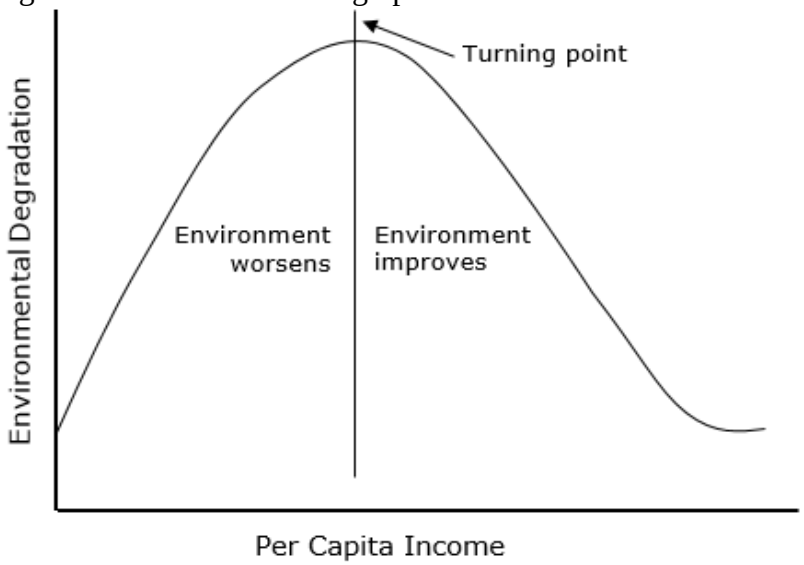

Figure 1: Environmental Kuznets Curve (EKC)

According to the theory, as incomes rise, societies will have both the means and willingness to pay for environmental protection. There is good evidence that this inverted-U relationship holds for some local pollutants such as particulate matter in the air, sulphur-dioxide and nitrogen oxides. However, there is no convincing evidence that other environmental damage decreases with higher incomes. In the case of global public goods, such as greenhouse gases, even if the EKC relationship does hold in the very long run, some damage such as loss to biodiversity may well prove to be irreversible.

As noted by Kuznets, the curve could be generated by a steady process of modern-sector enlargement growth as a country develops from a traditional to a modern economy. According to Todaro & Smith (2011), while Kuznets did not specify the mechanism by which his inverted-U hypothesis was supposed to occur, it could in principle be consistent with a sequential process of economic development. However, traditional and modern sector enrichment tends to pull inequality in opposing directions, so the net change in inequality is

ambiguous, which makes the validity of the Kuznets curve an empirical question. Disregarding the merits of the methodological debate, few development economists argue that the Kuznets curve of increasing and then declining inequality is inevitable.

There are enough case studies and specific examples (Todaro& Smith, 2011) of countries such as Taiwan, South Korea, Costa Rica, and Sri Lanka that demonstrate that higher income levels can be accompanied by falling and not rising inequality. This depends on the nature of the development process. What then is the relationship between rising income and inequality in Nigeria? This study thus contributes to this theoretical debate by investigating the relationship between economic growth and environmental degradation in Nigeria with the aim of examining the trade-off between them.

2.2 Related Literature on Economic Growth and Environmental Degradation

2.2.1 Cross-Country Evidence

Dizaji, Badri & Shafaei (2016) investigated the relationship between economic growth and environmental quality in D8 member countries. The study examined the relationship between economic growth and environmental quality in Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan and Turkey using panel data model in the period 1975 – 2012. The results showed that economic growth has a positive effect on carbon dioxide emissions. However, the square GDP per capita has significant negative effect on carbon dioxide emissions. The study concludes that the Environmental Kuznets Curve hypothesis is confirmed from the studied group of countries.

Wolde (2015) aimed to study the relationship between economic growth and environmental degradation in Ethiopia by questioning the existence of environmental Kuznets Curve (EKC). The study used time series data from 1969 to 2011 to analyse the relationship via the Vector Error Correction Model (VECM). The finding indicates existence of EKC hypothesis in Ethiopia. The EKC curve is consistent with findings in other countries – contributing to environmental degradations at the early stage and declines with increasing economic growth in the later stage. The study attributed this to an increase in share of service sector in the economic growth and application of environmental law with economic activity. The author recommended that to sustain the current trend, the country should have to follow the existing environmentally friendly economic policy.

Phimphanthavong (2013) on the impacts of economic growth on environmental conditions in Laos aimed at examining the relationship between economic growth and environmental degradation. The carbon dioxide emission (CO_2emissions) per capita was as a proxy for environmental degradation, using time series data for the period between 1980 and 2010. Hinging the background of the study on the hypothesis of the Environmental Kuznets Curve (EKC) that environmental degradation follows an inverted U-shaped trajectory in relation to economic growth. The result of the study confirms the inverted correlation between economic growth and environmental degradation of EKC's hypothesis (that at the early stage economic growth increases environmental degradation, then environmental degradation decreases after reaching a certain level of average income per capita). Moreover, other factors, such as trade openness, industrial extension, and becoming a full member of ASEAN, also caused an increase in environmental degradation. The study recommended that in order to reach the sustainable development goal, strong environmental and natural resource protection policies are suggested for the current and future development of Laos.

Abdullai & Ramcke (2009) examined the impact of trade and economic growth on the environment in developed and developing countries. The paper explores the interrelations between economic growth, international trade and environmental degradation both theoretically and empirically. Panel data from developed and developing countries for the

period of 1980 to 2003 was used and previous critique, especially on the econometric specification, was embedded. The results indicate that there is an Environmental Kuznets Curve (EKC) for most pollutants, but with several reservations. Also, they found that none of the various hypotheses that concern the link between trade and environmental degradation can be entirely confirmed. In addition, the results showed signs that trade liberalization might be beneficial to sustainable development for rich countries, but harmful to poor ones. They concluded that, given that developing countries do not usually have the institutional capacities to set up the appropriate environmental policies; it is on developed countries to take the lead in addressing environmental degradation issues and assisting developing countries.

Yang, Yuan & Sun (2007) carried out an empirical study of Zhejiang province to examine the Relationships between economic growth and environmental pollution based on time series data. They employed the methods of Johansen Cointegration test and Granger Causality test and applied it to the time series data of three kinds of pollution indices (discharged amount of industrial wastewater, discharged amount of industrial waste gas and the products of industrial solid waste material) from 1981 to 2006. The results showed that these pollution indices all had a negative long-term cointegrating relationship with GDP per capita, which means that economic growth does not necessarily result in environmental degradation. The results also indicated that the GDP per capita granger caused pollution emission of industrial wastewater and industrial waste gas except for industrial solid waste discharge, while it was not true vice versa. In line with the findings, they recommended that, accordingly, empirical researches on economic growth and environmental protection can be coordinated, as larger environment investment and stricter environmental policies regulations get down to play more important roles and has reference meaning for other regions.

2.2.2 Evidence from Nigeria

Ogboru & Anga (2015) in a theoretical approach to Environmental Degradation and Sustainable Economic Development in Nigeria asserted that successive Nigerian administrations from the colonial era paid little attention to environmental issues. The study examined the effects of environmental degradation and the risk or threat it poses to sustainable economic development in Nigeria. The paper posited that a high number of cases of diseases such as cancer, tuberculosis, viral diseases etc. are consequences 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 paper therefore recommended that since our national development policy objective is to achieve rapid economic growth and improvement in individual welfare on a sustainable basis a range of enabling policies, economic instruments and incentives are required to propel this development process in the desired direction.

Ejuvbekpokpo (2014) investigated the impact of carbon emissions on economic growth in Nigeria covering the period from 1980 – 2010. Secondary data was collected from Central Bank of Nigeria, carbon dioxide information analysis annual publication and international energy agency. The variables used include; gross domestic product, emissions from fossils fuel, gas fuels, liquid fuels and solid fuels. This was subjected to ordinary least squares method of analysis. The result revealed that carbon emissions have negative impact on economic growth in Nigeria. On the basis of the findings, it was recommended, that oil-producing countries like Nigeria should be compensated through the implementation of the Kyoto protocol agreement, there should be policy measures to reduce its greenhouse gas emissions and that concerted effort by both the government and oil multinational firms and the private sector must pursue these policies vigorously to bring about carbon emission free state.

Akpan & Chuku (2011) in a research work titled "Economic Growth and Environmental Degradation in Nigeria: Beyond the Environmental Kuznets Curve (EKC)" examined the policy relevance of the EKC for Nigeria by applying Autoregressive Distributed Lag (ARDL) framework to annual time series data from 1960 to 2008. The traditional EKC model was extended by including, trade openness as well as the shares of manufacturing, agriculture and service sectors in Nigeria's Gross Domestic Product. Using CO_2 emissions per capita to proxy environmental degradation, their findings do not support the existence of the EKC hypothesis. Rather it shows that Nigeria's situation when confronted with data is exemplified by an inverse 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 posits 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.

Akomolafe, Danladi & Oseni (2015) analyzed the relationship between trade openness, economic growth, and environmental pollution in Nigeria. The study introduced urbanization and ruralisation as measures of the growth of urban and rural sectors to analyze their contributions to pollution in the country. Using Vector Error Correction Mechanism (VECM) and co-integration techniques, the result confirms the existence of the Environmental Kuznets Curve in Nigeria. Also, there is a positive relationship between ruralisation and environmental pollution both in the short and long run. However, the result reveals a negative relationship between urbanization and environmental pollution in the long run, but positive in the short run. The study concludes with a recommendation that there is a need for policy makers to enact and enforce environmental laws that are aimed at regulating various sources of environmental pollution in the country.

3. Research Methodology

3.1 Model Specification

This study hinges on the theoretical underpinning of the Environmental Kuznets Curve (EKC) which postulates a relation between economic growth and environmental degradation. To examine the trade-off between these variables and the causality between them, carbon dioxide emissions per capita and GDP per capita are used as proxies for environment and economy respectively. The model evaluated is given as:

$$CO2_t = \alpha_0 + \alpha_1 GDP_{t-1} + U_1 \quad . \quad . \quad . \quad \text{i}$$

$$GDP_t = \alpha_0 + \alpha_1 CO2_{t-1} + U_2 \quad . \quad . \quad . \quad \text{ii}$$

Where: CO2 = Carbon dioxide emissions (metric tonnes per capita)
GDP = Gross Domestic Product (per capita)
$\alpha_0 - \alpha_1$ = parameters to be estimated
U_i = Error term

Based on a priori expectation, it is expected that there should be a positive relationship between GDP per capita and CO2 emissions per capita. This implies that as GDP per capita increases, CO2 emission is expected to increase (signifying environmental degradation). On the other hand, as CO2 increases, GDP per capita is also expected to increase. Thus, a significant trade-off is expected to exist between economic growth and environmental degradation.

3.2 Method of Study

The Vector Auto Regressive (VAR) model is used to estimate the trade-off between economic growth and environmental degradation in Nigeria. The VAR is commonly used for forecasting systems of interrelated time series and for analyzing the dynamic impact of random disturbances on the system of variables. The VAR approach sidesteps the need for structural modelling by treating every endogenous variable in the system as a function of the lagged values of all of the endogenous variables in the system. The Granger causality test and is also used to buttress the VAR model and diagnostic tests are also employed to examine the stability of the sample estimates. This is done to obtain plausible numerical estimates of the parameters, and to give empirical content to the estimated function. The model is estimated using data gotten from 1986 – 2015. This data is sourced from World Development Indicators.

4. Results and Discussion

4.1 The Nigerian Environmental Kuznets Curve

Kuznets' inverted-U hypothesis has been empirically tested and confirmed by some economists while others find it the other way. In his study of eleven developing and developed countries, Kravis (1960) confirms the Kuznets hypothesis that the degree of inequality first increases at lower levels of development and then declines at higher levels of development. Adelman & Morris (1973) in their study of 43 developing countries and 13 developed countries came to the conclusion that income inequality increases up to a certain level of development and then declines – thereby confirming the Kuznets inverted-U hypothesis. Similarly, Ahluwalia (1963) in his analysis of data for 60 countries found out that relative income inequality increases substantially in the early stages of development with reversal of this tendency in the later stages.

Despite these, the validity of the Kuznets inverted-U hypothesis has been questioned on the basis of the data taken by Kuznets and others for their studies. Critics opine that his analysis is based on 5 per cent empirical information and 95 per cent speculation (Jhingan, 2007). According to Todaro (cited in Jhingan, 2007), the long run data for developed countries do seem to support the Kuznets hypothesis, but the studies of the phenomenon in LDCs have produced conflicting results. His study of 13 LDCs shows that higher income levels can be accompanied by falling and not rising inequality. Todaro also finds fault with the methodology used by economists to test the Kuznets hypothesis. The time series data being not available for most LDCs, economists use cross-sectional data for drawing conclusions which is basically wrong. A study by Anand & Kanbur (1993) showed that the choice of data as the measure of inequality may lead to U-relationship between income inequality and development, inverted-U relationship or no relationship at all. The graph below empirically tests the EKC using time series data and examines the relationship between economic growth and environmental degradation.

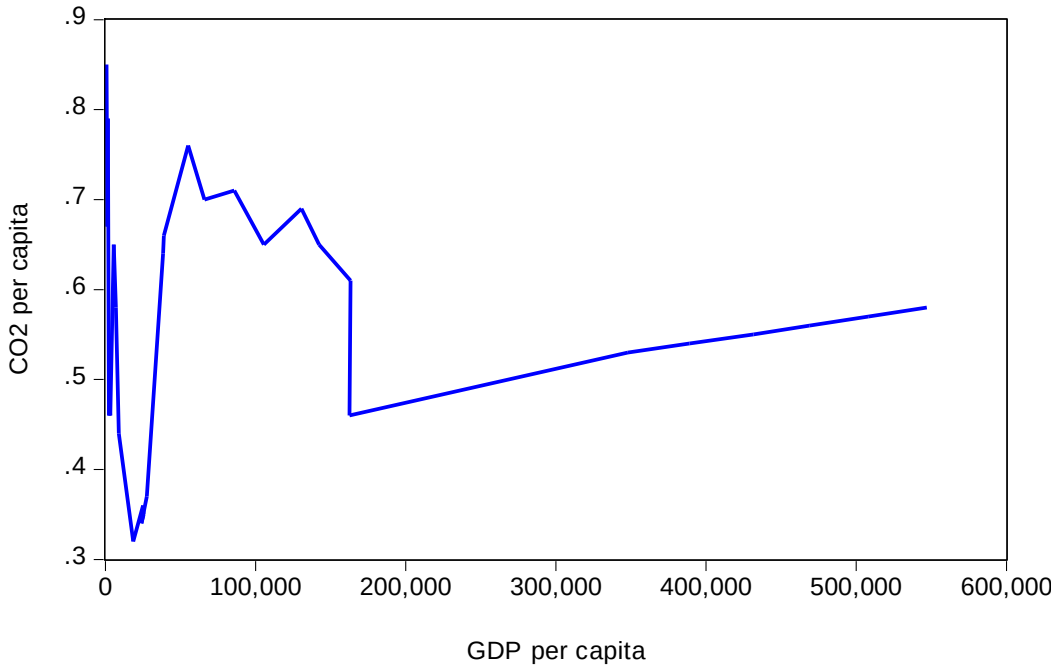

Figure 1: The EKC for Nigeria
Source: Authors Computation

The graph above shows that the EKC does not fit the Nigerian data. In other words, it does not conform to Kuznets hypothesis of increasing inequality at lower levels of development and declining inequality at higher levels of development. The graph above shows that in Nigeria, CO2 emissions reduces at a lower level of income (development) and increases at a higher level of development. This contradicts the findings of Kuznets with respect to Nigeria. Conversely, this is in line with the findings of Fields (2001) which contends that the results of LDCs produce conflicting results. This can be attributed to geographic, social, financial and technological dualism prevalent in LDCs.

4.2 Data Analysis

In order to avoid nonsensical regression estimates which may lead to spurious results, the data is subjected to unit root test to examine the stationarity of the data series. The result of the Augmented Dickey-Fuller (ADF) test is presented below:

Table 1: Stationarity Test

Variable	ADF Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	Prob.	Order of Integration
CO2	-6.28	-3.69	-2.97	-2.63	0.0000	I(1)
GDP	-4.28	-3.69	-2.97	-2.63	0.0024	I(1)

Source: Eviews9 Output, 2016.

The ADF statistic values for CO2 and GDP are -6.28 and -4.28 respectively. The associated one sided p-values (for 30 observations) are less than 0.05. The result also shows that the statistic t_α value is greater than the critical values at 1%, 5%, and 10% for both variables, so we reject the null hypothesis at the conventional test size. Thus, the variables are stationary at first difference series.

The finding that the macro time series contains a unit root has spurred the non-stationary time series analysis. Engle and Granger (1987) pointed out that a linear

combination of two or more non stationary time series may be stationary. If such a stationary linear combination exists, the non-stationary time series is said to be cointegrated. The stationary linear combination may be interpreted as a long run equilibrium relationship between the variables. The Johansen system framework is employed to test for the presence of cointegrating relationships among the non-stationary variables. The result is presented below:

Table 2: Co integration Test

Null Hypothesis	Trace Statistic	0.05 Critical Value	Null Hypothesis	Max-Eigen Statistic	0.05 Critical Value
r = 0*	18.67	15.49	r = 0*	17.03	14.26
r ≤ 1	1.64	3.84	r ≤ 1	1.64	3.84

Source: Eviews9 Output, 2016.

*Note: r represents number of co integrating vectors. Both Trace statistic and Max-Eigen statistic indicates 1 co integrating equation each. * denotes rejection of the hypothesis at the 0.05 level*

The Trace test and Max-Eigen value test shows a long run equilibrium relationship between the variables. Thus, the null hypothesis of no co integrating equation is rejected since their statistics are greater than their respective critical values for the co integrating equations at 5% significance level. This implies a stationary linear combination, as such the non stationary time series are co integrated.

The cumulative sum of squares of the recursive residuals shows that there is stability in the equation within the sample period. The result is shown below:

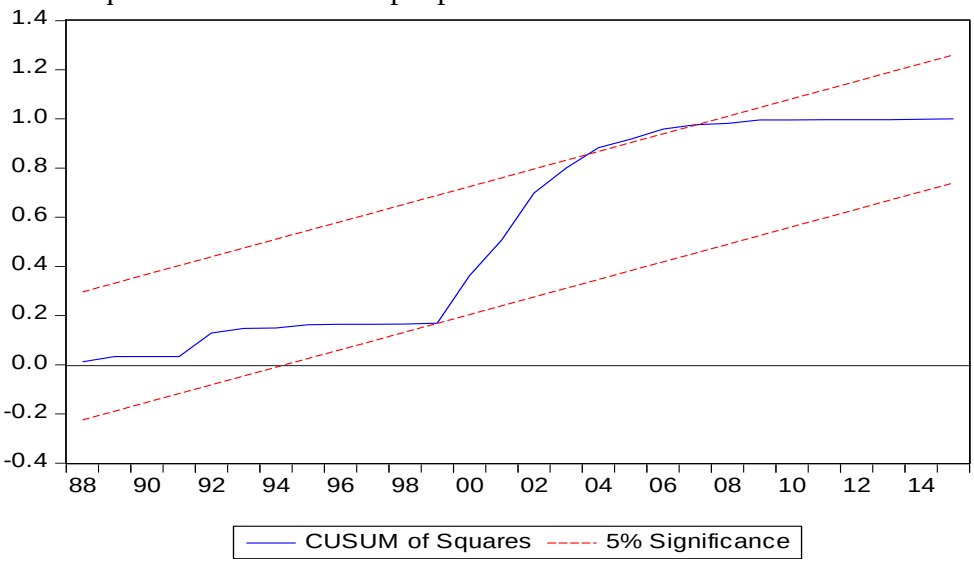

Figure 2: CUSUM of Squares Test
Source: Eviews9 Output, 2016.

Movement of recursive residuals inside the critical lines is suggestive of coefficient stability. This further substantiates the long run equilibrium relationship between the variables.

VAR Lag Order Selection Criteria

An optimal lag of 1 is chosen for the empirical model based on Schwarz Information Criterion, Akaike Information Criterion, Sequential Modified LR Test Statistic, Final Prediction Error and Hannan-Quinn Information Criterion.

Table 3: Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-359.8173	NA	5.74e+08	25.84409	25.93925	25.87318
1	-304.0478	99.58834*	14248590*	22.14627*	22.43174*	22.23354*
2	-303.1722	1.438413	17920085	22.36945	22.84523	22.51490

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: Eviews9 Output, 2016.

4.2 Economic Growth and Environmental Degradation in Nigeria

The study estimated the effect of economic growth on environmental degradation and vice versa. The table below shows the estimates of the coefficients.

Table 4: Unrestricted VAR

Independent Variables	**Dependent Variables**	
	CO2	**GDP**
GDP	0.02	-
	(0.02)	
CO2	-	-0.01
		(0.13)
R^2	0.51	0.99
Adj. R^2	0.47	0.99
F statistics	13.55	1,338.97
$F_{0.05}$	4.20	4.20

Source: Eviews9 output, 2016

Note: Standard Error in parenthesis

The result reveals that economic growth has no significant effect on environmental degradation in Nigeria. Conversely, environmental degradation also does not significantly affect growth. The result further shows that GDP per capita moderately explains the variations in CO2 per capita by about 51% while CO2 per capita explains about 99% of the variations in GDP per capita. In addition, while GDP per capita may contribute positively to CO2 emissions which is harmful to the environment, CO2 emissions on the other hand does not spur growth – this is contradictory as increases in CO2 emissions indicates a higher level of industrialisation and in principle should signify economic growth.

This result is substantiated by the granger causality test which shows that both economic growth and environmental degradation contain no future information about each other. In other words, the series of GDP per capita is not useful in predicting the future values of CO2 per capita and vice versa. The result is shown below:

Table 5: Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
GDP_PER_CAPITA does not Granger Cause CO2_PER_CAPITA	28	0.06749	0.9349
CO2_PER_CAPITA does not Granger Cause GDP_PER_CAPITA		0.73090	0.4923

Source: Eviews9 output, 2016

This shows that there is no causality between the variables. This buttresses the non-significance of the VAR estimates.

5. Conclusion

From the above analysis, it is difficult to conclude that the Environment Kuznets Curve (EKC) fits the Nigerian data. The EKC for Nigeria shows that at low income levels (early stages of growth), the relationship between growth and environment is inverse while at high income levels (later stages of growth) it is direct. Thus, at low income levels, the environment improves while at high income levels, the environment worsens. This is not consistent with the findings of Kuznets – who observed that in the early stages of growth, pollution and environmental degradation first rises and then falls with increase in income per capita. The empirical results reveal that an increase in GDP per capita leads to a rise in CO2 per capita which denotes environmental degradation. Conversely, an increase in CO2 emissions does not contribute significantly to growth which is contradictory.

The study therefore concludes that there is no significant trade-off between economic growth and environmental degradation – as both variables do not meaningfully affect each other. The study recommends that unless a meaningful reconciliation is done between fostering economic growth and protecting the environment, the goal of sustainable development will continue to be impaired by the overlaps. Further studies are recommended on estimating the balance between sustained economic growth and environmental sustainability.

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DATA ESTIMATED

YEAR	CO2 per capita	GDP per capita
1986	0.85	869.83
1987	0.67	1,265.80
1988	0.79	1,629.78
1989	0.46	2451.73
1990	0.47	2,944.55
1991	0.46	3,354.94
1992	0.65	5,521.74
1993	0.58	6,934.33
1994	0.44	8,941.18
1995	0.32	18,524.95
1996	0.36	25,179.19
1997	0.35	25,502.29
1998	0.34	24,100.54
1999	0.37	27,642.03
2000	0.64	38,390.77
2001	0.66	38,959.88
2002	0.76	55,152.09
2003	0.70	65,941.69
2004	0.71	85,814.29
2005	0.65	105,545.351
2006	0.69	130,547.35
2007	0.65	142,307.54
2008	0.61	163,220.94
2009	0.46	162,595.97
2010	0.53	347,934.39
2011	0.54	389,040.11
2012	0.55	431,523.16
2013	0.56	468,762.86
2014	0.57	507,882.71
2015	0.58	547,002.56