Income Effect and Environmental Sustainability in Nigeria

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Abstract
This study "Effect of Income on Environmental Sustainability in Nigeria" is aimed at investigating whether sustainable environment is a major index of economic growth and to see if environmental sustainability affects economic growth; the study shall also establish whether Environmental Kuznets Curve exists in Nigeria. To achieve these, we have to check how the following variable per capita GDP affects the environmental factor Co_2. The study then applied a simple regression analysis to test for the behavior of some variables. It was discovered that; environmental sustainability is a major indexes for sustainable development in Nigeria, On the other hand it was surprising to found that environmental degradation promote economic growth in Nigeria. The study also proved that there is the present of Environmental Kuznets Curve in Nigeria.

Keywords: environmental sustainability, income, EKC, carbondioxide

1.1 Background to the study

Environmental sustainability and income are two fundamental issues that have drawn attention to scholars recently owing to the level of degradation by man in search for better living. Generally, income generating activities affect the environment. Also, there is no environment that is independent from economic activities. It is this economic activity that determined the level of economic growth. Therefore, economic growth and environmental sustainability are the major discuss in this paper. Hence, both of them depend on each other for the economy to improve. However, this interdependent has resulted to much damage being caused to the environment if not well managed. The extent of destruction has call for global interest as the world over is yearning on how the level of depletion of the ozone layer could be reduce, thus calling for what is known as 'green economy'. 'Green economy' discussion focuses attention on how economic growth can be attained with some kind of moderation on resource use of the environment, [17]; since economic growth cannot exist without negatively affecting the environment; hence, the need for sustainability. It is also observed that recently, there is high level environmental disaster in Nigeria ranging from flooding, soil float, increase in radiation and above all massive destruction of farm land and waters due to the effect of oil exploration especially in the Niger Delta region. This however, has aroused many scholars to suggest that one of the majors for Nigeria to achieve environmental sustainability is to declare the "Niger Delta region as an ecologically devastated environment and to as a matter of urgency declare the region a state of emergency for restoration and compensation", [11].

Also, the Director of "The Environmental Rights Action/Friends of the Earth Nigeria" (ERA/FoEN), Dr. Godwin Uyi Ojo has suggested that one of the measures to achieve environmental sustainability is the establishment of a National Environmental Tribunal that will be Independent without any interference by Government. The tribunal, according to Ojo, is to try to basically concentrate on resolving environmental cases to avoid delays of cases relating to the environment.

Also, ozone layer depletion has caused too much hazard in the environment through emission of carbon dioxide, as it is seen as the major component of green house gas, [4]; (10). Even though the implications of this serious issue are not yet understood, it is generally accepted that the risk is high enough to attract immediate response. Some of these risks are seen in the level of recent degradation caused by massive erosion on farmlands and cities across Nigeria. Economists are therefore, expected to lead in this response as they are considered to be the only people that can make a remarkable difference in policy formulation, especially as the growth of the economy is seen as being necessary in order to maintain environmental quality, [2], because as the success of growth leads to its own demise and generates adverse effects on an economy [8] & [15], hence, the need for policy makers to direct attention towards maintaining a sustainable environment that will preserve its capability so as to support human life.

Environmental sustainability is therefore about making reasonable decisions that will reduce insignificant impact on the environment. It is not just about reducing the level of waste produced or using less energy, but is interested with developing processes that will make growth to become completely sustainable even in the future. It involves decisions and actions that are geared toward the protection of the natural world, particularly the preservation and the ability of the ecosystem to support human life. It is a very important topic at this present time, because people are beginning to realize the real impact which businesses and individuals play on the environment.

However, environmental sustainability cannot be studied without mentioning who developed and introduced the Environmental Kuznets Curve, (EKC). This curve was named after [9] who postulated that as income grows, pollution reduces but subsequently decline if growth proceeds far enough. This statement represents a powerful and attractive policy message, suggesting that we can pursue and attain sustainable environment and economic growth simultaneously in the same time frame, [6]. That is, growth will eventually lead to greening over time after it has established a reasonable turning point, which is, income level beyond which growth causes pollution to decline [6]. [1], p. 6). However, the EKC has become the most widely used model to check the growth of the economy, environmental consumption and degradation. EKC generally is used to estimate issues relating to sustainable growth path. Sustainable growth is a concept that is connected with the preservation of basic needs of the individual. EKC now applies to diverse contaminating elements, and despite the high dispersion of the model, it has suffered from wide range of criticism due to incompleteness of sustainable development analysis. This led to the introduction of a Modified EKC, (MEKC), introduced by [7], which shall be the basic model this study will apply. However, the general view of EKC is about the relationship between income, the growth of the economy and the environment. This study is therefore imperative to fast-track the need for sustainable growth for today and future.

2.1 Empirical Literature on Sustainable Growth in Nigeria

[12] investigated the affiliation level of economic growth and environmental quality in Nigeria using Johansen cointegration analysis for the period 1970-2005 with no evidence to support EKC in Nigeria. [3] adopted an ordinary least square regression to investigate whether an EKC path exist in Nigeria as income grows for the period of 1980-2008. The study found a U-shaped bond between CO_2 emissions and GDP growth rate in Nigeria, and concludes that carbon emissions in Nigeria is not driven by economic growth, hence, there was no existent of EKC in Nigeria. [14] investigated the correlation between environmental sustainability and economic growth or viability in some developing countries within the period 2001 to 2005, using a panel regression analysis and discovered an opposite U – shaped interaction between environmental sustainability and economic growth in some selected developing countries.

[2], research on the effect of environmental quality on economic growth in Nigeria, using a fractional cointegration analysis for a period of 41 years by controlling for the role of institutional quality, trade openness and population density. The paper found that early stages of development in Nigeria accentuate the level of environmental degradation. It also finds that weak institutions and unrestricted trade openness increase the extent of environmental degradation due to environmental dumping. Finally, the paper shows that a larger population density enhances the promptness of environmental abatement measures and consciousness for cleaner environment. The study, however, failed to attain a reasonable turning point and hence a non-existence of EKC in Nigeria

In another similar study conducted in Nigeria by [16], the researcher uses population density as an illustrative variable in the model to show the level of resilience of the environment to pollution. He found out that at the lower stage of income, environmental degradation declined with income growth, rises as income grew further, then declined again. Suggesting that income did not contribute significantly toward the explanation of environmental degradation like population density. This research found no synergies between addressing poverty and environmental problems in Nigeria. He then suggested that complementary environmental policies must be put in place when addressing poverty. He also found different shapes of the relationship between income growth and various measures of pollution and environmental degradation, and concluded that 'developing countries must recognize that no one size fits all in this relationship'.

Another study in Nigeria by [10], employs standard and nested EKC models to examine the income-environment relation for Nigeria, between 1960 and 2008. On the one hand, the proceeds or results from the standard-EKC model provides weak evidence of an inverted U shaped relationship with turning point (T.P) around \$280.84, while o the other hand, the nested model presents strong evidence of an N-shaped relationship between income and emissions in Nigeria, with a T.P around \$237.23. Tests for structural breaks caused by the 1973 oil price shocks and 1986 Structural Adjustment are not rejected, implying that these factors have not significantly affected the income-environment relationship in Nigeria. Furthermore, available results from the rolling correlative analysis show that the observed relationship is unwavering and insensitive to the sample interval chosen. Extensively, the findings reveal that economic development is compatible with environmental improvements in Nigeria. However, stricter and more concentrated environmental policy regimes will be required to ensure that the relationship is sustained and perpetual around the first two-strands of the N-shape, [10].

2.2 Summary of Empirical literature on Sustainable growth in Nigeria

Table 1.1 Summery of empirical literature

Name of Author	Investigation	Scope	Method used	Findings
Omasikan (2009)	The relationship between economic growth environmental quality	1970-2009	Johanson cointegration analysis	No evidence to support EKC in Nigeria
Bello and Abimbola (2010)	Whether an EKC path exist in Nigeria as income grows	1980-2008	Ordinary least square regression	It found a U-shape relationship between CO_2 emission and GDP. No EKC
Samimi et. al (2006)	Environmental sustainability and economic growth in some developing countries	2001-2005	Panel regression analysis	Found an inverted U curve due to the relationship between environmental sustainability and

				economic growth.
Alege and Ogundipe (2013)	Effects of Environmental quality and economic growth in Nigeria	1971-2012	Fractional cointegration analysis	The early stages of development accentuate the level of environmental degradation and also found that; unrestricted trade openness, weak institutions increase the extent of environmental degradation due to environmental dumping. No evidence of EKC.
Stern (2010)	The level of resilience of the environment to population	1980-2009	Multiple regression analysis	At lower stage of development degradation declined with growth and rises as income grew further and concludes that the result is inconsistence.
Mohammed (2010)	The income-environment relation for Nigeria	1960-2008	Standard nested EKC model	The standard EKC model shows weak evidence of EKC in Nigeria, while the nested present strong of N – shape relationship between income and emission in Nigeria.

Table 2.1 As generated by the researcher

3.1 Methodology

3.1.1 Scope and Data Sources

The study will cover a period of 52 years (1960-2012). Data used were sourced from the Central Bank of Nigeria statistical bulletin, various issues and World Development Indicator.

3.2 Model Specification

This study shall use the Classical Kuznets Model as modified by [7] to analyze the data. It is in the form:

$$Ei = \Theta_0 + \Theta_1 Xi + \Theta_2 X^2 i + \Theta_3 X^3 i + \Theta 4 Zi + e \quad \text{..} (1)$$

Where, Ei stand for the overall level of environmental stress, Xi the income per capita and Zi other covariates. The inverted U-shaped curve which is derived from such a formula requires Q_1 to be positive, Q_2 negative and Q_3 positive.

For the purpose of this work, the general environmental stress is co_2, while Y_t is income per capita, therefore:

$$CO_2 = \alpha_0 + \alpha_1 Yi + \alpha_2 Y^2 i + \alpha_3 Y^3 i + X_t + e_i \quad \text{..} (2)$$

The variable Y_t and its quadratic and cubic transformation captures the shape of the EKC function. Y_t shows that early stages of development accelerate the environmental degradation. The Y^2_t and Y^3_t corroborate to indicate if there is an inverted U-shaped, implying the realization of the EKC.

4.1 Limitations

The limitations of the data sources, in this case, secondary sources, are incessant inconsistencies which border on political, economic and social issues. It can reasonably be argued that the quality of a model's simulation results is as good as the quality of data used in calibrating the model. This can be particularly true of developing countries where the quality and availability of macroeconomic data are highly suspect. For some reasons some series have blank spaces for several years in the statistical publications. The consistent changes therefore affect the parameters of estimates of an emerging economy such as men, money and material that can ensure error proof output. Again, the incomparability of data from different sources or even data from the same source but published at different periods is a frustrating experiences. A lot of care and discretion are therefore needed in deciding which sources to rely on for different series. But our consolation is our ability to make comparisons with other international sources in order error level within acceptable limit. It is a common fact that data assemblage in the third world countries is still in its infancy when compared with advanced economics.

Online data gathering which is the norm in advanced economies is hampered by lack of research funds, human capital, power supply and enabling environment. But the introduction of information technology is providing a relief, though still just starting, become conclusions we reached in our research and limited time and financial resources available. Time is always of essence in any research of this magnitude. This therefore made us to work within a limited time frame and finance restricted the number of variable. Again, the variables we used show that further research that may include other variables is not foreclosed since no research is error free but our comparison with other sources created more confidence in their usage for projection or general guide for economic policies. However, these limitations do not in any way impinged on the usefulness of the outcome of the study.

5.1 Result and Discussion of Findings

Table 5.1.1: Parsimonious result of environmental sustainability

Dependent variables: DCO2

Variable	Coefficient	Std. error	t-statistics	Prob.
C	0.099221	0.054984	1.804553	0.0789
$DCO_2(-1)$	0.001189	0.152982	0.007774	0.9938
DPCGDP(-1)	5.86E-05	2.56E-05	2.289061	0.0434
DPCGDP2(-1)	-1.00E-09	0.51E-09	-1.960784	0.0497
DPCGDP3(-1)	6.13E-15	1.08E-14	0.566472	0.5743
ECM1(-1)	-0.247614	0.110951	-2.231754	0.0314

| R-Squared	0.532789
R-squared Adjusted	0.468971
f-statistic	7.084415
Durbin-watson stat	2.088989

Source: Author's Computation 2015

The result shown above in table 4.1 indicated that, carbon dioxide emission (environmental pollution) do not have significant influence on environmental sustainability in Nigeria, (that is, air pollution does not help in maintaining sustainable environment. This can be seen in the value of CO_2 being 0.001 though it is statistically significant in the variable.

From the parsimonious table above it can be seen that the lag of per capita GDP (DPCGDP)(-1) impacted positively on CO_2 emission. This is seen in the positive sign of 5.86 showing a statistically significant level of 5 percent. This result can be used for economic policy. As Nigeria per capital GDP increase by 10%, CO_2 will increase by 5%. This high rate of carbon dioxide emission may not be healthy for the economy, but is in conformity with "Environmental Kuznets Curve" (EKC) condition that inversed U shape that is derived from such formula requires that a1 to be positive, a2 negative and a3 positive.

The error correction Mechanism, (ECM)(-1) appeared with the correct negative sign and was also statistically significant. It indicated that the speed of adjustment is slow at 24%, implying that it takes a longer time for the variable to adjust. The coefficient of determination, R^2 was 0.53 implying 53percent strength of the model to explain changes in CO_2 carbondioxide emission. The Adjusted R^2 was 0.47 implying 47% explanatory power of the model after adjustment of possible errors. F Statistic of 7.08 indicated that the variables were jointly statistically significant therefore the model is good. D-W statistic with the value of 2.08 indicated no autocorrelation in the model; hence it can be used for policy making.

5 1.2 Graphical representation the Environmental Kuznets Curve (EKC) Graph

Figure 5.1 below is the Environmental Kuznets Curve (EKC) generated for Nigeria
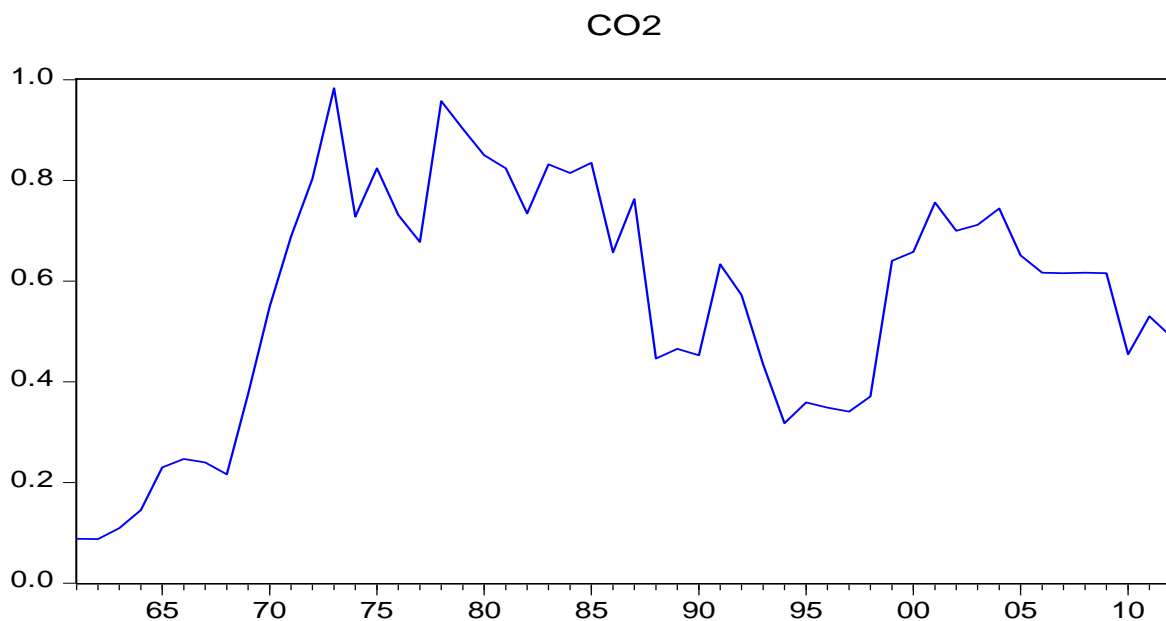
According to the EKC theory; Environmental depression increases with growing income up to a long while level beyond which environmental quality improves with higher income per capita. This relationship can be shown by an inverted U-shaped curve. According to "[4]; [5], [7] & [13], analyzed the E.K.C. using a dynamic specification where lag variables of Y (income) were introduced so as to understand the medium/long term run pattern, consequently, from the figure above income (Y) increase with 10% while pollution increases with 5%, showing the rising of income (Y) and CO_2 (carbondioxide) simultaneously, meaning that at early stage of economic growth income increases, so also is environmental pollution; when it get a certain level there will be application of cleaner technology, people begins to be aware of the implication of environmental pollution; hence, pollution will begins to reduce then the graph will begins to

drop. This condition is proved by the fact that the inverted U shape requires that, a_1 be positive, a_2 negative and a_3 positive a_1, a_2 and a_3 are the coefficient of Y^1, Y^2 AND Y^3. These conditions are met as a_1 is 5.9, a_2-1.0 and a_3 is 6.1 meeting the EKC condition. This result is extracted from table 5.5 showing 'the parsimonious result of environmental sustainability'. It states that; DPCGDP(-1) = 5.86, DPCGDP2(-1) = -1.00 and DPCGDP3(-1) = 6.13.

. The following points are responsible for the inverted U shape of the EKC.

1) Pollution is high at the early phase of a any country's industrialization due to the setting up of undeveloped, inefficient and polluting industries during industrialization

2) The deviation point for pollution is the result of more better and progressive communities placing higher value on the cleaner environment and thus putting in place institutional and non-institutional measures to affect this.

3) Is a sufficiently advanced, clean technology will gain prominence and will further reduce pollution.

6.1 Summary of major findings

Major discussion among policy makers are issues bordering on environmental sustainability as it affect economic growth today and for the future. One example of such was from the just concluded national conference in Nigeria, on issues based on the following: "mines and minerals, including oil fields, oil mining, geological surveys and natural gas." How best to extract these resources having in mind issues on sustainability.

Consequently, we have found from the study that:

CO_2 emission does not encourage environmental sustainability in Nigeria, because increase in environmental pollution will cause the environment to deteriorate, hence lose of environmental nutrient and shape. When these nutrients are loosed drastically, future use will be a mirage hence, lack of sustainable behavior.

It was also discovered that CO_2 emission increases with increase in income, thus in conformity with the "Environmental Kuznets Curve" (EKC). To prove the conformity of EKC the coefficient of Y^1 that is (a_1) will be positive, while the coefficient of Y^2 (a_2) be negative and the coefficient of Y^3 is (a_3) be positive; these conditions are met from the result of this study.

6.2 Conclusions

The major contribution of this study on effect of income on environmental sustainability in Nigeria (1960 – 2012) has been that environmental sustainability is found to be the major indexes for sustainable development in Nigeria. Therefore, the study concludes the following:

Environmental debasement worsens along side with income during the first stages of development and improves in the later ones, following an inverse U-shaped curve, as revealed by environmental Kuznets curve. This also means for income to increase in Nigeria environmental pollution will also increase, evident in the Niger Delta area.

The study also proved that there is the presence of EKC in Nigeria meaning that the Nigerian economy is sustainable, and that Nigeria can practice a green economy.

It also means that there is a transformation in the management of technology in Nigeria, (which means, technology is not static).

Again, there are certain levels of abatement measures (legislations) in Nigeria to cop or maintain environmental sustainability, though it was confronted with some irregularities due to policy inconsistencies.

6.3 Policy Recommendations and suggestion for further study

From the research findings, the following recommendations are made:

a) The managements of macroeconomics therefore requires that effort should be geared towards a reduction in CO_2 emission as it has been proved that it is the main component of green house gas which enhances the depletion of the ozone layer. Hence,

b) Nigerian, government should try to adopt cleaner technology that will reduce the rate of CO_2 emission.

c) Regulations on unit of emission per day should be set and punishment should be meted on defaulters.

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