

Does Gross Domestic Products Granger Cause Environmental Pollution In Nigeria Or Vice Versa?

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Abstract: This study examined the causal relationship between environmental pollution and economic growth in Nigeria. It therefore employed the Granger causality test to investigate the interrelationship between carbon dioxide (CO₂) emission (environmental pollution) and economic growth in Nigeria and vice versa. It was surprising to find that environmental pollution promotes economic growth in Nigeria, but economic growth does not promote environmental pollution in Nigeria. This is because, Nigeria depend mostly on pollution prone activities for her income owing from the massive pollution of the Niger Delta area which is the major income source for Nigeria, to the burning of fuel (CO₂ emission) for other economic activities by firms and individual. The study then recommend that: government should initiate better policy measure that will reduce the level of pollution even while striving to achieve certain level of economic growth to protect the environment from degradation.

Keywords: Environment, carbon dioxide emission, pollution, economic growth, granger causality and Niger Delta

1.1 INTRODUCTION

Environmental pollution and economic development discuss has attracted considerable debates in recent decades. Also, economic development activities have great impact on the environment. This implies that they both (economic development and environment) depend on each other to accentuate economic activities to the desired threshold. The debate on “Green economy” is focused on how economic growth can be attained with some level of regulation on the use of resource, (Strand 2010); since it’s difficult to attain economic growth without generating externalities. 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. Consequently, Nigerian cities are witnessing high rate of environmental deterioration and are rated among urban areas with the lowest livability index in the world. It is estimated that between 20 percent and 30 percent of the urban population only enjoy decent urban life in the country, (Daramola & Ibem 2010). Again natural resources exploitation and the need to embark on developmental projects have degenerated into the destruction of human resources which in turn has its own consequences, hence the need to exercise some restraint by involving in activities that are in line with policies, (Obabori et al, 2009). However, the question is can they be any form of economic development activities without negatively impacting on the environment or on the other hand, do the environment negatively affect economic development? The puzzle is what this research will be trying to unravel.

1.2 Statement of the problem

Nigeria is heavily dependent on natural resources as drivers of economic growth. But most of these resources for example, fossil fuels, metallic and non-metallic minerals are non-renewable and are being depleted at a very rapid rate with negative consequences for future

growth and sustainability,(Omojolaibi 2009). Again, per capita agricultural output and productivity in the region are still low compared to the global average, with dire consequences for food security and social stability, (Samimi 2006). He also observed that, Nigeria current pattern of growth is that it has been accompanied by deindustrialization, as evidenced by the fact that the share of manufacturing in Nigeria’s gross domestic product (GDP) which has fallen significantly. In time the past, most industries have acted with little regard or concern to the destruction and consequent impact meted on the environment. Most firms and industries are guilty of the rate they pollute the environment with practices that are not sustainable. Example, Nigeria’s major foreign earning economy activity is pollution-intensive. Statistics has shown that between the year 1973 and 2008, the quantity of crude oil and gas produced in total GDP leveled between 21.1% and 37.5%; while, output from the service sector (with less pollution) has been between 6.7% and 16.3% for the same period (CBN 2009). Again, from 1961 Nigeria’s balance sheet on ecological issue has been deficient consistently, with marginal increase recently. The outcome in 2010 was about 0.3 from a shortfall of 1.92 in 1964, (Alege et al 2013). Furthermore, according to the High Emission Scenario (HES), it is suggested that by 2025 Ghana, Nigeria and Sierra Leone will emit 4.4, 5.4 and 1.2 million tons of carbon respectively. This would amounts to seven, six and four folds increase over present emissions, (Alege et al 2013). However, emissions can be reduced by 36 “per cent”, 25 per cent and 13 “per cent respectively” if adequate measures to conserve carbon are introduced as contained in the Low Emission Scenario (LES) (Omojolaibi, 2010). Also, the climate change crisis and development needs of the world’s poor requires the acknowledgement of the necessity and urgency for both continued growth at the current pace, and rapid greening of this growth strategy. However, are the aims of growth and environmental protection irredeemably incompatible? Another question is; do we need to trade off our environment for development?

Compared to developed nations, developing countries are much more victims of climate change due to their low capacity to adapt and their disproportionate dependency on natural resources for welfare. However, a major challenge facing Nigeria is discovering new ways to grow the economy without growing environmental impacts, commonly referred to as “decoupling” economic growth from environmental degradation. It is, however, a wide acceptance among both economists and regulators that the adoption of environmental regulation will, by nature, impair economic growth. In this view, policies or regulations designed to improve the environmental performance of economic actors (for example, firms) will, by default, reduce the potential for economic growth — which means decoupling is not viable as a policy objective. There is little question that in the long run, unconstrained environmental impacts will have a significant effect on the prospects for economic growth. However, traditional economics argues that placing environmental restrictions on firms — for example, to reduce emissions of air or water pollution — will necessarily restrict firms’ potential decisions and, therefore, ultimately decrease their potential profits (Palmer, Oates and Portney 1995). Hence the basic question is: What is the relationship between income and environmental pollution in Nigeria?

1.3 Research hypothesis

From the statement of the problems discussed above, the following research hypothesis is formulated to enhance the realization of the research objective. The hypothesis is stated in null form as seen below:

H_{01} GDP does not granger cause environmental sustainability and environmental sustainability do not granger cause GDP in Nigeria

2.1 LITERATURE REVIEW

“Modern management theory is constricted by a fractured epistemology, which separates humanity from nature.... Reintegration is necessary if organizational science is to support ecologically and socially sustainable development”, (Gladwin & James. 1995). The reality of this statement represents a powerful and attractive policy message, suggesting that the pursuit of economic growth and sustainable environment can be attained simultaneously in the same time frame. That is, growth will eventually lead to greening over time after establishing a reasonable turning point - the income level beyond which growth causes pollution to decline (Deacon & Norman 2004). And because we live in a materially closed system, decisions made and actions taken now affect the choices of future generations, and these: outcome keep adding themselves, such that the result for later subjects and their choices of action will be quite different from the initial agent and even more the fated product of what was done before (Jonas 1984). However, Bostow et al 2010 argued that regardless of various criticisms, there is a general acceptance that the extent of environmental defacement is on the increase and that the level of modification of the ecosystem is very rapid mostly in the developing countries that are presently going through industrialization. The impact and level of the global human impression is not in contention. Consequently, there is high use of living resources as raw

material and apprehension for waste materials is also high and growing (Wackernagel & Rees 1996). Therefore, the attainment of economic development and the need to establish harmony between the environment, and man has become the important goal that is confronting the communities, enterprise organizations, government and the world. However, this study suggests that for this interrelationship to be complete there must be an interaction between the economy and environment; economy and society; and society and environment; and a coordinate between all the three main components.

3.1 AN OVERVIEW OF ENVIRONMENTAL POLLUTION IN NIGERIA

Oil is the primary base of Nigeria’s economy and is also the cause of major environmental and social problems in the Niger Delta region of Nigeria. Over the years, oil exploration, production, and refinement in Nigeria has resulted in various environmental and ecological problems that range from oil spills, gas flares, habitat destruction, air and water pollution, and land degradation. Also, a major cause of oil pollution in that same region is also to a great extent, from the activities of illegal oil bunkering and illegal refineries operated indigenes and some highly placed individuals in government. The chemical properties of spilled oil often affect the productiveness of soil and pollute water bodies, thereby causing irreparable damage to agricultural lands as well as aquatic bodies. Gas flaring is a significant environmental and economic problem in and Nigeria emits approximately 70 million metric tons of carbon dioxide annually (US EIA1999) This adversely affects the socio-economic activities of local communities, which is primarily based on fishing and farming (Egunjobi1993). . It is estimated that in one region alone in the Niger Delta, flaring is statistically likely to cause 49 premature deaths, 5000 respiratory illnesses among children and some 120,000 asthma attacks and 8 additional causes of cancer each year (Environmental Rights Action and the Climate Justice Programme).

3.1.2 Water Pollution

According to Anukam (1997), the main source of water pollution in Nigeria has to do with forestry activities. Deforestation and improper soil tillage practices increase the concentration of soil particles that make their way into water bodies and in turn increases their sediment loads.. The discharge of industrial waste materials into bodies of water is another major source of pollution in Nigeria. Discharges from industries such as petroleum, mining, iron and steel, pharmaceuticals, and textiles among others have increased the contents of sulfates and nitrates in water bodies and has altered properties such as color and odor (Adelegan 2004) These metals and other chemical substance increase the toxicity of water bodies as well as soils.. A large percentage of Nigerians derive most of their domestic and drinking water from ponds, stream, and shallow wells. Hence, water pollution is a major health concern that places the health of about 40 million people at risk of diseases such as cholera, dysentery, diarrhea, and typhoid (Anukam 1997, Adelegan 2004, Orubu 2006).

3.2.2 Domestic and Industrial Waste

The improper disposal and ineffective management of municipal solid waste and industrial waste creates major environmental and aesthetic problems in most of Nigeria's urban areas. Due to overpopulation and the creation of slums, most municipal areas currently generate more waste than they can manage (Ogbonna and Ekweozor 2002). This has led to the accumulation of waste heaps in "several areas, blocking motorways and making passage along alleys and pavements difficult" (Ajayi and Ikporokpo 2005). The most common method of waste disposal in Nigeria is waste transfer from one region to another and incineration. The first involves the transfer of waste from a region that is considered to have a higher aesthetic value to one that has a lower one. The waste incineration method of waste disposal often results in air pollution due to the release of gases such as carbon monoxide, sulfur dioxide, oxides of nitrogen, halogenated carbons, and other particulate matter.

4.1 THEORETICAL FRAMEWORK AND MODEL ANALYSIS BASED ON THE EKC MODEL

The EKC concept became apparent in the early 1990s because of the work of Grossman and Krueger's breakthrough in the study of the potential impacts of the "North American Free Trade Agreement" (NAFTA) and Shafik and Bandyopadhyay's background study for the World Development Report 1992. However, the notion that economic growth is paramount for environmental quality to be managed or improved is an indispensable part of the sustainable development argument propagated by the World Commission on Environment and Development in Our Common Future. The EKC theme was popular by the International Bank for Reconstruction and Development's (IBRD) World Development Report 1992, which claimed that "the view that greater economic activity inevitably hurts the environment is based on static assumptions about technology, tastes, and environmental investments" and that "as incomes rise, the demand for improvements in environmental quality will increase, as will the resources available for investment." Others have expounded this position even more forcefully, with Beckerman claiming that "there is clear evidence that, although economic growth usually leads to environmental degradation in the early stages of the process, in the end the best—and probably the only—way to attain a decent environment in most countries is to become rich." At one level, the EKC is therefore explained by the following "proximate factors":

- (i). Scale of production means expanding production, with the mix of products made available, production inputs mix used, while the state of technology all held constant.
- (ii). Variation in the strength of industrial emission and the changes in output mix normally over the course of economic development.
- (iii). Variation in input mix involves the substitution of less environmentally damaging inputs to production for more damaging inputs and vice versa.
- (iv). Enhancement in the state of technology involves changes in both

- (a) Production efficiency in terms of using less, *ceteris paribus*, of the polluting inputs per unit of output and
- (b) emissions-specific changes in processes resulting in less pollutant given off per unit of input.

These adjoining variables may, in turn, be incited by changes in underlying variables such as environmental performance index, openness, population density, institutional quality and environmental dumping by multinationals. The foremost EKC's were simple quadratic functions of income level. This is shown by the work of Beckerman (1992) as he compared emission and population to GDP. The underlying model used was.

$$\ln(E/P)_{it} = \alpha_i + \gamma_i + B_1 \ln(GDP/P)_{it} + B_2 (\ln(GDP)_{it})^2 + \epsilon_{it} \quad 4.1$$

where E equals emissions; P, population; GDP, gross domestic product; ϵ , a random error term, and \ln equals natural logarithms.

Thereafter, Grossman et al (1995), shows the correlation between pollution and Growth using reduced-form:

$$E_i = B_0 + B_1 X_i + B_2 X_i^2 + B_3 X_i^3 + B_4 Z_i + e_i \quad 4.2$$

where X_1 represent income per capita and for the purpose of this work, represents a vector of other covariates; environmental dumping by multinationals, openness (OP), corruption (Cc) and population density (PD). The "EKC" hypothesis postulate that the negative impacts on environment associated to the scale effect have a propensity to prevail in the initial phases of economic growth, but after a certain level (of development) it should be over shadowed by the direct impacts of the proportion and technological effects. As was earlier suggested by Grossman et al (1995), the correlation between pollution and growth has been measured using reduced-form equations that associate the level of pollution to a simple function of per capita income and to other covariates. The classical reduced functional form representing the EKC is given by equation:

$$E_i = \pi_0 + \pi_1 X_i + \pi_2 X_i^2 + \pi_3 X_i^3 + \pi_4 Z_i + e_i \quad 4.3$$

where E_i signifies the common rate of environmental stress, X_i representing the income per capita and Z_i other covariates which is here represented as economic growth. Therefore, to inquire the causal relationship between environmental sustainability and economic growth and vice versa, the study adopted the Granger Causality test to evaluate this relationship. It state thus: is it carbon dioxide emission Co_2 (environmental pollution) that "causes" economic growth, $PCGDP(Co_2 \rightarrow PCGDP)$? Or is it $PCGDP$ that causes carbon dioxide emission (environmental pollution) $Co_2(PCGDP \rightarrow Co_2)$? The arrow points at the direction of causality. Hence the estimation of the following pair of regressions:

$$CO_{2t} = \sum_{i=1}^n x_i PCGDP_{t-i} + \sum_{i=1}^n B_i CO_{2t-i} + U_{it} \quad (4.4)$$

$$PCGDP_t = \sum_{i=1}^n L_i PCGDP_{t-i} + \sum_{i=1}^n K_i CO_{2t-i} + U_{it} \quad (4.5)$$

5.1 INTERPRETATION OF RESULT

The causality examination in table 5.1 reveals that the direction of causality is from carbon dioxide CO_2 emission (environmental degradation) to per capita GDP because the documented F statistic is relevant at the five percent

level. On the other hand, there is no “reverse causation” from PCGDP since the F value is statistically insignificant. This means that environmental degradation can cause a rise in per capita GDP. The result is in line with the parsimonious growth model which proved that environmental pollution (CO_2) impact positively on per capita GDP (PCGDP) in Nigeria. Lag of PCGDP was 0.32 and CO_2 was also with the value 9.3 meaning that if PCGDP increase by three per cent CO_2 will increase by over 90 per cent. Meaning that, Nigeria depends highly on pollution prone activities for her income, hence the need for sustainability. This also proved that degradation increases with income at early stages of development. Thus in support of the Kuznets curve.

Table 5.1

Result of the Granger causality test

Date: 04/15/18 Time: 15:49

Sample: 1961 2015

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
D(GDPC) does not Granger Cause D(CO2)	52	0.97862	0.3839
D(CO2) does not Granger Cause D(GDPC)		2.87546	0.0670

Source: As generated by the author 2018

6.1 SUMMARY

Consequently, the study found that; CO_2 emission (environmental degradation) causes economic growth in Nigeria and not vice versa. This is because, Nigeria depend mostly on pollution prone activities for her income owing from the massive pollution of the Niger Delta area which is the major income source for Nigeria, to the burning of fuel (CO_2 emission) for other economic activities by firms and individual. 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. The study also found that CO_2 impacted positively on per capita GDP (PCGDP). This result is very surprising but reveals that the major contribution to PCGDP is basically pollution prone activities. This means that Nigerian depend mostly on pollution prone activities for their daily income. Also, extraction of oil and other minerals are majorly pollution sensitive.

7.1 CONCLUSION

This study concludes that environmental degradation enhances economic growth in Nigeria. This is seen at the direction of causality moving from carbon dioxide CO_2 emission (environmental degradation) to per capita GDP. Meaning, the major means of livelihood in Nigeria is from environmentally degraded source. This is quite evidenced from the various economic activities in Nigeria from the smallest to the highest level; all depends on environmentally polluted prone activities. Example of such are the uses of generators, plants and gas flaring; and the issue in the Niger Delta; even the activities of farmers involves deforestation; every activities is geared towards revenue generation either to self, Industries, and to the country in general.

8.1 POLICY RECOMMENDATIONS AND SUGGESTION FOR FURTHER STUDY

It is recommended that there should be a reduction in CO_2 emission as it has been proved to be the major source of environmental degradation. Hence, there should be regulations to control the level of emission. There should be stringed measure against any form of gas flaring and oil spillage. Multinational companies should try by all means

to adopt the global best practice in gas processing and crude oil extraction. Hence government should try and reduce the level of corruption because this is the major source of non compliance.

References

- [1]. Akbostanci, E., Turut-Asik, S. & Tunc, I. G. (2009), The Relationship Between Income and Environment in Turkey: Is there an environmental Kuznets Curve?, *Energy Policy*, 37, pp 861-867
- [2]. Alege, P. O., Ogundipe, A. A., (2013) Environmental Quality and Economic Growth in Nigeria: A Fractional Cointegration Analysis: *International Journal of Development and Sustainability*. Online ISSN: 2168 – 8662 – www.isdnet.com/ijds Volume 2 Number 2. ISDS Article ID: IJDS13011502
- [3]. Bello, O., Abimbola, W (2010). Sustainable strategies for housing the urban poor : A case study of Lagos Nigeria, University of Ife Press. 87-101.
- [4]. Carvalho V. A. & Eduardo, L. (2012). Organizing matters: how “the social dimension” gets lost in sustainability projects. *Sustainable Development Journal* 20(1):18–27.
- [5]. Coondoo, D., & Dinda, S., (2002). Causality between income and emission: a country group-specific econometric analysis. *Journal of Ecological Economics*, 40: 351- 367.
- [6]. Deacon, R.T. & C.S. Norman (2004). "Does the Environmental Kuznets Curve Describe
- [7]. How Individual Countries Behave?". *Land Economics*. vol.82. 2 (2000). pp. 291 – 315.
- [8]. Grossman, G. M. (1995). Pollution and growth: what do we know? In: I. Goldin and L. A. Winters (Editors) *The Economics of Sustainable Development*, Cambridge University Press, Cambridge, pp. 19-47.
- [9]. Kemp, Benedict E, (2003), Travelling Along The Environmental Kuznets Curve. Case Study number 2, a scripting language for sustainability scenario
- [10]. Kuznets, R., (1955). On the Robustness of Robustness Checks of the Environmental Sustainability, FEEM Nota di Lavoro n. 22, Fondazione Eni Enrico Mattei, Milan, Italy.
- [11]. Mohammed, A. M. (2010). Techniques of energy savings in the sustainable urban built environment, *Australasian Journal of construction Economic and Building*, 12 (2), 55-71
- [12]. Nzeh, O. (2009) Vanguard News paper 27th August Edition page 13
- [13]. Omisakin, O. A. (2009). Exchange rate pass through to domestic price and output in Nigeria. *International Journal of Business Management*, vol 3(3), pp 38-42.
- [14]. Perman, R. & Stern, D. I. (2003). Evidence from panel unit root and cointegration tests that the environmental Kuznets curve does not exist. *Australian journal of Agriculture and Resource Economics*, 47(325-347).
- [15]. Samimi, A. J. (2006). Environmental Performance index and economic growth: Evidence from some selected developing countries in West Africa, *Australian journal of basic and applied sciences*, 4(8) pp 3098 – 3102, 2010, issn1991 - 8178
- [16]. Smulders, S. (2000). Economic Growth and Environmental Quality. Principles of environmental and Resources Economics. Henk Folmer and JLandis Gabel (eds), Edward Elgar.
- [17]. Stern, D. I. (2004). The rise and fall of the environmental Kuznets curve. *World Development*, 32(8), 1419-1439.
- [18]. Strand, T. (Editor) 2010. Economic policies for sustainable development. Dordrecht: Kluwer Academic Publishers