Growth Limits: A Conceptual Analysis for Sustainable Development in Nigeria

Adejumo Oluwabunmi[1]

[1]Obafemi Awolowo University

February 25, 2019

Growth Limits: A Conceptual Analysis for Sustainable Development in Nigeria

Adejumo O. Oluwabunmi
Institute for Entrepreneurship and Development Studies, Obafemi Awolowo University, Ile-Ife, Nigeria.
Correspondence: jumobum@gmail.com; adejumobum@oauife.edu.ng; +2347039075914

Abstract

In the school of development thought, growth has been identified as a viable alternative to the challenge of poverty and economic backwardness. However, the ecologist have continuously challenged the growth position in relation to environmental degradation and depletion. It is against this background, this study examined the limits to growth in Nigeria beyond which there will be inimical consequences for the environment. Using time series data between 1970 and 2014, Chow estimates were used for breakpoint regression analysis. It was discovered that below the identified growth limit, there are currently significant negative impacts on the quality of the environment in Nigeria via economic growth. But beyond the growth limits, as against the ecologist perspective, it was discovered that there were prospects for sustainability in the quality of the environment in the long-run.

Keywords: 'Environment', 'Growth', 'Population', 'Sustainability', 'Optimality'

1. Introduction

Since the 19th century, the issue of continuous growth has dominated the classical and neoclassical schools of economic thought. This is because growth has always been a desirable outcome of economic activities because of its usefulness for poverty reduction. Nonetheless, it has been asserted in the literature that there are limits to growth. This has generated issues on sustainable growth thereby providing a basis for the ecological theory of growth as an alternative to the classical and neoclassical doctrines, (Stokey, 1998; Jhingan and Sharma, 2008). Basically, the central issue the ecologist focuses on is the extent to which growth can be pursued without inimical consequences to sustainability. In other words, the concern is how to find the optimal growth level that will not become counter-productive with regard to adverse environmental impacts on health capital and human development, which are critical inputs to the growth process, (Hussen, 2000). Thus, the overriding economic policy challenge for the developing economies like Nigeria is how to promote the positive effects of growth while limiting its negative impact on the health capital stock. This has necessitated a public health dimension to critically assess the threshold level of growth for environmental and health capital sustainability, so that the growth which creates the wealth of nations will not become the creator of the poverty and death of nations.

The natural environment no doubt is an ultimate determinant of human state and survival. However, striking the balance between the use of the environment by humans to sustain its needs and the preservation of the environment to sustain man is another concern. Previous studies assume

the earth to have an infinite ability to maintain ecological balance. However, some other studies maintained that the earth possesses an upper limit of the natural system, known as assimilative capacity, "throughput constraint" or optimal level (Hussen, 2000; Jhingan and Sharma, 2008). It is expected that beyond this assimilative capacity, there could be adverse reaction on human capital development. This could be reflected in indices such as human health and existence; which could consequently compromise future development in terms of labour productivity and growth sustainability. Thus, a central question that may emanate from this thought is "To what extent is continued economic growth consistent with maintaining the environmental quality?"

Some previous studies led by Meadow *et al* on the *Limits to Growth*[1] and *Beyond limits*[2] in 1972 and 1992 respectively were used to explain possibilities of a near collapse of the Planet. Based on a thesis *continued growth leads to infinite quantities that do not fit into a finite world*, an elaborate model was drawn. The model revealed that cases of where growing population could either stay within the limits of the environment, deviate and return to eco-limits or overshoot the eco-limits. In the light of this, the model predicted that given an exponential population growth and consumption rate, it is possible that there will be a collapse by the 21st century, which will bring about the world economy reaching its physical and eco-limits. It was further postulated that if the population growth of the world continues and industrialization, resource depletion remain unchanged, in hundred years (which is about sixty to seventy years from now), growth limits will be attained.

Until recently, when recession was experienced, the Nigerian economy has experienced continuous growth at an average rate of 6% (CBN, 2016). However, this growth has been contingent on resource depletion and over-utiliisation. For instance, crude oil exploration and exportation, which is a major component of the GDP growth, accounts for than 90% of foreign earnings in Nigeria (CBN, 2016). Incidentally, these mining activities have been associated with gas flaring and burning of fossils which releases chlorofluorocarbons and carbon monoxide into the environment. Although, contrary to the expectations of Meadows *et al* (1972, 1992) of a Planet collapse in the 21st century, there are indications that the environment is endangered even in Nigeria. This is made feasible by the consumption rate of commodities and non-renewables, population growth rate (which is the highest in Africa) and resource depletion rates (via mining, desertification, and land degradation). Therefore, using Nigeria as a case-study, this study examines the limits to growth beyond which there will be adverse effects on the environment. In doing this, the effects of economic growth on the environment will be equally ascertained.

2. Literature Review

The Classicist are of the opinion that economic growth produces pollution and wasteful consumption that contribute nothing to human beings. According to them, the tenets of economic growth needs to be reviewed as it can affect the quality of life negatively. For instance, it was believed that the golden path of economic growth cannot be achieved without subjecting people to necessary pressures; although these pressures will increase the stages and rate of economic growth, but this will be at some cost to the environment and human beings through health impairments. Brown, *et al*, (2015) also added that given current economic growth, the costs from

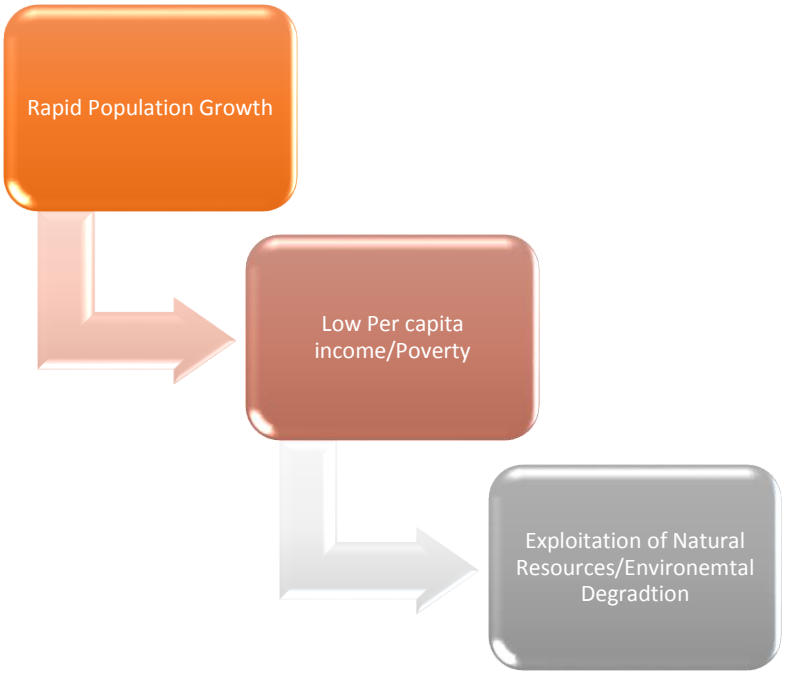
[1] D.A. Meadows, D. L. Meadows, J. Randers and W. W. Beherns, *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind, 1972.*

[2] D.A. Meadows, D. L. Meadows, and J. Randers, *Beyond the Limits:* Global Collapse or a Sustainable Future, 1992.

environmental pollution usually outweighs its benefits. These costs include rapid depletion of natural resources, urban problems like congestion, and noise pollution, and in the rural areas are challenges like deforestation; hence the impetus for eco balance.

Amongst the Classicist, Malthus expressed concerns over population growth and environmental crisis. Inherent in the Malthusian population trap model are some inherent social and environmental crisis. Malthus believes "population has a constant tendency to increase beyond the means of subsistence, and that it is kept to its necessary level and thus humankind, is confined in room by nature." (Weil, 2009). Thus, Malthus, pre-empting the future, saw humanity being deprived given the possibility of consumption being outweighed by available resources; which could therefore lead to resource exploitation/overuse and eventual environmental depletion.

Incidentally, neo-classical economist have analysed the relationship between population growth and environmental quality as a process. This is as typified in figure 1.



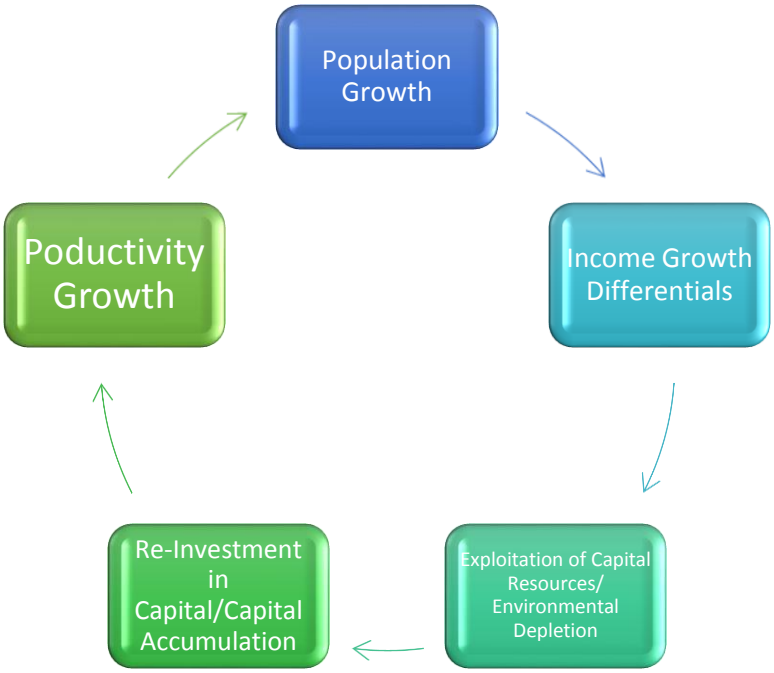
Source: Author's adaptation from Weil (2009)

Figure 1: Population Growth and the Environment

Basically, it is assumed that rapid population growth leads to poverty and low economic status of family members. Further, scarcity of land and housing facilities pushes people to ecological sensitive areas which could lead to exploitation of natural resources thereby causing environmental degradation (Jhingan 2013).

A further analysis on the population, growth and environment nexus was equally explained by the Solow Growth model. Solow (1956) treats population growth as exogenous; because it concentrates on the effect of population growth on the income of an economy. Solow specified that the differences in countries' growth rate of population can explain the reasons for growth differentials among countries (*see* Barro and Sala-i-Martin, 2004). Therefore he inquired that "if

population is examined what happens if the capital (both physical, human and natural capital) of an economy remains stagnant and the population keeps growing?" Modifying figure 1, Solow's thought is depicted in figure 2: Where it is expected that there will be a negative effect of population growth on capital per worker, which is known as *capital dilution*. This will further lead to a decline in the amount of output produced per worker which could result in exploitation and a decline in productivity. Therefore, if there is a rapid increase in population, capita per worker can be maintained by investing a large fraction of its output (which accounts for growth) in building new capital; and in the case of maintaining natural capital, investment in recycling possibilities will be an option (Weil, 2009). This would lead to a modification/extension of Figure 1.

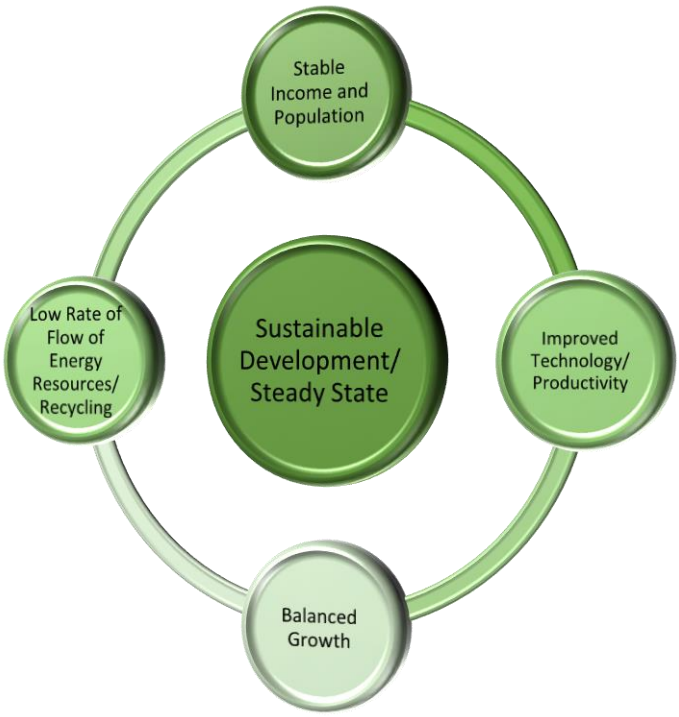


Source: Author's Modified Adaptation from Jhingan and Sharma (2008)

Figure 2: Solow's View on the Growth

Incidentally, human and physical capital can be built. While natural capital may be recycled, but cannot be increased; thus the growth-environment dilemma. This has accounted for the proposal of the endogenous growth models where an economy is expected to display some sense of productivity and efficiency within the limits of its resources and capital; which has been described as real economic growth (Rebelo, 1991).

Nonetheless, following the steady-state model, the growth-environment dilemma can be thus, neutralized. As shown in Figure 3 The steady-state economic system which otherwise depicts equilibrium in the environment has been characterised by balanced, opposing forces that maintain a constant stock of physical wealth and people through a system of dynamic interactions and feedback loops. Put differently, it proposes that economic systems are not isolated from the natural world; thus they are fully dependent on the eco-system for the natural goods and services it provides. Hence, it maintains that maintenance flows must be kept within ecological limits.



Source: Author's Modified Adaptation from Jhingan and Sharma(2008)

Figure 3: Growth for Sustainability: The Steady-State Model[3]

For instance, it is assumed that a low rate of flow of matter and energy resources maintains wealth and population size at some desirable and sustainable levels. This implies that in order to achieve eco-balance, economic systems cannot be isolated from the natural world, as they are fully dependent on the eco-system for the supply of natural goods and services. Therefore, the steady-state model also emphasized the production of quality goods and services without depleting natural resources for future generations. In addition, the model asserts that the maintenance flows (of waste) must be kept within ecological limits; this implies a more efficient use of energy and resources efficiently, while also considering the limits to growth (Jhingan, 2013).

3. An Over-view of the Growth-Environment in Nigeria

Emphasis has also been placed on the bottom-up approach to solving environmental issues in Nigeria. Towards this end, two programmes have been initiated which focus on community-driven investments in environmental management. The first is the Micro-Watershed and Environmental Management Programme (MEMP), which is based on directly financing rural community dwellers in carrying out environmental amelioration activities, through existing local mechanisms, such as community-based organizations and cooperatives. The second is the Integrated Management of Natural Resources in the Trans-Boundary Areas of Nigeria and Niger Republic. The project aims at enhancing biodiversity and protection of shared natural resources in the cross-border area, with a high *level* of community participation in programme activities (Nnanna *et al*, 2003; NESREA, 2011).

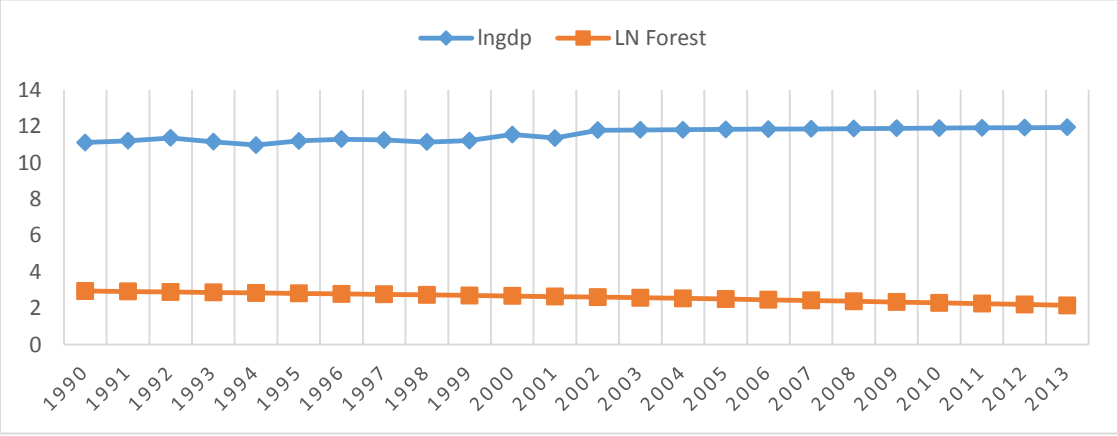
[3] Herman Daly (1973), *Towards a Steady State Economy* in Jhingan and Sharma (2008)

Some progress has been made in a few areas, including a significant reduction in gas flaring, the success of which is attributable to the high levies imposed on oil companies for gas flaring.

Another area of success is the demand for environmental impact assessment before any new industrial or major project can be implemented. However, environmental protection measures *have* not been so successful in many other areas. The cities are still littered with industrial and human waste that deface the environment and pollute the air. Noise and other pollutants are common features of the neighborhoods, while the waters are still contaminated by dangerous industrial and human wastes, chemicals and oil spills. Although with effect from May 1999, a full-fledged Federal Ministry of Environment is now in charge of the Nigerian environment, a lot still needs to be done to achieve a cleaner environment conducive to national sustainable socio-economic development. It is also a fact that the Ministry cannot do it alone; the cooperation and assistance of all stakeholders is required. These include the private sector, especially industrial establishments, the oil companies, the banks, and the Niger Delta Development Commission. Their cooperation is needed in the areas of waste management, desertification and deforestation control, industrial pollution control, including oil and gas pollution.

A typical measure of the environmental quality in any country is the state or pattern of agroforestry in Nigeria. The specific aim of agroforestry in Nigeria is to encourage afforestation, reseeding, reforestation, and forest conservation of vulnerable regions and rehabilitation of degraded lands. In addition, it involves rehabilitating the natural vegetation through tree planting, and control of forest exploitation which will introduce a reversal in desertification trend. Specifically, the government policy aimed at accomplishing the 25% national forest cover as prescribed by United Nations Food and Agricultural Organisation (UNFAO) as this will encourage self-sufficiency in wood and other forest resources. Besides, this will enhance ecological integrity and reduce drastically the effects of climate change.

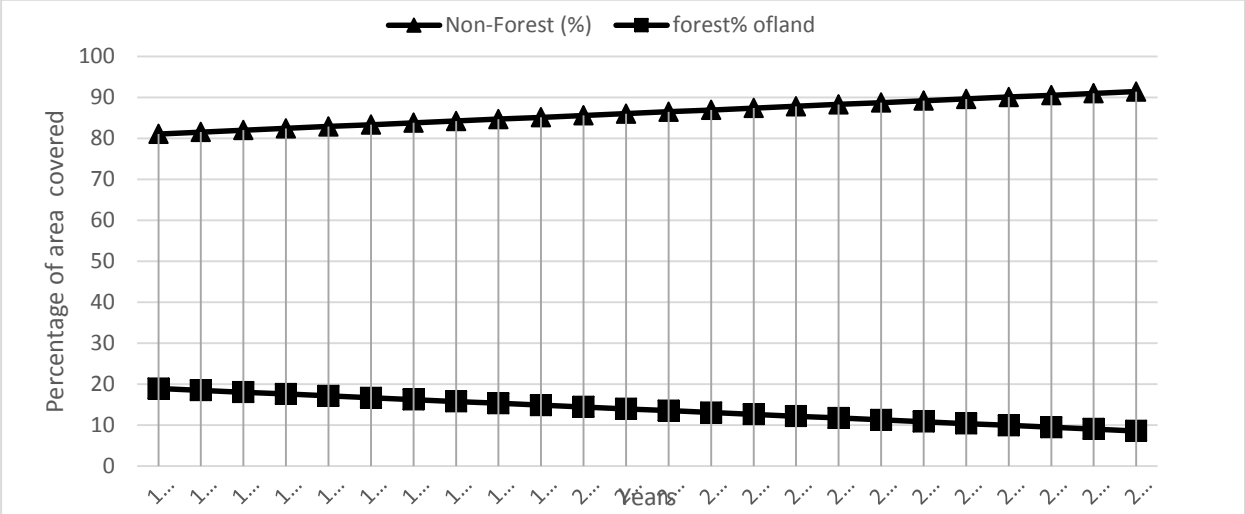
From the available statistics in Nigeria, from 1990-2013, it can be deduced that desertification is increasing rapidly in Nigeria. Besides, since 1990, till 2013, Nigeria has not achieved the 25% feat of agroforestry set by the FAO. Specifically, from Figures 4 reveal the natural depletion rate of forest cover in Nigeria as against the natural growth rate of income (GDP).



Source: WDI, 2015

Figure 4: Growth Rate of Forest area in Nigeria, 1990-2013

At a natural GDP growth rate of about 11%, it was seen that the rate of decline in forest area was about 3% in the mod 2000s. Although, this depletion since 2010 is gradually on the decrease with a rate of about 2.5%. This probably is due to an increase in environmental awareness and campaigns by the government. However, the statistics from the World Development Indicators revealed that percentage of area covered in Nigeria is contantly on the rise. This is revealed by figure 5 where the uncovered land area is depicted in Figure 5; where the non-forest area rose from 80% to more than 90% in year 2010 and about 92% in 2013.



Source: WDI, 2015

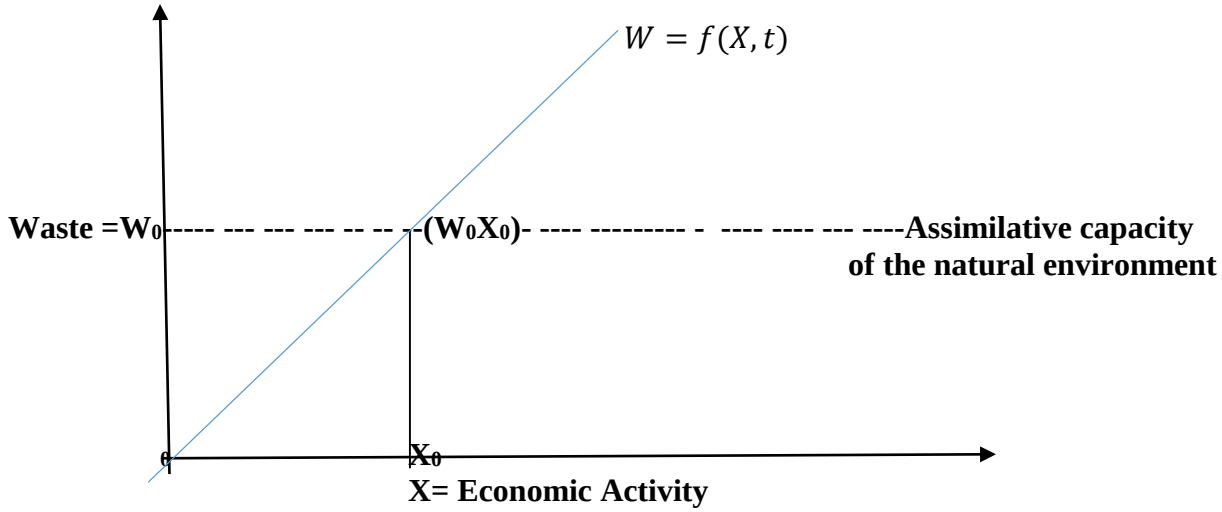
Figure 5: Comparison between Agroforestry and non-forestry in Nigeria, 1990-2013

The implication of this is that land degradation remains an economic activity that is eroding environmental quality in Nigeria and as such there may be the need to design policies that will engineer local content adaptation, prevention and curation. This is with a view to consolidating the benefits of afforestation and mitigating the negative consequences of deforestation- which include: erosion, health impairments from excessive sun rays and flooding.

4. Methodology

Theoretical Framework: Assimilation Model

A simple model of positive linear relationship is hypothesized between waste and productive economic activities - that is more waste is associated with increasing levels of economic activities. This relation can be graphically depicted as shown in Figure 6.



Source: Hussen, 2000

Figure 6: The Theoretical Relation between Economic Output and Waste Discharge

From Figure 6, the X-axis is seen to represent output of economic activities, while the Y-axis depicts the quantity of waste disposed into the environment in some unspecified unit. The line depicted as **W_0** assumes the total amount of waste that the environment could assimilate at a given point in time. Some of the major deductions from Figure1 include:

i) The point **W_0, X_0** depicts the maximum amount of economic activity that can be undertaken without necessarily inflicting injuries on the environment. Thus **X_0** is an ecological threshold of economic activity which is acceptable for sustaining environmental quality.

ii) An increased economic activity beyond **X_0** would be tantamount to accumulation of unassimilated waste in the natural environment.

iii) The only process that can alterate the ecological threshold of economic activities is technological changes; and this may be through the use of technology to aid decomposition or using technological change to alter the relationship between economic activities and the rate at which waste is discharged into the environment. It is therefore noted has been noted that the production of the environmentally–friendly technologies can check degradation and assure quality environment. In addition, this can inhibit aggravating the problem from local pollution problem to transboundary acid rain problem.

Thus, given the advancement of the assimilative capacity model, it can be deduced that environmental quality which is necessary for natural human development remains a scarce resource, and as such must be guarded.

Model Formulation

In order to obtain the threshold points and effects in the relationship between environmental quality (COI) and economic growth (GDP) in Nigeria, non-linear relationships are assumed among the two pairs of variables. This assumptions follows the work of Hansen (1999). According to Hansen (1999), threshold variables are used in their logarithmic form. Therefore, these models takes the natural logarithm of the variables, and are implicitly specified as follows:

$$lnCOI_t = \mu_1 \varphi_1 ln(X_t) * I(GDP_t \leq \gamma) + \varphi_2 \ln(X_{it}) * I(GDP_t > \gamma) + u_t \ldots\ldots\ldots (1)$$

Alternatively, $lnCOI_t = \begin{cases} \mu\varphi_1 \ln(X_t) + u_t & GDP_t \leq \gamma \\ \mu\varphi_1 \ln(X_t) + u_t & GDP_t > \gamma \end{cases}$ ……..…… (2)

COI_t and GDP_t is the threshold variable for the country under study in time period t. X_t are the vectors of other covariates, μ represents the level of the country fixed effect, $\mu_t$is the level of time t's fixed effect.

The equations (2) indicate clearly that the observations are divided into two regimes depending on whether the threshold variable (COI_t) is smaller or larger than the threshold point (γ). The regimes or periods of GDP are distinguished by differing regression slopes; that is φ_1 and φ_2 for growth per capita. According to Hansen (1999), for the identification of the parameters φ_1 and φ_2. It is required that we assume that the element of X_t and the threshold variable are not time invariant and that u_t are assumed to be independently and identically distributed (iid) with mean zero and finite variance σ^2.

Estimation Technique

The study employed quantitative method of analysis on a time series variable. The period under study is between the year 1970-2014.

The study in determining the limits to growth used threshold points and effects as specified by equation (1) and (2) The equations are in the form of a non-dynamic fixed effects, single-country model. Given the assumption of the absence of any unmeasured time-invariant properties (Greene, 2005), the bootstrap procedure proposed by Hansen (1999) was carried out to test and obtain threshold (breakpoint) point estimates. Specifically, Chow test estimates were used to generate breakpoints, which further lead to the development of least squares estimates results. The regression results, as suggested by Hansen (1999), gave a clue as to the threshold effects between the variables of interest..

Using the statistical package STATA 12.0 for estimation purposes, it is required that all variables employed in the threshold estimates be in logarithmic form. However, data on variables used are have been left in their original forms as they are measured in percentages and rates.

Variable Sources and Measurement

The table below summarizes the sources and the measurements of variable.

Table 1: Presentation of Variable Measurement and Sources

Variables	Sources of variable	Measurement of Variables
Environmental Quality	World Development Indicator, 2015	Carbon Intensity (COI)[4]
Economic Growth	World Development Indicator, 2015	Growth rate of current GDP

[4] COI is used to measure environmental quality because D. Meadows (1972) noted that while some other pollutants may be related to growth and advances in technology, pollution from carbons or thermals usually cause irreversible damages in the earths climate.

5. Results

Prior the presentation of the result, some preliminary checks on the descriptive nature of the variables. The description of common sample statistics of the variables employed within the study. The descriptive statistics of data series gives information about on the mean, median, minimum value, maximum value and the distribution of the sample measured by skewness, kurtosis and the Jaque-Bera statistic. From Table 2, most variables show that all the series displayed a high level of consistency as their mean and median values are within the maximum and minimum values of the series. Besides, the deviation of most data in the series are not really different from their mean value, except for the PCI which is due to the presence of some negative values in the series.

Table 2: Table 2: Descriptive Statistics of the Major Variables

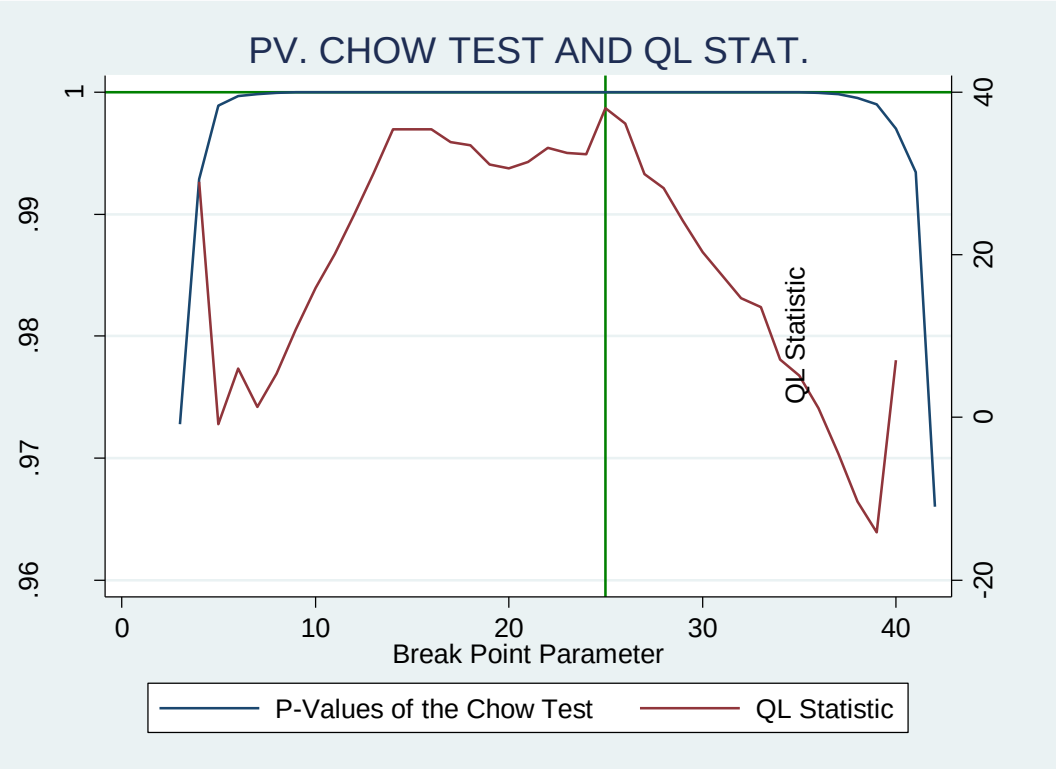
STATISTICS	GDP	COI
Mean	25.0998	0.9599
Median	24.6876	0.95163
Maximum	29.7992	1.68217
Minimum	21.821	0.47382
Std. Dev.	2.52778	0.29929
Skewness	0.39394	0.24255
Kurtosis	1.9134	2.30808
Jarque-Bera	3.302651*	1.309163*
Probability	0.1918	0.51966

Note: Critical values of χ^2 at 5% and 1% levels are 5.99 and 9.21 respectively.
** (**) denotes the acceptance of the null hypothesis that the variables are normally distributed at 5% and (1%) significant level,.*

The skewness and kurtosis statistics provide useful information about the symmetry of the probability distribution of various data series as well as the thickness of the tails of these distributions respectively. The data shows that the distribution of the data are normal, given the skewness and kurtosis values. With regard to the skewness of the variable, the rule of thumb may be arbitrary; but the general threshold is one. Since all the variables lie within 1.0 and -1.0, the skewness is not substantial and it can be said that all the distribution of the variables are symmetrical. Also a Gaussian distribution is expected to have kurtosis of 3.0 (Wooldridge, 2013); thus, since all the variables lie within the range of 3, the distribution is normal.

Threshold Estimates of the Relationship between Economic Growth and Environmental Quality in Nigeria

The task of identifying a precise level of growth limits (which explains economic activities) beyond which environmental quality will be affected required estimating the threshold level of GDP growth rate, beyond which it begins to correlate with the quality environment in Nigeria. The optimal threshold is the level of economic activities that shape environmental quality or a point at which there is a break-point. The estimation of the model in equation (2) shows that threshold level occurs at the point where the growth rate exceeds 25% (*see* figure 7). This is because the optimal point existed at this level of growth.



Source: Author's computation using Stata 12.0

Figure 7: Break point (Optimal Point) between Economic Growth (GDP growth) and Environmental Quality (Carbon Intensity) in Nigeria.

Following the threshold point which has been estimated, threshold effects between the two variables were also estimated as shown in Table 3. This was with a view to expound the threshold point and lend more meaning to the results generated in Figure 7.

Table 3: Break-point (Threshold) Estimates of the Relationship between Economic Growth and Environmental Quality (Dependent Variable-COI)

Estimates before the Break-point				
Variable	**Coefficient**	**Standard Error**	**t-statistic**	**P- value**
GDP	0.118955	0.0034634	3.43	0.002
Constant	0.6537043	0.1410948	4.63	0.000
Estimates after the Break-point				
GDP	0.0072844	0.0055694	1.31	0.209
Constant	1.453789	0.1370206	10.61	0

Source: Author's computation using Stata 12.0

Table 2 presents the break-point regressions for the relationship between economic growth and environmental quality. Specifically, the threshold level before and after growth that could accelerate environmental degradation were estimated. In the regression, it was discovered that before the break-point, an increase in emissions economic activities had more significant effect on the environment. It was such that a percentage increase in economic growth, caused environmental quality to reduce significantly by 11 percent ($t = 3.4$; $p = 0.02$). But beyond the break point, an increase in economic activities showed that there was still an increasing effect on environmental quality but appeared insignificant; specifically, a one percent increase in economic growth caused environmental quality to reduce by 0.07 percent ($t = 1.31$; $p = 0.29$).

The implication of this result is that increases in economic growth resulting from increased economic activities are already resulting in environmental degradation in Nigeria. However, estimates after the threshold point revealed that there are potential prospects for maintaining environmental quality via mitigation strategies (through technological development and use of cleaner processes) and adaptability. Hence, there is the indication of the room for stabilizing environmental quality through a technological re-ordering and human economic activities.

6. Discussion of Results

The result on the growth limits for the ecosystem revealed that beyond a break-point of twenty-five (25) percent growth rate, there will exist a positive but insignificant effect of economic growth on the environment in Nigeria. Interestingly, the result appeared inconsistent with theoretical postulates expectation on growth limits which expects that as population and economic activities increases, resource depletion will occur, such that growth limit will be reached, thereby resulting in decline in resources and economic output (Meadows, *et al*, 1974).

Beyond the optimal point instead of an adverse reaction on the environment, it was discovered that continuous economic activities had a negative but insignificant effect on the environment. This insignificant relationship is consistent with the argument of Soroos (1997) where it is expected that modern technology has been successful in shifting environmental impacts that may be hazardous. In addition, advancement on technological processes will further enhance productivity and mitigate environmental challenges. Thus, if the advent in technology brings about positive changes, the challenges that could emanate from continuous growth processes will even out in Nigerian in the long-run.

Although, it has been argued that technology could be a primary source of pollutants, (Commoner *et* al, 1971). Specifically, this has been made visible through the excessive use of synthetic organic products like plastic, detergents, paper products, rubbers, pesticides, herbicides, wood pulp, production of energy and electricity, petroleum-driven vehicles, production of cements, aluminium, chlorine, petroleum and other petroleum products - all of which produce heat, radiation and other greenhouse gases that are hazardous . Nonetheless, it has been widely accepted that modern technology has been successful in shifting the environmental impact of growth than in removing it. Moreover, the neoclassicals upheld that improvement in abatement technologies is capable of moderating the negative influences of growth beyond the threshold point.

Besides, economic growth which causes increased income per capita could eventually lead to demands for cleaner environment as explained by the cubic function of the EKC estimate in

Nigeria (Panayotu, 2003). In addition, enactments of environmental regulations in Nigeria and advances in emission control technologies could enhance the quality of the Nigerian environment. According to the material balance theory, it is expected that the environment has the ability to adjust in the long-run to imbalances that occur from economic activities (Hussen, 2000).Thus, long-run adjustment of the environmental from pollutants economic activities can account for the insignificant effects beyond the growth limit.

Below the optimal point on growth limit estimates in Nigeria, economic growth affected environmental quality more in Nigeria. A major factor that accounted for this current effect in Nigeria is increase in human population and consumption. This has become evident in myraids of economic activities which is evident in factors like over-utilization of resources. This has resulted in a less stable environment and increasing vulnerability of the population to hazards from increased economic activities that trigger pollution, (Allen and Barnes, 1995; Rudel, 1989). This analysis provides a basis for the Malthusian idea that increased population growth contributes directly to struggle for space (such as high deforestation rates) and indirectly (demand for production). The response of the environment to pollution from economic activities below the optimal point is made clearer from the long-run causality estimates (from the error correction estimates) where environmental quality responds quickly to distortions from economic growth. This findings are consistent with the findings of Balibey (2015); Ozturk, *et al* (2013).

7. Conclusion and Recommendation

In all, the current trend of growth-environment nexus in Nigeria reveals that the response rate to challenges emanating from economic activities appear to be low. This is because despite that several policies have been put in place to check environmental challenges that could result from human economic activities, more pertinent issues that have overtaken the issues of environmental degradation include poverty, consumption, political upheavals, conflicts, socio-economic developmental factors, struggle for survival and comfort.

Since zero emission is impossible, there is no doubt that production of non-economic materials like emissions and waste will be an on-going process from economic activities. Therefore, technological best practices in our economic activities and processes that can promote and maintain environmental resilience is a viable option. This is because advances in technology, which is an offshoot of human capital development, has been identified as a threshold breaker and modifier. Thus, but eco-friendly technologies are consistent with the propositions on sustainability of the natural ecosystem.

References

Allen, J. C. and Barnes, D. F. (1995). "The Causes of Deforestation in Developed Countries." *Annals of the Association of American Geographers* 75, 2: 163-84.

Balibey M. (2015). "Relationships among CO_2 Emissions, Economic Growth and Foreign Direct Investment and the Environmental Kuznets Hypothesis in Turkey." *International Journal of Energy Economics and Policy*, 5(4), 1042-1049.

Barro R. J. and Sala-i-Martin X (2004). "Economic Growth." *Asoke K. Ghosh, PHI Learning Private Limited*, M-97, Connaught Ciircus, New Delhi, ISBN- 978-81-203-2551-7.

Brown, L., Larsen, J., Roney, J. M., and Adams, E. E. (2015). "The Great Transition: Shifting from Fossil Fuels to Solar and Wind Energy." *Earth Policy Institute, 2015*

Central Bank of Nigeria (CBN), (2016). "Statistical Bulletin". *Central Bank of Nigeria* P. M. B. 0187, Garki, Abuja.

Hussen M. A. (2000). "Principles of Environmental Economics". *Routledge, London and Newyork*; ISBN:0-415-19570-5(hbk)

Jhingan, M. L. and Chandar K. S. (2008). "Environmental Economics: Theory, Management and Policy." *Vrinda Publications Ltd, Delhi, India.* ISBN:978-81-8281-1140.

Jhingan, M. L. (2013). "The Economics of Development and Planning". *Vrind Publications, Mayur Vihar Phase-1, Delhi*-110091.

Meadows D. A., D. L. Meadows, J. Randers and W. W. Beherns (1972). "The Limits to Growth" *A Report for the Club of Rome's Project on the Predicament of Mankind, 1972*

.

Meadows, D. H., Meadows, D. L., Randers, J. and Behrens, W. W. III (1974). "The Limits to Growth A Report for the Club of Rome's Project on the Predicament of Mankind." *2nd edn., New York: Universe Books.*

Nnanna, O. J., Alade, S. O., and Odoko, F. O. (2003). "Contemporary Economic Policy Issues in Nigeria." *Central Bank of Nigeria* ISBN: 978-37024-0-8.

National Environmental Standards and Regulations Enforcement Agency (NESREA) (2011). *Minitry of Environment, Nigeria*

Ozturk, I.and Acaravci, A. (2013). "The Long-run and Causal Analysis of Energy, Growth, Openess and Financial Development on Carbon Emissions in Turkey." *Energy Economics*, 36, 262-267.

Panayotu, T. (2003). "Economic Growth and the Environment." *Economic Survey of Europe, 2003 No.2*

Rebelo, S. (1991). "Long-Run Policy Analysis and Long-Run Growth." *Journal of Political Economy*. **99** (3): 500. doi:10.1086/261764.

Rudel, T. K. (1989). "Population, Development, and Tropical Deforestation: A Cross-national Study." *Rural Sociology* 54, 3: 327-37.

Soroos, M. S. (1997). "The Endangered Atmosphere: Preserving a Global Commons." *Columbia, S. C.: Universityof South Carolina Press*

Stokey, N. L. (1998). "Are there Limits to Growth?" International Economic Review 39 (1), pp 1-31.

Weil N. David (2009). "Economic Growth." *Dorling Kindersley (India) Pvt, Ltd. Licenses of Pearson Education in South Asia. ISBN 978-81-317-2481-1.*

World Development Indicator (2015). *The World Bank, Washington D. C. U.S.A.*