**POPULATION GROWTH, INSTITUTIONAL QUALITY AND ENVIRONMENTAL SUSTAINABILITY NEXUS: AN EMPIRICAL EVIDENCE FROM NIGERIA**

**INTRODUCTION**

According to the UN, there are three pillars of sustainability: social sustainability, economic sustainability and environmental sustainability. Environmental sustainability, which is the crux of this research, Environmental sustainability is defined as responsible interaction with the environment to avoid depletion or degradation of natural resources and allow for long-term environmental quality.

In today’s world, the issue of sustainable environment has been a major concern to individuals, researchers, institutions and governments. As the population of Nigeria increases, growing numbers of people and firms interact with the environment, increasing the pressure on the environment thereby making it less safe for living.

Although extensive academic research has explored the characteristics and dynamics of the interactions between population growth and environmental sustainability in Nigeria, much less research has investigated the interactions between institutional quality and environmental sustainability in Nigeria.

*Fig. 1: This chart shows the amount of carbon released into the environment, in Nigeria, annually.*

Research has shown that Nigeria has one of the poorest environments in Africa, and this conveys the need for research that extends beyond the impact of increased population size on the environment. Furthermore, various policies have been put in place, and various institutions have been set up by the government to address these issues but yet expectations are not being met. Against this background, the purpose of this research is to answer the question: “What is the impact of population growth and institutional quality on environmental sustainability in Nigeria?”

**METHODOLOGY AND DATA ANALYSIS**

Using the IPAT model as the theoretical framework, time series data covering the period between (1981-2020) were collected from the World Development Indicators (WDI). Using the Econometric (E-views 9.0), Ordinary Least Squares, Johansen Cointegration technique and Granger Causality test were the time series techniques employed for the analysis. The model to be estimated is specified as follows:

***LCO2 = F(COC, LPOP, LGDPC, LMVA)*** *-* - - - - - - - - - - - -(1)

Specifying econometrically, we have:

***LCO2t = φ0 + φ1COCt + φ2LPOPt+ φ3LGDPCt + φ4MVAt + μt***- - -- - -- - - (2)

Where, L is natural logarithm; CO2 is the proxy for environmental sustainability; COC is the proxy for institutional quality; POP is the Population size; GDP Per Capita is denoted by GDPC; MVA is Manufacturing Value Added; and is the error term.

The a priori expectations are: ***φ1*** < 0, ***φ2*** > 0, ***φ3*** > 0 and ***φ4 > 0****.* All time series data used were tested for unit root using the Augmented Dickey-Fuller (ADF) test.

**EMPIRICAL RESULTS**

The ADF test showed that all the variables were stationary at first differencing thus indicating that all are I(1) series. Also, the Johansen co-integration test was employed to investigate for possible long-run relationship between the variables especially between openness and growth. The choice of Johansen cointegration is informed by the fact that all the series are integrated of order one. The result showed the existence of a long run relationship among the variables.

Looking at the broad objective of the study which is to examine the impact of population growth and institutional quality on environmental sustainability in Nigeria, the linear representation of the estimated result using the OLS equation (2) is outlined as shown below:

*LCO2 = -4.3658 + 0.0918COC + 0.7566LPOP + 0.1725LGDPC + 0.0141MVA*

(2.7983) (0.1779) (0.1663) (0.1787) (0.0083)

R2 = 0.762 F-stat = 28.036 D-W = 1.7089

(Standard errors are in parenthesis)

As could be seen from the regression equation, the F-Statistic is significant, good and fit. The R-squared is high and statistically significant. Infact, the coefficient of determination R2 which has a coefficient of 0.762 shows that 76.2 percent of the changes in LCO2 can be explained by the chosen explanatory variables. Also, the Durbin-Watson Statistic of 1.71 shows there is no autocorrelation among the variables. The overall interpretation of the regression result is that population growth has contributed significantly to making the environment worse off; also, the quality of institutions in Nigeria is low, since they do not contribute significantly in making the environment better-off. As could be seen also, all the variables in the model turned out with the expected sign.

Finally, the Pairwise Granger Causality test result conducted showed that there is a unidirectional causality between POP and CO2 emissions. This is because the null hypothesis of LPOP not causing LCO2 was rejected as informed by the probability value. This further lends credence to the negative, direct effect of population growth on the environment. Also, the result showed that there is zero causality between COC and CO2 emissions in Nigeria.

**CONCLUSION AND RECOMMENDATION**

It can be concluded from the findings that population size has positive and significant effect on carbon emissions in Nigeria, and also, control of corruption has negative and insignificant effect on carbon emissions in Nigeria. This insignificance is attributable to the fact that institutions (especially those in charge of implementing environmental policies) in Nigeria are operating below expectations. All other variables (GPD per capita and MVA) have positive relationship with carbon emissions, which is in alignment with the a priori expectation. However, these relationships are insignificant. The insignificance of GDP per capita may be attributed to the fact that there is high unemployment in the country, and thus, low demand for goods and services. Although GDP per capita experiences annual increase, this increase is not all-round since there is a wide gap between the fewer rich and the larger poor population. MVA, this may be attributable to the fact that the manufacturing sector in Nigeria is underperforming, since Nigeria is majorly an import-dependent country. Nevertheless, overall, population growth positively and significantly affects carbon emissions in Nigeria, while the reverse is the case between control of corruption and carbon emissions in Nigeria.

Based on the conclusion made from the findings, we recommend that the government create new systems of checks, reform institutions and implement new policies targeted at ensuring a healthy environment for all because the quality of institutions currently in charge of maintaining a healthy environment is low. Also, government should embrace alternative forms of transportation like use of cables, electric train, etc. In addition, government should make public mass transit comfortable and affordable, thereby reducing the number of vehicles on the road and thus reducing the amount of carbon monoxide released into the atmosphere. Finally, government should adopt policies that encourage afforestation as this will help reduce the amount of carbon in the atmosphere.

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