



Foreign Direct Investment and Environmental Sustainability in Nigeria

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ABSTRACT: Empirical studies have focused more on the impact of Foreign Direct Investment (FDI) on economic growth while neglecting its impact on environmental degradation. FDI contributes to environmental hazards which are harmful and detrimental to human wellbeing. This study employed the Ordinary Least Square (OLS) method to analyze the impact of Foreign Direct Investment on environmental sustainability in Nigeria. Data were collected on CO₂ emissions (proxying environmental degradation), FDI, Gross Domestic Product (GDP), and population covering the period 1986 to 2015. The study found out that FDI contributes to CO₂ emissions, hence environmental degradation. This is attributed to the activities of resource extracting industries which cause pollution in Nigeria. In addition, growth in GDP spurs environmental sustainability against a priori expectation due to the low level of Nigeria's industrialisation. Furthermore, population growth leads to environmental degradation because majority of Nigerian citizens are poor and depend on the environment for their livelihood which leads to its depletion. The study therefore concludes that Foreign Direct Investment impedes environmental sustainability – giving credence to the pollution haven hypothesis. It is recommended amongst others that; first, the Nigerian Government should impose stringent laws to protect our environment and regulate the activities of international corporations and ensure that these laws are adhered to; second, environmental friendly equipments should be employed by multinational corporations and resource extracting industries; finally, adequate lands should be provided for housing, farm and resources productivities among the less privileged to achieve environmental sustainability.

Keywords: Carbon Dioxide (CO₂) Emission, Economic Growth, Environmental Sustainability, Foreign Direct Investment

I. INTRODUCTION

Nigeria like many other developing countries is abundant in natural resources which lures Foreign Direct Investment (FDI) making it a worthy host country. For sustainable development to be achieved in any nation, there has to be a vast foreign capital inflow into that country, and hence, the importance of FDI. According to UNCTAD cited in Hassan, Sule & Abu, [1], FDI inflows to Nigeria amounted to \$588 million in 1990, rose to \$1,079 million in 1995 and declined to \$930 million in 2000. FDI inflows to the country stood at \$1.14 billion in 2001, \$7.8 billion in 2008, \$8.5 billion in 2009 and \$8.9 billion in 2011; it however dropped by 21.34 per cent to \$7.1 billion in 2012. These FDIs usually come from Multi-National Corporations (MNCs) who make massive investments in local economies.

International corporations operate in developing nations and extract natural resources to enhance economic growth. Due to their heavy involvement in manufacturing, the potential of FDI inflows are dual – it propels economic growth (through increase in production) and also precipitates environmental degradation (due to pollution). This is sometimes harmful to the citizens and the environment at large mostly due to the extreme levels of pollution and environmental degradation. Environmental well being has suffered greatly from FDI because of the highly concentrated polluting chemicals of extractive activities. The aftermath effects of mining operations are harmful to the populations in poor and developing countries which accounts for the largest releases of metals into the environment alongside sulfur dioxide and nitrogen.

The exploration and extraction of hydrocarbon deposit (fossil fuel) has led to a decrease in animal and marine life, vegetative land and contaminates water. All these leads to a rise in health risks from minor ailments such as headaches, nausea to major ailments like cancer, infections, dermatitis and other chronic illnesses

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caused by contaminated water. All these points out that FDI into REIs detrimentally affect the environmental well being of host countries. However, the governments of many of these host countries are unwilling to impose more restrictive regulations on multinational corporations (MNCs) because of the corruption, profitability and exploitation involved and also because it is important to note that not everyone or everyplace has felt the negative impact of environmental hazards by FDI.

The UNDP Human Development report [2] asserted that more than sixty percent of Nigerian citizens' principle source of food stems from their natural environment. However, the strong presence of REIs operating within the country has greatly weakened the status of this quintessential element of the human condition in Nigeria. According to Duffield [3], the U.N has concluded that it will take at least thirty years for Nigeria's environment to fully recover from the estimated 7,000 oil spills which have taken place since 2000. Moreover, minimal effort has been made by the Nigerian government to better regulate the workings of foreign firms due to its economic dependence on extractive foreign direct investment [4] [5]. Thus there is need for Nigeria to formulate a regulatory framework that is transparent and consistent in enforcing a safe and healthy environment on FDI, ensure that environmental friendly equipments are used by MNCs and REIs and create checks into the activities of said corporations.

Notwithstanding, most mineral and oil-abundant economies have performed worse in terms of human development and poverty reduction than resource-poor ones [6]. The disconcerting reality that two-thirds of the world's poor reside in resource-rich states suggests that their wellbeing may be greatly affected by the presence of extractive MNCs operating within their region [7]. Poverty is one of the problems that need to be tackled in order to solve environmental degradation in Nigeria. The poor or less privileged depend mostly on the resources gotten from the environment to survive daily leading to an excessive use of these resources, therefore depleting the environment and impoverishing themselves, which means a difficult existence for them.

FDI in Nigeria has been mainly channeled into the industrial sector to improve economic development and growth without tackling the consequences involved. Therefore, it is necessary to examine the effect of FDI and economic growth on the environment. This study therefore deemphasizes the effect of FDI on economic growth (as per previous studies) and focuses on their joint effect on environmental sustainability. The study thus seeks to: first, examine the relationship between FDI and the environment; second, the effect of FDI on the environment; the impact of economic growth and population on the environment, and finally, attempts some policy recommendations. The rest of the paper is structured as follows. The theoretical considerations and the review of related literature are done in section two. Section three is the methodology of the study. Section four presents the results and discussion of findings while Section five is concludes the paper and attempt some policy recommendations.

II. REVIEW OF RELATED LITERATURE

2.1 Theoretical Framework: The Pollution Haven Hypothesis

The pollution haven hypothesis, or pollution haven effect, is the idea that polluting industries will relocate to jurisdictions with less stringent environmental regulations. Empirical studies of the phenomenon have been hampered by the difficulty of measuring regulatory stringency and by the fact that stringency and pollution are determined simultaneously. Early studies based on cross sections of data found no significant effect of regulations on industry locations. Newer studies that use panels of data to control for unobserved heterogeneity or instrumental variables to account for simultaneity have found statistically significant, reasonably sized effects. The pollution haven hypothesis (or pollution haven effect) posits that jurisdictions with weak environmental regulations – 'pollution havens' – will attract polluting industries relocating from more stringent locales. The premise is intuitive: environmental regulations raise the cost of key inputs to goods with pollution-intensive production, and reduce jurisdictions' comparative advantage in those goods. The Heckscher–Ohlin model provides the theoretical foundations by showing that regions will export goods that use locally abundant factors as inputs. Empirically, however, robust evidence that industries shift production to less stringent jurisdictions has proven elusive.

The original Copeland and Taylor analysis develops a two country static general equilibrium model of international trade with a continuum of goods differentiated by their pollution intensity. There is only one primary factor of production in which it is assumed that countries only differ in their endowment of this factor which focuses on how differences in human capital across countries affects their income, regulation, and resulting trade flows and pollution levels [8]. The production of any good in the economy creates pollution as a joint product. Pollution abatement is possible, but requires real resources and active abatement plus joint production leads to a final goods specification where pollution appears as if it was an input to production. Assumptions are adopted on abatement to allow for an unambiguous ranking across the continuum of industries according to their pollution intensity.

According to Copeland & Taylor [9], the theory reflects three realities. There is a very unequal distribution of income worldwide; industries differ greatly in their pollution intensity of production; and

environmental quality is a normal good. It then provides predictions on trade patterns and pollution levels from these assumptions. When countries differ only in human capital levels, it generates the Pollution Haven Hypothesis: a movement from autarky to free international trade in goods leads to the relocation of dirty good production from the high income tight environmental regulation country to the low income lax environmental regulation country. It also provides two corollaries. Pollution rises in the lax regulation country and falls in the tight regulation country. Overall, world pollution rises with trade.

It is not surprising then that subsequent empirical work on the PHH has sometimes confused two quite different empirical findings linking regulation to trade flows. The first is finding evidence of the "pollution haven effect." The pollution haven effect arises when a tightening of environmental regulation deters exports (or stimulates imports) of dirty goods. In many conventional models, a tightening of regulation will raise production costs and lower both production and exports [10]. Evidence for the pollution haven effect comes from examining variation in the cost of meeting regulations and linking this to trade flows. Many of the studies in this area provide evidence on the pollution haven effect.

This study therefore examines the effect of FDI on environmental sustainability within the framework of the Pollution Haven Hypothesis.

2.2 Empirical Review

Idoko, Idachaba & Emmanuel [11] carried out a study on the Effects of Foreign Direct Investment on Sustainable Development in Nigeria. The period covered for this research was 1980-2013. The result of the OLS techniques indicates that FDI is statistically significant and relevant to sustainable development in Nigeria. From the result of this study, it portrays that for effective economic growth and sustainable development to be achieved in Nigeria, it will be better to focus on the improvement of infrastructural development, human resource, entrepreneurship, and stable macroeconomic framework capable of fostering productive investment that can augment the process of sustainable development.

In a research titled 'Impact of FDI in U.A.E over the Main Elements of Sustainable Development: Economy and Environment', Khan & Agha [12] used Augmented Dickey-Fuller (ADF), Johansen co integration and Granger Causality tests to study the direct relationship between the FDI inflows, GDP and CO₂. The results showed that there is no causality between the growth rate of GDP and FDI, growth rate of FDI and CO₂ within the period covered (1990 - 2010). This paper concludes that government should make policy that will ensure that transnational companies use equipment that is environmentally friendly.

Riti & Kamah [13] carried out a study on Globalization, Economic Growth and Environmental Sustainability Nexus in Nigeria. The study analyzed the contributions of trade liberalization and foreign direct investment inflows on growth in Nigeria and the implications of economic globalization on the Nigerian environment by applying the co-integration and Vector Error Correction Mechanism using data from 1981 to 2013 sourced. The findings indicated that trade openness and FDI inflows have made substantial contributions to economic growth in Nigeria. GDP and trade openness also aided environmental quality in the long run. FDI inflows on the other hand contributed to the worsening of the environment evident in more pollution emission in the long run. Some of the suggested recommendations were that Nigeria must put in place sound environmental policy to ameliorate the globalization effects on the environment particularly in FDI attractions. In addition, government and stakeholders alike must adhere to strict environmental enforcement to avoid excessive pollution discharges, indiscriminate deforestation, over exploitation of the flora, fauna and marine resources, and ill defined property rights among others. Government should realize effective macro-economic policies along with momentous improvements in the structure and functioning systems of governance for stabilizing economic growth along with trade and financial liberalization reforms.

Imougehele & Ismaila [14] examined the Nature of Foreign Direct Investment and its Impact on Sustainable Economic Growth in Nigeria for the period which spanned between 1986 and 2009. The study used co-integration and Error Correction Mechanism (ECM) to determine the relationship between FDI, its components and economic growth. The study found that continuous inflow of foreign direct investment in mining and quarrying, telecommunication, building and construction, trading and business and agricultural sectors have a robust impact on Nigeria's economic growth. The study recommended among others that there is need for government to consciously improve the business environment by conscious provision of necessary infrastructure, which will lower the cost of doing business in Nigeria and adequate macroeconomic policies that will open up the economy should be put in place to encourage foreign direct investment inflow and make Nigeria an export platform, where export commodities could be manufactured for established international market, this will help to Strengthen Nigeria's Balance of Payment position (BOP).

Danladi & Akomolafe [15] in their study Foreign Direct Investment, Economic Growth, and Environmental Concern: Evidence from Nigeria, analyzed the impact of FDI in Nigeria and its effect on environment degradation. This was done within the period of 1977-2010. The methodology adopted was the granger causality test to examine the direction of causality between FDI and economic growth, Economic

growth and Pollution, FDI and Pollution. The results revealed that the only causality found is a uni-directional causality between the growths of FDI and the growth rate of pollution. The study recommended that government should make policy that will ensure that multinational companies use equipment that is environmentally friendly.

In another research on Estimating the Impact of Foreign Direct Investment in Nigeria, Anfofum, Gambo & Suleiman [16] used time series data and found out that FDI spurs exports, gross fixed capital formation and economic growth in Nigeria. Thus, FDI is a positive measure of economic growth. The study recommended among others that improvement in infrastructural development especially in good roads and electricity supply as this will increase the level of development which will in turn attract more inflow of FDI. The government should provide an enabling environment in the area of security so that foreign investors would be encouraged to invest more and local investors will not relocate to neighboring countries.

Mojekwu & Ogege [17] examined Foreign Direct Investment and the Challenges of Sustainable Development in Nigeria. Data for the study was collected within the period 1970-2010. The results of the co-integration and error correction model revealed that there exist a long-run relationship between GDP and the explanatory variables. The results conform to the economic a priori expectation. It also revealed that Gross Capital Formation has a positive and significant relationship with economic growth. It was recommended that capital formation encourages economic growth via savings accumulation vis-a-vis, increase in the gross domestic investment. Also, there is need for constructive attention to be given to provision of needed infrastructure, especially power generation and distribution, to enhance economic growth and development.

In the research Foreign Direct Investments, Strategic Assets and Sustainable Development: A Critique of International Investment in Nigeria's Steel Sector, Tenuche [18] relied essentially on secondary sources of data. Specifically the paper critically assessed the agreements signed by SOLGAS Energy Nigeria Limited (SOLGAS) and Global Infrastructure Nigeria Limited both of whom are core investors in the steel sector and the Nigerian Government for the development of Ajaokuta Steel Project. One of the recommendations was that management has been identified as a very important element in the development of any sector of the economy. The management of any project/programme must always be an exclusive area of control of Government.

III. METHODOLOGY

The Ordinary Least Squares (OLS) econometric technique is employed for this study using time series secondary data from 1986 – 2015, obtained from World Bank Statistics (Nigeria Estimates) and CBN Statistical Bulletin. The study adapted the model used by Khan & Agha [12] which was modified to achieve the stated objectives.

3.1 Model Specification

The model examines the impact of FDI on environmental sustainability in Nigeria. The dependent variable is Carbon dioxide (CO₂) emission used as proxy for environment and the independent variables are FDI, GDP and POP. This statement is written in functional form as;

$$CO_2 = f(FDI, GDP, POP)$$

The stochastic form of the model is given below:

$$CO_2 = \alpha_0 + \alpha_1 FDI + \alpha_2 GDP + \alpha_3 POP$$

Where:

CO₂ = Carbon dioxide emission

FDI = Foreign Direct Investment (₦'billion)

GDP = Gross Domestic Product (₦'billion)

POP = Population (millions)

μ = Error Term

α₀ – α₃ = Parameters to be estimated.

The a priori expectations are α₁ > 0, α₂ > 0 and α₃ > 0 which means that FDI, GDP and POP are expected to have a positive relationship with CO₂. In general, it is expected that foreign direct investment should have a positive relationship with CO₂ emissions signifying environmental degradation.

IV. DATA ANALYSIS

4.1 Trend of FDI and Environmental Sustainability in Nigeria

Carbon dioxide (CO₂) emission has an average of 69,068.79kt between the periods 1986 to 2015. The maximum and minimum values recorded within the period are 104,696.5kt in 2005 and 34,917.17kt in 1995 respectively. This means that in 2005 the industrial activity in Nigeria was high and because of the CO₂ emission the rate of environmental depletion was high. It also means that 1995 recorded the lowest case of environmental risks to the citizens in Nigeria. Steady increase of CO₂ emission from 71,788.859kt in 2009 to 99,247.36kt in

2015 is unhealthy as it greatly affects the environment and population negatively. These increases in the industrial operations denoted from the increases in CO₂ are backed up with the increases in GDP within the same period of this study.

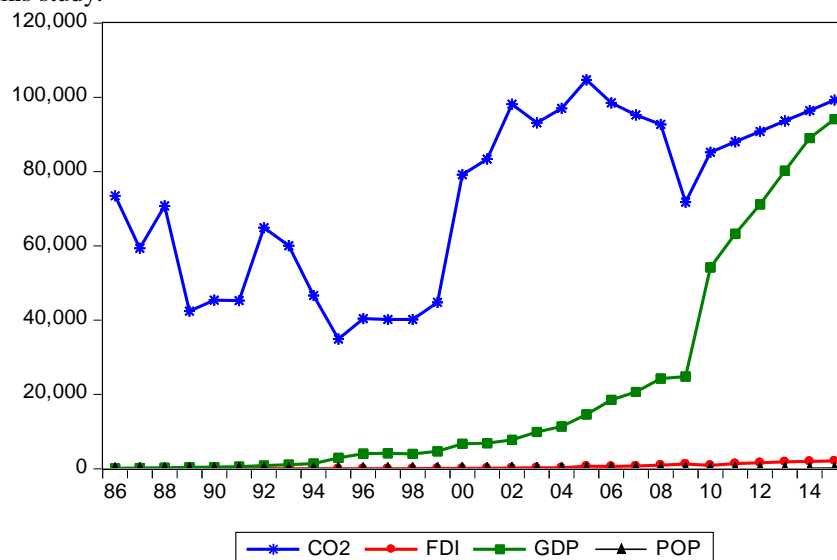


Figure 1: Graphical Trend of Variables

Source: Eviews9 Output, 2016.

There has been a steady increase in GDP from ₦134.60 billion in 1986 to ₦94,144.96 billion in 2015 this can be due to the fact that the activity sectors in the economy increased from 33 in 1990 to 46 in 2010 after the rebasing of the economy. As these sectors experienced growth, GDP also increased. In the period 1986 to 1998 FDI saw fluctuations in its growth and increased from ₦23.01 billion in 1998 to ₦93.16 billion in 1999 and continued to rise till date. The beginning of a new era (democracy) led to the increase in FDI inflow in Nigeria. Population has been on a steady increase within the period of study. The population more than doubled in 2015 from 88.06 million in 1986 to 178.40 million. According to Okwori, Ajegi, Ochinayo & Abu, [19], with a growth rate of 3.02% per annum, the population is capable of doubling itself in less than 23 years.

4.2 Result and Discussion

In order to avoid spurious results, the unit root test is used to examine the stationarity of the data series. The Augmented Dickey- Fuller (ADF) test is important because it authenticates results and is a prerequisite to the OLS and Cointegration test. The stationarity test result is presented below:

Table 1: Stationarity Test

Variables	ADF Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	Prob.	Order of Integration
CO ₂	-5.81	-3.69	-2.97	-2.63	0.0000	I(1)
FDI	-6.21	-3.69	-2.97	-2.63	0.0000	I(1)
GDP	-3.71	-3.69	-2.97	-2.63	0.0096	I(1)
POP	-4.57	-3.71	-2.98	-2.63	0.0020	I(1)

Source: Eviews9 Output, 2016.

The result shows that, the ADF test statistic is less than the critical values at all significant levels. This is evidenced further by the low probability values. Thus, the variables attained stationarity at first difference.

The finding that the macro time series contains a unit root has spurred the non stationary time series analysis. Engle and Granger [20] pointed out that a linear combination of two or more non stationary time series may be stationary. If such a stationary linear combination exists, the non stationary time series is said to be cointegrated. The stationary linear combination may be interpreted as a long run equilibrium relationship between the variables. The Johansen system framework is employed to test for the presence of cointegrating relationships among the non stationary variables. The result is presented below:

Table 2: Co integration Test

Null Hypothesis	Trace Statistic	0.05 Critical Value	Null Hypothesis	Max-Eigen Statistic	0.05 Critical Value
$r = 0^*$	51.71	47.86	$r = 0^*$	27.03	27.58
$r \leq 1^*$	24.69	29.80	$r \leq 1$	15.13	21.13
$r \leq 2$	9.55	15.49	$r \leq 2$	9.55	14.26
$r \leq 3$	0.00	3.84	$r \leq 3$	0.00	3.84

Source: Eviews9 Output, 2016.

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

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

4.2.1 Effect of Foreign Direct Investment on Environmental Sustainability in Nigeria

On the basis of the stationary linear combination, the effect of Foreign Direct Investment on Environmental Sustainability is examined via the OLS method. The result is presented below:

Table 3: Regression result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-12.17	6.08	-2.00	0.0558
LOG(FDI)	0.04	0.08	0.48	0.6341
LOG(GDP)	-0.56	0.16	-3.40	0.0022
LOG(POP)	5.78	1.52	3.80	0.0008
$R^2 = 0.62$, Adjusted $R^2 = 0.58$, F-statistic= 14.10, Prob. (F-stat) = 0.000012, D-W Stat = 1.13				

Source: Eviews9 Output, 2016.

The table above shows the regression analysis result. From the result, FDI and POP conform to a priori expectations while GDP does not conform to a priori expectations. The result further reveals that GDP and POP are statistically significant. A unit change in FDI and POP will cause CO_2 to increase by 0.04 and 5.78 respectively of that unit change while a unit change in GDP will cause CO_2 to decrease by 0.56 of that unit change. The adjusted R^2 implies that 58% of the variations in CO_2 are accounted for by FDI, GDP and POP. This is moderate and shows that our regression line moderately fits the data due to the fact that the maximum value of R^2 can at most be 1. The F-statistics reveals the overall goodness of fit of the model. The F calculated (14.10) is greater than the F tabulated (2.62) – therefore, we infer that the independent variables (FDI, GDP and POP) have joint influence on CO_2 . Thus, the overall predictive power of the econometric model is statistically significant.

V. CONCLUSION AND RECOMMENDATIONS

Our investigation reveals that foreign direct investment affects the environment through carbon dioxide (CO_2) emission given credence to the pollution havens hypothesis. This is because multinational companies and resource extracting industries operating in Nigeria exploit our natural resources to the detriment of the environment and population at large. The negative relationship Gross Domestic Product has with carbon dioxide (CO_2) emission mean that increase in GDP does not affect the environment. This is because the industrial sector is not the major booster of the Nigerian economy due to the low level of the country's industrialization, hence contributing little to environmental degradation which connotes sustainability. Population growth as seen from its contribution in the model has the highest effect on environmental sustainability. This is because majority of Nigerian citizens are poor and depend on the environment for their livelihood which leads to its depletion. The study therefore concludes that Foreign Direct Investment contributes to CO_2 emissions and thus impedes environmental sustainability. The study therefore suggests the following recommendations:

1. The Nigerian Government should impose stringent laws to protect our environment and regulate the activities of international corporations and ensure that these laws are adhered to.
2. Environmental friendly equipments should be employed by multinational corporations and resource extracting industries.
3. Government should formulate policies/programmes that will alleviate poverty and cater to the less privileged and poor citizens. This is to ensure that natural resources are not wasted or misused by the poor.
4. Adequate lands should be provided for housing, farm and resources productivities among the less privileged to achieve environmental sustainability.

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