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The Effect of Economic Crisis on Institutional Quality and Climate Change in Nigeria

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Abstract

This research examines the interrelation between economic crises, institutional quality, and climate change in Nigeria. The country has faced numerous economic downturns primarily driven by fluctuations in climatic conditions and domestic governance challenges. As Nigeria grapples with these crises, the quality of its institutions has deteriorated, consequently affecting the implementation of climate change initiatives. Using a mixed-methods approach, this study incorporates secondary data analysis of economic indicators and institutional performance metrics alongside qualitative interviews with key stakeholders in governance and environmental sectors. The findings highlight that economic crises significantly contribute to institutional degradation, which in turn adversely impacts climate policy formulation and execution. The study concludes with recommendations for enhancing institutional resilience and promoting sustainable development in the face of economic challenges.

Background to the Study

Nigeria, Africa's most populous country and one of its largest economies, has endured a series of economic crises that have profoundly impacted its institutions and climate policy. The country's dependency on oil revenues exposed it to global market vulnerabilities, leading to economic volatility. Concurrently, weak governance structures and pervasive corruption have hindered effective responses to climate change.

The quality of institutions in developing countries has taken central in empirical discourse. Institutional quality entails the rule of law, individual rights, as well as high-quality government regulation and services. It is the extent to which a country's institutions facilitate international transactions, and provide for their security and predictability. To Bruinshoofd (2016), it captures laws, individual rights and high-quality government regulation and services and that it reinforces economic development. The importance of the quality of institutions in supporting investment and economic growth cannot be overemphasized. As a result, the quality of institutions is critical in ensuring the regulation and implementation of political, social, and economic activities around the world, as well as proper monitoring. Viable institutions foster social cohesion and macroeconomic stability, thereby increase investment and growth (Easterly, Ritzen & Woolcock, 2006). Evidence suggests that countries with strong institutions encourage a strong legal framework for efficient fund mobilization and allocation, resulting in a less risky business environment (Abubakar, 2020; Law & Azamn-Saini, 2008). According to Zubair (2025) reveals that inadequate institutional frameworks significantly hinder economic growth, while escalating public debt imposes constraints on fiscal policies, thus further undermining economic growth prospects.

Other studies have also emphasized the importance of strong institutional quality in ensuring long-term growth and development (Thorbecke, 2013; Iheonu, Ihedimma, & Onwuanaku, 2017; Parks, Buntaine & Buch, 2017). Nigeria, a nation rich in natural resources and human potential, has been grappling with a persistent development crisis that has hindered its progress and prosperity. This paper aims to explore the intricate relationship between these economic crises and their repercussions on institutional quality and climate change initiatives in Nigeria, contributing to a better understanding of governance challenges within developing economies.

Literature Review

Economic downturns often trigger governance crises characterized by increased corruption and reduced public trust in government (Acemoglu & Robinson, 2012). Scholars such as Olowu and Diouf (2017) note that weak institutions exacerbate the effects of climate change, particularly in resource-dependent countries like Nigeria.
This section outlines the theoretical framework underpinning this research, linking economic crises, institutional performance, and environmental governance.

Economic Crises and Governance

Multiple studies have documented how economic crises compromise governance structures, leading to weakened institutions and diminished capacity for policy implementation (Imoudu& Leke, 2021). Corruption becomes more rampant during austerity measures, further complicating governance (Aiyede & Onagoruwa, 2023). Moreover, in the works of Zubair (2022) there was extensively discussion on the impact of good governance in attainment of infrastructural development in Nigeria's economy

Some studies investigated the impact of institutional quality on investment and its relationship to economic growth. For example, in trying to understand the role of institutional quality in the nexus between FDI and economic growth, Jilenga and Helian (2017) used the fixed effect and GMM models for the analysis on a sample of 36 countries from 2001 to 2015. The study found that institutional quality has a positive influence on economic growth even as foreign direct investment exerts negative influence on economic growth and development. In understanding the relationship between institutional quality and FDI, the study showed that institutional quality increases the spill-over effect from FDI and thus matters for economic growth. Peres, Ameer, and Xu (2018) categorized countries into developed and developing in assessing the influence of institutional quality on investment. The study found that institutional quality has positively and significantly impacted on investment (particularly, FDI) in developed countries.

Further research found that institutional quality has a favourable and considerable impact on economic growth in developed countries, whereas it has a negligible impact in developing economies. Bon (2019) also investigated the role of institutional quality on the public investment-growth relationship using a balanced panel data of 52 provinces in Vietnam from 2005 to 2014 through the estimation method of difference panel Generalized Method of Moments (GMM). The study found that public investment and institutional quality significantly promote economic growth and development.

Climate Change and Institutional Response

Research emphasizes the importance of robust institutions for effective climate governance. According to the Global Environment Facility (2020), effective climate action must be integrated into national planning and governance frameworks. Countries with strong institutions tend to have better resilience and adaptability to climate risks.

Gebreegziabher et al. (2011) examined the economic effect of climate change on agriculture productivity using a countrywide computable general equilibrium (CGE) model. The study observed that the impact of overall climate change will be relatively benign until approximately 2030, and thereafter worsen considerably. Further, the simulation results showed that, over a 50-year period, the projected reduction in agricultural productivity may lead to about 30% less average income, compared with the possible outcome in the absence of climate change. Using descriptive analysis, Ozor (2009) demonstrated the processes that lead to climate change so as to enable a better understanding of the concept. The study described in details the impacts of climate change on various issues of national development such as low agricultural productivity, food insecurity, resource conflicts, unemployment, environmentally-induced migration, livelihood problems and health issues. The study also noted that these impacts are as a result of devastating effects of flooding, drought, erosion, desertification, sea level rise, heat stress, pests and diseases, and erratic rainfall patterns, arising from climate change. The study further suggested the need for climate policy in Nigeria, the establishment of NCCC, the development of a national framework for climate change adaptation, and the embracing of emerging technologies.

Methodology

Model Specification

This study adopts the standard EKC model following the pioneer studies of Grossman and Krueger (1991) and subsequently adopted by Alege and Ogundipe (2013) and Osabuohien *et al.* (2014). The EKC model captures the Environmental Kuznets Effect using six environmental variables (carbon dioxide, nitrous oxide, total greenhouse emission, suspended particulate matter, Temperature, and Rainfall).

The specification in equation 1 assumes environmental pollution (*ENV*) as a function of income (Y_t) and the squared of income (Y_t^2). Income is used to capture the nature of the pollution-income relationship at the initial stage of development while the squared of income tests for the validity of the EKC by illustrating whether a turning point had occurred or not. X_t and ε_t are other exogenous variables and the disturbance stochastic term, respectively. β_0, β_1, β_2, and β_x are the coefficients.

$$ENV_t = \beta_0 + \beta_1 Y_t + \beta_2 Y_t^2 + \beta_x X_t + \varepsilon_t \quad . \quad . \quad . \qquad 1$$

Adding other exogenous variables of the study to equation 1 and applying the natural logto variables that are not rates or in the index form, we have;

$$lnENV_t = \beta_0 + \beta_1 lnY_t + \beta_2 lnY_t^2 + \beta_3 POPD_t + \beta_4 REGU_t + \beta_5 lnGDI_t + \beta_6 lnEDU_t + \beta_7 lnFDI_t + \varepsilon_t \quad . \quad . \quad . \qquad 2$$

ENV_t represents the six selected environmental pollution indicators- carbon dioxide (CO_2), nitrous oxide (NO_2), total greenhouse emission (TGH), suspended particulate matter (SPM1 and SPM2.5), Temperature (TEMP), and Rainfall (RAIN). Y and Y^2 are as defined before and they are measured as gross domestic products (GDP) per capita. Other variables are defined as follows, *POPD*: population density, *REGU*: regulation index represents the role of institution, *GDI*: gross domestic investment, *EDU*: education expenditure, and *FDI*: foreign direct investment. The six different pollution indicators for ENV_t were model led separately to disaggregate and capture the effects of the independent variables. Moreover, carbon dioxide, nitrous oxide and other greenhouse gases have different global warming potentials. Data on the variables were obtained from the World Bank's World Development Indicators, except for CO_2 which was obtained from the Global Carbon Atlas (source is the Carbon Dioxide Information Analysis Centre (CDIAC)), education expenditure and gross domestic investment (also called gross capital formation) are from the Central Bank of Nigeria, and rainfall and temperature is from the World Bank's Climate Change Knowledge Portal.

Following Wen and Cao (2009); and Ogundipe *et al.,* (2013), the theoretical interpretation of the sign and relationship of the parameters are shown as follow:

1. $\beta_1>0$, $\beta_2=0$, it indicates linear shape and monotonically increasing function. As income rises, environmental pressure is increasing.
2. $\beta_1<0$, $\beta_2=0$, it indicates linear shape and monotonically decreasing function. As income rises, environmental pressure is decreasing.
3. $\beta_1>0$, $\beta_2<0$, it indicates inverted U-shape of the EKC. As income reaches a threshold, environmental pressure decreases as income rises.
4. $\beta_1<0$, $\beta_2>0$, it indicates U-shape. Environmental pressure falls with falling income and increasing when income is rising.

The necessary decision regarding the objective of the study is to be ascertained using the sign and the magnitude of β_1 and β_2 respectively. The estimated turning points would be computed using this formula $e^{-\beta_{1/2}\beta_2}$ and compared with the descriptive statistics for GDP per capita.

Technique of Estimation

To estimate the parameters of the models, the econometric methodology employed is the Autoregressive Distributed Lag (ARDL) approach to co-integration and error correction models. This method was postulated by Pesaran, Shin, and Smith (2001) as a superior alternative to Johansen and Juselius (1990) multivariable co-integration test.

The ARDL framework for this work is formulated from equation 3 as follows:

$$\Delta lnENV_t = \delta_0 + \pi_1 lnY_{t-1} + \pi_2 lnY^2{}_{t-1} + \pi_3 POPD_{t-1} + \pi_4 INST_{t-1} + \pi_5 lnGDI_{t-1} + \pi_6 lnEDU_{t-i} + \pi_7 lnFDI_{t-1} + \sum_{t-i}^{p} \partial_1 \Delta lnENV_{t-i} + \sum_{i=0}^{p} \alpha_1 \Delta lnY_{t-i} + \sum_{t=0}^{p} \alpha_2 \Delta lnY^2_{t-i} + \sum_{t=0}^{p} \alpha_3 \Delta POPD_{t-i} + \sum_{t=0}^{p} \alpha_4 \Delta INST_{t-i} + \sum_{t=0}^{p} \alpha_5 \Delta lnGDI_{t-i} + \sum_{t=0}^{p} \alpha_6 \Delta lnEDU_{t-i} + \sum_{t=0}^{p} \alpha_6 \Delta lnFDI_{t-i} + \varepsilon_{2t} \quad . \quad . \quad . \quad 3$$

The variables are as previously defined in section 3 δ_0 is the drift component and Δ is the first difference operator. The π_1-π_7 denotes the long-run multipliers while the term with summation signs is used to model the short-run dynamic structure. P denotes the lag length while ε_{2t} is the white noise disturbance term.

A bound test for co-integration will be based on F-test restrictions of the joint significance of the estimated coefficient of the lagged level variables in the equations. Since the asymptotic distributions of theft–statistics is non-standard, Pesaran, Shin and Smith

(2001) provided two sets of adjusted critical values that provide the lower and upper bounds used for inference. While the first set of critical value assumes that variables are I (0), the other assumes they are I(1). Cointegration exists and so there is evidence of a long-run relationship if the computed F-statistics exceeds the upper bound critical value. However, the hypothesis is of no cointegration if the F-statistic is below the lower bound. The result will be considered inconclusive for a value within bounds. The Akaike Information Criterion (AIC) will be used to determine the optima lag length for the ADRL model. The autoregressive conditional heteroscedasticity (ARCH) langrage multiplier (LM) is the diagnostic test applied to examine the specified models.

Results and Discussions

The analysis is in two parts: the descriptive and the econometric analysis.

Descriptive Statistics

The descriptive statistics results are presented in Table 1

Table 1: Result of Descriptive Analysis

	CO_2	NO_2	RAIN	SPM1	SPM2.5	TEMP	TGH
Mean	0.637	20484.4	92.86	17.97	0.234	27.08	204219.0
Median	0.646	19488.0	93.71	17.41	0.250	27.07	171312.8
Maximum	1.007	46431.0	109.31	30.68	0.297	27.85	374421.7
Minimum	0.307	11576.0	73.01	2.833	0.079	26.22	74939.7
Std. Dev.	0.184	8232.1	7.263	7.644	0.056	0.404	87146.3
	POPD	GDI	REGU	EDU	FDI	GDP	
Mean	121.6	9.31E+09	5.902	76462.3	2.15E+09	1729.31	
Median	114.7	1.74E+09	5.340	8132.6	1.07E+09	1724.11	
Maximum	209.6	8.98E+10	8.571	394900.0	8.84E+09	2562.52	
Minimum	61.63	2.99E+08	4.800	3.940	1.89E+08	1147.07	
Std. Dev.	43.59	2.22E+10	1.114	124436.7	2.52E+09	436.75	

Source: The Authors' Computation

Econometric Results

The time series properties were examined using Augmented Dickey Fuller (ADF) and Philip- Perron to determine the order of integration of each variable. Table 2 shows the results of unit root tests. The results show that while rainfall (RAIN)is stationary at level, other variables (except population density) are stationary at the first difference. Population density is stationary at first difference under Philip-Perron unit root test but stationary at second difference under Augmented Dickey Fuller unit root test. By these results, we assume that the condition for the application of the ARDL technique is satisfied.

Table 2: Results of Unit Root Tests

Variables	ADF	P-value	Remarks	Philip-Perron	P-value	Remarks
CO_2	-7.601	0.0000	I(1)	-7.847	0.0000	I(1)
NO_2	-6.621	0.0000	I(1)	-6.181	0.0000	I(1)
RAIN	-5.696	0.0000	I(0)	-5.763	0.0000	I(0)
SPM1	-7.147	0.0000	I(1)	-7.147	0.0000	I(1)
SPM2.5	-5.412	0.0001	I(1)	-5.502	0.0000	I(1)
TEMP	-9.619	0.0000	I(1)	-3.073	0.0357	I(0)
TGH	-7.960	0.0000	I(1)	-8.046	0.0000	I(1)
POPD	-6.271	0.0000	I(2)	-3.435	0.0592	I(1)
GDI	-4.235	0.0001	I(1)	-5.378	0.0000	I(1)
REGU	-10.501	0.0000	I(1)	-10.531	0.0000	I(1)
EDU	-3.956	0.0002	I(1)	-5.733	0.0000	I(1)
FDI	-8.662	0.0000	I(1)	-8.355	0.0000	I(1)
GDP	-5.955	0.0000	I(1)	-6.072	0.0000	I(1)

Note: I(1)- the stationarity of the variables is at first difference. I(0)- the stationarity of the variables is at level.
Source: The Authors' computation

The ARDL bond tests in Table 3 show that the F- statistics is greater than the Pesaran critical value at 10% lower bound (1.92) and upper bound (2.89). We may reject the null hypothesis that there is no long-run relationship between environmental pollution and the explanatory variables. This implies that, in the long-run, the factors identified affect environmental pollution.

Table 3 displays the short-run and long-run coefficients of the variables in the model. Based on the EKC model specified, our focus is on the long-run coefficients. Economic growth has a long-run effect on carbon dioxide emissions, suspended particulate matter 1 and 2.5. Furthermore, economic growth has no significant effect on other indicators of environmental pollution. The turning point was calculated to be $1792.38 for carbon dioxide, $1472.76 and $1449.39 for suspended particulate matter1 and 2.5, respectively. These points are within the range of Nigeria's GDP per capita. These results contradict earlier studies like Ajide and Oyinlola (2010) and Alege and Ogundipe (2013) and support recent studies like Osabuohien, EfobiandGitau (2014,2015), Egbetokun and Ogundipe (2016), MdRafayet, Alam, Erick and Bizuayeku (2017), Itochoko and Pierra (2017), and Pata (2018).

Nigeria's population has been rated as one of the fastest-growing in the world (UN DESA, 2017). The results reveal that population density has a significant negative relationship with suspended particulate matter 1 and 2.5, in the long run. This implies that suspended particulate matter 1 and 2.5 reduces as the population increases. This can be attributed to the situation of Nigeria in the tropics were burning of firewood to keep warm is not needed and there is the increasing use of gas cooking stoves in the cities. With education expenditure on the increase in Nigeria in the past four decades, there has been a significant pollution reduction in carbon dioxide and temperature but a significant increase in suspended particulate matter 1. This may imply an increased expenditure in climate change awareness but not specifically on local pollution.

Table 3: ARDL Results

Short-run coefficients							
Variables	CO_2	NO_2	RAIN	SPM1	SPM2.5	TEMP	TGH
D(lnGDP)	39.37**	-2.717	11.18	43.36***	29.19***	-0.868	-15.15
	*(12.09)	(7.820)	(7.571)	(9.940)	(9.413)	(0.983)	(10.89)
D(lnGDP(-1))	-1.335***	----	----	-43.06***	----	----	----
	(0.268)			(13.09)			
D(lnGDP^2)	-2.623***	0.164	-0.745	-2.978***	2.022***	0.057	1.071
	(0.820)	(0.531)	(0.513)	(0.675)	(0.640)	(0.066)	(0.741)
D(lnGDP^2(-1))	----	----	----	2.910***	----	----	----
				(0.888)			
D(POPD)	0.209***	-0.002	0.114***	-0.005	0.930***	0.013***	-1.017**
	(0.070)	(0.004)	(0.017)	(0.348)	(0.139)	(0.002)	(0.376)
D(POPD(-1))	0.368***	----	----	1.532***	----	----	1.446***
	(0.085)			(0.468)			(0.415)
D(lnEDU)	-0.038*	0.002	0.007	0.062***	0.014	-0.002	0.009
	(0.021)	(0.014)	(0.013)	(0.019)	(0.016)	(0.001)	(0.019)
D(EDU(-1))	0.048*	----	----	----	----	----	----
	(0.023)						
D(lnGDI)	-0.071*	0.038	-0.056**	-0.000	0.039	0.002	-0.173***
	(0.039)	(0.035)	(0.023)	(0.044)	(0.042)	(0.003)	(0.049)
D(lnGDI(-1))	0.113*	-0.098***	----	----	----	----	0.147***
	(0.035)	(0.030)					(0.043)
D(lnFDI)	-0.107**	0.073***	-0.004	-0.001	0.041*	-0.004	-0.059**
	(0.038)	(0.022)	(0.021)	(0.025)	(0.024)	(0.003)	(0.028)
D(lnFDI(-1))	0.219***	----	----	----	----	----	----
	(0.044)						
D(REGU)	-0.098	-0.006	-0.016	-0.288***	-0.113	0.007	0.052
	(0.089)	(0.067)	(0.052)	(0.083)	(0.077)	(0.007)	(0.089)
D(REGU(-1))	-0.299*	----	----	----	----	----	----
	(0.101)						
Coint Eq(-1)	-0.727***	-0.619***	-1.017***	-0.998***	-0.576***	-1.081***	-0.726***
	(0.065)	(0.096)	(0.149)	(0.129)	(0.086)	(0.150)	(0.115)
Long-run Coefficients							
lnGDP	86.12***	3.840	-4.285	123.4***	97.29***	0.695	3.694
	(18.15)	(11.40)	(6.683)	(14.88)	(18.25)	(0.841)	(18.44)
lnGDP^2	-5.748***	-0.294	0.296	-8.458***	-6.683***	-0.048	-0.237
	(1.218)	(0.769)	(0.451)	(1.007)	(1.236)	(0.056)	(1.248)
POPD	0.012	-0.004	-0.002	-0.017**	-0.034***	0.000	-0.011
	(0.010)	(0.005)	(0.002)	(0.007)	(0.011)	(0.000)	(0.010)
lnEDU	-0.158**	0.013	0.007	0.072**	0.015	-0.004**	0.019
	(0.063)	(0.026)	(0.015)	(0.028)	(0.043)	(0.002)	(0.045)
lnGDI	-0.154*	0.142***	-0.038*	0.158***	0.112*	0.001	-0.243***
	(0.078)	(0.043)	(0.020)	(0.038)	(0.060)	(0.002)	(0.069)
lnFDI	-0.680***	0.194**	-0.002	-0.057	0.052	-0.001	-0.105
	(0.145)	(0.072)	(0.029)	(0.062)	(0.065)	(0.003)	(0.065)
REGU	0.065	0.301**	0.005	-0.310***	-0.161	0.005	0.329*
	(0.203)	(0.146)	(0.055)	(0.109)	(0.149)	(0.007)	(0.177)
C	-308.1***	-10.70	20.74	-450.9***	-358.8***	0.762	2.779
	(66.56)	(42.20)	(24.81)	(54.95)	(67.27)	(3.114)	(68.29)
Turning Point	$1792.38	----	----	$1472.76	$1449.39	----	----
AdjustedR^2	0.93	0.96	0.33	0.98	0.93	0.64	0.96
D-W statistic	2.26	1.72	1.88	2.46	2.28	2.09	2.13
ARCHLM Test	0.054	0.008	1.171	0.519	1.418	0.226	2.588
	[0.8159]	[0.9278]	[0.2852]	[0.4756]	[0.2557]	[0.6366]	[0.0890]
Bounds Test F–statistic	7.705	4.380	4.949	3.381	4.299	5.017	3.019
Critical Value Bounds		10%	5%	2.5%	1%		
I0		1.92	2.17	2.43	2.73		
I1		2.89	3.21	3.51	3.9		

Note: ***, ** and * represent 1%, 5% and 10% levels of significance, respectively. Standard error is in parenthesis () while probability value is in parenthesis [].

Source: The Authors' computation

The future productive capacity of Nigeria (gross domestic investment also called gross capital formation) does not significantly increase temperature instead it significantly reduces the level of carbon dioxide emissions, rainfall and total greenhouse gases. It, however, contributes to nitrous oxide, suspended particulate matter 1 and 2.5. This implies that Nigeria's future production capacity contributes to pollution and reduces rainfall. The reduction in the level of rainfall could adversely affect the agricultural sector, which is still the largest employer of labour in Nigeria. The reduction in carbon dioxide emissions and total greenhouse gases in Nigeria indicates that gross domestic investment contributes to better air and ambient quality. As such, there are opportunities to create and/or attract more investments in environmentally cleaner technologies using fiscal incentives, instruments and tax holidays. The negative effects of education expenditure and foreign direct investment on carbon dioxide emissions support this finding, as carbon dioxide is a component of and the most concentrated greenhouse gas in the atmosphere. These effects that reduce carbon dioxide emissions are contradicted by the positive effect of gross domestic investment and foreign direct investment on nitrous oxide (another component of greenhouse gases).

The negative relationship between foreign direct investment and carbon dioxide emissions negates the popular notion that the major proportion of foreign direct investment in Nigeria goes to oil exploration as posited in Alege and Ogundipe (2013). This finding reemphasizes the results obtained in Ajide and Oyinlola (2010). The positive relationship between foreign direct investment and nitrous oxide emissions indicate that foreign direct investment has not supported green agriculture in Nigeria. The above is in line with the submission made by El- Kassar and Singh (2017) with respect for business activities be more environmentally friendly (i.e. green) through the adoption of green innovations and technologies; as well as the development of green supply chain processes through requisite capabilities (Singh &El- Kassar,2018).This is essential as regulation in Nigeria(i.e. institutional quality) is can check only suspended particulate matter 1 and 2.5 but not effective enough to limit nitrous oxide and total greenhouse gases. Rather, nitrous oxide and total greenhouse gases emissions are increasing while regulation has no significant effect on other environmental indicators. It will be interesting to know the factors responsible for this ineffective regulation in further studies.

Theoretically, the implication of the findings in this study is that the EKC does not hold for all the measures of environmental quality and economic growth is not the only factor that can increase or limit environmental pollution. Practically, Nigeria's increasing population still consumes a reasonable level of carbon resources; the reducing level of rain fall in Nigeria may affect the productivity of agriculture sector and raw materials supplies to manufacturing sector and exports; and Nigeria's institutional arrangements are not effective enough to reduce environmental pollution, except for suspended particulate matter 1.

Discussion

The Cycle of Economic Crisis and Institutional Quality

The findings illustrate a cyclical relationship where economic crises undermine institutional quality, which in turn negatively affects climate governance. Corruption and poor governance during downturns divert attention and resources away from critical environmental issues, leading to inadequate responses to climate change challenges (Ogunbado and Thune, 2021).

Recommendations for Improving Institutional Quality

To enhance institutional quality and climate response, the study recommends:

Strengthening Anti-Corruption Measures:
Establishing robust anti-corruption frameworks that promote transparency and accountability can improve governance during economic crises.

Integrating Climate Policy into Economic Planning:
Incorporating environmental sustainability into national economic policies will ensure that climate considerations are prioritized alongside economic recovery efforts.

Enhancing Stakeholder Engagement:
Fostering collaboration between governmental bodies, civil society, and private sector actors can lead to more effective climate governance.

Conclusion

This study was carried out to examine the relationship among the various variables of environmental pollution, institutional quality measured by regulation index and economic growth in Nigeria within the period 1970 and 2017. The ARDL results show that Nigeria has been making efforts to grow green by curbing global pollutants (carbon dioxide emissions) and local pollutants (suspended particulate matter 1 and 2.5) as the EKC was found for them. Although Nigeria has experienced the EKC under carbon dioxide, increases in the population per unit area of Nigeria leads to an insignificant increase and not decrease in carbon dioxide emissions. This implies that Nigeria's increasing population still consumes a reasonable level of carbon resources. Evidence that connotes increasing education awareness on climate change and global warming but not for local pollution was observed. The negative effect of the future production capacity on the level of rainfall may have an implication on the agriculture sector being the highest employer of labour in the country. It may also reduce the supplies of raw materials to the manufacturing sector and export earnings from the export of agricultural produce in Nigeria. This deduction may be escalated by the increasing emissions of nitrous oxide resulting from gross domestic investment, foreign direct investment, and weak or ineffective regulation. The ineffective regulation (i.e. institutional arrangement) has been unable to generally curtail environmental degradation indicators, except for suspended particulate matter one.

This study hereby recommends the following: First, the government of Nigeria should enforce stricter environmental regulations in the main polluting sectors, as well as, periodic environmental impact assessment aimed at erring firms or organisations and they should also bear the full cost of environmental clean-up. Human capacity should be developed in the relevant ministries, departments and agencies for this purpose. Furthermore, policies to regulate the use of improved technologies that reduce the level of emission in production and discharge of wastes should be enforced in the extractive industries. In addition, the study recommends an evenly spatial population distribution through direct government intervention towards creating low carbon communities and cities. Although the study found that with carbon dioxide and suspended particulate matter one and 2.5, the country can achieve the turning point on the EKC, due to its increasing population, there is still need for Nigeria to take responsibility to reduce emissions below the levels they are currently. In this regard, it is recommended that policies be implemented to check the quality of used vehicles and machines, bush burning, grazing, use of fertilizers, and extractive activities.

It is needful to consciously inculcate environmental improvement standards and good health habits through the basic schooling curriculum in Nigeria. This stems from the country's struggles to generate and distribute adequate electric power that has made individuals to embark on private electricity generation. Consequently, leading to uncontrollable use of poor grade generators which may have contributed to suspended particulate matter 1 and 2.5 and impair human health. In addition to the use of a basic schooling curriculum, Nigerian regulatory agencies should embark on public orientation, advertisement and campaigns towards environmental improvement awareness and to motivate the citizenry with a sense of responsibility about all environmental challenges.

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