



How Agricultural Nitrous Oxide Emission and Crude Oil Spillage Affects the Quality of Life in Nigeria

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Abstract

The study examined the effect of agricultural nitrous oxide emission and crude oil spillage on quality of life in Nigeria from 1981 to 2020. In order to achieve this, descriptive statistics, unit root test, bound co-integration and ARDL estimation method were employed to analyze the data. The study used Agricultural Nitrous Oxide Emission (ANXD) and Crude Oil Spillage (OSPL) to capture environmental pollution as the explanatory variables whereas Life Expectancy (LFXP) was used to proxy quality of life as the dependent variable. The result revealed that Agricultural Nitrous Oxide Emission (ANXD) increases quality of life in Nigeria, while Crude Oil Spillage (OSPL) reduces quality of life in Nigeria within the period of study. The study therefore concluded that Agricultural Nitrous Oxide Emission (ANXD) do not decrease the quality of life in Nigeria within the period under review and Crude Oil Spillage (OSPL) reduces quality of life in Nigeria within the period of study. The study recommended that the Government should ensure that agricultural nitrous oxide emission (ANXD) should maintain its current status of not decreasing the quality of life in Nigeria, and the Government should ensure that crude oil spillage (OSPL) does not reduce quality of life in Nigeria by making sure that crude oil spillages (OSPL) are contained.

Keywords: Environmental Pollution, Agriculture, Nitrous Oxide, Emission, Crude Oil, Spillage, Quality of Life, Nigeria.

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INTRODUCTION

Nigeria, a country in West Africa, faces significant challenges related to agricultural nitrous oxide emissions and crude oil spillage, both of which have profound impacts on the quality of life of its population. These environmental issues not only affect the health and well-being of the people but also have far-reaching consequences on the economy, social stability, and overall sustainable development of the nation.

According to Omorogiuwa et al. (2014) and Sertoğlu et al. (2017), agriculture is a crucial sector in Nigeria, providing livelihoods for a large portion of the population. However, agricultural activities contribute to nitrous oxide emissions, a potent greenhouse gas that significantly impacts climate change. The use of nitrogen-based fertilizers and poor agricultural practices lead to the release of nitrous oxide into the atmosphere, exacerbating global warming and environmental degradation.

The impact of agricultural nitrous oxide emissions goes beyond climate change. Nitrous oxide is not only a greenhouse gas but also plays a role in ozone depletion, further affecting atmospheric composition and human health. In Nigeria, where agriculture is a primary economic activity, addressing these emissions is essential for sustainable development and ensuring a healthy environment for all citizens (Oladunni et al., 2022).

Nigeria is known for its rich oil reserves, making it a significant player in the global oil industry. However, the extraction and transportation of crude oil come with risks, including frequent oil spills that devastate local ecosystems and communities. Crude oil spillage contaminates water sources, soil, and air, leading to severe environmental pollution and health hazards for nearby residents (Ordinoha & Brisibe, 2013).

The impact of crude oil spillage on the quality of life in Nigeria is profound. Communities living near oil-producing areas suffer from health problems due to exposure to toxic substances present in spilled oil (Ewim et al., 2023). Additionally, livelihoods dependent on agriculture and fishing are severely affected, leading to economic hardships and social unrest in these regions.

The combined effects of agricultural nitrous oxide emissions and crude oil spillage create a challenging environment for Nigerians. The health implications of exposure to these pollutants are significant, with respiratory illnesses, skin conditions, and other ailments becoming prevalent among affected populations (Nriagu et al., 2016). Moreover, the contamination of natural resources hampers access to clean water and fertile land for farming, further exacerbating poverty and food insecurity. The quality of life indicators such as life expectancy, infant mortality rates, access to education and healthcare services are all impacted by these environmental issues. The need for urgent action to mitigate these challenges is evident to safeguard the well-being of current and future generations in Nigeria (Siddiqua et al., 2022).

Thus, agricultural nitrous oxide emissions and crude oil spillage pose serious threats to the quality of life in Nigeria. As such, this study aims to investigate how agricultural nitrous oxide emission and crude oil spillage affects the quality of life in Nigeria

Statement of the Problem

Agricultural Nitrous Oxide Emissions and Crude Oil Spillage in Nigeria pose significant threats to the quality of life in the country. The release of nitrous oxide from agricultural activities contributes to greenhouse gas emissions, exacerbating climate change and impacting agricultural

productivity. On the other hand, crude oil spills in regions like the Niger Delta has led to environmental contamination, affecting water sources, soil quality, and food security. These dual challenges not only endanger human health but also disrupt livelihoods, exacerbating poverty and social tensions. Investigating and understanding the combined effects of these pollutants on agriculture, health and well-being is crucial for developing effective mitigation strategies in Nigeria.

Aim and Objectives of the Study

The aim of this study is to investigate how agricultural nitrous oxide emission and crude oil spillage affects the quality of life in Nigeria. Specifically, the study is set to:

- Investigate how agricultural nitrous oxide emission affects the quality of life in Nigeria.
- Examine how crude oil spillage affects the quality of life in Nigeria.

Hypotheses

The study is guided by the following null hypotheses.

- **H₀₁:** There is no significant relationship between agricultural nitrous oxide emission and quality of life in Nigeria.
- **H₀₂:** There is no significant relationship between crude oil spillage and the quality of life in Nigeria.

CONCEPTUAL CLARIFICATIONS

Theoretical Framework

The study employed the and Ecological Change and Development by Wilkinson and Boulding (1973) to advance and explain the link between agricultural nitrous oxide emission and crude oil spillage and how they affect the quality of life in Nigeria.

Ecological Change and Development by Wilkinson and Boulding (1973)

The ecological perspective of change and development perspective is associated with the works of Wilkinson and Boulding (1973). The theory is concerned with issues of change and development in contemporary societies, especially as they relate to environmental changes and/or ecologically related trends of population growth and the need to devise and sort out techniques of tackling development problems. The theory states that, as the population of a society increases in size, individual members of the society exert more pressure on scarce available resources such as land and other natural endowments for survival. They directly or indirectly carryout socioeconomic activities that pollute the environment/society, and further cause harm (degradation) to the environment/society.

The socio-economic activities, according to these theorists include subsistence agricultural activities of people in agrarian societies of Africa, Latin America, etc. and the commercial and industrial activities of people in urban industrialized societies of the western-

Europe and North America. The perspective further argued that development is needed when a society outgrow its resource base and productive system. The perspective therefore posits that as the established economic system of a given environment/society is proved inadequate and productive system becomes more problematic, societies are therefore driven to change their methods. For instance, as the population of a society outgrows the available resources, especially in agrarian societies, people are forced to migrate to urban centres/cities in search of job opportunities. Some sell their labour, whereas some engage in several other commercial and agricultural investments such as livestock; some still carry out some technical and entrepreneurial businesses – all for survival. The urban and city dwellers establish and carry out industrial activities that equally pollute the society. Wilkinson and Boulding concluded that these activities directly and/or indirectly pollute the environment with its attendant consequences on biodiversity.

Environmental Pollution

Environmental pollution in Nigeria is a significant issue that poses serious risks to public health and the ecosystem. The country faces various forms of pollution, including air pollution, water pollution, soil contamination, and noise pollution. These pollutants are primarily caused by industrial activities, urbanization, oil exploration, and inadequate waste management practices (Abdel-Shafy & Mansour, 2018).

One of the most pressing environmental pollution problems in Nigeria is air pollution. The sources of air pollution in the country include emissions from industries, vehicular exhaust fumes, open burning of waste, and gas flaring from oil exploration activities in the Niger Delta region. These pollutants release harmful substances such as particulate matter, sulfur dioxide, nitrogen oxides, and volatile organic compounds into the atmosphere, leading to respiratory diseases, cardiovascular problems, and other health issues among the population.

Water pollution is another critical environmental concern in Nigeria. The contamination of water bodies results from industrial effluents, agricultural runoff containing pesticides and fertilizers, improper waste disposal practices, and oil spills in the Niger Delta region (Ferronato & Torretta, 2019). This pollution affects both surface water sources like rivers and lakes as well as groundwater reserves. The presence of pollutants in water bodies poses a severe threat to aquatic life and human health through the consumption of contaminated water (Kibria et al., 2023).

Soil contamination is a growing problem in Nigeria due to activities such as illegal dumping of hazardous waste, improper disposal of industrial chemicals, and oil spillage. These contaminants can persist in the soil for extended periods, affecting soil fertility and posing risks to agricultural productivity. Soil contamination also has implications for food safety as crops grown in polluted soils may accumulate harmful substances that can enter the human food chain (Alengebawy et al., 2021).

Environmental pollution in Nigeria, particularly in region of Niger Delta, is a significant concern due to activities such as oil and gas operations leading to issues like oil spills, groundwater pollution, air quality degradation from gas flaring, and biodiversity loss. These environmental challenges have a direct impact on the quality of life in Nigeria. The pollution contributes to health problems, reduces life expectancy (which is estimated at about 54.6 years for all parts of Nigeria), and affects overall well-being (Pona et al., 2021).

The contamination of water sources, air pollution from industrial activities like gas flaring, and the destruction of ecosystems due to oil spills all contribute to a decline in the quality of life for residents in these areas. The presence of pollutants not only affects physical health but also has socio-economic implications. For instance, contaminated water sources can lead to waterborne diseases, further exacerbating health issues and reducing productivity among the population (Lin et al., 2022).

Moreover, environmental pollution adds to existing challenges such as poverty, low life expectancy, high infant mortality rates, corruption, and depletion of natural resources in regions like the Niger Delta. The combination of these factors creates a complex web of issues that impact the overall quality of life for individuals living in these areas (Siddiqua et al., 2022).

The cumulative effect of environmental pollution on public health in Nigeria is alarming. According to Manisalidis et al. (2020), air pollution contributes to respiratory illnesses such as asthma and chronic obstructive pulmonary disease (COPD), while water contamination leads to waterborne diseases like cholera and typhoid fever. Soil contamination can result in heavy metal poisoning and other health complications. Additionally, noise pollution has been linked to mental health issues such as anxiety and depression.

The Nigerian government has taken some steps to address environmental pollution through legislation and regulatory frameworks (Ogunkan, 2022). However, enforcement mechanisms are often weak due to corruption, inadequate funding for monitoring agencies, and lack of public awareness. More stringent measures are needed to control emissions from industries, improve waste management practices, clean up polluted sites like the Niger Delta region, and promote sustainable development initiatives (Orji, 2012). Environmental pollution remains a critical challenge in Nigeria with far-reaching implications for public health and ecological sustainability.

Soil Pollution

The increase in global population, mechanization and the rising demand for the transportation of goods and services have resulted in the increase of the number of vehicles that operate in many cities of the country (Diao, 2014).

A major effect of this trend is the issue of environmental pollution. The use of motor vehicles as a major means of transportation has resulted in several environmental, economic and social problems to the society. Over 600 million people globally are exposed to hazardous level of traffic generated pollutants (De Donno et al., 2018).

Following the internal combustion engine during the early decades of the last century, there was growing demand for petrol of higher-octane rating to avoid unseen combination in the engine cylinder generally known as “knocking “. In the early 1920’s, it was discovered that the addition of lead alkyls (tetra ethyl and tetra methyl lead) to petrol helps to overcome this problem. As time went on, the use of leaded petrol rapidly became a standard practice. As the combustion of fuel takes place in the engine of motor vehicles a lot of pollution are released from the exhaust into the environment.

The emission of lead and other toxic pollution by vehicles has been found to depend on a number of factors such as the type of fuel used, the type and age of vehicle, the type of exhaust used by the vehicle, the vehicle speed and its loading condition. Most of these pollutants are harmful to both human and animal health and phytotoxic to plants and thus can reduce agricultural productivity. As these substances are released, some get entrapped into the

surrounding soil while some can travel several kilometers into the air thus leading to both air and soil pollutions. Some of them during rain can percolate or be washed into stream leading to both ground water and surface water pollution. Soil pollution occurs when contaminants that lead to change in the physical or chemical properties of the soil are introduced in the soil (Aqeel et al., 2014).

The solid components of soil are usually clustered together in form of aggregates, thus creating a system of interconnected voids of various sizes filled with either air or water. These voids facilitate the accumulation of substances that settle on them easily thus resulting to pollution. Soils are dynamic bodies in equilibrium with environmental forces acting upon them. Based on this, they are subjected to short term fluctuation such as variation in moisture content, potential of hydrogen (pH) and redox condition thus undergoing gradual alteration in their physical and chemical properties due to change in management and environmental factors. Soil is an extremely complex medium and different fractions and constituents have variable degree of reactivity to introduced components (Al-Taai, 2021).

Soil pollution may lead to acidic conditions which promote a range of reactions including the production of hydrogen cyanide from sulphides in the presence of moisture, increase in the attack to building materials and services.

Environmental pollution is a product of urbanization, technology and other factors that result from population density, mechanization and industrialization that serve to provide the necessities of the population. In the urban areas, the major sources of pollution are anthropogenic. On the other hand, contamination from natural sources predominate the rural areas. In most developing countries of the World, vehicular growth has not been checked properly by Environmental regulating agencies leading to increase in levels of pollution.

Traffic emissions contribute about 50-80% of Nitrogen Dioxide (NO₂) and Carbon monoxide (CO) concentration in developing countries. Studies and aerial view of Nigeria have shown that our atmosphere is highly polluted. This is very evident in the number of smoky vehicles plying our roads on daily basis, causing visibility problems and sometimes accidents. In Nigeria much attention is given on general industrial pollution in oil industries, with little reference on damage from pollution caused by mobile transportation. Vehicular emission is at its peak when there is an increase in population, together with increase in number of vehicles on roads (Pona et al., 2021). The emission of lead and other toxic substances have diverse impact on the environment. Some of the major impact of soil pollution on various aspects of human environment which are of permanent interest are associated with the public health, water quality, agricultural productivity and the engineering properties of soil. The effect of pollutants may be instantaneous while others may take years to manifest (Osuagwu et al., 2019).

Agricultural Nitrous Oxide Emission and Quality of Life in Nigeria

Nitrous oxide (N₂O) emissions in the agricultural sector of Nigeria play a significant role in the country's overall greenhouse gas emissions profile. Nitrous oxide is a potent greenhouse gas with a much higher global warming potential than carbon dioxide. In Nigeria, nitrous oxide emissions primarily stem from activities such as synthetic fertilizer application, manure management, cropland fires, and other agricultural soil emissions (Abaje et al., 2020).

The emission of nitrous oxide in agriculture can have several implications for the quality of life in Nigeria. High levels of nitrous oxide emissions contribute to climate change, which can lead to adverse effects on agriculture, food security, and public health. Climate change impacts

such as extreme weather events, changes in rainfall patterns, and temperature variations can disrupt agricultural productivity and food availability.

Furthermore, increased nitrous oxide emissions can contribute to air pollution, which poses risks to human health. Nitrous oxide itself is not only a potent greenhouse gas but also plays a role in the formation of ground-level ozone, which can have detrimental effects on respiratory health (Wang et al., 2021).

According to Wang et al. (2021), reducing nitrous oxide emissions from agricultural activities through sustainable practices and improved management techniques can help mitigate these negative impacts. Implementing measures such as efficient fertilizer use, proper manure management, and reducing waste burning can not only lower greenhouse gas emissions but also improve air quality and support sustainable agriculture practices.

Crude Oil Spillage and Quality of Life in Nigeria

Crude oil spillages in Nigeria, particularly in the Niger Delta region, have had significant negative impacts on the quality of life for the people living in the affected areas. To Adesanmi et al. (2021), the continuous oil spills have led to environmental degradation, contamination of water sources, destruction of plant and animal life, and adverse health effects on the local communities.

The oil spills have polluted water sources that are essential for daily activities such as drinking, bathing, and irrigation. This contamination has resulted in health issues among the population, including illnesses from consuming polluted water. The destruction of plant life due to oil spills has also affected food security and livelihoods, leading to a reduction in household food security (Nriagu et al., 2016).

Furthermore, according to Adesanmi et al. (2021), the loss of mangrove ecosystems due to oil spills has not only impacted biodiversity but also affected the cultural practices and economic activities of indigenous communities that rely on these ecosystems for their livelihoods. The degradation of land and soil caused by oil spills has further exacerbated the challenges faced by local populations, especially those dependent on agriculture.

In addition to environmental consequences, oil spills have also led to social disruptions and economic hardships for communities in the Niger Delta region (Ordinioha & Brisibe, 2013). The reliance on oil extraction as a major revenue source has not translated into improved living conditions for the local population (Orisakwe, 2021). Instead, it has often resulted in land degradation, loss of traditional ways of life, and limited economic opportunities beyond the oil industry (Ipingbemi, 2009).

Thus, reducing crude oil spillage in Nigeria is critical not only for environmental sustainability but also for safeguarding the well-being and quality of life of the people living in affected areas. Efforts to prevent future spills, clean up existing contamination, provide healthcare services, and support sustainable livelihoods are essential to mitigate the adverse impacts on communities' quality of life.

METHODS

Research Design

The study adopted the Ex-post facto research design. Ex-post facto study or after-the-fact research is a category of research design in which the investigation starts after the fact has occurred without interference from the researcher. Here the effect of two or more independent variable was investigated. This method allows the researcher to determine the effects of independent variables and also whether they interact in some way as they influence the dependent variable. One advantage of Ex-post facto design is that it uses secondary data to investigate the impact of the independent on the dependent variable. Ex-post facto research helps the researcher to examine the effect of one variable on another, and thereby tests the hypothesis that a particular factor is responsible for the occurrence of another situation (Cohen et al., 2000).

The goal of this present study is to seek the effect of agricultural nitrous oxide emission an crude oil spillage on the quality of life in Nigeria and also explain the relationship that exist between them.

Model Specification

The model specification of this study is in line with the works of Amuka et al. (2018) and Romanus et al. (2021) with a slight modification. Romanus et al. (2021) who studied the effect Carbon Emissions on Life Expectancy in Nigeria modelled:

$$LE = f(CO_2, FFC, TEPC, EH) \quad (3.1)$$

Where;

LE = life expectancy

CO₂ = emissions of Carbon dioxide

FFC = consumption of energy from fossil fuel

TEPC = total electric power consumption

EH = government health expenditure

Amuka et al. (2018) who examined the effect of Climate change and Life Expectancy in a Developing Country: Evidence from Greenhouse Gas (CO₂) Emission in Nigeria

$$LE = f(CDF, CO_2, IMU, PC, SANI, HEP) \quad (3.2)$$

Where:

LE = Life expectancy,

CDF=Caloric deficiency,

CO₂=Carbon dioxide emission,

IMU=Immunization,

PC=Per capita income,

SANI=Sanitation,

HEP=Health expenditure per capita

However, the present study deviates from these studies by examining the effect of environmental pollution on quality of life in Nigeria by using life expectancy to proxy the quality of life as the

dependent variables whereas Agricultural Nitrous Oxide Emission (ANXD) and Crude Oil Spillage (OSPL) were used to proxy environmental pollution as the explanatory variables.

Hence, the functional relationship of the models will be:

$$\text{LFXP} = f(\text{ANXD}, \text{OSPL}) \quad (3.3)$$

From equations (3.3), the mathematical form of the models is specified as:

$$\text{LFXP} = \beta_0 + \beta_1 \text{ANXD} + \beta_2 \text{OSPL} \quad (3.4)$$

From equations (3.4), the econometric form of the models is specified as:

$$\text{LFXP}_t = \beta_0 + \beta_1 \text{ANXD}_t + \beta_2 \text{OSPL}_t + \mu \quad (3.5)$$

Where;

LFXP = Life Expectancy a proxy for quality of life

ANXD = Agricultural Nitrous Oxide Emission

OSPL = Crude Oil Spillage

Where; β_0 is the intercepts

$\beta_1 - \beta_5$ are the coefficients of independent variables

t = Time t

while μ_1 is the error terms.

Theoretical Expectations

On a prior ground, we expected the following signs of the coefficients of the explanatory variables

$$\beta_1 < 0, \beta_1 < 0 \text{ and } \beta_2 < 0.$$

The implication of the above signs of the parameter estimates is that, we expect a negative relationship between each of the explanatory variables and the dependent variable.

Dependent Variables

In this study, life expectancy (LFXP) a proxy for quality of life is the dependent variables in the models.

Life Expectancy (LXP)

Life expectancy refers to the number of years a person is expected to live base on the statistical average. Life expectancy varies by geographical area and by era. Life expectancy at birth reflects the overall mortality level of a population. It summarizes the mortality pattern that prevails across all age groups in a given year – children and adolescents, adults and the elderly.

Independent Variables

Agricultural Nitrous Oxide Emission (ANXD)

Nitrous oxide or dinitrogen oxide occurs naturally and also as a result of man's activities especially from the application of fertilisers to soils in agriculture, the manufacture of acids and nylon and from power stations and road transport. In environmental conditions it is a colourless,

sweet smelling gas. It is only slightly soluble in water and although non-flammable itself it will support combustion. When inhaled it has an anaesthetic (sedative) and analgesic (pain relieving) effect - as well as causing amusing effects, hence the name "laughing gas".

On a global scale however, it does contribute to global warming and is the third most important greenhouse gas in the UK. Although relatively small amounts are released, it has a high "global warming potential" (310 times that of carbon dioxide). Nitrous oxide also damages the ozone layer, thus reducing the protection offered from harmful UV sun rays.

At normal environmental concentrations, nitrous oxide is not harmful to humans. Inhalation of higher concentrations in an enclosed space could however exclude oxygen - causing dizziness, nausea and eventually unconsciousness. Depletion of the stratospheric ozone layer (in which nitrous oxide plays a part) means that humans may be exposed to high doses of UV sunlight which might cause skin cancers. It is expected that an increase in agricultural nitrous oxide emission will decrease the quality of life. Thus, $dLFXP/dANXD < 0$.

Crude Oil Spillage (OSPL)

An oil spill is the release of a liquid petroleum hydrocarbon into the environment, especially the marine ecosystem, due to human activity, and is a form of pollution. The term is usually given to marine oil spills, where oil is released into the ocean or coastal waters, but spills may also occur on land.

Oil spills may occur all around us. Since oil products include a lot of common fuels, it is obvious that oil spills may happen at high rates and in many locations, including residential areas. Surface oil spills are easy to identify and will leave visible traces such as oil stains, as well as other characteristic signs such as odors due to the vapors emitted by the spilled oil. The underground oil spills are more difficult to catch and yet may be more problematic (oil may reach groundwater more easily and travel with it). Both surface and underground oil spills have the potential to contaminate soils, sediment, water (groundwater and surface water bodies), and air (due to many volatile compounds emitted by the spilled oil into the air).

It is expected that an increase in oil spillage will decrease the quality of life. Thus, $dLFXP/dOSPL < 0$.

RESULTS

The time series plots of the variables used in this study such as Nigeria's Life Expectancy (LFXP), Agricultural Nitrous Oxide Emission (ANXD) and Crude Oil Spillage (OSPL) between 1981 and 2020 are shown and presented in Tables below.

Table 1: Data Presentation

YEAR	LFXP (Years)	ANXD (Thousand metric tons)	OSPL (Barrels)
1981	45.637	12781	42722
1982	45.867	13501	42841
1983	46.023	13396	48351.3
1984	46.106	13539	40209
1985	46.127	13298	11876.6
1986	46.101	13570	12905
1987	46.048	13732	31866
1988	45.99	13736	9172
1989	45.939	14471	7628.16
1990	45.9	16480	14940
1991	45.875	16740	106828
1992	45.857	17010	51187.96
1993	45.845	17560	9752.22
1994	45.843	17830	30282.67
1995	45.854	17870	63677.17
1996	45.88	18580	46353.12
1997	45.923	19110	81727.85
1998	45.994	20590	99885.35
1999	46.103	20730	16903.96
2000	46.267	20940	84071.91
2001	46.51	21040	120976.2
2002	46.835	21170	241617.6
2003	47.242	22140	35284.43
2004	47.72	22100	17104
2005	48.252	24000	10734.59
2006	48.812	23830	20000
2007	49.373	23180	30000
2008	49.913	23630	100000
2009	50.422	22860	110000
2010	50.896	24850	25383.16
2011	51.346	25590	16000
2012	51.786	26390	665.03
2013	52.228	27110	3749.21
2014	52.672	27480	10302.18
2015	53.112	27540	32756.87
2016	53.541	29750	32202.99
2017	53.95	30760	10096.08
2018	54.332	30950	25018.65
2019	54.687	30950	22439.24
2020	54.323	30886	29184.66

Note: (i) LFXP = Life Expectancy,
(ii) ANXD = Agriculture Nitrous Oxide, and
(iii) OSPL = Oil Spillage

Source: NNPC Annual Statistics (various Issues) and World Development Indicators.

Also, Table 1 shows that ANXD in Nigeria has been on the increase. It increased from 1981 to 1990 to 2000 to 2010 and to 2020 as shown in Figure 1.

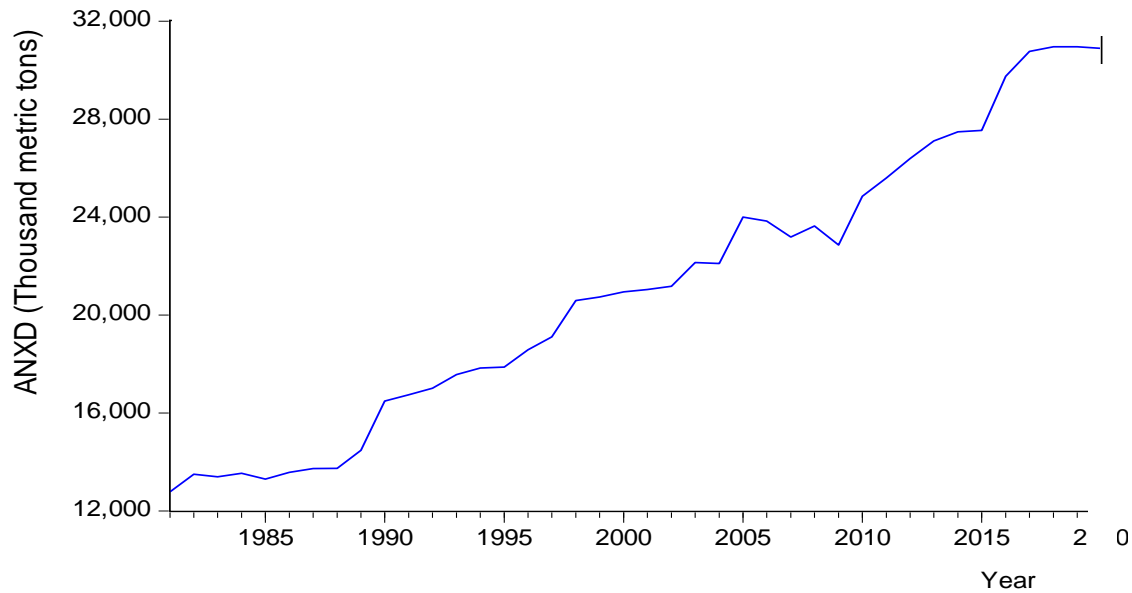


Figure 1: Time Series Plot of Nigeria's ANXD (1981-2020)

Also, the table shows that OSPL in Nigeria has been fluctuating within the period of study. It moved up and down in an increasing form from 1981 to 1990 to its peak 2002, dropped the following year and moved up and down again till 2020 as shown in Figure 2.

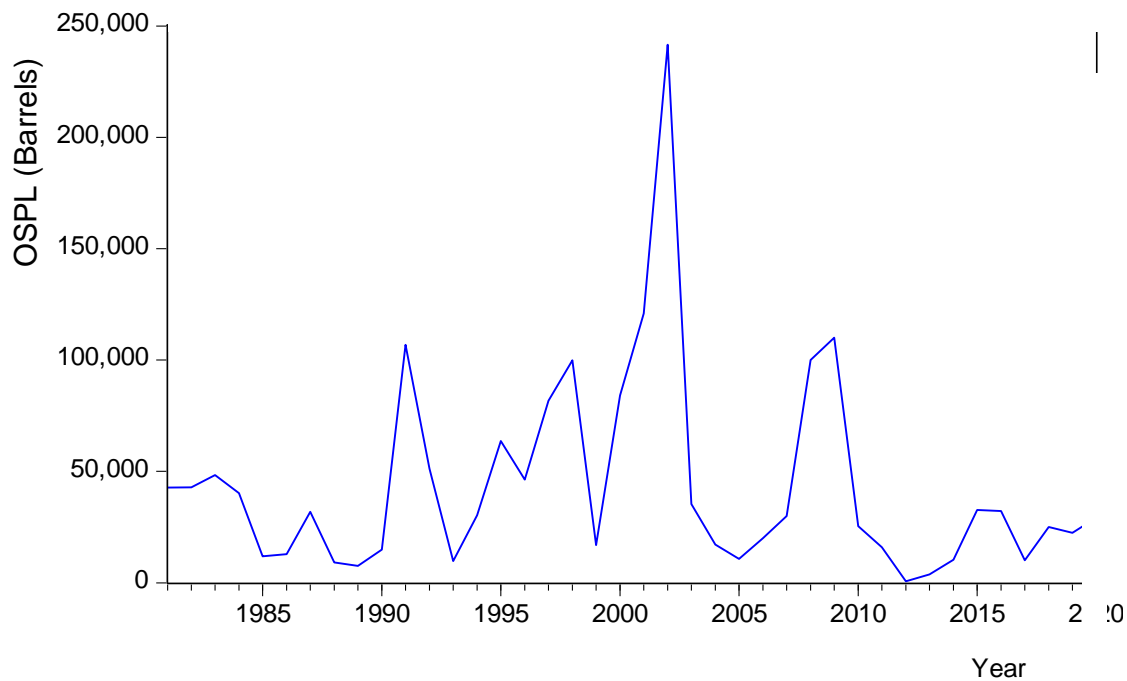


Figure 2: Time Series Plot of Nigeria's OSPL (1981-2020)

Table 2: Descriptive Statistics Test Result

	LFXP	ANXD	OSPL
Mean	48.42828	21041.75	43667.40
Median	46.38850	20990.00	30141.34
Maximum	54.68700	30950.00	241617.6
Minimum	45.63700	12781.00	665.0300
Std. Dev.	3.135288	5740.256	45733.20
Skewness	0.812688	0.199187	2.355167
Kurtosis	2.074212	1.939426	9.922896
Jarque-Bera	5.831550	2.139199	116.8562
Probability	0.054162	0.343146	0.000000
Sum	1937.131	841670.0	1746696.
Sum Sq. Dev.	383.3713	1.29E+09	8.16E+10
Observations	40	40	40

Source: Authors Computation (2022)

The result of the descriptive statistics in Table 2 above shows that LFXP has a mean value of 48.42828 and ranges from 45.63700 to 54.68700 with a standard deviation of 3.135288. The skewness value of LFXP is positive (0.812688), meaning that LFXP has a long-right tail while the kurtosis value of LFXP is 2.074212 (i. e. less than 3), meaning that it is platykurtic. That is, it has a flat distribution, meaning that the series has a low value lower than the mean sample.

ANXD has a standard deviation of 5740.256 with a mean value of 211041.75 and ranges from 12781.00 to 30950.00. The skewness value of ANXD is positive (0.199187), meaning that ANXD has a long-right tail while the kurtosis value of ANXD is 1.939426 which is less than 3, meaning that it is platykurtic. This means that the series has a lower value below the sample mean, that is, it has a flat distribution or surface.

The OSPL has a mean value of 43667.40 and ranges from 665.0300 to 241617.6 with a standard deviation of 45733.20. The skewness value of OSPL is positive (2.355167), meaning that OSPL has a long-right tail while the kurtosis value of OSPL is 9.939426 (i. e. more than 3), meaning that it is not platykurtic. This means that the series has a higher value than sample mean, that is, it has an abnormal flat distribution or surface.

Based on these observations, it is therefore necessary to test for the stationarity of the variables and the long run relationship since using the variables at level might give a spurious result. The unit root test is conducted so as to make the variables stationary. The study adopts the Augmented Dickey Fuller (ADF) unit root test procedure.

Unit Root Results Analysis

The ADF result for the variables – Life Expectancy (LFXP), Agricultural Nitrous Oxide Emission (ANXD) and Crude Oil Spillage (OSPL) used in this study are presented in tables 3 below. The Augmented Dickey Fuller (ADF) was tested with intercept and no trend.

Table 3: ADF Unit Root Tests Results

Variable	ADF at Level	ADF Critical Value	ADF at 1 st Difference	ADF Critical Value	Status	Remark
LOG(LFXP)	0.0.899970	-2.943427	-3.309765	-2.941145	I(1)	Stationary
LOG(ANXD)	-0.685102	-2.938987	-6.460732	-2.941145	I(1)	Stationary
LOG(OSPL)	-3.570892	-2.938987	-	-	I(0)	Stationary

Source: *Extract from Appendix using E-view version 9.0 software*

The result of the unit root test in Table 3 reveals that OSPL variables was stationary at level while LFXP, and ANXD were stationary at 1st difference. The result depicts that the independent variables used in model one were integrated of both order zero and one, that is, I(1) and I(0) and the dependent variable is integrated of order one, that is, I(1). Since the ADF results indicated that the series are of mixed order of integration, we cannot use the Engle-Granger and Johansen co-integration tests but rather the appropriate test to use in this study is the Bounds co-integration test. This is because when the series used in any study are of different order of co-integration, the appropriate test to use is the bound co-integration test.

Table 4: ARDL Short Run Estimation Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LFXP(-1))	0.768938	0.256166	3.001718	0.0070
DLOG(ANXD)	0.043440	0.377255	0.115147	0.9095
DLOG(OSPL)	-0.202462	0.079236	-2.555174	0.0189
ECM (-1)	-0.350041	0.098625	-3.549203	0.0020
Adj-R2 = 0.679759; F-stat. = 7.155680 (f-prob. = 0.000132); DW = 1.861381				

Source: Authors Computation using E-view 9

From Table 4, the result shows that the ECM included in this model has the right sign (i. e. negative) and is statistically significant at 5 percent level. The coefficient indicates a low adjustment speed of about 35 percent. This adjustment implies that 35 per cent of errors are corrected within one year since that data were annual series. The ECM also reveals that a long run relationship exists between the regressors (AXND and OSPL) and the response variable (LFXP) in this model. The findings confirmed that a short run relationship exist among the variables in the model.

Furthermore, the calculated Adj-R² is 0.679759. This means that about 68 per cent of the total variations in LFXP are caused by the explanatory variables AXND and OSPL. Thus, the remaining 32 per cent of variations is caused by exogenous factors to the model but covered by the error term. Also, the F-statistics calculated of 7.155680 with a probability value 0.000132 which is less than 0.05 level of significance, means that the overall model is significant at 5 per cent level. The value of the D.W 2.3681381 suggests that there is minimal serial autocorrelation in the model.

The coefficient of past lag 1 value of ANXD has a positive relationship with quality of life (LFXP) while current value of and OSPL has a negative relationship with quality of life (LFXP) in Nigeria within the period under review.

Long-Run Estimation Results

Table 5 shows the estimated coefficients of the long run relationship between the variables in the model.

Table 5: ARDL Long Run Estimation Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(ANXD)	0.518178	4.400853	0.117745	0.9074
LOG(OSPL)	-0.975901	0.333043	-2.930255	0.0083
C	77.425752	50.820820	1.523505	0.1433

Source: Authors Computation using E-view 9

From Table 5 the result of the long run estimation shows that OSPL has a negative and a significant effect on LFXP. The coefficient of ANXD has positive relationship with LFXP and are not statistically significant with LFXP at 5 percent level of significance in Nigeria in the long run within the period under review.

Diagnostic Testing

The researcher also conducted a diagnostic test to ascertain whether or not the series are free from linearity (Ramsey Reset Test), autocorrelation (Breusch-Godfrey Serial Correlation LM Test), heteroscedasticity (Breusch-Pagan-Godfrey Test). The result of the diagnostic test is presented in Table 6 below.

Table 6: Ramsey Reset Test, Serial Correlation LM Test and Homoscedasticity Test Results

	F-Statistic	Prob. Value
Ramsey Reset Test	0.012862	0.9109
Breusch-Godfrey Serial Correlation LM Test	0.924626	0.4093
Breusch-Pagan-Godfrey Heteroskedasticity Test	1.053303	0.4135

Source: Authors Computation using E-view 9

From Table 6 above, the results of the diagnostic test shows that the linearity test using Ramsey reset test indicates that the f-statistic is 0.012862 with a computed p-value of 0.7202 which is greater than 5 percent (0.05) critical value rejects the null hypothesis and conclude that the model is correctly specified. The result of the serial or autocorrelation test using Breusch-Godfrey Serial Correlation LM Test shows that the f-statistic is 0.924626 with a Chi-Square probability value is 0.4093. This indicates that the probability value of about 41 percent (0.4093) is greater than 5 percent (0.05) critical value; hence we confirm no serial correlation in the model. The result of the heteroscedasticity test using Breusch-Pagan-Godfrey test shows that the f-statistic is 1.053303 while the Chi-Square probability value of 0.1993. The result suggests that there is no evidence of heteroskedasticity in the model since the probability Chi-square value is more than 5 percent ($P > 0.05$). So, residuals do have constant variance which is desirable in regression meaning that residuals are Homoscedastic.

DISCUSSION

Agricultural Nitrous Oxide Emission and Quality of Life in Nigeria

The study revealed that coefficient of Agricultural Nitrous Oxide Emission (ANXD) has a positive (0.518178) relationship with quality of life in the long run. This implies that an increase in Agricultural Nitrous Oxide Emission (ANXD) increases quality of life in Nigeria within period of study. The positive sign of Agricultural Nitrous Oxide Emission (ANXD) do not conform to a prior expectation in line with economic theory.

The negative relationship between Agricultural Nitrous Oxide Emission (ANXD) and quality of life disagrees with the findings of Frank et al. (2012) who found that Agricultural Nitrous Oxide Emission (ANXD) affect the quality of life of countries.

The coefficient of Agricultural Nitrous Oxide Emission (ANXD) is not statistically significant with quality of life at 5 per cent level. This is because their p-values calculated of 0.9074 is greater than p-table value of 0.05. The study therefore accepts the null hypothesis as there is no significant relationship between Agricultural Nitrous Oxide Emission (ANXD) and quality of life but do not reject the alternative hypothesis in Nigeria within period of study.

The positive and insignificant effect of Agricultural Nitrous Oxide Emission (ANXD) on quality of life may suggest that Agricultural Nitrous Oxide Emission (ANXD) is not a threat to the quality of life and longevity in Nigeria but may be other factors like per capital health spending (HEP), improvement in sanitary practice and immunization of the child hold the key to longevity, especially in Nigeria or the provision of adequate health care services that has been a lingering problem in the country with public health institutions running shortage of skilled workforce as well as essential drugs and amenities.

Crude Oil Spillage and Quality of Life in Nigeria

The study revealed that coefficient of Crude Oil Spillage (OSPL) has a negative (-0.975901) relationship with quality of life in the long run. This implies that an increase in Crude Oil Spillage (OSPL) decreases quality of life in Nigeria within period of study. The negative sign of Crude Oil Spillage (OSPL) conforms to a prior expectation in line with economic theory.

The negative relationship between Crude Oil Spillage (OSPL) and quality of life agrees with the findings of Effiong and Etowa (2012) who found that Crude Oil Spillage (OSPL) reduces the quality of life of countries. The coefficient of Crude Oil Spillage (OSPL) is statistically significant with quality of life at 5 per cent level. This is because their p-value calculated of 0.0083 is less than p-table value of 0.05. The study therefore rejects the null hypothesis as there is no significant relationship between Crude Oil Spillage (OSPL) and quality of life but do not reject the alternative hypothesis in Nigeria within period of study.

It is expected that Crude Oil Spillage (OSPL) will reduce the quality of life and this study confirm that Crude Oil Spillage (OSPL) has negative effect on quality of life in Nigeria.

CONCLUSION

The study examines empirically the effect of environmental pollution on quality of life in Nigeria in Nigeria from 1981 to 2020. In order to achieve this, descriptive statistics, unit root test, bound cointegration and ARDL estimation method were employed to analyze the data. The result of the

ARDL revealed that Agricultural Nitrous Oxide Emission (ANXD) increases quality of life in Nigeria and Crude Oil Spillage (OSPL) reduces quality of life in Nigeria within period of study.

The study therefore concluded that Crude Oil Spillage (OSPL) reduces quality of life in Nigeria, while Agricultural Nitrous Oxide Emission (ANXD) do not decrease the quality of life in Nigeria within the period under review.

Recommendations

- The Government should ensure that agricultural nitrous oxide emission (ANXD) should maintain its current status of not decreasing the quality of life in Nigeria.
- The Government should ensure that crude oil spillage (OSPL) does not reduce quality of life in Nigeria by making sure that crude oil spillages (OSPL) are contained.

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