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ASSESSING THE EFFECTIVENESS OF PUBLIC POLICIES IN THE OIL AND GAS INDUSTRY FOR ENVIRONMENTAL PROTECTION IN ABIA STATE, NIGERIA.

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Abstract:

Public policies are important instruments in the society. They are often used to identify and resolve problems and challenges in the society. Public policies can be effective – when they achieve the objectives for which they were formulated in a cost-effective manner, serve the interests of all stakeholders fairly and justly and support government actions as well as encourage good conduct from the entire citizenry. They are ineffective when they are unable to perform these functions. The Nigerian oil and gas industry is replete with public policies. These policies whose main objective, among others, is the prevention of environmental degradation especially in the oil-bearing communities include: the Associated Gas Reinjection Act, 1979; Environmental Impact Assessment Act, 1992; the Environmental Guidelines and Standards for the Petroleum Industry (EGASPIN) Act, 2002, and others. Despite the multiplicity and existence of these policies however, oil spillage and gas flaring – the main culprits in respect of the despoliation of the environment – resulting from oil exploration and production operations, still take place. The objective of this study therefore, is the assessment of the effectiveness of public policies in the oil and gas industry in Nigeria for the protection of the environment and human health. The survey method was used to gather, through the use of a questionnaire, the primary data analyzed; and, the Multiple Regression Technique was used to test the hypotheses formulated to guide the study. The findings include the confirmation that the development and existence of public policies in the Nigerian oil industry in Nigeria have significantly impacted environmental protection in the country through the steady and persistent decline in the volume and intensity of gas flared in the country; increased awareness by the oil-bearing communities of what their rights are under the law and have provided a legal basis for seeking redress in situations of real or perceived injustice, among others. However, the rate of this decline is identified to be slow. Moreover, oil spill incidents are still frequent.

1.0 Introduction

Public policies, especially when effectively implemented, can be a veritable instrument for the resolution of problems and challenges in the society – be they social, environmental, economic, political and cultural. They are often important and viable tools for resolving the contradictions inherent in the society and for pointing the way forward for the development of certain aspects of the life of a people and society. Governments, at all levels, have often relied on public policy for the identification and resolution of environmental, socio-economic and political problems in the society. For instance, public policies have been formulated in several countries of the world to guide democratic and political behaviours, economic actions, and the relationship that exists between nature and man. Public policies may be effective or ineffective, good or bad. They are considered effective when they achieve the objectives they set out to achieve in an efficient and cost-effective manner. They are also said to be effective when, in the course of solving problems in the community, they are directly or indirectly fair to all stakeholders and serve or perceive to serve justice to all concerned; and, support government actions and institutions as well as encourage good conduct from the entire citizenry.

Generally, oil production operations usually pose serious negative consequences not only to the environment where such operations take place but also to the human health conditions of people in such places. This is made worse by the existence of weak, ineffective policies or the total absence of policies to checkmate the excesses of oil production operations. The experience of Nigeria as an oil-producing country is essentially not different. The production and exportation of crude oil and natural gas by Nigeria since the mid-1950s have brought about serious environmental and sustainable livelihood challenges in the oil-bearing communities of Abia State, Nigeria. Oil and gas production operations have adversely impacted the environment of these communities despite the huge financial resources that have accrued to the country and to the oil and gas companies from oil production and exportation. Thus, the operations of these companies have resulted to biophysical changes in the environment of the communities including biodiversity loss, ecosystem changes, and reduction in soil fertility due to oil spills as well as the disruption of the livelihoods of households and serious human health challenges (Salako, Sholeye & Ayankoya, 2012) to members of these communities (Inoni, Omotor & Adun, 2006; Osuji & Nwoye, 2007). The mangrove and rainforests which are prominent in this environment are gradually but steadily being decimated. There is also the contamination of both surface and ground water – collectively, these have made life difficult for the peoples of these communities (Onwuka, 2005; Adekola & Mitchell, 2011). This situation is attributable mainly to frequent oil spills and incessant gas flares from oil production operations resulting ultimately to massive reduction in yields from the farm (United Nations Development Programme UNDP, 2006; United Nations Environment Programme, UNEP, 2011).

Consequently, the government of Nigeria has, over the years, formulated policies intended to obviate and mitigate the adverse consequences of oil production in the region. Thus, the Nigerian oil and gas industry is replete with such policies with the overarching objective of protecting the environment in which oil exploration and production take place. These policies include: The Constitution of the Federal Republic of Nigeria, 1999 (s.20); the Environmental Impact Assessment Act, 1992 (s.2); the National Environmental Standards and Regulations Enforcement Agency (NESREA) Act, 2007; the Hydro-Carbon Oil Refineries Act, 2004; the Petroleum Act, 1969; the Associated Gas Re-injection Act, 1979, as amended, 2004; the Environmental Guidelines and Standards for the Petroleum Industry (EGASPIN), 2002; the Petroleum Products and Distribution Act, 2004; the Niger Delta Development Commission (NDDC) Act, 2006 and the National Oil Spill Detection and Response Agency (NOSDRA) Act, 2006. However, it is not clear how these policies and regulations have impacted the continuous degradation of the environment and the livelihoods of households in these communities.

This research therefore, aims at assessing the effectiveness of these policies *vis-a-vis* the protection of the environment and the resources on which the people of the oil-bearing communities of Abia State, Nigeria, depend for livelihood. It will attempt to address the question: what are the contributions of public policies to environmental protection in the oil-bearing communities of Nigeria with particular reference to

Abia State? The study represents a timely and modest contribution to the search for solutions to the challenges confronting these communities presently. Specifically, the study sets out to:

1) Appraise the nature of public policies in the oil and gas industry for the protection of the environment in Nigeria with particular reference to oil-bearing communities of Abia State;
2) Evaluate the impacts of public policies on the environment and livelihoods (income levels, employment opportunities, educational levels, crop yield and health conditions) of households in the oil- and gas-bearing communities of the study area;
3) Appraise the factors necessary for the effectiveness of public policies in the oil and gas industry in Nigeria; and,
4) Suggest solutions for public policy effectiveness in the oil and gas industry for the protection of the environment and sustainable livelihoods in Nigeria.

1.1 Geographical scope of the study

Location and size

This study covers oil- and gas-bearing communities in Ukwa West Local Government Area of Abia State, including: Owaza, Umuorie, Ozar, Umunteke, Umuokwor and Uzuaku/Imo River communities. The Ukwa West Local Government Area with headquarters at Okeikpe is one of the 17 local government areas in Abia State. The local government area lies approximately within Longitudes 7^0 11′ 0″ and 7^0 22′ 0″ East of the Greenwich meridian and Latitudes 4^0 52′ 30″ and 5^0 9′ 0″ North of the Equator. It has a total area of about 271 km^2 and is bounded to the east by Ugwunagbo Local Government Area and by Ukwa East Local Government Area to the south-east. It is also bounded to the north and north east by Aba North and Aba South Local Government Areas respectively. To the south and south west of the local government is Rivers State (Ibekwe, 2017).

Physiography, rainfal and climate

Ukwa West Local Government Area is situated in the wet equatorial climatic zone with high cloud cover. There is limited sunshine, low sunshine hours, extended high cloud cover and relatively high humidity of about 96 percent most part of the year (NDES, 1999). The area is also characterized by a mean daily temperature of 26^0C with the feature of incessant rains every month of the year except for a brief dry spell between the months of January and March (NDES, 1999). The area, which is characterized by flat, low-lying land, falls within the riverine region of Nigeria with heavy rain of about 2,400 millimeters per year.

There are two climatic seasons in the area, namely: rainy season and dry season. The rainy season is usually long and takes place between the months of March and October with a short spell of dryness in August referred to as 'August Break'. The dry season begins in November and ends in February. The soil types found in the area includes the ferralitic soils of the coastal plain and alluvial soils. The vegetation of the area is typically tropical rain forest.

People, population and settlements

The people of Ukwa West Local Government Area are mainly of the Igbo ethnic origin with projected populations, based on the 2006 Nigerian census figures, of about 101, 619 persons in 2010 and 116, 610 in 2014 respectively. This is made up of about 52, 334 females (or 51.5 percent) and 49, 285 males (or 48.5 percent) in 2010; and about 60, 054 females and 56, 556 males in 2014 respectively. The people live in clustered communities of about 5,000 inhabitants for the biggest communities and much less for the small communities. They are mostly farmers and fishermen, and, depend hugely on natural resources – land, forests, and rivers, among others, for livelihood. A few of them are artisans (for example, carpenters, boat-carvers, traditional cloth-weavers and so on) and petty-traders, and, yet others engage in sand-mining, dredging and in various agri-business ventures such as piggery, poultry, among

others. The people of the riverine areas of Imo River community and its environs are mostly fishermen, boat carvers and sand miners and dredgers (Ibekwe, 2017).

Economy

The major agricultural crops in the local government area are oil palms, cassava, yam, corn and plantain. Agriculture and fishing are the main occupations of the people, which together employ about 66 percent of the people though on a subsistence basis. The Ukwa West Local Area is the major income earner for the Abia State government since the local government area is the only crude oil-bearing area in the State. It is noted that oil and gas produced in this area contributes about 39 percent of the gross domestic product (GDP) of the State (ZODML, 2013).

Administration and governance

The major autonomous communities in Ukwa West Local Government Area include Igiriukwu Autonmous Community, Ipu West Autonomous Community, Etitioha and Isi-Etitioha Autonomous Communities – these 4 autonomous communities collectively make up Owaza. Other autonomous communities are: Isimanu Autonomous Community, Isimiri Autonomous Community and Ipu South Autonomous Community. Owaza is particularly, of great importance to this study because the area hosts more than 90 percent of oil and gas installations in the local government area as well as in the State.

Fig. 1 shows the map of Ukwa West Local Government Area with the oil- and gas-bearing communities of Owaza, Umuorie, Umuokwor, Ozar and Imo River/Uzuaku, among others, clearly delineated. Inset is the map of Abia State showing Ukwa West LGA and that of Nigeria respectively.

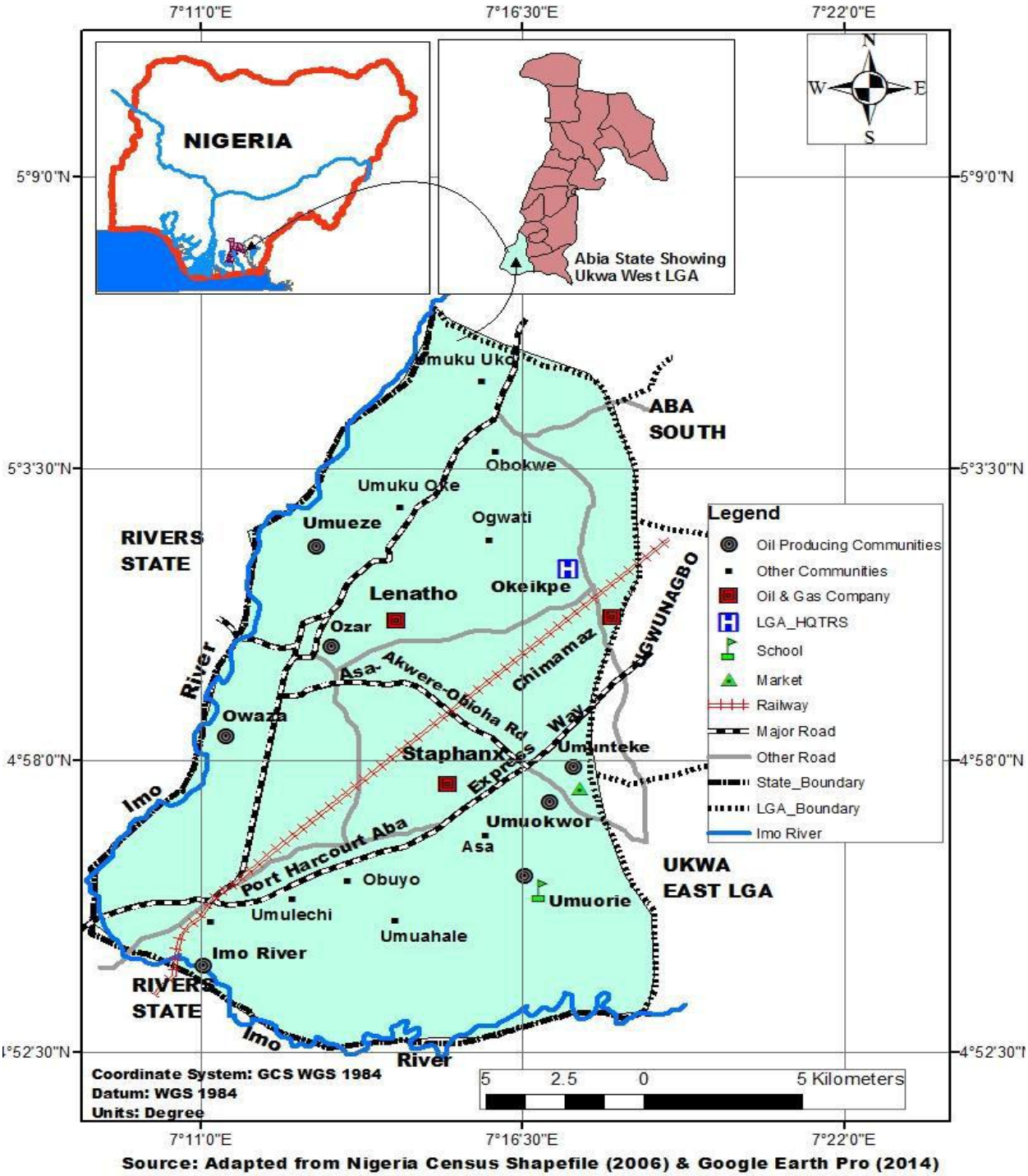
2.0 Literature Review

There are divergent views regarding the effectiveness and contributions of public policies in Nigeria's oil and gas industry to the protection of the environment in the country. These views are polarized into two major divides, namely: the proponents who believe that these policies have been effective (for example, Ite, et al. 2016; Kankara, 2013; Shell Petroleum Development Company, SPDC, 2015) and the antagonists (including Adekola &Mitchell, 2011; Onwuka 2005; UNDP, 2006) who hold contrary views. The dominant view emanating from the literature, however, is that of the failure of public policy to effectively deal with the environmental and sustainable livelihood challenges of the oil-bearing communities arising from oil exploration and production operations in the country. This is despite the multiplicity of environmental policies and regulations in the petroleum industry in Nigeria. Consequently, the oil- and gas-bearing communities of Abia State have been characterized for a long time by environmental and sustainable livelihood challenges resulting to tension, civil unrest, restiveness, militancy and political instability as a result of the failure of public policy to ameliorate the perceived or real injustice and deprivation against them caused by oil production operations in the area.

Frequent oil spills and incessant gas flaring resulting from the operations of oil companies have been profoundly fingered as being responsible for the myriad of environmental challenges, livelihood hiccups and human health issues confronting oil-bearing communities in Nigeria. For example, it has been established that oil spills impact soil fertility negatively and result in the massive decline of agricultural productivity and, by extension, the incomes of rural households. In a study of the effect of oil spillage on crop yield and farm income in Delta State, Nigeria, Inoni, Omotor and Adun (2006) using a sample of 262 farmers drawn from 10 communities and 5 local government areas in Delta State, found that oil spills reduced crop yield, land productivity and depressed farm income. According to them, a 10 percent increase in oil spill reduced crop yield and farm income by 1.3 percent and 5 percent respectively. This finding is similar to the results of UNEP (2011) which assessed the impact of environmental pollution in Ogoniland, Niger Delta, on the people's livelihood, health, water sources, among others. Other studies which have confirmed this result include UNDP (2006) and Osuji, Egbuson and Ojinaka (2005); NDDC (2006).

Gas flaring is another phenomenon with serious impact on the life and livelihoods of households in the study area. This phenomenon has taken place in certain locations in the study area consistently day

and night without stop since the related oil wells began producing decades ago. According to Ndubuisi and Asia (2007:20), "the cumulative environmental impact of the numerous flares…result in contaminant build-up into the land and shallow ground water resources". There is a collection of poisonous matters which people, and especially children, living in the flare vicinities constantly inhale. These contribute to respiratory diseases as well as other health challenges like dermatological complications and vision impairments. Moreover, vegetation around flare sites is scorched and burnt affecting agricultural productivity and livelihood assets of the local people. The people constantly complain of respiratory problems, skin rashes and eye irritations as well as damage to agriculture due to acid rain (Salako, Sholeye & Ayankoya, 2012).



Source: Adapted from Nigeria Census Shapefile (2006) & Google Earth Pro (2014)

Fig. 1: Map of Ukwa West Local Government Area showing oil-bearing communities.

Elenwo and Akankali (2014) in their contribution, contend that despite the challenges confronting the development, implementation and enforcement of oil-industry related policies, there have been enormous positive impacts on the operations of oil companies and tremendous gains to the Nigerian economy as a result of the development of these policies. According to them, "environmental policies and strategies development for the oil and gas industry in Nigeria has engendered so many gains for the Nigerian environment" (Elenwo & Akankali, 2014:891). Among these gains are: massive creation of awareness on environmental issues in the oil-bearing communities in the country; remarkable reduction in the rate of conflicts among the various stakeholders in the industry by providing a framework and bases for litigation wherever and whenever dialogue and arbitration have failed to resolve issues central to the conflicts; provision of strong incentives for the attraction of foreign investments into the oil and gas industry in Nigeria since these policies now engender an environment of certainty on which contracts may be concluded and executed; attainment of an enhanced implementation and enforcement capacity; and, finally, the development of policies and strategies in the Nigerian oil and gas industry has assisted in defining roadmaps for the reduction of adverse environmental practices such as gas flaring and for the achievement of sustainable development initiatives, amongst others.

In their study of environmental issues and policies in the Nigerian Petroleum industry, Ite, et al., (2016), argue that the development of petroleum resources in the country has contributed greatly to the socio-economic development of Nigeria especially in the last 55 years or so. However, developments in the industry have negatively impacted the natural environment as well as human health conditions of people in the oil-bearing communities. The authors aver that the enormous revenues derived from oil exploited from this region have been appropriated by the oil-companies operating in Nigeria, with the active connivance of the national government, thus, leaving the people of the area immensely impoverished. The study attributes this state of affairs to, among other factors, massive corruption bedeviling the industry in Nigeria, ineffective government's petroleum development policies, and so forth. It is contended that "existing Nigerian statutory laws and regulations for environmental protection appear to be grossly inadequate…" (2016:21). The study concludes by maintaining that the ineffective government's oil policies, unsustainable operational practices by international oil companies, et cetera, have been responsible for the oil hydrocarbon pollution of the environment, human health risks and socio-economic problems which characterize the day-to-day living experiences of households in the oil-bearing communities of Nigeria.

The multinational oil giant, Shell Petroleum Development Company (SPDC) which operates in the study area argues that the company has adopted, since the year 2000 a multi-year programme designed to install technologies to capture associated gas (AG) from oil production facilities (SPDC, 2015). Consequently, the company claims that it has progressively reduced gas flaring volume from its production facilities by 75 percent between 2003 and 2012. It also contends that it has reduced gas flaring intensity, defined as the quantity of gas flared per unit (barrel) of oil produced, by 60 percent between 2003 and 2012 (SPDC, 2015). It is believed that these efforts are in response to policies formulated by the Nigerian government for the protection of the environment as well as reactions to pressures from local and international advocacy groups. However, non-governmental environmental organizations (NGOs) like The Friends of the Earth (FoE) (2011), IRIN (2012) and Amnesty International (2009) have all disputed these claims saying that the claims are not supported by the reality on ground.

More importantly, the present state of the oil exploration and production technology in Nigeria is a contradiction of the Petroleum (Drilling and Production) regulations which provide that it is mandatory for all oil companies granted license to operate in the country to adopt all measures necessary, as precautions, to forestall disaster of any sort related to their operations. The oil companies are expected to provide up-to-date and modern equipments capable of pro-actively preventing oil pollution of any kind and volume. The companies are also required to adopt measures, whenever and wherever oil pollution occurs, to stop and control the pollution as rapidly as possible. Moreover, these companies must maintain their equipments and facilities in good operational state to prevent the spill of crude oil and to cause as

little damage as possible to the environment including the trees and crops, buildings, structures and other property (Petroleum-Drilling and Production-(Amendment)-Regulations, 2006).

Despite the provisions of the law, oil spill incidents have continued to be a regular occurrence in the study area. The oil companies have often blamed the communities, alleging sabotage, militancy, theft and other such vices for the oil spills. However, a careful study of this situation confirms that oil spillage is not a recent phenomenon in the area but is as old as the oil industry in Nigeria itself. On the other hand, militancy, illegal bunkering, kidnapping and civil unrest in this region are recent in origin due mainly to the inability of oil companies to react promptly and proactively to issues of justice and fairness in their operations as perceived by the oil-bearing communities. In-fact, the Department of Petroleum Resources (DPR) reported a total of 6,744 oil spills between 1976 and 2001 which resulted in approximately 2.4 million barrels of oil being spilled into the environment (cited in Udoudoh, 2011). On the other hand, there were barely any recorded issues of sabotage, kidnapping, and the like during this period. The National Oil Spill Detection and Response Agency (NOSDRA) confirms that oil companies operating in the country reported 2, 054 cases of oil spill incidents with spill volumes greater than one barrel each in the 4-year period from June 2006 to June 2010 (Milieudefensie-FoE, 2011).

3.0 Methodology

The ex post facto research design is considered appropriate for this study because it is impossible to apply the entire protocol of pure experimental research design in investigating the impact of public policies in the oil and gas industry on environmental protection and human health and on the protection of the resources needed for sustainable livelihoods in the oil- and gas-bearing communities of Abia State, Nigeria. This is because these policies have been in existence several years before the commencement of this research. Moreover, it is ethically unacceptable to deliberately cause an oil spillage, for example, in order to study the effectiveness of policies on the environment of the study area. Furthermore, the formulation of environmental and health policies in the oil industry is beyond the control of this researcher. It is therefore, not possible to select, control and manipulate the factors necessary for the study of direct cause-and-effect relationships associated with public policies and environmental protection.

The survey method was used to gather the primary data used for this study; and, these consisted mainly of data acquired through the field survey using a questionnaire designed and administered to elicit information on, among others, demographic characteristics of households in the study area. These include: data on family size, educational levels of household members, income, age, gender and occupation. A combination of the purposive sampling technique (to select specified number of oil- and gas-bearing communities in Abia State of Nigeria) and, the simple random sampling technique (to select respondents, based on the Bourley (1988) proportional allocation formula, from each of these communities to include in the sample population for the purpose of the questionnaire administration) was used for the study. A total of 392 respondents were so selected. In addition, the participatory research approach was used to gather supplementary data and or to cross-check the authenticity of data collected through the use of the questionnaire. This involved the use of informal discussions, interviews and physical observation of the environment. The data for the study were also obtained from secondary sources including publications by the Department of Petroleum Resources (DPR), the Nigeria National Petroleum Corporation (NNPC), the Central Bank of Nigeria (CBN), the Organization of Petroleum Exporting Countries (OPEC), to mention just this few.

The Multiple regression technique (MRT) was used to test the hypothesis formulated to guide the study. This statistical technique is given by:

$$y = a + b_1x_1 + b_2x_2 + b_3x_3 \ldots b_nx_n + e \quad - \quad - \quad -$$

Where: y = dependent variable (Environmental Protection: Oil Spills, Gas Flares, Soil Fertility loss, Human health impairment).

a = regression constant (Y intercept)

$b_1, b_2, b_3 \ldots b_n$ = regression coefficients of the independent variables.

x_1, x_2, x_3,… x_n = independent variables of EGASPIN, 2002; the Hydro-Carbon Oil Refineries Act, 2004; NESREA Act, 2007, Associated Gas Re-injection Act, 1979 and NOSDRA Act, 2006.
e = stochastic error

4.0 Data Presentation, Analyses and Discussion of Findings

Table 1 presents an analysis of the socio-demographic characteristics of the respondents to the questionnaire. It shows that 49 percent of the respondents are males while 51 percent are females. In the same vein, the age distribution of the population shows that children of 18 years or less constitute 11 percent while those from ages 19 to 35 make up 24 percent; 36 -50 years constitute 32 percent and 65 and above 14 percent. This means that a greater number of people in the communities are active and productive as opposed to ageing, dependent population. Furthermore, secondary school certificate holders make up 43 percent, followed by those with tertiary educational qualification 32 percent while 7 percent represent those without formal educational qualification. In addition, while 72 percent of the people are engaged in farming, hunting and fishing, 12 percent of the respondents are petty-traders, 6 percent are artisans and technicians such as carpenters, mechanics, electricians and plumbers; and, civil/public servants 4 percent. In terms of incomes, it is shown that 15 percent of the respondents earn a maximum of N5, 000 per month. This translates to about N167 or US $0.46 per day in a 30-day month given the prevailing (as at July, 2017) exchange rate of N360/dollar. In the same manner, 46 percent earn N10, 000 or less which means a daily income of about N333 or US $0.93 per day. On the other hand, 35 percent of the respondents earn between N11, 000 and N25, 000 or N367 and N833 per day translating to between US $1.02 and US $2.31 per day. The implication of this finding is that more than 71 percent of the respondents live below the poverty line of US $1.90 (World Bank, 2015) per day. This scenario highlights the high incidence of poverty in the communities as only about 5 percent of the respondents earn N50, 000 or more per month (that is, N1, 667 or US $4.6 per day) (Ibekwe, 2017).

Table 2 shows the annual quantities of gas produced and flared by Nigeria for each of the 15 years from 2000 to 2014 based on the figures given by the Nigeria National Petroleum Corporation (NNPC) in its annual statistical bulletins for the years as indicated. For example, in 2000, a total of 1,599 billions of standard cubic feet (bscf) of gas was produced and about 883 bscf representing 55 percent of the total quantity produced was flared. In the same vein, in 2007 and 2013, 2,416 bscf and 2,325 bscf respectively were produced in the country while the quantities of gas flared in the two years corresponded to 760 bscf (31 percent) and 409 bscf (18 percent) respectively.

Similarly, Table 3 which was based on figures supplied by the OPEC in its annual statistical bulletins for the years indicated contains the same information. However, the quantities produced and flared by Nigeria for each of the years differ from the figures given by the NNPC. For instance, while Table 2 shows that 1,823 bscf of gas was produced and 921 bscf (51 percent) flared in 2001, Table 3 indicates that in the same 2001, 1,387 bscf and 678 bscf (49 percent) of gas was produced and flared respectively.

In Table 4 are shown the total number of oil spills and the corresponding quantities (in barrel) of oil spilled annually from 2010 to 2017. It shows, for example, that in 2011 and 2015, there were 673 and 753 oil spill incidents in the country resulting to about 66, 907 barrels or 10, 638, 213 litres and 32, 757 barrels or 5, 208, 363 litres respectively of oil spilled into the environment in various parts of the country.

Table 1: Socio-demographic characteristics of the respondents

	Frequency	Percent
1. Sex of Respondents		
Male	192	49
Female	200	51
Total	**392**	**100**
2. Age of Respondents		
≤ 18 Years	43	11
19 - 35 Years	94	24
36 - 50 Years	125	32
51 - 65 Years	75	19
65 Years and above	55	14
Total	**392**	**100**
3. Educational Qualification of Respondents		
No Basic Education	27	7
Basic/Primary Education	71	18
Secondary Education	169	43
Tertiary Education	125	32
Total	**392**	**100**
4. Occupation of Respondents		
Farming/Hunting/Fishing	282	72
Trading	47	12
Technicians/Artisans	24	6
Civil/Public Service	15	4
Studies/Unemployed	24	6
Total	**392**	**100**
5. Income Level of Respondents		
< N5,000	59	15
N5,000 - N10,000	122	31
N11,000 - N25,000	137	35
N26,000 - N50,000	55	14
≥N50,000	19	5
Total	**392**	**100**

Source: Authors' field survey, 2018.

Table 2: Quantity of Gas Produced and Flared, 2000 – 2014 in Nigeria.

Year	Gas Produced (bscf)	Gas Flared (bscf)	Gas Flared (%)
2000	1599	883	55
2001	1823	921	51
2002	1652	754	46
2003	1829	845	46
2004	2082	887	43
2005	2094	811	39
2006	2182	804	37
2007	2416	760	31
2008	2288	619	27
2009	1837	509	28
2010	2393	582	24
2011	2400	619	26
2012	2580	589	23
2013	2325	409	18
2014	2524	290	11

Source: NNPC. (2000; 2001; 2002; 2003). Annual statistical bulletins; Authors' compilation, 2018.

Table 3: Quantity of Gas Produced and Flared, 2000 – 2014 in Nigeria.

Year	Gas Produced (bscf)	Gas Flared (bscf)	Gas Flared (%)
2000	1230	607	49
2001	1387	678	49
2002	1750	805	46
2003	1862	821	44
2004	2109	851	40
2005	2060	812	39
2006	2181	787	36
2007	2414	787	33
2008	2564	673	26
2009	2002	470	24
2010	2533	540	21
2011	2965	504	17
2012	2995	465	16
2013	2811	427	15
2014	3047	379	12

Source: OPEC. (2004; 2007; 2011; 2015). Annual statistical bulletins. Authors' compilation, 2018.

Table 4: Annual oil spill incidents in Nigeria, 2010-2017

Year	Number of Spills	Total Spill Qty (Barrels)
2010	537	17658
2011	673	66907
2012	844	17526
2013	522	4066
2014	1087	10302
2015	753	32757
2016	434	1659
2017	429	9097

Source: DPR. (2016; 2017). Nigerian Oil & Gas Industry: Annual Reports.

Similarly and specifically, Table 5 shows the yearly number of oil spill incidents and the total spill quantities (in barrels) in the study area for the period 2011 – 2018. In 2012 for example, 26 oil spills resulting to a total spill quantity of 2,273 barrels of oil were reported and investigated by the Joint Investigation Team (JIT) – which is usually composed of representatives from the host community, Department of Petroleum Resources (DPR), NOSDRA, State Ministry of Environment, Oil Company and the Nigerian Police Force.

Table 6 shows the human health conditions of members of the oil-bearing communities of Abia State, Nigeria. It shows that while about 7 and 15 percent of the people suffer from dermatological and respiratory diseases respectively arising from the adverse effects of oil production operations, notably, gas flaring, 76 percent complain of elevated ambient temperature. This high temperature within the vicinity of the people's residential areas makes sleeping a herculean task without some form of air-conditioning which, of course, is not affordable to the majority of the people.

Table 5: Annual oil spill incidents in the study area, 2011-2018

Year	Number of Spills	Total Spill Qty (Barrels)
2011	18	1454
2012	26	2273
2013	15	1330
2014	3	354
2015	6	80
2016	8	493
2017	15	1965
2018	23	583

Source: SPDC. (2015).Oil Spill Data: Historical spill incident data 2011 - 2018; Author's Compilation, 2018.

Table 6: Health conditions of members of oil-bearing communities in Abia State

S/No		No. of Persons	Percentage
1	Skin Diseases	27	7
2	Respiratory Diseases	59	15
3	High Ambient Temperature	297	76
4	None	9	2
	Total	392	100

Source: Author's field survey, 2018.

Test of Hypothesis

H_0: Public policies in Nigeria's oil and gas industry have not contributed significantly to environmental protection in the oil-bearing communities of Abia State, Nigeria.

H_1: Public policies in Nigeria's oil and gas industry have contributed significantly to environmental protection in the oil-bearing communities of Abia State, Nigeria.

Table 7 shows the multiple regression analysis of public policies on environmental protection in the oil and gas bearing communities of Abia State. The table indicates that at 0.05 level of significance under degrees of freedom 5 and 384, the critical F-ratio is 2.23. The calculated F-ratio is 10.551 ($p = 0.000<0.05$) and is greater than the critical F-ratio. The significance value is also less than 0.05 level used in the study. Therefore, the null hypothesis is rejected and the alternate hypothesis accepted, that is, public policies in the oil and gas industry in Nigeria have contributed significantly to environmental protection in the oil- and gas-bearing communities of Abia State, Nigeria.

Table 7: Multiple regression analysis of the contribution of public policies to environmental protection in the oil- and gas-bearing communities of Abia State, Nigeria.

Sources of Variation	SS	df	MS	F	Sig.
Regression	13.094	5	2.619	10.551	0.000[b]
Residual	95.309	384	0.248		
Total	108.403	389			

*p<0.05; df 5, 384; critical F = 2.23

a. Dependent Variable: Environmental Protection

b. Predictors: (Constant), EGASPIN 2002, Hydro-Carbon Oil Refineries Act 2004, Associated Gas Re-injection Act 1979, NESREA 2007, NOSDRA 2006.

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	3.910	0.089		43.822	0.000[b]
EGASPIN, 2000	0.111	0.036	0.269	3.038	0.003
Hydro-Carbon Oil Refineries Act, 2004	-0.148	0.077	-0.121	-1.935	0.054
Ass. Gas Re-injection Act, 1979	0.098	0.037	0.0345	2.674	0.008
NESREA, 2007	-0.007	0.034	-0.026	-0.211	0.833
NOSDRA, 2006	0.084	0.021	0.308	4.011	0.000

*p<0.05

a. Dependent Variable: Environmental Protection.

Model summary

The model yielded a correlation coefficient, R, of 0.348 and coefficient of multiple determination, R^2 of 0.121 as can be seen from Table 8. This means that the five independent variables have a significant composite effect on environmental protection in the study area.

Table 8: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.348[a]	0.121	0.109	0.4982

a. Predictors: (Constant) EGASPIN, 2000; Hydro-Carbon Oil Refineries Act, 2004; Ass Gas Reinjection Act, 1979; NESREA, 2007; NOSDRA, 2006.

ANOVA

The analysis of variance (ANOVA) of the regression model is shown in Table 9. It shows the F-ratio of 10.551 at a significance value of 0.000; and, also the sum of squares and the degrees of freedom.

Table 9: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.094	5	2.619	10.551	0.000[b]
	Residual	95.309	384	0.248		
	Total	108.403	389			

a. Dependent Variable: Environmental Protection
b. Predictors: (Constant), EGASPIN, 2002; Hydro-Carbon Oil Refineries Act, 2004; Ass Gas Reinjection, Act, 1979; NESREA, 2007; NOSDRA, 2006.

Coefficients

The coefficient table, Table 10 shows the relative contribution of each of the independent variables to the dependent: EGASPIN 2002, Associated Gas Reinjection Act 1979, and NOSDRA 2006 have significant positive contributions to the environmental protection of the oil- and gas-bearing communities of Abia State, with significant t-values of 3.038 ($p = 0.003<0.05$), 2.674 ($p = 0.008<0.05$) and 4.011 ($p = 0.000<0.05$) respectively.

Table 10: Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	3.910	0.089		43.822	0.000
EGASPIN, 2002	0.111	0.036	0.269	3.038	0.003
Hydro-Carbon Oil Ref. Act, 2004	-0.148	0.077	-0.121	-1.935	0.054
Ass.Gas Reinject.Act, 1979	0.098	0.037	0.345	2.674	0.008
NESREA, 2007	-0.007	0.034	-0.026	-0.211	0.833
NOSDRA, 2006	0.084	0.021	0.308	4.011	0.000

Regression equation

Based on Table 10, the regression model is therefore, given as:

$y = 3.910 + 0.111x_1 – 0.148x_2 + 0.098x_3 – 0.007x_4 + 0.084x_5 + e$

where, y = Environmental Protection

x_1 = EGASPIN, 2002
x_2 = Hydro-Carbon Oil Refineries Act, 2004
x_3 = Ass. Gas Reinjection Act, 1979
x_4 = NESREA, 2007
x_5 = NOSDRA, 2006

It is seen from this model that public policies in the oil industry in Nigeria, notably: EGASPIN 2002, Associated Gas Reinjection Act 1979 and NOSDRA 2006 have positively impacted environmental protection in the study area. Specifically, EGASPIN 2002 has contributed about 11.1 percent to environmental protection in the area while Associated Gas Reinjection Act 1979 and NOSDRA 2006 have contributed 9.8 percent and 8.4 percent respectively to environmental protection in the area.

The evidence from this study has shown that the Nigerian oil and gas industry is not bereft of public policies. Rather, the industry is replete with public policies whose major objective is the protection and preservation of the environment where oil and gas exploration and production take place. It is noted that these policies are usually well-formulated especially on paper but poorly implemented due to a number of reasons including allegations of humongous corruption in the industry, lack of the political will, on the part of the government, to ensure the effective implementation of same as well as the lack of the technical competence and knowhow on the part of the government agencies with responsibility to ensure the effective implementation of the policies.

Furthermore, the imperativeness of effective public policies in the oil and gas industry in Nigeria has been amply demonstrated given the devastating impacts of exploration and production activities of oil

companies in the country. The operations of these companies have resulted to serious health challenges for the people of the oil-bearing communities, contamination of surface and ground water sources, loss of soil fertility and the destruction of vegetation in this area. These combined, have led to the intensification of the sustainable livelihood challenges which characterize the daily living experiences of households in these communities.

However, evidence from the study has equally shown that the development and existence of public policies in the oil industry in Nigeria have contributed greatly to environmental protection in the oil-bearing communities. For one thing, it has brought tremendous awareness to the people of these communities of what their rights are under the law and have provided a legal basis for seeking redress in situations of real or perceived injustice. And for the other, the existence of these policies has actually brought about a reduction in the harmful and negative impacts of oil and gas production operations. For instance, a careful comparison of Tables 2 and 3 highlights the trend of falling quantities of gas flared as a percentage of the total quantity of gas produced each year. That is, there is a steady and persistent fall in the volume of gas flared as a percentage of the total volume of gas produced. For example, while Tables 2 and 3 show that the volume of gas flared in the year 2000 was 55 percent and 49 percent of the total quantities produced in the year, the volume of gas flared in 2014 declined to 11 and 12 percent respectively. Thus, there is a level of consistency between the two sets of figures presented in Table 2 and Table 3 in terms of the reduction in the flare volumes for the 15-year period though they differ in absolute sense. This has been attributed to the impact of public policies on the operations of oil companies as well as to pressures from local and international pressure and advocacy groups.

On the other hand, no discernable trend was observed in relation to oil spillage by this study. For instance, in 2013 the total oil spill incidents was 522 (Table 4) with a corresponding total spill quantity of about 4, 066 barrels. These numbers rose to 1, 087 incidents and total spill quantity of 10, 302 barrels in 2014, only to rise further to 32, 757 barrels from 753 spill incidents in 2015. Thus, the fact that there is no evidence to suggest that the annual rate and volume of oil spill incidents have declined or are declining is clearly a public policy failure in the country.

5.0 Conclusion

One of the salient outcomes of this study is the confirmation that public policies in the oil- and gas industry in Nigeria have contributed significantly to environmental protection in the oil-bearing communities of Abia State, Nigeria. This is seen in the steady and continuous decline in the annual volumes and intensity of gas flared as well as in the creation of awareness regarding environmental and human rights issues in the oil-bearing communities. However, it must be quickly pointed out that the rate of progress in this direction has been difficultly slow. It is seen as a failure of public policy that about 40 years after the enactment of the Associated Gas Reinjection Act, for example, gas flaring still takes place in Nigeria without an assured terminal date in sight. Furthermore, oil spill incidents are still a regular and frequent occurrence in the oil-bearing communities of Abia State, Nigeria despite the provisions of the Petroleum (Drilling and Production – Amendment) Regulations, 2006, which seek to ensure that the necessary precautions to avoid (or reduce to a minimum) oil spillage, are taken by operators in the industry through the deployment of modern and state-of-the-art equipments. It has been shown that these equipments are old, obsolete and pollution-intensive as most of the facilities were constructed and or installed between the 1960s and early-1980s to the then prevailing standards (Adelana, et. al, 2011). Moreover, the pipelines and flow-lines have been found to be too narrow in diameter and have been in use for periods longer than their estimated life spans making them vulnerable to frequent rupture and breakage. Furthermore, the pipelines are laid on the earth surface making them vulnerable to rupture as they come in contact with anthropogenic agents (Ibekwe, 2016).

The well-formulated policies to deal with these issues in the industry are extant but have been poorly implemented or not implemented at all due to a number of factors including the lack of the political will, on the part of the Nigerian government, to ensure that the policies are effectively

implemented. There are also the challenges of lack of the necessary expertise and capacity, on the part of responsible government agencies, to ensure the proper execution of public policies in the industry. Moreover, there have been serious allegations of massive corrupt practices in the oil industry in Nigeria. These, together have contributed to the weakening of the effectiveness of these policy initiatives and actions.

Based on the foregoing, it is believed that the implementation of the following recommendations will assist in resolving the contradictions and challenges bedeviling the effective implementation of public policies in the oil industry in Nigeria vis-à-vis environmental protection in the country:

i. There should be a stricter enforcement of the extant laws in respect of gas flaring in Nigeria. Gas flaring has been prohibited in Nigeria by the Associated Gas Reinjection Act, 1979 (as amended) and became operational in 1984. Section 3 allows companies to flare gas only if they have written permission duly issued by the Minister of Petroleum Resources relating to specifically-mentioned oil field(s).
ii. The government must summon the necessary political will to implement the provisions of existing laws and regulations guiding operations in the industry. Particularly, the provisions of the EGASPIN, 2002, and the Petroleum (Drilling and Production Amendment) Regulations, 2006, must be carefully and effectively implemented.
iii. The government of Nigeria must be serious in tackling corruption in all its ramifications in the industry. This is because winning the war against corruption in the country should strengthen public policy implementation in the industry in checking environmental degradation in Nigeria.

6.0 References

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