

**ENVIRONMENTAL IMPACT OF OIL AND GAS EXPLORATION AND PRODUCTION  
ON THE SOCIO-ECONOMIC LIFE OF NIGER DELTA**

A thesis submitted to the faculty at African University of Science and Technology in partial fulfillment of the requirements for the degree of Master of Science in the Department of Petroleum Engineering

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## **CERTIFICATION**

This is to certify that the thesis titled “ENVIRONMENTAL IMPACT OF OIL AND GAS EXPLORATION AND PRODUCTION ON THE SOCIO-ECONOMIC LIFE OF NIGER DELTA” submitted to the school of postgraduate studies, African University of Science and Technology (AUST), Abuja, Nigeria for the award of the Master's degree is a record of original research carried out by Antoniette Twum in the Department of Petroleum Engineering.

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## **ABSTRACT**

Niger Delta generates higher revenues for Nigeria through its abundant oil and gas resources. The region over the years has been faced with environmental challenges resulting from oil and gas operations. This study is aimed to evaluate the environmental impact of the oil and gas exploration and production on the socioeconomic life of the inhabitants of the Niger Delta. The data and analysis presented in this study relied solely on secondary data from past studies and reports from both governmental and non-governmental organisations. It has been discovered that the environmental damage has brought about health implications and affected the region's main sources of livelihood (farming and fishing), causing an increase in unemployment and poverty rate, and low standard of living. Nevertheless, these challenges could be managed by adjustment in the execution of cooperate social responsibility of oil companies, enforcement of existing laws and establishment of new regulations which can safeguard the environment and the people.

Keywords: Environment, Socioeconomic life, Oil and Gas Exploration and Production, Niger Delta, Pollution

## **DEDICATION**

To God Almighty, my provider.

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# CHAPTER 1

## INTRODUCTION

### 1.1 Background

The world's economy is run by technology and mineral wealth of nations. Many nations are noted by the amount and type of natural resources present in their country and as such Nigeria is noted for the Niger Delta hydrocarbon deposit. For all the resources (solid minerals, hydrocarbon, and economic crops such as coffee and cocoa), the extractive industry is the main driver for most of the economies. In 81 countries of the world, the extractive industry is the main economic driver and globally they account for a quarter of GDP (enviroliteracy.org, 2018). Among the extractives, crude oil has been a great contributor to many nations' economies and a main source of energy.

However, crude oil with its numerous benefit comes with a cost. The first successful oil well was drilled by Colonel Edwin Drake in 1859 at Titusville Pennsylvania in the United States of America. Spindletop also discovered oil in Texas in 1901. Though there were discoveries in other places afterward, the United States of America remained the highest producer of oil until the 1930s and 1940s when the giant fields of Kuwait and Saudi Arabia were discovered. Other countries like France and Britain began to explore for oil after the Second World War and the search has continued till date to all parts of the world (www.ektinteractive.com 2018).

The search for crude oil and gas has been intense because the exploration and production of crude oil or natural gas have served as the source of revenue for many countries and continents. Some of the major oil-producing countries include United States, Russia, Canada, Venezuela, Angola, Nigeria, Iran, and Saudi Arabia. Notably, for the past decades after the discovery of fossil fuel, it has become the main source of fuel for most human transportation via automobile vehicles, rail and airplanes; and also used for domestic and industrial activities. Over the period, many countries have benefited from crude oil but the increase in population rates and technological advancements globally has called for the higher demand for energy and hence putting pressure on the rate of

production of petroleum products. According to Mohamed Hamel (2006), the average annual demand for oil using OPEC reference will be 113 MMbbl/d and gas demand of 79 MMbbl/d of oil equivalent, which is 1.6 and 2.6 % demand growth, respectively from 2006 to 2025. (www.opec.org, 2006). Unfortunately, the quest to supply the market demand has turned the story of the benefit to a series of negative environmental impact globally, when proper measures are not taken in producing the oil and gas.

The environmental impacts of oil and gas are associated with all the processes of oil and gas exploration and production. That is from the seismic study during exploration to the transportation after refining the crude oil. Also, both offshore and onshore operations contribute to oil and gas environmental impacts. These impacts affect individuals, communities, organizations, counties and an entire continent. The main sources can be attributed to drilling operations, gas flaring, transportation, and oil spillages.

A number of major oil spillage incidences have occurred globally. They include the 1989 Exxon Valdez spill in Alaska and the Deepwater Horizon rig explosion in 2010 which led to an oil spill of about 172 million gallons into the Gulf of Mexico waters. These spills resulted in the loss of income to the coastal inhabitants and oil and gas industry, loss of seafood and tourism (Graham et al., 2016). Nigeria has also recorded major spills in the year 1980 and 1987, which include the blowout of a Texaco Funiwa-5 and Forcados Terminal tank failure (Okoroji, 2013).

Other than oil spillages, venting, leaking and flaring of natural gas during the production of oil and gas also have effects on the environment worldwide. Numerous chemicals are released into the atmosphere during these processes. Over 8% of the natural gas produced globally is lost to the aforementioned acts. Almost all the companies in Nigeria used to flare all the gas in their wells until “no flare” laws were passed. In spite of these laws, open fire gas flaring still continue, polluting the air around the area. “Air emissions associated with oil and gas production can significantly impact air quality and impair visibility” (USA EPA, 2008).

The petroleum industry has also been a global contributor to the increased rate of global warming by emitting greenhouse gases into the atmosphere during production.

According to Joyce Msuya, the emission of CO<sub>2</sub> increased in 2017, meaning it affects the gap to bridge global warming below 2°C. (Emissions Gap Report, 2018). To minimize the impact of gas flaring, World Bank together with countries, oil companies and some development institutions who form part of Global Gas Flaring Reduction Partnership have come together to discuss ways to either conserve the gas, or create a market to sell it or use it for other environmental friendly productions (World Bank, 2016).

Additionally, the discharged of drilling fluids, drill cuttings, and produced water into the seabed together with seismic surveys cause fish to swim away from their initial territory to a different destination. This disturbance affects the catches of fishermen in traditional areas ([www2.gov.scot](http://www2.gov.scot), 2018).

All these environmental impacts occur as a result of poor maintenance culture, complacency, and poor regulatory bodies and low enforcement of health and safety regulations on the part of parties involved and these are all human responsibilities. President Richard Nixon stated that “the deterioration of the environment is a large measure of the result of our inability to keep pace with progress. We have become victims of our own technology genius” ([web.cs.ucdavis.edu](http://web.cs.ucdavis.edu), 2018). These impacts on the environment range from social, political, and economic.

Also, the social implications of their occurrence on the people’s lives are very serious. These implications on people include domestic violence, alcohol, and drug abuse, mental health problems, and occupation (by William, 1996 cited in JORDAAN, 2010). According to the UN Development Program (UNDP), more than 60 % of the people in the Niger Delta depend on the natural environment for their livelihood. (Amnesty International, 2011). Other consequences are those related to land and human beings in general.

If proper care is not taken in exploiting oil and gas to meet global energy and economic needs, animals will become extinct because of loss of habitats; aquatic life will be lost and fishing will be a difficult profession; there will be the destruction of the ecosystem and loss of biodiversity. The impact eventually will affect human health, people will lose their means of livelihood and global warming will increase. It will also cause economic loss to the oil companies and loss of revenue to the oil-producing countries. Many organizations

are conducting research to find solutions to minimize the impact on the environment; companies are also investing in training personnel to minimize the impacts of their operations on the environment. Countries are also making legislation to monitor and ensure safe environmental impact.

The story of the aftermath of the environmental impact has been different from nation to nation. Over the years the priority of some European countries has been to reduce the environmental impact, while elsewhere in Africa the norm has been to cause the mess to the environment and compensate the people which may not even happen. In Angola and Nigeria, which are the top crude oil producers in Africa, records show significant environmental and social impact. According to Baumüller et al., (2011), the difficulty in tackling some of these issues is the unavailability of proper records of various incidences. In Angola for example, oil spill information is difficult to come by because of the threshold of 4000 bbl of oil spill given by their Ministry of Environment. This has made it even difficult to detect the source of some pollutants. The story continues to be different in all parts of the world, those that ensure that the impacts are minimized and the others who due to corruption turn a blind eye to how their environment is deteriorating. This study, therefore, intends to analyze the environmental impact of oil and gas exploration and production activities on the socioeconomic life of the Niger Delta Region of Nigeria.

## **1.2 Niger Delta Region**

Oil and gas production in Nigeria commercially commenced from the year 1958 (Egberongbe, Nwilo, & Badejo, 2006) after it was discovered by Shell British Petroleum in the year 1956 at Oloibiri village in Bayelsa State located within the Niger Delta (Ordinioha & Brisibe, 2013a). The Niger Delta is known to have huge oil and gas reserves making Nigeria the 6th largest oil producer in the world and largest in Africa (Adekola et al, 2017).

The exploration and production of this natural resource are done by government, multinational companies, locals or joint venture between any of the three groups. Most of the oil producing communities in Nigeria are located in the Niger Delta region with hundreds of producing wells, gas plants, networks of thousands of kilometers of pipelines

crisscrossing the entire oil-bearing zone to the flow stations and terminals and over 400 production and storage facilities (Chinweze et al., 2012).

Niger Delta region is made up of nine oil producing states (Abia, Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo, and Rivers) which comprises of 185 local governments for over 800 communities from 12 major ethnic groups, with a population of about 30 million people. It is Africa's largest delta and the world's third largest mangrove forest. It is one of the largest wetlands in the world, with about 2370 km<sup>2</sup> consisting of rivers, islands, creeks, swampy terrain and estuaries; the stagnant swamps cover 8600 km<sup>2</sup> and the coastline spans over 450 km. The mangrove forest covers 54,000 km<sup>2</sup> of the region, while the landmass is over 70,000 km<sup>2</sup> (Chinweze et al., 2012). The various occupation among the indigenes of the region before the discovery of oil and even now are mainly farming and fishing.

The oil and gas sector has been the backbone of the Nigerian economy for decades after its discovery. About 97% of the country's foreign exchange earnings and about 79.5 % of Federal revenue are from this sector (Amnesty, 2009). It also contributes to the growth rate of the Gross Domestic Product (GDP) of the Nigerian economy. Although, the entire country is known to benefit from the revenues generated from oil and gas production, the story is surprisingly different for the oil producing communities in the Niger Delta region (Odoemene, 2011).

Niger Delta has recorded various environmental implications from all stages of exploration and production which include, emission of harmful chemicals (carbon and other harmful gaseous substances) into the atmosphere during gas flaring, oil spillage with the effect of polluting the land and water bodies, clearing of vegetation, coastal and river bank, depletion of biodiversity, land degradation, among others (Nwankwo and Ifeadi, 1988).

### **1.3 Problem Statement**

Exploration and production of hydrocarbon in the form of crude oil or natural gas has been the source of revenue generation for some countries in the various continents on our planet earth. Though this commercial entity can be said to be a blessing to any nation

that produces it, nonetheless it has diverse environmental challenges that can also be called a curse in disguise if proper measures are not put in place to handle them on time. The environmental impacts of oil and gas production remains a contentious issue between oil-producing states, oil companies and governments in developing countries, but less so in developed countries with oil resources and vibrant civil societies. The impacts of the crude oil pollution occur at the local, national, regional and global levels but it's the locals (oil bearing communities) who experience the heaviest burden (UNEP, 2011). This has been the issue with regards to oil and gas production, and Niger Delta is no exception. These activities have gone a long way to impact the socio-economic life of these locals (Brown and Tari, 2015; Onosode, 2001).

As a result of the denial to the main means of livelihood of these people, the poverty rate has increased. Many are engaged in petty trading and increased in unemployment since they are not able to afford education for their children. At the United Nations Conference on Environment and Development in Rio de Janeiro, Brazil in 1992, the participants at conference observed that "environment and development are not separate challenges but inevitably linked" (Ugochuku, 2008). Considering all effects, most especially the negative impacts of oil and gas, it can be said as a means of altering the standards of the environment and compelling the inhabitants of the affected areas into new ways of life and adaptations. Of relevance, oil exploitation in the Niger Delta has shifted the visible environmental and climatic changes rapidly and in turn dictating the nature and pace of social changes in the region.

According to the UNDP Report (2006), more than 70% of the people depend on the natural environment for their livelihood. The over-reliance on oil production has led to the environmental degradation and economic exploitation and hence an inverse relationship between the wealth the community produces for the nation and the socio-economic growth of the indigenes. This state of oil-related environmental issues in Niger Delta and the population's concerns could not be far from what was aptly described by the European Parliament as 'environmental nightmare' (Takon, 2014).

The indifference by oil companies that are more scientifically equipped and have the resources to intervene but are perceived as major committers increase frustrations in affected communities. All these lead to the Niger Delta communities accusing the government through the Nigerian National Petroleum Corporation (NNPC) for not supporting the citizens, as well as oil companies' unimpressive approach to sustainable environmental practice.

To what extent then has the negligence of both the multinational companies, local companies, and the government contributed to the environmental impact of the socio-economic life of the people? This study, therefore, intends to evaluate the environmental impact of the oil exploration and production on the socioeconomic life of the people. It attempts to address two questions, i.e., has oil been a blessing or curse to the people of the Niger Delta? And should the locals have allowed the production of oil in their communities in the first place? (Okumagba, 2011). This research will then examine the impact of the above environmental damage on the indigenes of the Niger Delta to know how it has affected their social and economic life, and if the next generations to come should allow oil and gas production in their backyard.

#### **1.4 Aims and Objectives**

The main aim of the research is to evaluate the environmental impact of oil and gas exploration and production (E&P) on the socio-economic life of the inhabitants of Niger Delta. If oil exploitation has been a "curse" or "blessing" to the people in the region. The specific objectives are:

- a. To investigate pre-oil socio-economic life of the rural area (Niger Delta states);
- b. To assess the extent to which exploration and production activities in Niger Delta have degraded the environment (Environmental Impact Assessment);
- c. Analyze how the environmental impacts of oil exploration and production have affected socioeconomic life;
- d. To compare and contrast the levels of pre-oil and post-oil socio-economic livelihood in rural areas (Niger Delta states); and

- e. To use the findings of the study of the environmental implications on socio-economic life in the Niger Delta to propose recommendations or suggestions for managing these problems.

## **1.5 Methods Used**

In order to answer or achieve the set objectives the following methods were adopted:

- a. A review of the socio-economic life of the Niger Delta before the inception of oil E&P activities;
- b. Obtained secondary data from existing knowledge of the environmental impact and socioeconomic impacts of E&P as well as known theoretical knowledge on the subject from sources such as the internet, journals, conference proceedings, government institutions, and other establishments;
- c. Employed relevant descriptive and conceptual approaches to analyze and present the data obtained for appropriate assessment; and
- d. Use of information from relevant literature and other sources to deduce the contrast between the pre- and post-oil socioeconomic life in the Niger Delta and make necessary deductions and conclusions.

## **1.6 Scope of Work**

This study focuses on the environmental impact of exploration and production activities in the Niger Delta, mainly upstream processes with little emphasis on the downstream sector. The upstream is mainly exploration and production whereas downstream comprises of transportation, distribution, refining, and marketing. The thesis solely focused on the environmental problems related to oil exploration and production and evaluate their impact on socioeconomic life in the Niger Delta using mainly secondary data from various research and organizational projects. Necessary solutions are suggested after analyzing and discussing the information available.

## **1.7 Research Gap**

Though there exist literature on environmental impacts of oil and gas exploration and production activities as well as the social and economic effect of these activities across the world and especially on the Niger Delta, there is very limited studies that has been conducted on how the environmental impacts of the E&P activities have affected the social and economic life in the Niger Delta. The study focused on how the environmental impacts of oil and gas exploration and production activities in the Niger Delta snow-balls to affect the socio-economic life of the people.

## **1.8 Organization of Thesis**

The thesis is organized into seven chapters. Chapter 1 entails introduction which comprises of background, study area, problem statement, aims and objectives of the study, methods used to achieve the set objectives, the scope of work, how the project is organized and justification. Chapter 2 focuses on the review of relevant literature on the environmental impacts of E&P activities on the Niger Delta. Chapter 3 describes the materials and methods used during the research. Chapter 4 deals with the post- and pre-oil socioeconomic life of the Niger Delta people and the various E&P operations that are sources of environmental degradation in the region. Chapter 5 consists of environmental impacts of oil E&P activities and their socioeconomic implications in the region. Chapter 6 presents a general discussion of the findings of the research. Finally, Chapter 7 provides conclusions and recommendations based on the outcome of the project work.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

A number of researchers from academia, oil and gas industry and even other fields in Nigeria and other parts of the world have contributed immensely to provide information concerning the Niger Delta. Their works have brought to light some environmental impacts of exploration and production (E&P) of oil and gas, corporate activities of the International Oil Companies (IOCs) towards the locals, issues between the host communities and the oil companies, Petroleum laws and Acts, impacts of extractives to the Nigerian economy, and all other issues relating to E&P of gas and oil. Inputs from all these researches, together with the studies of organizations such as, United Nations Environmental Programme (UNEP), World Health Organization (WHO), World Bank, Friends of the Earth, Amnesty International and the Nigeria Federal government have helped to provide the structures and strategic means of handling environmental and social issues regarding oil and gas E&P activities in the country.

#### **2.2 Social and Environmental Impacts of E&P Activities in the Niger Delta Region**

A lot of works, research, investigations have been conducted to ascertain the causes, effects, and solutions to the problems surrounding the production of oil and gas. Some studies are based on only the problems leading to environmental damage from oil and gas activities. Other works are based on the effect of oil and gas production on peculiar items. Nigeria is no exception of all the effects on the environment as a result of oil and gas E&P. Niger Delta which has been the main host region of oil and gas production in Nigeria may go with the irony of hydrocarbon production being a curse rather than a blessing which the entire country sees. Among all the nine states (Abia, Akwa, Ibom Bayelsa, Cross River, Delta, Edo, Imo, Ondo, and Rivers) in the Niger Delta, some communities are noted by their rich culture, others are noted for their occupation and others. Each oil company is located in one community or the other and even an entire state. Fifty-five percent of the

500 fields in the Niger Delta are onshore and the others are shallow water (napims.com, 2018), meaning, with the 193 oil fields currently operating, the majority are close to the land (communities). Due to this, significant communities are faced with peculiar environmental challenges even though other challenges run through all communities.

### **2.2.1 Oil Spillage and Land Resources Pollution**

Niger Delta is known to be a major farming region in Nigeria, contributing remarkably in the agricultural sector of the country. It's said to be the third producer of oil palm in the world after Indonesia (Kadafa, 2012a). Because of their rich vegetation, most of the indigenous people are engaged in farming as their means of livelihood. Some studies have been focused on how the various environmental challenges have affected the farming activities in the region (Niger Delta). That is. the productivity, fertility of the crops, access to farmlands for transportation of goods to their farms and to the market to sell their products; and others have also been focused on crop diseases.

Before the production of oil, the lands in Niger Delta were used for farming and other activities but the land is now shared with oil companies for crude exploitation. Activities of the oil companies are still affecting the remaining lands left for the people to use. Their farmlands for growing crops are being reduced every day because of oil spillage and other forms of pollution (Hubbert et al., 2014). Investigations on the various environmental problems associated with oil exploration and production in specifically the Niger Delta in Nigeria have revealed that oil spillages have caused immense damage to farmlands, sources of water, mangrove forest, fishing activities, and other marine resources. This has caused people to completely relocate from their communities, no source of proper drinking water, loss of ancestral homes, pollution of fresh water, loss of agricultural land, destruction of fishing grounds and reduction of fish population (Adejoh, 2014; Asoya, 2010; Kadafa et al., 2012).

Kadafa (2012b) has argued that, after all the enormous contribution of the oil companies located in the Niger Delta region of the country and their host communities, the exploration and production of crude oil has also led to the contamination of streams and

rivers, forest destruction and loss of biodiversity in the area. Studies have shown that over 50 years' period of exploration and production activities in the Niger Delta at least 9-13 MMbbl of oil have been spilled.

Considering the effect of oil spillage on farming activities, Ojimba and Iyagba (2012) focused on how oil pollution has affected horticultural crops in Rivers State, Nigeria. Multistage sampling procedure was used to obtain data from 17 local government areas. The results from analyzing 296 questionnaires showed that average hectare of horticultural farm cultivated was smaller in crude oil polluted farms (1.04 ha) than in unpolluted farms (1.17 ha). It revealed that output of fruits, banana, pepper, okra, leafy vegetables and melon in crude oil polluted farms (15.98 tons) were lower than in non-polluted farms (18.75 tons). The income per farm in crude oil polluted farms was also lower (US\$ 324.70) than that of non-polluted farms (US\$ 365.84). They noted that the reduction in income of farmers was because of low harvest resulting from retarded crop growth. And the retardation in growth was due to air-borne pollutants released into the environment during gas flaring. It was, therefore, shown that crude oil pollution had detrimental and negative effects on the area of farmland cultivated, horticultural crops output produced and hence farmers' income (Dung et al., 2008; Inoni et al., 2006; Ojimba & Iyagba, 2012).

In 2009, Abii & Nwosu conducted a study to know why the polluted farm recorded retarded plant growth which has affected the income of the farmers. Analysis was conducted on soil samples from three communities, two oil spill affected communities (Ogali and Agbonchia) and a non-oil spill affected community (Aleto) to serve as a control. After analyzing the samples with standard methods of some petrophysical properties that determine the content of nutrient in the soil and the soil's fertility status, affected oil spill soils recorded a decrease in Ca, K, P, Cation Exchange Capacity (CEC) contents and the content of sand fraction and Na increased. From the results, nutrient level and fertility status of Eleme soil had been adversely affected by oil and hence, it was included in the soil cleaning areas in Rivers State. They concluded that the oil companies should adhere to environmental laws during their operations and regular monitoring of petroleum production activities. The people of the communities should also be given compensations when their

lands get affected by these activities (Abii & Nwosu, 2009). A higher concentration of heavy metal in polluted soil in maize farms and stress induced by the spill on cowpea seedlings account for the retardation in the growth of both plants (Achuba, 2006; Ekundaya et al., 2001). The question now is what has happened to these people whose lands are affected? Are there any changes in their socioeconomic life because of the impact on their communities? This study will reveal the socioeconomic implication of all these environmental damages.

To know the influence of oil spillage on cassava productivity, Ahmadu and Egbodion (2013) conducted research on 17 cassava farmers each from three oil spillage communities (Otor-Udu, Olomoro and Uzere) and three non-oil spillage communities (Egini, Aradhe and Ellu) in Delta State. Ahmadu and Egbodion (2013) examined the effect of oil spillage on cassava farmland, yield and land productivity. The outcome indicated that oil spillage on cassava farms has led to major crop failure, poor yield, rotting tubers and stunted crop growth, increased soil temperature and toxicity, reduction of soil fertility, degradation of farmlands and low land productivity. Further analysis indicated that at the oil spillage affected land, there were smaller cassava farm size, low yield and less land productivity as compared to those of the non-oil spillage communities. They concluded that there should be a maintenance culture on the part of oil companies. And suggested further study to be conducted to know what adaptation measures the farmers need to engage in. This paper also analyzed basically, the effect of oil E&P on the cassava crop and to know what has become of the people in the communities whose means of livelihood has been affected by the oil spillage. The question then is where are the cassava farmers, their children and how are they coping with life?

Akpokodje and Salau (2015) employed an empirical analysis derived from a unique estimable production function based on Ramon Lopez's Cobb Douglas production function model to investigate the relationship between agricultural productivity and oil pollution in the Niger Delta of Nigeria. The results from their study showed that agricultural productivity is increasingly being affected by levels of oil spill and forest loss, whereas land, labor and capital positively improved agricultural productivity in the Niger Delta. The long term effect

of platform sites, access roads, test sample pits, pipeline routes and seismic activities is typically a reduction in crop yield. (Agahlino, 2000).

### **2.2.2 Pollution of Water Resources**

Water is essential to all activities of man, from domestic to industrial activities. Niger Delta is made up of different drainage systems, the Gulf of Guinea, creeks, rivers, streams and other sources of water. There is, therefore, the need to make water usable for all other activities. Oil companies use water for activities such as drilling and hydraulic fracturing.

The problem of water pollution by oil companies and other activities of man have attracted many researchers into analyzing water samples from oil-producing areas. Water quality is paramount in every society because man can leave without a lot of things in a day but not water. Most of the domestic activities of the communities are done with surface water, so polluting it will definitely affect them. Ibisí et al.,(2017) analyzed the impact of oil spill on surface water at Obunku in Rivers State of the Niger Delta Region. From the analyses, four different samples were collected from the pollution source, and other samples from 100m and 200m intervals away from the pollution source, and a control sample was collected from an unpolluted source. The results showed that the values of pH, the total dissolved solids, total petroleum hydrocarbon, total suspended fluid,  $\text{NO}_3^-$ , and  $\text{NH}_4^+$  are indications that the water was polluted. Hence, the oil spillage was the cause of the pollution. Also, the  $\text{NO}_3^-$ ,  $\text{NH}_4^+$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$ ,  $\text{Na}^+$ , and  $\text{Mg}^{2+}$  contents decrease in distance away from the source. The water quality analysis was conducted on Bayelsa Rivers to evaluate the pollution index using the WHO standard for domestic water supply and permissible levels for the discharge of produced water by the Department of Petroleum Resources. Regression analysis showed a positive correlation of pH, total suspended solids, total dissolved solids, and total petroleum hydrocarbon, respectively, with ions in the water samples. It is also observed that Obunkun River in Oyigbo local government of Rivers State, Nigeria is polluted with regards to pH values, total suspended solids, total dissolved solids, and total petroleum hydrocarbons. Unlike the other three water samples, the control showed no trace of heavy metal and as such the water is not polluted with toxic metals.

The pH for the polluted area was within 5.81 to 6.02 while the pH for safe drinking water is 6.5 to 8.5. The UNEP report of 2011 reveal the drinking water in Ogoniland contains carcinogen that is 900 times higher than WHO guideline (UNEP, 2011).

Similarly, an analysis done by Eluchie (2017) on river Brass and river Oloibiri depicted that, the former was highly polluted as compared to the later. The pollution index (PI) in terms of relative damage for Brass and Oloibiri were 2.85 and 2.55 respectively and this difference was attributed to the discharge from oil servicing companies. The safe PI is 1, hence PI above 1 is unacceptable. (The chloride contents for the two rivers were higher than the World Health Organization (WHO) standard implying that the water was chemically unsafe for human consumption. The safe chloride concentration is 250mg/l but Brass and Oloibiri rivers recorded concentrations of 9266mg/l and 8485mg/l, respectively. The contamination of surface water was also recorded in the United Nations Environmental Programs report that surface water throughout the creeks in Ogoniland contains hydrocarbons (UNEP, 2011).

Further studies have been conducted on the impact of petroleum production on groundwater since crude oil exploitation is basically a subsurface activity. The results of water samples taken from three active boreholes in Gokana, Ogale and Trans-Amadi communities in Rivers State showed that the water has been polluted by petroleum activities. These activities included artisanal refining, illegal tapping, and other industrial activities. The  $\text{NH}_3$ , pH, acidity, and color among others exceeded the required limit set by the Department of Petroleum Resources(DPR) and Nigerian Standards for Drinking Water Quality (Nwaichi and James, 2012). Emuedo et al., (2014) also had similar recordings from their research and stated that oil exploration and production have affected the quality of water in the Niger Delta. They then encouraged the companies to organize effective cleanups after spills and also embark on remediation of the water bodies in their sphere of operation. Considering the case of Gokana, Ogale and Trans-Amadi communities in Rivers State the color of the water sample was 5 H.U. which is above the DPR limit of 0.5 H.U. The pH of Gokana and Ogale were between 3.54 and 4.97 which was below the safe limit

of 6.5-9.2 given by DPR. Emuedo et al., (2014) in their studies recorded pH range of 5.03 at Nembe to 5.6 at Okpare. The range of pH values showed that the groundwater is acidic.

Another source of water for domestic activities in the region is rainwater. Over a period of time until now, rainwater has not been able to serve the needed purpose because the water the people collect has been acidized (acid rain). Gas flaring alters the ions (nitrate, carbonate, sulphate,) in water usually rainwater and finally leading to acid rain which is quite common in the region (Seiyaboh & Izah, 2017). Acid rain in a community such as Ijaw has affected the quality of their drinking water, their zinc roofing sheets are corroded and increased the contents of heavy metals in their surface water (Raji & Abejide, 2013).

Additionally, the pollution of water bodies has also affected fishing activities. This is because the fishes move to deeper places that are not polluted and also caused some fishermen to resettle or move farther during fishing. The water bodies are polluted by the dumping of drill mud, drill cuttings and other fluids used to stimulate production. Their chemical component affects aquatic lives negatively which led to reduced catch during fishing and render some drinking water unsafe for drinking, and recreation (swimming) (Okaba, 2005; Nwaomah, 2009).

The usage of these unpurified water has led to water-borne diseases such as typhoid fever, cholera, etc.(Ishaku et al., 2011). However, with all these results revealed by the researchers, the Niger Delta Development Corporation (NDDC) has worked to improve the issue of access to potable water by some communities. One of these water projects is the water plant in Warri, where the water meets the requirement by the World Health Organization for portable drinking water (Akpoborie and Ehwarimo, 2012).

### **2.2.3 Impact of Gas Flaring**

Globally, Nigeria is ranked the sixth country to flare gas. Before recently, the natural gas has been exploited as hydrocarbon reserves, all the gas after the discovery of oil in the 1900s was flared. This, in the long run, has affected the local settlers and the region in general. Gas flaring has been the highest source of air pollution in the Niger Delta. The

uncontrolled gas flaring is gradually destroying the ecosystem of the Niger Delta. Gas flaring goes on for twenty-four hours and some have gone on for as long as thirty years and in the process hydrogen sulphide is released into the atmosphere. The oil companies are not only destroying Niger Delta environmentally but also immensely contributing to global warming. (Comet Newspapers, 2001 cited in Arong & Ikechukwu, 2013). The chemicals released aid in acid rain formation which corrodes the roofing sheets, causing skin diseases, etc (Okaba, 2005). Olobaniyi and Efe (2007) also showed elevated levels of lead at concentrations of 0.56 mg/l in the atmosphere and argued that large concentration of oxides of nitrogen and sulphur from gas flares in the Niger Delta released into the environment contributes to acid rain experiences in the region. The quantity of carbon released per day is about 2,525,000 tons (Ubani & Onyejekwe, 2013). These flares have affected vegetation, farming, fishing and the entire community in general.

Ubani and Onyejekwe (2013) noted that there has been massive destruction of aquatic life in communities due to acid rain. Also, no vegetation can have proper growth in an area close to flare sites. The leaves of cassava, waterleaf, and pepper near flare sites have decreased in dimension and the nutrients such as starch and ascorbic acid in the cassava in flare sites are less as compared to those located farther away from flare sites (Dung et al., 2008).

A study done at the Izombe flaring site indicates that there is a 100% loss in crop yield within 200 meters of the station. Cotton and oil palm among other economic plants wither away at any instance where they are located close to flares (Ibaba, 2001). This has brought about high socioeconomic cost on the people in terms of repairing their corroded zinc roofing sheet, treating of sicknesses (breathing difficulties and pain, asthma, headaches, nausea, chronic bronchitis), buying of fertilizers, resettlement, and farming. And eventually increase in unemployment and poverty in the region (Chijioke et al., 2018). Unfortunately, these impacts will continue for a long time if not forever because the existing law only charges companies monies for continuous flaring but do not ban gas flaring (Udok & Akpan/ 2017).

Orubu (2002) stated that pollutant concentrations are highest in the Niger Delta after undertaking a comparison of concentrations of ambient air pollutants in the Niger Delta region and Lagos State. Orubu argued that the emitted greenhouse gases (such as methane and carbon dioxide) at flare sites contribute to global warming. Sadly, the highest number of the flare sites are located in the Niger Delta where the heat temperature from the flare sites could be as high as 1600 °C contributing to thermal pollution. Also, Adewale and Mustapha (2015), after their research on gas flaring at Akwa Ibom, Rivers and Bayelsa states confirmed that gas flaring has caused sicknesses, a damaged and unsustainable environment, toxic waterways, loss in productivity of fishing and farming activities. What changes have these implications brought to the life of the people of the Niger Delta?

#### **2.2.4 Social and Economic Implications**

As part of the Corporate Social activities, the oil companies have provided for the citizens of Nigeria pipe borne water, electricity, proper roads, school buildings, scholarship programs, and job opportunities. The amenities the companies provided are not enough as compared to the environmental impact (pollution and degradation) of their activities on these communities (Niger Delta). From the most questionable act about these oil companies is their agreement with the federal government to militarize the Niger Delta region to improper cleaning of oil spill site. And the state resources that were to be used to develop the Niger Delta region have been diverted to state security (Chukwuemeka & Aghara, 2010; Ololube et al., 2012).

Kafada (2012) in his study noted that the oil industry has benefited the country's economy enormously but unsustainable oil exploitation activities have rendered Niger Delta region one of the five most severely petroleum damaged ecosystems in the World. The traditional economy of the Niger Delta region which is largely dependent on fishing and farming is however under constant threat by oil E & P activities. The continuous spillage of oil, venting and flaring of gas and discharge of drill waste into the environment pollute farmlands and coastal waters. The people are continuously being handicapped and have negatively affected their standard of living (Aworawo, 2000). Poverty, social conflict,

occupation dislocation, ill health, unemployment, are some of the social and economic hardship identified as problems the Niger Delta Region people are facing (Ugbomeh, 2007 and Omajemite, 2008). These hardships are outcomes of poor productivity in farming, less catch during fishing, loss of land due to oil spillage, inaccessibility to farmland and workplaces and relocation of communities to unpolluted degraded sites.

Oruonye (2011) stated in his work that resettlement at Lake Chad, Nigeria has hindered the locals' farming and transportation of their farm produce to and from the market. And farming is the main means of livelihood for most of them. However, problems of access to good roads have been minimized in some communities after the NDDC constructed roads for them. It has therefore granted access for people to come and buy fish and food crops from the communities. This development has reduced their economic burden a little (Isidiho and Sabran, 2015).

Ogwu and Adejoh (2014) talked of how some people being winners, gaining something and others being losers, experiencing cost. Which even in world business venture everyone has the idea of gaining some profit. The losers (locals) are the most vulnerable and the winners tend to be less vulnerable and possess the economic and privileged political power to influence institutions and the decision-making process (Ajakaiye, 2008). These dissatisfactory situations have compelled or ignited all environmental justice movements including militancy, vandalism and pipeline sabotage (Bullard, 1994), among others. The fight of the people of the Niger Delta is not only because of wrongful placement of pipeline but also their unmet compensations. The Nigerian National Petroleum Corporation at its inception in 1977 paid compensation for portions of land required for its projects but after the Land Use Decree of 1978 payments of compensation were limited to economic trees and structures. The land required for pipelines and other projects were not compensated for. The affected people aim of fighting for what is due them, then resorted to illegal bunkering, vandalizing of the crude oil pipelines and other oil installations (Olokesusi, 2005). Unfortunately, their quest for justice has increased the mode of degradation of the environment. Nonetheless, the illegal bunkering and petroleum pipeline vandalization are the outcomes of destructive tendencies of angry

youths, who are pained by the neglect of government and oil companies on oil producing communities and corruption of the ruling class in amassing wealth through collaborations with oil companies. Unfortunately, these social vices committed by the youths have a counter-effect in increasing the levels of the oil spill in the environment and the negative effect on water and land agricultural produce (Odalonu, 2015; Amabipi, 2016).

The chaos in the region according to Acemoglu and Robinson (2012) is the main reason why development cannot occur in the environment. The relationship between the oil and gas companies and host communities has broken down and unproductive (Okonta and Douglas, 2003). Several attempts by the federal government and the state government and traditional rulers to intervene have not yielded results because all parties are not pacified as desired (Obi and Rustad 2011). The resource curse dilemma of Nigeria as others may call it is due to the mismanagement of the proceeds from petroleum exploration.

Ugboma (2015) examined the historical influence of petroleum activities on the series of economic crises in Nigeria. In using a descriptive technique to analyze data obtained from a secondary source, the study confirmed that the transition of the economy from agricultural-based to petroleum-based laid the foundation for the economic crises in Nigeria.

Abdullahi et al., (2015) evaluated the influence of petroleum on the Nigerian economy using secondary annual data from 2000 to 2009. The technique employed for the analysis include the linear regression model and found that petroleum has a considerable direct effect on the economy of the people.

Adah (2003) reported that the waste situation in Port Harcourt is now a crises matter. He added that if nothing is done about the situation more quickly, Port Harcourt will turn into a state of one man one refuse dump. These are all result of the increase in population as a result of oil and gas activities. The environment is being polluted by both activities from the oil companies and other individual activities. And the impact of the above cannot be overemphasized. Aghalino (2000) detected that the several stages of crude oil exploitation from geophysical prospecting, drilling, and production through to transportation cause substantial environmental stress. This is due to operational accidents, equipment

failure, and other reasons. Some amount of oil and gas are released into the environment during exploration, storage, processing, and transportation. Although the unhealthy working environment is only attributed to Niger Delta, Nigeria stands to lose both human resource and financially or economically if the environment continues to suffer from pollution (Etuonovbe, 2009).

### **2.3 Legislation and Environmental Management**

The extraction of natural mineral resources in the various parts of the world has called for the enactment of laws to enhance the smooth operation of activities, from the permit for the exploration stage to the refinery stage. Every country has a series of legislation regarding its natural resources. In view of this, Nigeria has had a series of laws and regulations concerning oil exploration and production which ranges from the onset of a permit for exploration to the sale of the hydrocarbon products to the world market.

In view of assessing legislation and systems that are to monitor and safeguard the environment, Kadafa et al., (2012) analyzed some existing laws applicable to oil pollution in Nigeria. They stated that environmentalists and others apportion all blames of environmental damage of Niger Delta on the oil companies but fail to remember that the federal government is the lawmaker and provides licenses to the oil companies. Therefore, the government should ensure all regulations are adhered to. They suggested that there must be the provision of individual agencies and communities based on environmental regulatory bodies which are not dependent on the state. This is due to the fact that NNPC cannot operate without being bias since some of its own plants and installations are causes of the pollution recorded; and also reforms are needed in the present judicial attitude towards litigation in relation to the environment, among others. These independent sectors will ensure government directives and legislation pertaining to oil development activities are monitored. Kadafa (2012) also suggested a review of legislation and made known that the monitoring agents are not available and the government cannot systematically or frequently monitor these sites. The question still stands, after all the losses faced by the

people, what has become of them? Why are the monitoring team not available? Will anyone who does not stay in the affected community allows such acts in their back yards?

Among the various ways used by the federal government to handle the issues of Niger Delta was the establishment of the Niger Delta Development Commission (NDDC) in 2000. This was to enable the rapid, even and sustainable development of the Niger Delta into a region that is economically prosperous, socially stable, ecologically regenerative and politically peaceful (www.nddc.gov.ng, 2018). According to Isidiho and Sabran (2015), the formation of this corporation has positively affected some communities in the Niger Delta region although some communities in the region have not been covered.

The environmental policy of Nigerian covers the legislation, standards, regulations, and administrations that are accepted to regulate the activities that have the potential in causing damage to the country's environment. These environmental laws were formed to protect the environment from pollutants, such as toxic chemicals, noise, etc.; control particular activities, such as mining, power generation and petroleum industry and provide general guidelines for protecting basic natural resources, such as air, land and water (Eneh, 2010; Anukam, 1997). Some of these laws were generated by international agency regulations. The laws are to prevent the oil companies, contractors and individuals from illegal and unlawful disposal of harmful waste in the air, land or waters of Nigeria and specifically, the Niger Delta. So the question is what then happened that the environment has been polluted by drill waste, flares, etc.? The law also forbids unauthorized transportation, depositing or dumping of harmful waste on any land, territorial waters, contiguous zone, and inland waterways of Nigeria. So why then, in the existence of these laws, the records of oil spills increased?

Even in the existence of several laws and regulations, the ecosystem of the Niger Delta with its thick mangrove, streams, crop farms and rivers are being destroyed (Eneh, 2010 and Anukam, 1997). (Lekwot et al., 2014), worked on how to use the Environmental Planning and Management (EPM) process as a means of solving environmental problems in Bonny Island, Rivers State, Nigeria. They investigated the view of the general public on the state of the environment in the area, level of participation of

people in compliance to existing environmental strategies, causes of ineffective environmental management in the area and assessing community satisfaction with existing environmental management approach. The responds or results of questionnaires given to the people confirmed that the level of damage from oil exploration, gas flares, oil spillage, water pollution, and pipeline vandalization is continuously increasing. This has given rise to the dilapidation of the environment, irregular routine of facilities and compliance with environmental management, and inspections are not properly carried out because of grossly inadequate facilities and equipment. About 85% of the people expressed displeasure with the existing environmental management approaches that were not fully implemented in their community.

The Mineral Act of 1946 which conferred crude oil in Nigeria with the government prohibits pollution of the environment through exploration activities and made provision for the restoration of the extraction areas. These laws were all set to ensure safe and environmentally friendly operation of the oil sector or companies in order to prevent degradation of the environment. Many researchers have called for the review of these laws to make new laws in order to preserve the environment and also get more qualified personnel to ensure that these laws are adhered to by the companies (Amnesty International, 2009).

Every individual deserves some form of basic needs and every state also deserves development both physical and social. The people of the Niger Delta have human, political, social, economic and cultural rights as the oil companies and their workers. Therefore, they all must be subjected to the same set of rules, rights and obligations. These basic elements, describes the equality of all persons before the law, effectively eliminate any risk of arbitrariness manifesting itself in discrimination, abuse or oppression (Ogata et al., 2012). The political elites of Nigeria since 1970 established an authoritarian power system that allows central control of strategic resources including the country's substantial oil deposits. These have led to the powerful elites pursuing social and economic strategies that are short-sighted, selfish, and not at motivated by the needs of the people whose environment

has been degraded. These have consequently led to scarcity of material, deep frustration, and youth restlessness in the Niger Delta region (Chukwuemeka and Aghara, 2010).

This chapter has given an overview of various researches that have been conducted by individuals, governmental and non-governmental organizations on the environmental degradation ensuing from oil and gas exploration and production in the Niger Delta. However, it is observed that most of the researches are based on individual states or local government areas, others also focus their study only on peculiar environmental challenges like oil spillage or gas flaring, some on particular food crops, and others discussed only the health implications. The main causes of environmental challenges noted are gas flaring, oil spillage and other notable ones that have led to the loss of land, biodiversity, diseases and some agricultural impacts. These environmental challenges include air pollution, water pollution, land degradation, etc. On average, a picture of what is really happening in the entire region is hardly represented in singular research work. Also, the linkage between the environmental challenges and socioeconomic life of the people of the Niger Delta region is given little or no attention at all. Hence how the environmental challenges of E&P of crude oil are affecting the people after the commencement in 1956 at Oloibiri is not well depicted.

This work brings forward the general relationship between the environmental degradation by oil and gas E&P activities and their socioeconomic implication on the people living in Niger Delta. An understanding of how the oil and gas E&P environmental problems in the Niger Delta and their impacts on the socioeconomic life of the Niger Delta people would provide an insight to policymakers, oil and gas companies, other stakeholders and organizations on how to handle such problems. The findings from the thesis could provide some suggestions or measures to control or minimize this environmental challenge. The proceeding chapters gives the necessary information and methods that are appropriately adopted to achieve these results.

## **CHAPTER 3**

### **MATERIALS AND METHODS**

This chapter presents the data gathering and analysis of the research. The various methods and techniques that were used to achieve the set objectives are described below. The work is arranged to capture the socioeconomic history of the Niger Delta and the current state of the socioeconomic life in relation to oil E&P environmental challenges. The Niger Delta region of Nigeria is the study area for this research.

#### **3.1 Materials**

The study relied mainly on secondary data obtained from past and present studies, governmental and non-governmental institutions and existing literature. The data was obtained from World Bank Reports, United Nations Development Programme, United Nations Environmental Protection, Amnesty International, Nigerian National Petroleum Corporation, Niger Delta Development Commission, Department of Petroleum Resources-Nigeria, National Bureau of Statistics-Nigeria, published and unpublished materials, conference and seminar papers, journals, books and the internet.

#### **3.2 Methods of Data Collection, Analyses, and Presentation**

This research is based mainly on secondary data. The research also adopted comparative study method, descriptive and conceptual approach to analyze all the information generated from the various sources of data. The work is not focused on a peculiar sample size in one community because analyzing the socioeconomic implication of oil and gas on one community and generalizing it for the entire region will be more biased.

The statistical information used was extracted from:

1. Official statistics from Nigeria: this comprises of information obtained from government institutions, departments, bureaus and agencies in Nigeria. Such government institution consulted for data during this thesis were Nation Bureau of

- Statistics, Central Bank of Nigeria, Nigeria National Petroleum Corporation, Annual Statistical reports, Niger Delta Development Commission.
2. Data from other Organization: World Bank Report, Amnesty International, UNEP Reports, UNDP Report, WHO, Friends of the Earth Nigeria.
  3. Other sources of information: Kadafa (2012), Ojimba (2011), Osuagwu & Olaifa (2018), Eregha & Irughe (2009), Francis & Sardesai (2008), Society of Petroleum Engineers journals and other journal publications, websites (E.g., [www.dw.com](http://www.dw.com)), etc.

All the data for the research were combined to form database of information that is regionally representative. Both qualitative and quantitative data collected from the different source were analyzed and added in order to come up with the output concerning each relevant parameter discussed in this work. The mixed method approach was considered suitable to meet the objective of the research.

The data collected are as follows:

- I. The socioeconomic history of the Niger Delta before crude oil production began and the socioeconomic life after oil E&P commenced.
- II. The operations or practices of oil companies and their associated environmental issues.
- III. Environmental issues from oil operations and how they contribute to the post-oil Niger Delta socioeconomic life.

The data obtained were sequentially presented to identify and describe the facts needed to give a clear picture of the problem. The data was then analyzed using descriptive and conceptual approaches and from the analysis, logical deductions and presentation were made. A comparative study method was also adopted to review, interpret and cross-analyze the pieces of information to allow a better understanding of the specific causes of environmental pollution and its impacts on socioeconomic life. The methodology gave a

clear picture of the environmental challenges facing the region due to oil and gas operations and linkages between these challenges and socioeconomic life. The normative analysis was used to evaluate or propose desirable new pollution control regulations. The application of the proposed methodology is presented in the following chapter.

**CHAPTER 4**  
**PRE-OIL AND POST-OIL SOCIOECONOMIC LIFE OF THE PEOPLE OF NIGER**  
**DELTA**

**4.1 Introduction**

The Nigerian economy which is known to today's generation as oil-driven has evolved from the support of other resources as other economies of the world. The primary sector of an economy includes agriculture, forestry, mining, fishing, and extraction of oil and gas. Nigeria is blessed with all these resources in commercial quantities. However, one thing that supported the country in the years up to the nineteenth century when exploration and production of crude oil began was agriculture. This means before the discovery of oil in Nigeria there was Niger Delta without the E&P activities. These people lived in their region based on the available natural resources excluding oil. After the first oil production in Oloibiri in 1956, there has been a vast change (economically, socially and environmentally) in the country most especially the Niger Delta province which houses most of the oil wells in the country. This section of the research considers the socioeconomic life of the people in Niger Delta before and after the inception of oil and gas exploration and production in the region and explains the activities of E&P as a source of environmental degradation in the Niger Delta.

**4.2 Pre-oil Niger Delta**

Before 1956 when commercial production of crude oil started in Nigeria, the people of the nine states of Niger Delta had an economic life, an environment, and a social life that was enough to support them, their families, the neighboring communities and the nation at large. Every human community is located in a geographical location, with particular ecology and social life.

Every community and even countries have distinct trait from their neighbors, for example, Ghana is to gold whereas Nigeria is to crude oil. In the same vain Niger Delta region was distinguished from the other regions in Nigeria by their peculiar ecological,

social and economic parameters. The geographical landmark of the area covers 70,000 km<sup>2</sup>. World Bank (1995) describes it as the World's largest Wetland and "Africa's largest delta" as cited by Otonye & Gowon (2012). Before oil exploration activities, the region was famous for the abundance of useful plankton, fishes, snails, crocodiles, alligators, and shrimps, in their creeks, rivers, streams, and sea. The region was blessed with naturally clean water that was safe for human consumption even without any treatment by modern technology or filtration, chlorination, sedimentation, fluoridation, coagulation, etc. Some of the people earned a living by the sale of the water, the water was also used for domestic activities like drinking, cooking, bathing, and washing without any fear of contracting diseases such as typhoid, cholera, etc. (Alens, 2014). Transportation from one rural community to the other was done by trekking or using canoes to cross unpolluted creeks and rivers. (Alens, 2014).

Economically, the region is known for its contribution to the income of the federal government through agriculture far before the commencement of oil production (Okumagba, 2011). The main contributors included fishing and farming activities of the Niger Delta people. These agricultural products comprised rubber, palm oil, cotton, fish and some wildlife reserves. These lands are now converted to the fields where oil is currently being exploited. Oil palm which was produced mainly from the region became the main foreign exchange or export earner for the country from 1558 to 1855 and contributing to about 72 % of the gross domestic product (GDP) in 1856 when it was exported as cash crop (Otonye & Gowon, 2012). As oil palm sustained the entire country for 297 years, it contributed to the economic life of the people for the same period. The people generated income from the palm fruits by the sale of oil extracted from it, the sale of the palm fruit itself and the use of the kernel for other domestic activities. The oil was used for cooking, making candles, margarine, and also used as pomade and the preparation of soap and other medicinal products. In other places in the region oil palm was used for batter trading in exchange for gin, gun powder, salts, cutlass, and other luxurious goods. During marriage ceremonies, acres of oil palm farms and sometimes tons of palms fruits are used as a means of paying dowries (Otonye & Gowon, 2012). The farming activities helped the local

people in all their social and economic ways. Palm fronds, tree trunks, hay and branches of trees were used in the building of houses, fencing of houses and farms and also feeding of livestock (Aghalino, 2000).

The people were also engaged in the planting of cocoa, coffee, coconuts, plantains, bananas, sweet potatoes, maize, sugarcane, yams, marshy and upland rice, making all these food crops available all year round which is currently not the case in the region and the entire country. Due to the thick vegetation, the mangrove with predominantly high rainfall supported the growth of these crops which boosted the agricultural production and encouraged more people to go into farming. During this period both the young and the old had jobs to do (Olukoju, 2009). The fishing activities were also very supportive to the agricultural sector as there were unrestricted areas for people to go for fishing, clean water to fish from and plenty fish to catch which is currently not the case. Trees were available for making canoes and boats, basket weaving, coastal trading together with the business of transporting people from one river bank to the other using canoes. Both the land and the water bodies provided several means which people could earn income and generate revenues for their communities and the country by paving way for occupations like farming, fishing, weaving, hunting, craft making, and canoe riding. The environment was a beneficial substance to the people of Niger Delta and without any adverse impact being generated from any of the activities which could render the environment unsafe for the people (Alens, 2014).

Ugochukwu and Ertel (2012) stated that the region is made up of two distinct ecological zones namely the tropical rain forest in the northern reaches of the Delta and the mangrove vegetation at the coastal area of the south. However, early 1995 the World Bank identified the ecological zones as four different forms which included freshwater swamp forests, mangroves, lowland rainforests, and barrier island forests. The main water bodies also included the creeks, stream, tributaries, rivers, lagoons and the sea and they contained a variety of aquatic life ranging from plants to fishes like shellfish and crustaceans. The marshland, creeks, tributaries, and lagoons occupied 36,000 square kilometers. The mangrove forest covered about 12,000 square kilometers. The area was

known to contain varied species of plants and animals making the Niger Delta biodiversity very high (Ibeanu, 2000).

#### **4.3 Post-oil Niger Delta Socioeconomic life**

The entire country experienced a socioeconomic change after commercial oil production commenced in Oloibiri in 1958. The changes that evolved affected each state or region differently with the Niger Delta being the oil-producing region and where most of the operations take place experiencing the highest impact. There have been environmental, social and economic changes. The country's economy which was initially agriculturally based shifted to crude oil based with about 90% of the GDP coming from crude oil alone. From 1956 till date, the nine states in Niger Delta have faced many changes. This section of the research seeks to examine the socioeconomic life of the Niger Delta people after the oil and gas E&P operations started in their region. A few of the socioeconomic changes are discussed below.

##### **4.3.1 Occupation and Income**

As stated earlier, the main occupations in the region before oil and gas E&P activities took place were farming and fishing and others such as blacksmithing, hunting, weaving, and other petty trades. The intervention of oil and gas in the local economy has led to a reduction in economic activities in particular agriculture which has resulted in a low output of crops like cassava, cocoa, maize, rice and oil palm and fish catch (World Bank, 1993; Maduagwu 2000; Ibaba & Olumati, 2009). Almost all nine states are involved in the farming of cash or food crops. The decline in agricultural production began after the oil boom in the early 1970s because of the distortion in the labor market. This eventually ensued into adverse effect on the production of food or cash crops and fishes in the region and even the nation at large. The output of fisheries for the country which ranged from 600,000 to 700,000 tons decreased to 120,000 tons in 1990 as a result of low production from Ogoniland ([www.nationsencyclopedia.com](http://www.nationsencyclopedia.com), 2019). Land and waterbodies contamination as a result of oil E&P activities have also affected productivity in fishing and

farming. The low production in fishing can be attributed to the prolonged oil spill in almost all the fishing communities in the region. Niger Delta indigenes began to find agriculture unattractive when the government instituted a policy of paying farmers low prices for basic food product over the years to meet urban demands (Amnesty International, 2009).

Eventually, some people resorted to the trading of other goods, others become unemployed and others also tried to seek employment in the oil companies. Owners of some business firms in the regions shut down their business to invest in oil and gas businesses. Notable amongst such businesses is cocoa cottage industries. This diversion rendered a good number of local people unemployed (Ofoche, 2012). Laws such as the Petroleum Act of 1969 and the Land Use Decree of 1978 made some people lose their land and farms with no compensation. This was because compensations were given to only cash crop owners and not food crops owners whose lands were being affected by the oil and gas activities.

The loss of productivity in the traditional occupation has reduced the income of families and an increase in the rate of unemployment. Therefore, because of lack of income, they are not able to afford basic needs of life such as food, shelter, clothing, and access to education and basic health care. Table 4.1 gives a description of the percentage distribution of different occupations in each of the nine states. The distribution of the working population was grouped into agriculture (farming), fishing, manufacturing companies, construction workers, trade, transportation, public administration, education, health/social, services and others. The most predominant occupation is observed to be agriculture, followed by trading which constitutes about 20% of the overall employment in the region and services is 9%. Fishing, on the other hand, is becoming less popular because the youth most especially prefer urban employment than fishing and even agriculture.

Although most people are not absorbed by the oil companies for employment, there has been the development of other business ventures in the region which includes hotels, tourist sites, radio, restaurant, insurance firms, and television houses and they take in some of the local people. However, the oil companies and NDDC also have special ways of

contributing to the occupational needs of the people by organizing training, entrepreneurial programs, and other initiatives in order to increase their employability and also assist them in their traditional occupation. An example is the Green River Project (GRP) by Eni Nigeria. Green River Project (GRP) is based on entrepreneurial development of farmers. Through these projects, the company has taken some indigenes of the region through vocational guidance and training in order to increase their crop availability, employment and earning the opportunity. From 1997 to date, 3750 young people have received education, 35,000 farmers, 500,000 indirect beneficiaries in 120 communities and 235 cooperatives receiving support (UNDP, 2017).

**Table 4.1 Distribution (%) of Employed Working Population by activity and Region**

<b>State</b>	<b>Agric</b>	<b>Fish</b>	<b>Manuf.</b>	<b>Constr.</b>	<b>Trade</b>	<b>Transp.</b>	<b>Public Admin</b>	<b>Educ.</b>
<b>Abia</b>	44	0	4	3	25	4	4	4
<b>A/Ibom</b>	35	2	2	2	26	5	4	3
<b>Bayelsa</b>	34	19	3	4	16	2	7	8
<b>C/River</b>	68	0	1	1	9	2	5	5
<b>Delta</b>	38	6	4	4	21	5	5	4
<b>Edo</b>	41	1	6	3	22	5	3	5
<b>Imo</b>	50	0	3	3	20	4	3	3
<b>Ondo</b>	42	2	3	3	27	4	5	5
<b>Rivers</b>	49	4	4	5	13	3	6	7
<b>Niger Delta</b>	44	4	3	3	20	4	5	5

Source: World Bank 2008, (Francis & Sardesai, 2008)

### **4.3.2 Education**

The trend of the educational life of the people seems not to differ so much from the other socioeconomic issues. Many of the youth especially the males prefer quick money than schooling, therefore, they engage in all forms of activities. The number of school dropout increases from time to time. Children have to walk a long distance (10 or more miles) to go to the nearest schools (Jike, 2004). The educational infrastructure is in very poor condition as the school buildings are in a deplorable state. The funding for these schools are inadequate; there is lack of ICT materials and even qualified ICT teachers. Many of the higher learning institutions are not meeting the educational standards and objectives; and there is no design program to effect changes in the curriculum to see better academic achievement for the students (Ololube et al., 2013).

A faculty in Cross River State reported that, the cycle of poverty in the region is affecting the education of the current generation (Ololube et al., 2013). Extreme poverty hinders parents from sending their children to school and even encouraging the children to go to school. This is because they cannot afford the school fees, buy books and provide for the other requirements of the school and some parents also are supported by the children who engage in other trades to provide for themselves and their families. Some children have turned into breadwinners of their families. Bit by bit all these are jeopardizing the educational system in the region.

However, the oil companies and other organization like NDDC provide educational scholarships for the indigenes of the region. An example is the Koko scholarship by Total Nigeria Plc that has about 34 beneficiaries in the Delta States stated in 2017 Sustainability Report.

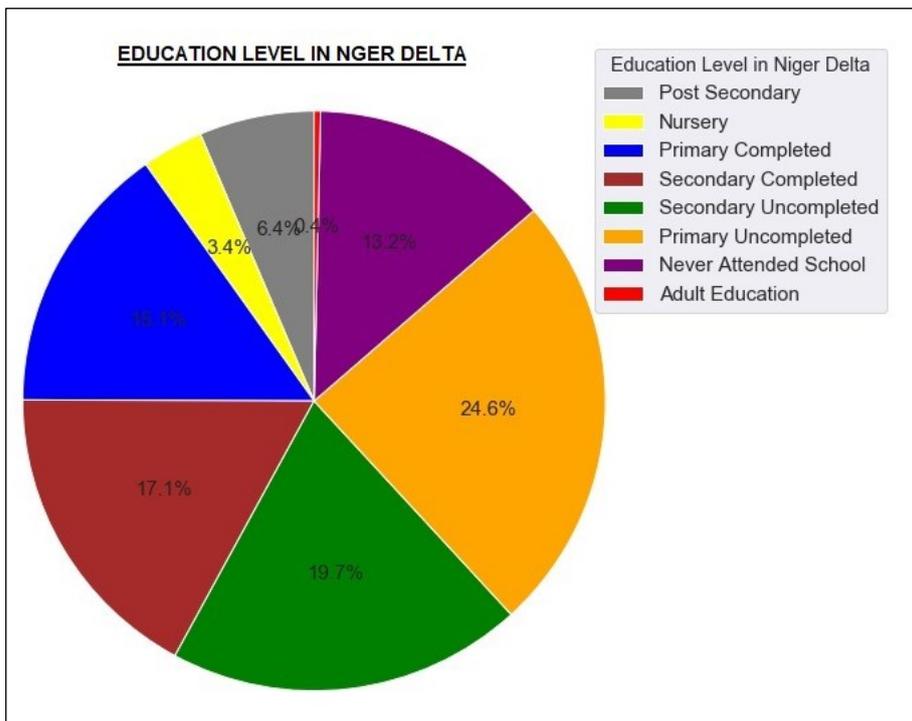


Figure 4.1 Education Level in Niger Delta. Source: (World Bank, 2003).

The pie chart in Figure 4.1 represents the educational level of 120 households investigated in the nine states of the Niger Delta during the study on “Nigeria Poverty-Environment Linkages in the Natural Resource Sector” by the of World Bank’s Africa Environment and Social Development Unit (World Bank, 2003). The analysis considered the frequency of the educational level per number of members in a family. Educational level as revealed by the Figure 4.1 indicates that, out of the 846 persons from the 120 households, 13% have never been to school, about 45% are school dropouts and only 6% have post-secondary school education.

#### 4.3.3 Standard of Living

Standard of living of farming or fishing community is far different from that of an oil producing community or any other community where extractive activities like gold mines, copper or diamond mine take place. The cost of living is very high because the cost of goods and services are quite high as compared to the other parts of the country because of the existence of oil companies. This situation is at the detriment of the local people because most of the local people are not employed into the oil companies so they cannot

afford such goods or services hence they continue to be disadvantaged (Uyigüe & Agho, 2007). With all the development ongoing at other places, there are villages in the region without basic amenities such as power, water, health centers, roads and most importantly schools are completely absent. People are relocated voluntary or involuntary from their villages due to one situation or the other associated with oil and gas activities and they become internally displaced in the region. All these people are living mostly from hand to mouth because some are occupationally displaced or there is competition in the available jobs at where they currently find themselves.

Poverty has been on the increase in the region after oil E&P activities commenced in their communities. From 1985 to 2002 the poverty level in Niger Delta increased about 55% with Ondo State being the poorest among all the oil-producing states and also Ondo was ranked the 3<sup>rd</sup> poorest State by UNDP 1998 report (Apata, 2010). The classification by UNDP was based on the level of infrastructure, post-secondary schools, and functional industries among others. Despite the revenue that is generated in the region, the Niger Delta people live in abject poverty with about 36.4 % of the people living below the poverty line (World Bank, 2003). Only 34% of the people use electricity for lighting and the primary energy source for about 73% of the populace is firewood. The roads in the rural areas are in very poor condition (UNDP 2006; NDDC 2005). Due to hunger and financial needs, sex for financial and other gratifications is common in communities. This act has led to a high prevalence of teenage pregnancy, sexually transmitted infections and criminal abortions.

However, it is noted that Shell-Nigeria LNG Limited has established the Bonny utility company that generates electricity and supplies this in an affordable and reliable manner to about 93,000 people in Bonny Island community. This provision of electricity has brought about economic growth, security enhancement, and a safer environment to go about daily activities in the community (UNDP, 2017).

#### **4.3.4 Social Environment**

The people in the region believe that the government together with the oil companies are denying them of their wealth or share of the revenue generated from oil and

gas production (Odoemene, 2011). A lot of movement groups such as Niger Delta Peoples Volunteer Force, the Egbesu Boys, Martyrs Brigade, Coalition of Militant Action in the Niger Delta and Niger Delta People's Salvation Front amongst others have been formed in the region. Most of them have been involved in the destruction of oil facilities, attacks against petrol businesses and others. Kidnapping and taking persons into hostage especially oil company workers have been on the rampant in the region especially in 2006 with a total of about 118 hostages in about 24 kidnapping incidence (Opukri & Ibaba, 2008). Some people have also been sexually abused, abusive military occupation and destruction of some communities in the state and violence in the region (Odoemene, 2011).

Intercommunal or interethnic or intracommunity conflicts have increased in the region from the 1990s due to struggle of ownership of petroleum resources such as land, sharing of largesse and other items from the state governments or oil companies. And these have been happening because some of the agencies, both state and private liaise with the people through 'divide and rule tactics'. Some of these conflicts occur among communities or people with no history of antagonism. A typical example of such conflicts is intra-community conflict in Ogbogoro community. In 2003 Joint Security Task Force 'Operation Restore Hope' attacked indigenes of Ohoror-Uwheru community in Ughelli North local council and militants youth killed two Americans and three others traveling in boat along Benin River (UNDP, 2006).

#### **4.3.5 Health Issues**

The health profiles of the local people do not vary much from the other socioeconomic parameters but rather may even have shifted far wide as it used to be; and the profile is sometimes referred to as miserable. Only half of the population has access to safe drinking water, hence an increase in the occurrence of waterborne diseases. Due to unavailability of health facilities in some communities, patients sometimes travel about 52 miles to see a doctor and 1 in 5 children die before their fifth birthday. Some notable illness in the region includes malaria, cough, respiratory problems, fever, skin rashes, etc. (World Bank, 2003). There are significant threats to the health of people as they continue to drink

contaminated water (UNEP, 2011a). As of 2011, Imo state had the highest number of health facilities with Rivers state having the least number in totality with both private and public sectors combined (UNDP, 2015).

There is a high mortality rate among children with an increase in the occurrence of malaria and HIV/AIDS due to widespread poverty in the region. From 1999 to 2003 the prevalence of HIV/AIDS has increased tremendously as compared to the other parts of the nation with 2.3 % in Ondo to 12% in Cross River. It is much higher in areas with a heavy concentration of oil production. The sad news is that there is limitation to antiretroviral therapy for the treatment of infected people and also it is the younger people that are highly infected (UNDP, 2006).

#### **4.4 Oil and Gas E&P Activities as a Source of Environmental Degradation in the Niger Delta**

##### **4.4.1 Environmental Pollution**

Environmental pollution is defined as “the contamination of the physical and biological components of the earth/atmosphere system to such an extent that normal environmental processes are adversely affected (Muralikrishna & Manickam, 2017).

The above discussion in section 4.1 gives a brief history of the economic, social and environmental picture of the Niger Delta region before the discovery of oil and commercial oil and gas exploration and production in the region in 1956 and the current socioeconomic life after 50 years of oil production. The discussion provides some information on the occupational, education, water and some social life of the people, among others in the region before oil and gas E&P activities of IOCs, NOC, and other operators and contractors. These operations have varied impact on the environment they work in. From exploration through to the transportation of the refined crude, there are contacts between the environment and the oil companies. The increasing demand for crude oil products has caused much work to be done in order to increase the crude oil reserves of the country and also companies desire to increase production have caused the immediate environment to

experience both direct and indirect impact. Example of these activities but to mention a few include seismic, drilling, production, refining and transportation of the refined crude oil or natural gas.

These activities as mentioned earlier contributed to a series of environmental pollution or damage to one or more sections of the environment. From 1956 till today the Niger Delta people have endured many of such environmental hardship, some of which are recorded and others not accounted for. During the prospecting and exploration of crude, the biodiversity of the region is highly affected and these have left several unfortunate impacts. The activities involved in oil and gas exploration and production affect the environment directly or indirectly. These negative environmental impacts affect the flora and fauna, the atmosphere, the hydrosphere, lithosphere, man and other natural resources. The variability of the environmental impact is usually based on the proximity to the site of production. Deforestation started in the region at the time of clearing of forest to assess the open area for seismic work. Oil spillages of massive quantities have affected the soils and the water bodies. The flaring of gas in the region has caused massive air pollution to communities close to flare sites and discharges by the oil companies have caused shallow underground water to be contaminated (Eregha & Irughe, 2009; Kadafa, 2012c; Ofoche, 2012; Okafor, 2016; UNDP, 2006). Some of the notable sources of environmental damage by E&P oil and gas operation are as follows.

#### **4.4.2 Gas flaring/ Gas venting**

Gas flaring refers to the combustion of gas in an open flame that burns unceasingly at the top of flare stacks in oil production sites (www.eniscuola.net, 2013). Gas venting is the discharge of unburned gases into the atmosphere which leads to the release of chemicals such as carbon dioxide, volatile organic compounds, methane, Sulphur compounds and gas impurities (www.eniscuola.net, 2013).

Gas flaring is one of the major environmental challenges of crude oil production in the Niger Delta. Nigeria's gas until about 2 decades ago was usually flared since only crude oil was the main hydrocarbon of interest. Nigeria is known to be among the top ten gas

flaring countries in the world. Natural gas had not really been regarded as reserves until recent after Nigeria join the Zero Gas Flaring Project of the World Bank (Okafor & Aniche, 2016). This could be ascribed to the unavailability of storage facilities. As stated by World Bank (2005), about 75% of the gas Nigeria produces is flared due to the lack of a local market and infrastructure. Some of the flares run for about 24 hours daily, with some which have run over the past 30 years. The quantity of carbon released per day is about 2,525,000 tons (Ubani & Onyejekwe, 2013). These over the years, most of the gas, if not reinjected as a secondary drive mechanism, are flared or vented into the atmosphere. The main atmospheric pollutants in the oil producing communities in the Niger Delta is from gas flaring or venting and the activities of illegal refineries and all are sources of greenhouse gas emission. Gas flaring releases pollutants including Sulphur oxides, nitrogen oxides, carbon disulfide, carbonyl sulfide, carbon dioxide and volatile organic components into the atmosphere.

These gas flares just like the oil spillage affect every part of the ecosystem from the ozone layers to the microorganisms in the soil. From the study conducted at Izombe flare site, farmlands close by the site have recorded loss of productivity in plants such as cotton and oil palm (Ibaba, 2001). In an area such as Ijaw, gas flaring started as early as 1970 with 7957 mm<sup>3</sup> and eventually increased to 2,5934 mm<sup>3</sup> in 1994 (Raji & Abejide, 2013).

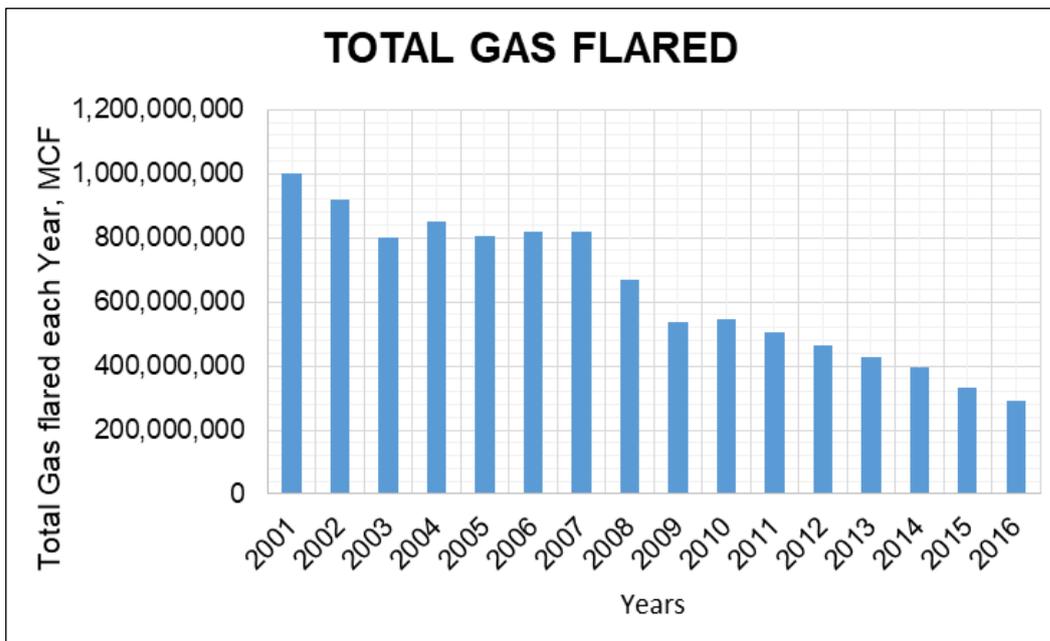


Figure 4.2 Gas flared in Niger Delta from 2001 to 2016. Source: DPR 2016 Oil and Gas Annual Report

Figure 4.2 gives the account of the volume of the gas flared for a period of fifteen years from 2001 to 2016 by the accredited oil companies without the flares from the unauthorized producers or refineries. In 2001 74.5% of the total gas produced was flared but reduced to 14.33% in 2016. The volume of gas produced within the period under consideration increased by 91.13% whereas the volume flared reduced by only 38.06% (BudgIT, 2018).

#### 4.4.3 Oil Spillage

“These are leakages or spillage of petroleum and their byproducts into the environment particularly onto the surface of large water bodies such as oceans, lakes, and rivers as a result of human activities” ([www.conserve-energy-future.com](http://www.conserve-energy-future.com), 2019).

This is one form of environmental pollution in the Niger Delta with a lot of controversy surrounding its sources and causes and the number of spills that have occurred. This could be recalled from the disagreement of SPDC and ENI with the findings of Amnesty International's internal report on the number of spills caused by the two oil

companies. SPDC and ENI have questioned the findings of the International organization on oil spills in the Niger Delta (Amnesty International, 2015).

The barrels of oil spilled for over the past 5 decades is estimated to be about 9-13 million barrels into the Niger Delta ecosystem (Kadafa, 2012a). From 1976 to 2001, the available records show that there had been about 6817 oil spill incidents in Niger Delta with an approximate total loss of about 3 million barrels of oil within this period. The records show that about 25% of the spills affected swamps, 6% affected land, and about 69% affected offshore (UNDP, 2006).

The oil spill in the region occurs both on land and in water bodies as a result of human errors or sometimes deliberate acts. The occurrence of oil spillage in the host communities is attributed to many activities on the part of both the oil companies and the local inhabitants. These spills have gone on from the early years when E&P began till date, even though not all occurrences of spills have been recorded by the authorities in charge and the oil companies. There have been a number of recorded cases of oil spillage in the region which were caused by both oil companies and some militant activities. The main sources of the oil spill in the Niger Delta have been attributed to militancy, bunkering, oil theft operations, sabotage of pipelines, equipment failure, poor infrastructure maintenance, human error, vandalism, spills or leaks during processing at refineries and corroded pipelines (Ugochukwu & Ertel, 2012).

Conventionally, oil spill by oil companies can occur as a result of human negligence, equipment failure (corroded pipelines and other vessels), and accident of oil tankers and rupturing of pipelines. Examples of such incidence include the Forcados terminal spillage in 1980 and the Funiwa 5 oil well blowout in 1980 owned by Texaco Oil Company , oil tankers accidents (M.T. Aribi accident that occurred in Bonny in 1999 and M.T. Crown O accident in Warri in 2000), leakages from pipelines or storage vessels or underground tanks due to corrosion and others problems (Oyakana pipeline spillage, 1980; the Okoma pipeline spillage, 1985; the Oshika pipeline spillage, 1993; and the Goi Trans Niger pipeline oil spill, 2004) (Ugochukwu & Ertel, 2012; Okoroji, 2013).

On the other hand, the local people also contribute to the spills in their own communities by bunkering, vandalizing of pipelines for revenge on the oil companies or stealing of oil to be sold in the black markets and some also occur at the illegal artisanal refineries. According to Shell in Nigeria, some major acts other than that of the company contribute to the oil spill in their operating area. In 2017, about 9212 barrels of oil per day were lost due to theft from SPDC JV. Approximately 90% of the spill from SPDC JV pipelines were caused by third party interference and there had been about 70% reduction in oil spillage caused by operational spills from Shell Companies in Nigeria in the year 2017 as compared to 2016 (Royal Dutch Shell Group, 2017). A total of 17276 incidences of pipeline vandalism has occurred in Warri and Port Harcourt from 2001 to 2016 (NNPC, 2013, 2016). All these have major consequences on the people both directly and indirectly. From Figure 4.3, it can be seen that the higher quantity of spills occurred within 1978 to 1980 and these are periods when the Forcados terminal and Funiwa incidences occurred.

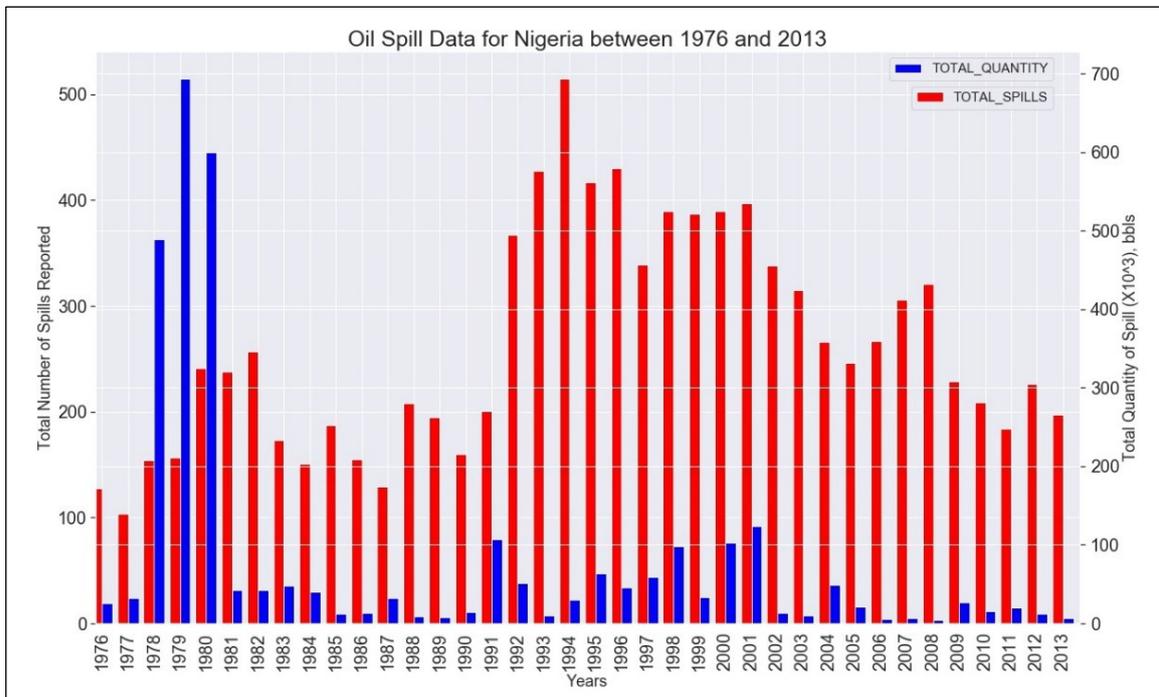


Figure 4.3 Total Number of Oil Spill Incidence and Total Quantity of Oil Spill recorded from 1976 to 2013. Source: Department of Petroleum Resources

The spills effect on the environment varied in many ways and oil spills usually have direct contact with the land, waterbodies and some also evaporate into the atmosphere. Every chemical component has its own implication on the environment. The accumulated spills, the improper cleanups, delay in the cleanup, unattended spills, unrecorded spills, and other forms of environmental negligence on the part of oil companies and regulatory bodies in the country have led to the alarming negative effects of oil spillage in the communities. People have lost their land because of the spill, farmers have recorded low productivity over some period and people have migrated from very prominent spill locations to neighboring communities and the urban centers. Many socioeconomic implications have resulted from this incidence. In 2008 people of Bodo community experienced an oil spill that went on for about 72 days and between 103,000 and 311,000 barrels of oil were spilled. In June 2012, they experienced another oil spill in the Bodo creek area. Also, there are about 2000 oil spill sites that need rehabilitation in Niger Delta (Amnesty International, 2012).

#### **4.4.4 Other Sources of Environmental Problems**

##### ***Canalization***

Canalization occurred by creating the path to oil fields and other facilities for easy transfer of product and also to improve travel or transportation. The oil companies have constructed canals and roads that have caused loss of land due to the roads passing through farmlands, cutting down of trees to make a path for canals, pipelines, and others. Some freshwater has been invaded by salt water due to the construction of some canals. Some of the canals or pipelines also pass through some protected or sensitive sites. These activities have increased illegal logging activities in the region over the past years. There is constant dredging of river channels to enable navigation and the materials dredged from the channels are left on the banks of the channels. This creates a disruption of the hydrology of low-lying and coastal environments. The raised banks end up forming ponds that negatively affect the downstream environment. The extraction of sand and gravel for construction of facilities creates burrow pits, causes siltation and erosion (UNDP, 2012).

### ***Effluent, Inappropriate waste management and Leakages from oil companies***

Oil companies like the other industries in the country generate another form of waste other than the general waste produced in the process of extracting the crude oil. Due to lack of proper or absence of appropriate waste treatment facilities, the companies resort to the discharge of these waste at improper landfill sites, on lands, into the mangrove, other water bodies and the sea (UNDP, 2006). Over the years, oil and gas companies have created unlined dumping sites or pits with drill cuttings, condemned pipes, and machinery parts and cement slurry all over Niger Delta. Due to the open nature of most pits, thousands of water birds with direct access to it die annually (UNDP, 2012). The sources of water are then polluted with after effects such as health problems and also conflict between the affected community and the companies in charge (Gilbert et al., 2018; Raji & Abejide, 2013). Pollution from oil wells, pipelines, ships, and refineries are endemic in the Niger Delta area. The consequence includes contamination of surface and groundwater resources. Discharges also affect plants, marine organisms such as plankton, benthos and stresses terrestrial as well as wetland ecosystem (Mogborukor, 2014). Additionally, because most of the pits are unlined they contaminate shallow underground water and occasionally when it rains it overflow and the toxic waste spread through the wetlands of the Delta. Water quality evaluation that was conducted around WRPC (Warri Refinery, Delta State) show elevated levels of BTEX (Benzene, Toluene, Ethylbenzene and Xylene) in a shallow borehole or dug well water. These are naturally present in crude oil. Due to high mobility of BTEX and the shallow water table of less than 1m, the BTEX find their way into the groundwater and dissolve since they are highly soluble in groundwater. Poor management practices of oil installations lead to oil leaks in the region (Ukozor & Onwugbufor, 2014).

### ***Depletion of forest reserve/destruction of aquatic life***

Environmental degradation arising from oil and gas prospecting and exploration has negative impacts on the biodiversity of the affected area (Niger Delta). Exploration activities, illegal logging, construction of canals, shore-crossing pipelines, jetties and moles

in the region has led to the depletion of biodiversity in the region, most especially flow stations and terminals. This has led to an increase in coastal and river bank erosion. There is therefore easy access for contaminant into both surface and underground water because the eroded materials flow into them. During the laying of seismic lines, the pristine forest trees are cut and fragmented habitats are destroyed in order to get access to the openings in the forest. This paves way for illegal timber cutting at areas that were previously accessible (UNDP, 2012). Discharge of drilling mud and produced water containing hydrocarbons into the environment most especially surface water causes harm to the inhabitants. All the above environmental pollutants have affected the environment enormously; the air, water, soil, vegetation, and even physical structure (UNDP, 2006).

Table 4.2 is a general ranking of the various environmental challenges that are facing the Niger Delta region.

**Table 4.2 Ranking of Major Environmental Problems in the Niger Delta**

<b>Problem Type</b>	<b>Problem Subset</b>	<b>Problem Ranking</b>
<b>Natural Environment</b>	Coastal/River bank erosion	Moderate
	Flooding	High
	Sedimentation	Moderate
	Substance	Low
	Exotic (water hyacinth)	Low
<b>Development Related</b>	Land degradation/Soil fertility Loss	High
	Agricultural decline/shortened fallow	High
	Delta forest loss(Mangrove)	High
	Biodiversity depletion	High
	Fishery Decline	High
	Oil Spillage	High
	Gas Flaring	Moderate
	Sewage and wastewater	High
	Other Chemical	Moderate

Source : (Eregha & Irughe, 2009)

## CHAPTER 5

### ENVIRONMENTAL IMPACT OF OIL AND GAS EXPLORATION AND PRODUCTION AS A SOURCE OF SOCIO-ECONOMIC PROBLEMS IN THE NIGER DELTA

#### 5.1 Introduction

The connection between environmental damage and oil and gas E&P activities in the Niger Delta has been established by many researchers and some have also been explained in the previous chapters. The life of the people living in the oil producing communities is affected by the impacts on the environment they live in. This section of the thesis seeks to evaluate how the environmental damages, that have impacted the oil producing communities, have affected their socioeconomic life over the past decades. Over the years, there have been a series of changes and adaptations that have been developed by the people in order to survive in their changing environment. Changes in socio-economic life can be related to all forms of environmental damage which were caused by either the oil companies or the indigenous people or both.

“Without appropriate environmental management initiatives, both the rural and urban poor suffer from the three key dimensions of human poverty-insufficient livelihoods, poor health and vulnerability” (UNDP, 2006).

#### 5.2 Environmental Impact on Living Standards

Living standards of a community relate to their level of comfort, wealth, health or material things available to them as a group of people (www.investopedia.com, 2019) (Reference). With the change in environmental conditions as a result of E&P oil and gas activities, there is a direct change in the standard of living of the people in the immediate environment. These impacts encompass basic needs to other relevant factors of life.

Some of the basic needs that have been affected by environmental degradation in the Niger Delta include shelter, water, food, clothing, health, and wellbeing. Food items such as yam, fish, cassava, fruits and plantain that were initially produced in abundance in communities are now imported from elsewhere into the communities as a result of pollution.

In effect, the cheaply sold food items are now expensive which makes it difficult for some people to afford and some are not able to sustain their families. Famine is high in the land since crops do not yield enough. People are not able to afford purchasing food items to feed up to 10% of their families (Okpako, 2014). In Ibeno, Akwa Ibom State, for instance, it is those who are able to afford large boat engines and trawlers that can go into high seas for fishing. The rest buy frozen fish from commercial fishermen and the market price keeps increasing, hence many of the people go without fish (Egbe & Thompson, 2010). The issue of food insecurity in the region boils down to the lack of adequate cleanup and remediation, and failure to address the long term possible effects of oil spillage on farmlands, crop production and food safety (Amnesty International, 2009).

According to Amnesty International (2009) the right of the inhabitant to an adequate standard of living, which include the right to food, has been violated. This is as a result of damage to their main sources of food which are agriculture and fisheries. The people living in the Niger Delta have to drink, cook with, and wash in polluted water; they eat fish contaminated with oil and other toxins if they are lucky enough to still be able to find fish.

In considering the effects of the environmental changes on the standard of living of the people, it must also be realized that the sources of fuel and energy and wood for the indigenous people (i.e., the mangrove forest) have been destroyed (Kadafa, 2012a). The destruction of mangrove forest in Ibeno by oil spillage has led to the loss of their source of energy and fuel and building material (mangrove wood) (Chijioke et al., 2018).

The environmental predicament has created social and economic deprivation such as income inequalities and poverty which is complicating the development situation in the region (Omohimoria et al., 2014); and this has gradually reduced their standard of living (Amnesty International, 2009). Due to the economic stagnation, unemployment and poor quality of life (shortage of essential goods and facilities, and unhealthy environment spreading diseases and malnutrition), agricultural underdevelopment from soil infertility, and poverty has become their way of life. Without proper environmental management, the poor in the urban and rural areas suffer from insufficient livelihoods, poor health, and vulnerability which are the key dimensions of human poverty (UNDP, 2006).

Gas flaring also poses serious problems, discomfort from light generated by the flare and noise pollution to the people living in areas around flare sites. In an interview with the people of Eboach in Rivers State, the inhabitants express that black oil dust pollutes their houses, food and dirty their clothes. Their roofs are subjected to rusting due to acid rain associated with the gas flares. All these undermine the quality of life and their right to live in a healthy environment (Amnesty International, 2009). The zinc roofs do not last for more than two years because they become corroded by the acid rain. This increases the socioeconomic cost of the communities (Chijioke et al., 2018).

As farmers and fishermen lose their means of generating income, they are forced to relocate to nearby communities, villages, or nearby urban centers in search for greener pastures. This migration has created the problem of unemployment in the region as people relocate. With the displacement, the oil industry offers very little or no employment as their current agricultural work offers (Afonughe & Mukoro, 2017; Egbe & Thompson, 2010). Some spills have caused the complete relocation or resettlement of an entire community and loss of ancestral homes (Kadafa, 2012a). The migration from polluted communities to other nearby villages or urban centers has brought about congestion in the rural and urban centers. As such, it has created problems such as poor housing condition, low levels of personal hygiene and environmental sanitation. The migration and overcrowding of urban centers encourage the sexual network to flourish contributing to the spread of HIV/AIDS in the region (UNDP, 2006).

The local economy has been affected by the contamination of the environment (Egbe & Thompson, 2010) by eroding the people of their traditional sources of income (Okpako, 2014). "Despite increasing oil revenues, all the region had to show for, are rising unemployment and poverty as a result of the denial of their means of livelihood, notably farming and fishing, environmental dislocations, and general underdevelopment" (Ojakorotu, 2009). Available information shows that there is limited access to employment in the region. With the exception of Edo, Ondo, and Abia, the unemployment rate in the other six states in the region is higher than the national average. Lack of jobs or unemployment is linked to the prevalent incidence of youth restiveness and conflicts in

Delta, Bayelsa and Rivers States (Omohimoria et al., 2014). In addition, loss of economic livelihood in the region has resulted in an increase in school dropouts among teenage girls, early child marriages and trafficking girls for prostitution and as domestic helps to other urban cities. This, in the long run, continues to lower the female status and economic autonomy and makes females highly vulnerable to STDs and HIV/AIDS (Ekanem & Nwachukwu, 2015).

Access to potable water which is one of the basic necessities of every community is a great challenge in the region. Water is a basic need that is very essential to human life or to every community. Source of water for domestic work is a big problem in most communities in the region which are surrounded by streams, rivers, creeks, lagoons, and even underground water.

People in Ogale are spending much money buying water and in some cases, they spend as high as one-third of their weekly income. Due to the facts that they need water for personal and domestic activities, they are forced to, even when they cannot afford. Those who cannot afford to buy water from the private vendors use local groundwater despite the knowledge of its health impact. The government taps in the community run for only an hour or two in the morning or afternoon and the quantity they are able to get is not enough to sustain them (Amnesty International, 2018). Except for Cross River State most of the people in other parts of the region depend on untreated surface water and well which leads to health implications from waterborne diseases (UNDP, 2006).

### **5.3 Environmental Impact associated with Employment and Occupation**

Over the years, farming and fishing have been the main source of employment for most of the Niger Delta inhabitants. However, the environmental destruction elicited by oil and gas exploitation has diminished farming and fishing activities in the region. These activities have rendered farming and fishing almost impossible in the region (Ebegbulem et al., 2013).

Other forms of occupation include hunting, palm kernel collection, production of palm oil and palm kernel, distillers of gin from raffia palm and rubber tapping. Hunting,

which is another traditional occupation, has reduced drastically in the region due to environmental destruction by oil and gas E&P activities. People whose occupation were rubber tapping, palm oil production, and palm oil collection have been displaced from their jobs (Ojakorotu, 2009). The destruction of the forest reserves denies the local people of bush meat (Okpako, 2014). Due to environmental damage by oil and gas activities, the major occupation of the riverine minorities has been decimated (Ebegbulem et al., 2013a).

“Throughout the more than 50 years of crude oil exploration and production in Niger Delta region, oil drilling and refining has caused unquantifiable and inhuman devastation to the people of the region as the people are no longer engaged in their fishing, farming, and hunting activities which were the mainstay of their economy” (Chijioke et al., 2018).

Large oil spills usually pollute coastal waterbodies, kill fishes and destroy agricultural crops and farmlands. The continuous impacts have caused major loses in productivity in fisheries and agriculture activities. There is mostly stoppage of fishing or farming activities when such oil spills occur (Ebegbulem et al., 2013a). In effect, the farmers and fishermen become unemployed as it takes a long time for cleanup and other times not done at all. UNEP report suggests that for proper clean up to occur in Ogoniland it will take about 25 years. Some farmers and fishermen who have lost their source of income through the spillage may not even be alive to see the cleaned environment (Ebegbulem et al., 2013b; Leonore et al., 2018).

The destruction of biodiversity in Akwa Ibom State has destroyed the largest labour employer (agricultural sector) in the state, thus making it unprofitable for the people. Many women and youth have become unemployed due to this environmental hardship. In Ibeno Local Government, continuous oil spillage in the area has caused loss or death of parts of the mangrove forest, killing animals and marine life (fishes) that depended on the mangrove. The inhabitants are not able to go about their normal ways of fishing and farming because the land, and their environment can no longer provide the support they require for effective work (Chijioke et al., 2018).

### 5.3.1 Impacts on Farming

Farming is one of the most common occupations among Niger Delta indigenes apart from fishing. Some crops commonly planted in the region include oil palm, cassava, maize, cashew, and cocoa. The story of farming or agriculture, in general, has changed after crude oil exploitation commenced in commercial quantity in 1956 in the region. E&P oil and gas activities have contributed to a decline in crop production and other farming activities (Ebegbulem et al., 2013a). In the research conducted by Ahmadu & Egbodion (2013) to examine the effect of oil spillage on cassava farmlands and productivity, they observed that the effect of oil spillage on the farmlands were crop failure, poor yield, rotting tubers, stunted crop growth, toxicity, reduction in soil fertility and cassava production. These impacts sometimes happen after the oil is washed into farmlands and rainfall contributes to the spreading of the spills, most especially when there is delay in the cleanup. Accumulated oil also percolates into the soil and kills vegetation (UNEP, 2011a).

"Oloibiri is a shadow of its former self. Farming which used to be the mainstay of the community's economy has been paralyzed as farmlands were destroyed, fishing activities grounded and aquatic life virtually castrated by many years of oil prospecting and exploration." (Ibaba, 2001).

Another major environmental challenge hindering farming is gas flaring. Flares cause an elevation in temperature. The heat generated kills vegetation by suppressing the flowering of plants, in turn, preventing proper growth and decrease in production (Omohimoria et al., 2014). Dung et al. (2008) noted that crops (pepper, cassava) planted close to flare sites experience retardation in their development because of high temperatures around flare sites.

Sizes of farmland have experienced changes by influence of environmental pollution associated with oil and gas E&P activities. The oil spillages have compelled farmers to reduce farm sizes when parts of their farms get polluted by oil spillage. Loss of agricultural land, for example, translates into a loss of livelihood for farmers (Omohimoria et al., 2014). Table 5.1 is the result of a survey conducted by ThankGod et al., (2014) in Rivers State to know the economic effects of crude oil spillage on crop farms in the State.

The table is a portion of the survey that analyzed the impacts of oil spillage on the size of farmlands. The oil spillages were classified based on the intensity of the spill from the highest to the lowest as heavy oil spillage (all crops destroyed), medium oil spillage (almost all crops destroyed) and light oil spillage (some crops destroyed). It can be observed from the table that in 2003, Rivers State recorded a huge loss of farmland thus 272.90 hectares out of the total of 548.09 hectares of farmland were affected by oil spillage.

**Table 5.1 Area of crop farms affected by crude oil spillages in varying degrees in Rivers State in 2003**

<b>Degree of oil spill</b>	<b>Total crop farm affected by the spill, hectares (ha)</b>	<b>Average farm size affected by oil spillage, hectares (ha)</b>
Heavy Oil Spillage (all crops destroyed)	272.9	3.37
Medium Oil Spillage (almost all crops destroyed)	164.5	2.79
Light Oil Spillage ( some crops destroyed)	110.69	2.09
Total	548.09	8.25

Source : (Ojimba, 2011)

Ahmadu and Egbodion (2013) observed that majority of the youths find agriculture unattractive with all the misfortune associated with the toil of farming and not harvesting the expected yield. Their findings show that the average ages of farmers in the study area were between 47 and 48 years.

The crude oil spillage has caused the farmers to reduce the sizes of their farms where parts were affected by oil spillage. This causes planting fewer crops, which leads to low yield, and productivity as noted by Ahmadu & Egbodion (2013c) on the effects of spillage on cassava farms in Delta State. Majority of farmers in Ibeno local Government

area of Akwa Ibom State, after they experienced oil spillage, reduced the sizes of their farm as compared to unaffected oil spill areas. The differences in sizes of land have contributed to low agricultural growth that no longer supports mechanized or commercial farming (Sandra Ifunanya Asoya, 2010). The level of income realized by farming on such land size is very low (Inoni et al., 2006).

### 5.3.2 Impacts on Fishing

Oil spillage into waterbodies by the continuous incidence of pipeline vandalism and corrosion contaminates the waterbodies, which in the long-term destroy aquatic life (death of fishes). Fishing activity becomes impossible after such environmental pollution. In the long run, fish production depresses because of the death of the fishes. It also destroys the fish stocks and fishermen experience low catch and some fishermen stop fishing from the contaminated water (Osuagwu & Olaifa, 2018). The oil forms a coating on the water surface that reduces aeration and in effect kills the fish and the chemical components of the hydrocarbons cause the fishes to die (Ojakorotu, 2009).

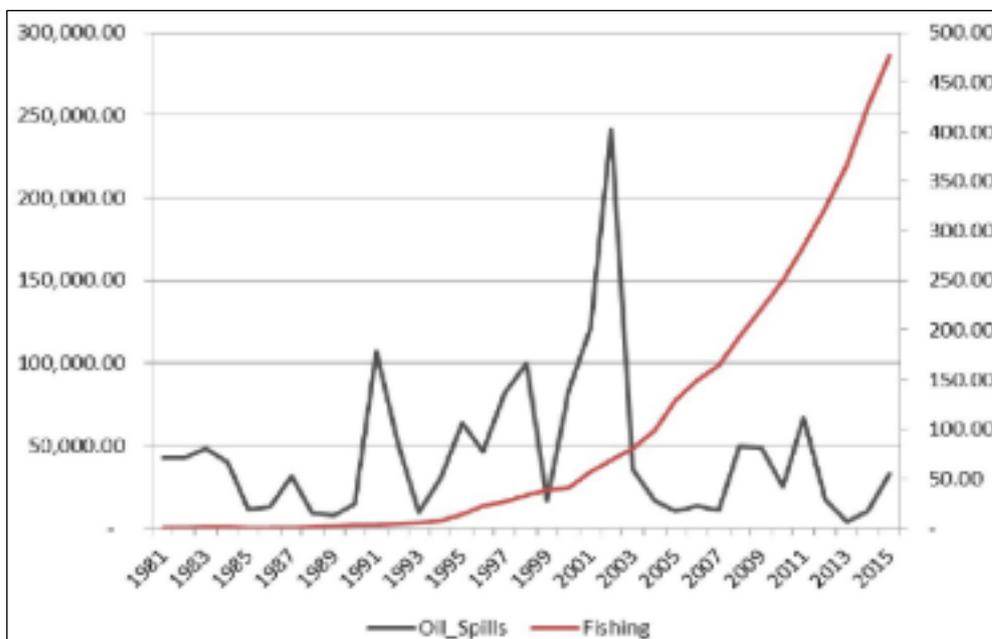


Figure 5.1. Graph of oil spills (Barrels) and fishing outputs (N' billions) of Nigeria (1981–2015). Source: (Osuagwu & Olaifa, 2018).

Figure 5.1 is a graph representing the barrels of oil spilled and the fish production in Nigeria from 1981 to 2015. From the graph, the trend of fish production increase as the barrel of oil spilled decreases. For example, after the Oshika oil spill in 1983, fishes, crabs, birds, and some aquatic vegetation were found dead in the impact assessment conducted (Omohimoria et al., 2014). The oil spill destroyed the mangrove forest and polluted waterbodies and in effect destroyed fish habitats. This caused the reduction in fish production and the abandonment of some fishing grounds in Ondo State. The reduction in fish production serves as a threat to fishing opportunities and means of livelihood (Bayode, Adewunmi, & Odunwole, 2011).

Seismic activity during exploration for hydrocarbons in the sea create environmental disturbance to the aquatic life. The sound generated in the process causes the dispersion of the fish and destruction of larva closed by and dispersion of fish stock (Ojakorotu, 2009). Loss of fishing grounds is one of the major challenges facing fishing or fishermen in the region. Many rivers, swamps, and creeks have been polluted by oil spillage and other activities and this has contributed to the loss of fishing grounds (Kadafa, 2012c). Quarrying has been a contributor to the loss of fishing grounds. The demand for fine sand for construction of some facilities led to river sand mining which has destroyed aquatic habitats and disrupts the hydraulic capacity and relationships in river channels (UNDP, 2006).

The occurrence of oil spillages does not only destroy aquatic life but also at times damage the fishing materials making it difficult for the fishermen to fish again. Several months after oil spillage, people lose their jobs (fishing) and fishing business becomes unattractive due to low catch and quantity of fish available to be traded at the market (Bayode et al., 2011).

When these environmental pollutions occur, the inhabitants of the host communities are forced to abandon their fishing nets, canoes, farmlands, etc., and seek alternative means of livelihood (Chijioke et al., 2018). In this regard, some inhabitants of Ogoniland decided to invest in fishing businesses such as fish farming. Due to an ever-present floating oil, their businesses were not fruitful (UNEP, 2011a). Other environmental factors affecting

fishing activities include oil well blowout, gas flaring, improper disposal of drilling fluid and pipeline leakages (Osuagwu & Olaifa, 2018).

#### **5.4 Environmental Impacts as a Source of Health Related Issues**

Health implications from the environmental destruction that have resulted from oil and gas activities are associated with upstream to downstream activities. However, much information is not made available by agencies including health institutions to show the series of recorded health incidence related to environmental problems caused by the oil and gas industry activities that affect the local people in the oil-producing communities. Therefore, there is continuous degradation of the environment and hence the health of people by the unnoted actions of the oil E&P operations. Each operation has a significant impact on people. The contaminants released into water, soil, and air are sources of some of the illness affecting the people. The health analysis done here is non-occupational health impacts on the oil producing communities. The diseases are either as a result of acute health effects and long term health effects that the people suffer from the pollutants as a result of inhalation, dermal contact or ingestion of the released toxins or chemicals.

An estimated number of about 638 million people in the low and middle-income countries (LMICs) stay very close to oil field sites. These people are vulnerable to these health problems because they are exposed to the contaminants for long times, through ingestion of contaminated foods and drinking water. Also, women, infants, children, and pregnant women together with people with other health issues are the most susceptible to the negative health impact of the oil and gas extraction (Callaghan-gordo, Orta-martínez, & Kogevinas, 2016). The pollution affects agricultural lands, fishing areas and sources of water and the atmosphere (air pollution), all of which have a direct or indirect influence on the human health through ingestion, dermal contact, and inhalation.

##### **5.4.1 Air Pollution and Related Health Impacts**

Air pollution by gas flaring, gas venting and even evaporated oil spill from E&P operations contribute to some health implications. "In the oil-rich Niger Delta of southern

Nigeria, 2 million people live within 4 km of a gas flare” (www.dw.com, 2018). Some chemicals released during gas flaring include benzene, Sulphur dioxides, carbon monoxides, nitrogen oxides, xylene, toluene, hydrogen sulfide and carbon dioxide (Adeyemo et al., 2009; Baumuller et al., 2011; UNDP, 2010; UNEP, 2011b). These chemicals either by themselves or combined with other components of the environment affect the health of the people. Sulfur dioxide causes a variety of health problems among children, elderly and others already suffering from heart or lung diseases such as asthma. These diseases include lung cancer, allergic rhinitis, cardiac and respiratory diseases (Sako, 2017). The entire air sample taken during the Ogoniland assessment by UNEP in 2011 contained a concentration of benzene ranging from 0.155 to 48.5  $\mu\text{g}/\text{m}^3$ . About 10% of the total samples had benzene concentration higher than that of the corresponding report by WHO and the United States Environmental Protection Agency (USEPA) of 1:10,000 cancer risk. Health implication by exposure to benzene includes disorders of the central nervous system, Leukaemia, aplastic anemia (WHO, 2003). Some sicknesses among others associated with the release of benzene into the environment by oil spill or gas flaring have also been recorded by research conducted by Adekola et al., (2017), Adekola et al., (2017), Atubi (2015), Ordinioha & Brisibe, (2013a), UNEP (2011a), Yakubu (2017) and reports have proved their existence in the region in relation to benzene in the particular community where the study was conducted. World Bank report on the health impact of gas flaring suggests that the Niger Delta (Bayelsa State alone) is likely to record 4960 respiratory illness among children, 49 premature death cases, and 120 asthma attacks annually (World Bank, 1995). Some other sicknesses of higher frequency are asthma, cough, breathing difficulty, eye/skin irritation, in the study area with a history of long exposure to gas flaring (Gobo et al., 2009). Similar diseases were recorded in the study conducted by Ogbija et al., (2015) in Delta State. Sooth and the flare contain benzene, mercury, and chromium which lower the immunity of the inhabitants especially children, making them more liable to diseases like polio and measles (NDDC, 2011).

#### **5.4.2 Water Pollution and Related Health Impacts**

The petroleum operations that are mostly responsible for contamination of water are oil spills, dredging, oil exploration, discharge of drilling fluid, produced water, gas flaring, refining and wastewater effluent (Adedeji & Adetunji, 2011). In 2011, the UNEP report on Ogoniland after their environmental assessment showed that the level of carcinogen in drinking water was 900 times above the WHO guidelines (UNEP, 2011a). The carcinogens observed in oil spill-contaminated surface water were polycyclic aromatic hydrocarbon and benzo (a) pyrene (Ordinioha & Brisibe, 2013c). The disadvantage of this pollution is that the local people consume the contaminated water, be it a river, stream or hand dug well. They use the water for most of their domestic activities such as cooking, drinking, and washing. Oil spillage has caused contamination of fishes and other aquatic animals. People who consume these contaminated fishes and water have been infected with all forms of illnesses (Adeyemo et al., 2009; Ana et al., 2009; Atubi, 2015; Laffon et al, 2016; Ordinioha & Brisibe, 2013b; UNEP, 2011a; WHO, 2014). Stagnant water in oil boreholes has become the breeding grounds of some waterborne diseases (cholera, typhoid, guinea worms, and river blindness) and the spread of mosquitoes (NDDC, 2011). The prevalence of diarrhea is noted to be higher significantly after an incidence of the spill in the study of the Niger Delta because the community folks eat the dead fishes and animals killed by the spill (Ordinioha & Brisibe, 2013c).

Ana et al, (2009) conducted a study in two communities (Eleme and Ahoada East) in Rivers State to assess the prevalence of various health consequences allied with exposure to environmental risk factors from oil pollution. The researchers used water, soil, air and urine samples from the two communities to conduct the study with 349 respondents for the survey. They also analyzed five years of hospital records of reported illness associated with skin, eyes, respiratory system, and gastrointestinal tract and poisoning cases. After the study, the perception of the respondents combined with the hospital records revealed that there are higher morbidity cases in Eleme as compared to Ahoada East. And the morbidity cases included cancer, skin diseases and respiratory disorders (Ana et al., 2009).

## **CHAPTER 6**

### **GENERAL DISCUSSION**

In this chapter, the findings of the research are discussed with reference to the aim of the study which was to determine the environmental impact of oil and gas E&P activities on the socioeconomic life of the people in the Niger Delta. Production of crude oil in Nigeria which commenced in 1956 has contributed to numerous changes in the country. As E&P activities expanded, the oil producing communities and the country at large have experienced, and continue to experience economic, social and environmental changes. The country's economy which was agriculturally dominated has changed to crude oil based, with crude oil production contributing about 90% of the total foreign exchange earned by the nation and over 80% of the annual revenue (Ahmadu & Egbodion, 2013a).

The exploitation of crude oil from exploration to the marketing of finished products journeys along with different forms of environmental impacts. Most of these environmental problems affected the occupants of the immediate environment. Many arguments and stories from all kinds of sources surround the irony of wealth and environmental damage co-existing in one region. The environmental crisis has long existed from early periods of crude oil production till date. The main environmental challenges facing the region are oil spillage and gas flaring. The others include improper discharge of drill waste into waterbodies and on land, deforestation resulting in the depletion of the mangrove forest, improper waste management and leakages from oil pipelines. All the environmental problems have direct or indirect consequences on the life of the inhabitants in the areas of oil E&P operations.

During this study, it has been noted that the listed environmental challenges in one way or the other have influenced the changes observed in the socioeconomic life of the Niger Delta people since the exploitation of crude oil began in the region. Most of these changes are observed mostly among the oil producing communities which in effect expands to the entire region of the Niger Delta.

In the aspect of occupation, Niger Delta has been known as farming and fishing region before oil production began. However, due to the effects of environmental challenges on these occupations, their existence has become quite unpopular among the people. Gradually, the number of people engaged in farming and fishing has reduced as more people venture into other forms of businesses as a means of escaping environmental issues confronting the farmers and fishermen. Through oil spillages, farmers have either lost their farmlands or sizes of the farmlands have been reduced. Chemicals in the spilled oil have led to the loss of soil nutrients making the lands infertile for any subsistence or commercial farming. Farmers have recorded low production as they have smaller farms to plant on. The spillages and flaring have reduced crop yields. Reduction in farming business has also caused the closure of businesses such as the sale of palm oil, palm wine and other smaller industries that depend on them for their raw materials.

Fishing which was also a predominant source of living for many in the Niger Delta fishing communities that unfortunately or fortunately have become oil-producing communities have been faced with extreme environmental challenges. Oil spillages together with leakages from pipelines and improper disposal of drilling fluid have been the main sources of pollutant to waterbodies. Oil spills into streams, rivers, the sea, and other aquatic habitats have caused a decline in the production of fish from the communities. Fish production has dropped in the region as a result of the loss of fishing grounds, death of fishes, dispersion of fish stocks, and loss of interest in fishing as an occupation due to continuous environmental pollution. In addition, in the processes of oil spills, some fishermen have lost their nets, canoes and other materials making it difficult for them to continue fishing (Bayode et al., 2011). In some areas, fishing has become impossible after an oil spill so they had to go deep sea for fishing. Sadly, it is only those who are able to afford the stronger equipment that are able to do so. In effect, people have lost their jobs which have increased the level of unemployment in the region. Other people who ventured into fish farming business to escape surface water pollution have become unfruitful by the ever-present floating oil film in the underground water (UNEP, 2011).

All this depletion of indigenous source of employment has rendered the region, most especially the oil producing communities, into abject poverty. Poverty has become common among the populace as they lose their sources of income. Many people are not even able to feed 10% of their families. These people, who once, could have fed their families by their farm's product or even generate money from the sale of their products have a different story to tell because of the environmental damage caused by oil E&P activities. Other challenges that have surfaced include; children becoming school dropout because of parents' inability to pay their fees and provide other basic needs. Hardship caused by the loss in productivity and depleted local economies by oil spills together with other environmental challenges have forced many women and young girls in the region into prostitution. Many of the young girls and women have claimed that they do prostitution to pay for their fees and support their family (Tuner & Wilson, 1999). Some young men have joined militant groups with the aim of generating quick money for themselves and families.

The canker of unemployment has caused migration of people to urban centers and other places in the region to seek for greener pastures. These acts have created congestion in these places and have contributed to the increase and spread of HIV/AIDS in the region. The quality of the neighbourhood has also become a problem. Gas flaring has caused the generation of acid rain which has destroyed roofs, creation of discomfort by the continuous presence of light in the communities, the difficulty in breathing and noise generation by flaring and other activities have rendered the area uncomfortable to live. A roof which could have lasted five or more years is now replaced within one or two years, this has increased the socioeconomic cost in the communities. Their source of fuel and energy which was the mangrove forest have also experienced destruction. A people who were virtually not buying many things for their survival are now buying almost everything to have a good quality life, their cost of living can be said to be high with a low standard of living.

A healthy mind and body are more productive and industrious than a sick giant. Some chemical compositions of the hydrocarbons released into the atmosphere during any form of oil E&P activities have acute or long time health implication on the people. From studies, it has been observed that some diseases have become prevalent in the region,

most especially the oil producing communities as the people get exposed to some of these chemicals. Exposure to chemicals like benzene, Sulphur dioxides, and others has caused health issues such as lung cancer, allergic rhinitis, cardiac, respiratory diseases, Leukaemia, and aplastic anemia. Some people are faced with other health challenges by consumption of contaminated food, fishes and water as they are mostly ignorant of the health implication. Some of such incidents that have been recorded are cholera, typhoid, guinea worms, river blindness and diarrhea (NDDC, 2011; Ordinioha & Brisibe, 2013). All the listed illnesses have affected their productivity and an increased poverty level of the people in the region. Some of the recorded diseases have their linkage mainly to oil and gas activities. Existence of carcinogens in oil spill-contaminated surface water can cause all forms of cancer which won't have ever been recorded in the region if there were no oil production activities in the region. The quest of the people to find solutions to the environmental challenges coupled with the government insensitivity to the problem has been a cause of the consistent conflicts in the region.

This discussion reveals that the environmental challenges that have evolved in the Niger Delta whether caused by the oil companies or the indigenous people have contributed to the change in socioeconomic life existing before crude oil production in the region. If some environmental laws were implemented early enough and those already established were properly enforced the region won't be experiencing such a shift in socioeconomic life.

## CHAPTER 7

### CONCLUSION AND RECOMMENDATIONS

#### 7.1 Introduction

The first part of this chapter summarizes the main conclusions derived from the study and the second part presents the recommendations derived from the findings of the research. As crude oil exploitation cannot be stopped outright, there is the need to talk for the future generation as they are not available to tell of the kind of environment they want. Niger Delta has earned huge revenues for the country since 1958 from its abundant crude oil resources. Despite the amount of revenue generated from the region, environmental pollution continues to swallow the region with its numerous direct and indirect impacts.

#### 7.2 Conclusions

Based on the research discussion, the following conclusions were made. Before commercial oil production in Niger Delta, the people in the region lived a special life that was predicted on the healthy environment surrounding them. Most of their life style, from social to economic, was linked to one or more objects in the environment. However, after oil production began, life continues, but this socioeconomic life seems to differ from what it used to be before oil production. From the research, it has been noted that there is a clear difference between the pre-oil socioeconomic life and the post-oil socioeconomic life of the Niger Delta people.

It has been noted that some activities arising from the E&P operations of crude oil in the region has caused immense environmental damage to the region, most especially to the oil-producing communities. These environmental challenges included oil spillage, gas flaring, canalization, inappropriate waste management and leakages from oil pipelines, depletion of forest reserve, among others. However, these environmental challenges come about by the action of the oil companies and other times by local militants. The extent to which the environmental pollution has degraded the environment include contamination of aquatic habitats leading to the death of aquatic life, pollution of drinking water, pollution of

air by flares and other chemicals, deforestation and destruction of farmlands, depletion of the Niger Delta mangrove forest, etc.

The post-oil socioeconomic life of the people in terms of their standard of living and health, and occupation as analyzed in the study show that environmental damage from E&P oil and gas operations to an extent have negatively impacted the socioeconomic life of the Niger Delta people. Due to the environmental challenges, farmers, fishermen, hunters and others have lost their jobs. This has increased the unemployment rate in the region. Some people abandoned their farming and fishing to move to urban centers for greener pastures as they could not continue to suffer in such hardship. Some farmers and fishermen lost their jobs because an oil spill polluted their lands, polluted the waterbodies they fish from or even destroyed the equipment they use for their work. As these continue, the poverty rate also continues to increase in the region. The standard of living of the people is low. Some of them can hardly afford meals for their families, pay children school fees and afford to buy safe drinking water. This hardship has forced some young ladies into prostitution and young men or boys joining militant groups. Some are also living in very poor neighborhoods, most of their roofs are corroded and some places have also been dirtied by oil spills that have not been cleaned. Diseases such as respiratory disorders, skin diseases, sore eyes and other health issues being experienced by the people are also linked to various environmental pollutions. Additionally, these activities can be seen as a chain as one leads to the other in that cycle.

There is no doubt, the environmental pollution from oil and gas E&P operations have contributed to the current poor socioeconomic state of the people of the Niger Delta. From the look of things one can predict that if care is not taken, in the future when crude oil is discovered in other parts of the country, the people will not allow the exploitation of the resource in their community as a case of "NIMBY," Not in My Back Yard.

### 7.3 Recommendations

The following recommendations are proposed in line with the research findings;

- i. Oil companies should adopt modernized technologies to enhance fewer contacts of pollutants into the environment.
- ii. To avoid prolonged spill before noticed, low-pressure sensors should be placed on pipelines to give signals of pipeline rupture by corrosion or vandalism.
- iii. The government should see to the enforcement of existing environmental laws and regulations. There should be an adjustment of the environmental rules and regulations where necessary to incorporate new methods and ideas being used in countries such as Canada and Norway.
- iv. Oil companies should improve on their Cooperate Social Responsibilities (CSR) in order to meet the relevant socioeconomic needs of the people.
- v. There should be an independent environmental regulatory body purely for the oil and gas industry. This body should be independent of the Department of Petroleum Resources and Nigerian National Petroleum Corporation.
- vi. National Oil Spill Detection and Response Agency should have oil spill preparedness and acute pollution response team that function for 24 hours in the whole week. This will respond to any emergency situation both onshore and offshore. They should be provided with modernized technologies to enhance the deliverability of their work. This will also help to tackle prolong oil spillage that causes massive damage to inhabitants of the region.
- vii. There should be Greenhouse Emission Regulations that monitors the gas being flared by the oil companies.

- viii. Also, there should be public education of the impact of some of these operations on the life of an individual, because it seems some of the people don't actually know the risk of being associated with things like gas flaring, etc.
- ix. The government should include the construction of gas storage facilities in the contracts with the IOCs and other oil producing companies. This can help curb the electricity challenge in the country by using the gas to provide electricity.

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