

Sustainable exploration of oil and gas in the United Kingdom and Nigeria

BY

Oghenemarho Inomiesa

A thesis submitted in partial fulfilment of the requirement
of Liverpool John Moores University for the degree of
doctor of philosophy

November 2015

Dedicated to almighty God

Abstract

This research analyses the impact of oil and gas exploration in the UK and Nigeria on the environment and settlements from the sustainability perspective, using a case study of an oil producing community (Uzere) in the Niger Delta region of Nigeria. This region is affected by oil and gas exploration activities, in terms of socio-economic, environmental and economic impacts. This state of affairs raises issues of environmental justice among the stakeholders.

The research had two case study areas and included a total of 13 focus group, 86 questionnaires and 7 interviews. Analysis of this data showed that the oil and gas exploration activities in Nigeria are different from that in the UK. The empirical evidence equally suggests that the lack of technological advancement, management, legislation and corruption are strongly related to incidence of environmental impact during oil and gas exploration. The research further discusses the need to strive towards a balance between environmental sustainability and economic growth. Highlighting the fact and fiction of sustainable development and sustainability in the Niger delta and Nigerian, how Sustainable environment and growth can only be achieved through the integration of policies that connect the environment, the economy and the society.

The novelty or contribution to knowledge of the research, developed a framework based on qualitative and quantitative findings. The resulting framework highlighted or proposed ways the Nigerian government can achieve its sustainable energy obligations based on the findings and the review of relevant literature, as well findings from methodology adopted. The proposed framework can be applied both theoretical and practical, this will not only protect the environment and people from the impacts of oil and gas exploration, but will also protect Nigeria crude oil resource saving lives and livelihoods over the coming years. Furthermore the research analyses a number of strategic initiatives, which can be adopted in Nigeria, taking lesson from the UK to achieve the balance between environmental sustainability and growth through the integration of policies, management, technology that connect the environment, society and economy.

Acknowledgements

Arriving to this stage of my life would have been impossible without the help, support and understanding of many people.

First of all I would like to say a warm thanks to you my supervisor, Professor Ahmed Al-Shamma'a. His supervision, help and support and advice has driven me to the completion of the research. Also my thanks go to doctor Jeffery Cullen and Edward Ochieng for their understanding and guidance in those difficult and complicated bits in the duration of the research.

As a whole, the BEST research group because it provided an environment conducive to interchange of ideas, jokes and drama. It has made a time of learning not just academic but human and socially too.

My gratitude also goes to the multidisciplinary and so very multiracial general BEST research institute, because of the sharing of experiences and knowledge. In a more personal note, there have been many people who have helped me over the years to whom I am deeply grateful: my gratitude goes to my parents Professor and Mrs E.A Inomiesa for their unquestionable support from the distance. My dearest sister Oke and Nyore, the Onojake and Nwaiwu family for all their prayers given on my behalf; I'm pretty sure that by now the gentleman upstairs is well fed up hearing my name so often.

On looking back to my life I can see how lucky I have been. I could certainly say that my life has been spared at least a couple of times. And always, even at the worst times I found my path crossing that of so many good people. My gratitude goes to all of them (too many to mention here), who at some time or another even to detriment of their own wellbeing were willing to extend the helping hand to this unknown quantity.

To my biggest fan, Aiden and Emmanuel for their unquestionable love and innocence and a big thanks to Jessica who was there when things became particularly tough. When I found myself wondering what on earth is the point of it all and how did I allow myself to get in such situation. You are the best.

Thank you all

TABLE OF CONTENTS

CHAPTER ONE	Introduction	13
1.1	Introduction, Background of study, Research Questions, Aim and Objective.....	13
1.2	Background of the study	13
1.3	Research Question	14
1.4	Research Aim	15
1.5	Research Objectives.....	15
CHAPTER TWO	Literature review.....	16
2.1	Literature review.....	19
2.2	Overview of Oil and Gas Exploration in the United Kingdom	19
2.2.1	Oil exploration.....	19
2.2.2	Causes of oil spillages in the United Kingdom	22
2.2.3	Impact of oil pollution in the United Kingdom	23
2.2.4	Environmental legislation of oil exploration in the United Kingdom	24
2.2.5	Gas exploration and flaring in the United Kingdom.....	26
2.2.6	The Legal Response to Gas Flaring In the United Kingdom.	27
2.2.7	Regulatory measures of gas flaring in the United Kingdom	27
2.3	Renewable energy in United Kingdom	29
2.3.1	Potentials of UK renewable energy resources	32
2.3.2	Climate change.....	34
2.3.4	Carbon capture and trading	35
2.4	Overview of oil and gas exploration in Nigeria	39
2.4.1	Background of Nigeria and Niger Delta	40
2.4.2	Oil exploration.....	41
2.4.3	Causes of Oil Spillage in Niger Delta	43
2.4.4	Impact of oil spillage in the Niger Delta and Nigeria	44
2.4.5	Impact on marine/aquatic life	45
2.4.6	Agricultural impact.....	47
2.4.7	Social impact and oil rent control	48
2.4.8	The Laws Governing Oil Exploration and Exploitation in Nigeria	48

2.5 Gas flaring in Nigeria	50
2.5.1 Causes of gas flaring.....	54
2.5.2 Environmental impact of gas flaring	55
2.5.3 Health impact of gas flaring	56
2.5.4 Economic impact of gas flaring	58
2.5.5 Policy and legislation on gas flaring in Nigeria.....	61
2.5.6 Nigeria’s international response to phase out gas flaring	62
2.6 Renewable energy in Nigeria	64
2.7 Sources of Renewable energy in Nigeria	67
2.7.1 Hydro Energy.....	67
2.7.2 Solar Energy	68
2.7.3 Wind Energy.....	69
2.7.4 Municipal waste	70
2.7.5 Other renewable Resources.....	71
2.7.8 Challenges	72
CHAPTER THREE	
Conceptual framework.....	72
3.1 Conceptual framework	74
3.1.1 Technological requirement:	76
3.1.2 Legislative requirement:	78
3.1.3 Corporate social responsibility requirement	81
3.1.4 Management requirement	85
3.1.5 Environmental requirement	89
3.2 Sustainable Development	92
3.2.1 Key Events in the formulation of sustainable development.....	92
3.2.2 The concept of Sustainability and Sustainable Development: Facts Verses Fiction.....	94
3.3 Environmental cost and Economic potential of Gas flaring in Nigeria	97
3.3.1 Relationship between the naira and pound	98
Chapter Four	
Research Methodology	102
4.1 Introduction	102
4.1.1 Meaning of research	103
4.1.2 Motivation for Research	103
4.2 Research Methods versus Methodology	105
4.2.1 Research methods:	105
4.2.2 Research methodology	107
4.2.3 Importance of Research Methodology in Research Study	108

4.3 Study Areas	108
4.5 Sources and Nature of Data	112
4.6 Procedure of Data Collection	114
4.6.1 Data collection procedure involves several stages	114
4.6.2 Techniques of Data Analysis	116
4.7 Qualitative and Quantitative Research	117
4.7.1 Quantitative Research Approach	117
4.7.2 Strengths and Weaknesses of Quantitative Research	120
4.7.3 Qualitative Research Approach	121
4.7.4 Strengths and Weaknesses of Qualitative Research	123
4.8 Questionnaire Layout	124
4.8.1 Nigeria	128
4.8.2 Primary Sources:	128
4.8.3 United Kingdom	130
Chapter Five	
Data Analysis and findings	131
5.1 Data presentation And Quantitative analysis findings of Nigeria Data	133
5.1.1 Analysis of Data collected from Nigeria	133
5.1.2 Demographic characteristics of data	134
5.2 Quantitative analysis findings of Nigeria Data	137
5.2.1 Result of Physical and Health impact represented in a scatter dot chart	139
5.2.2 Health implication	139
5.2.3 Socio Environment impact	147
5.3 Qualitative analysis of Nigeria Data	151
5.3.1 Presentation and analysis of focus group	151
5.3.2 Demographics	151
5.4 Qualitative analysis findings of Nigeria Data	154
5.4.1 Respondent perception, response based on discussion	155
5.4.2 Discussion results	155
5.4.3 Environmental laws	158
5.4.4 Physical environment Impacts	159
5.4.5 Physical impact caused by oil and gas exploration participant	162
5.4.6 Air pollution/ Impacts	163
5.4.7 Air pollution caused by oil and gas exploration participant	164
5.4.8 Biological environmental/ impacts	165
5.4.9 Biological impact caused during oil and exploration participant	165

5.4.10 Health related problems/impacts.....	166
5.4.11 Socio economic environment/impacts	167
5.4.12 Socio economic/ environmental impact caused during oil and exploration participant	168
5.5 Quantitative analysis of United Kingdom Data.....	172
5.5.1 Demographic characteristics.....	172
5.5.2 Quantitative analysis findings of United Kingdom Data	173
5.5.3 Socio-economic positive and negative impact	175
5.5.4 Physical/Environmental positive and negative impacts	176
5.5.5 Health/Gas flaring positive and negative impacts	178
5.6 T Test analysis	179
5.7 Qualitative analysis findings of United Kingdom Data.....	182
Chapter Six	Discussion of results.....
6.1 Discussion of results.....	189
6.2 Contributions to existing body of knowledge and the research challenges.....	192
Chapter Seven	Conclusions
7.1	Conclusions, recommendation and future work
7.1.1	Conclusions
7.1.3	Lesson for Nigeria and Other Developing Countries from UK Framework.....
7.2	Recommendations
7.3	Suggestions for further studies
Chapter Eight	References.....
References	213

List of figure

Figure 1 Nine Major Refineries in the UK	21
Figure 2 Greenhouse Gas Emission forecast	31
Figure 3	32
Figure 4 UK Co2 Emission graph from 1980-2011	32
Figure 5 Carbon Price projection (2010- 2050).....	37
Figure 6 UK Co2 Emission reduction target by 2050	39
Figure 7 Map Niger Delta States	40
Figure 8 Nigeria Oil production and consumption from 2000-2010	42
Figure 9 Nigeria Gas flaring graph from 1915 -2005	53
Figure 10 Gas flaring from Oil Multinationals Companies.....	57
Figure 11 List of 10 top countries that flare Gas	59
Figure 12 Pie chart of Nigeria Total Energy Consumption in 2010.....	65
Figure 13 Conceptual Framework Diagram	75
Figure 14 management Requirements in Nigeria Oil and Gas Sector	86
Figure 15 Relationship between the Nigerian Naira and the British Pounds	99
Figure 16 Map of Uzere (Study Area)	111
Figure 17 Quantitative Demographic data (Nigeria)	135
Figure 18 Sex Demographic data (Nigeria)	136
Figure 19 Scatter Dot Chart	139
Figure 20 Effect of gas flaring to human.....	141
Figure 21 respiratory diseases from gas flaring.....	142
Figure 22 CO2 emission from gas flaring.....	144

Figure 23 water pollution from oil spillage.....	146
Figure 24 Scattered Dot Graph of social impact.....	148
Figure 25 Qualitative Sex Demographic.....	152
Figure 26 Qualitative Age Demographic.....	153
Figure 27 language spoken in the study area	154
Figure 28 pie chart of qualitative findings	156
Figure 29 pie chart of qualitative findings	157
Figure 30 Negative impact from oil and gas exploration.....	159
Figure 31 Impact of oil and gas exploration on wildlife.....	161
Figure 32 Quantitative finding UK	174
Figure 33 framework diagram	201

List of tables

Table 1 Estimate potential's of some Renewable energy resource in UK	33
Table 2 Health impact from Oil and Gas exploration in the Niger Delta of Nigeria	46
Table 3 list of top twenty counties that flare gas	51
Table 4 percentage of gas flare from 2000 -2008 in Nigeria	59
Table 5 waste generation in some Nigerian cities.....	70
Table 6 Potential Environmental impact of Oil exploration	90
Table 7 Different research methods techniques	106
Table 8 Alphabetical representation of companies.....	116
Table 9 Quantitative Demographic data Nigeria	134
Table 10 Quantitative sex data Nigeria	136
Table 11 Physical Impact correlation table.....	140
Table 12 Respiratory, cough and skin diseases	142
Table 13 Poor health condition from gas flaring	143
Table 14 Water pollution from oil and gas exploration activities	145
Table 15 Social impact correlation from oil and gas exploration	148
Table 16 Qualitative Demographic sex data	151
Table 17 Qualitative Demographic age data	152
Table 18 Language spoken in the study area	153
Table 19 Environmental pollution by oil multinational's companies	155
Table 20 Breach of environmental laws by oil multinationals companies	156
Table 21 impact of Oil spillage on soil quality	159

Table 22 Impact of oil spillage on wildlife	160
Table 23 physical impact caused by oil and gas exploration	162
Table 24 air pollution caused by oil and gas exploration	164
Table 25 Biological impact caused by oil and gas exploration	165
Table 26 Socio-economic impact from oil and gas exploration.....	169
Table 27 UK Quantitative demographic.....	172
Table 28 T- Test table UK and Nigeria.....	180
Table 29 UK qualitative Demographic data	182

1.1 INTRODUCTION, BACKGROUND OF STUDY, RESEARCH QUESTIONS, AIM AND OBJECTIVE.

1.2 BACKGROUND OF THE STUDY

The consciousness and importance of environmental issues has become vital to oil exploration firms, in the United Kingdom, Nigeria and around the world. It has been over twenty years since the Brundtland Report drew the attention of the world to the need to re-examine our ways in the light of increasing use of resources with little or no concern for either the environment or future generations. Nonetheless, this notion remains elusive in the Niger delta area of Nigeria since it has deficiencies during oil and gas exploration which do not bode well for sustainable development in the long term. This however explains why the UK government set up regulations and means with the sole aim of regulating the impact of oil and gas exploration in a sustainable way. Despite the importance of oil and gas, oil companies in Nigeria still prefer to flare gas and oil spillage is also frequent (Ashton et al 1999). This is against the backdrop of what has been practiced in the United Kingdom as well as other developed countries where oil spillage and gas flaring is illegal (Omorotionmwan 2005) as flaring of gas is permissible only in certain circumstances such as emergency shutdown and maintenance (Hyne 1991). The World Bank (2002) estimated that about 100 billion cubic metres of natural gas is flared annually which is an amount equivalent to the annual gas consumption of Germany and France. In a separate report carried out by the World Bank in 2004 it publicized that Nigeria flares 16% of the world associated gas and added that the quantity of gas flared in Nigeria was equal to 40% of the entire Africa natural gas consumption in 2001. Baugh et al and Abdulkareem and kovo (2006) asserted that the gas produced from gas flaring contributed to climate change, environmental degradation and health problems.

Richard Steiner (2008) revealed the Niger Delta has endured and suffered for decades from oil spillages, which occur both on land and offshore and the oil spillages on land destroy crops and damage the quality and the productivity of soil that individual communities use for farming. Oil in water damages fisheries and contaminates water that people use for drinking and other domestic purposes. Ikelegbe (2005) also stated that Oil spillage in the Niger delta has left several arable lands

and aquatic lives destroyed By placing so much emphasis on the quantity of oil extracted without paying attention to what is left or the best use to which oil can be put, these companies have unconsciously made themselves an enemy of the environment.

1.3 RESEARCH QUESTION

It is worthy to note, that this research has been undertaken because, despite the abundant oil and gas resources present in the Niger delta, the living conditions within the host communities are below par prompting the need to evaluate the damaging impact of oil and gas exploitation on the Nigerian environment with a view to creating a framework or guidance based on lesson from the united kingdom to effectively combat this environmental menace bringing to the fore, pertinent research questions as highlighted below :

- What has been done by the Nigerian government and other national and international bodies to control the environmental problems in Nigeria?(For contribution to knowledge see pages 182,183 and 184)
- What are the factors affecting gas flaring phase-out regulations as well oil spillage in Nigeria? ?(For contribution to knowledge see pages 185)
- Do the operating companies carrying out oil exploration in Nigeria comply with the stipulated environmental guidelines and standards in their operation and waste management? ?(For contribution to knowledge see pages 186)
- What are the available legislative and institutional framework and enforcement strategies in Nigeria and United Kingdom? ?(For contribution to knowledge see pages 186 and 187)

- How can the Nigerian government achieve its renewable energy obligations? (For contribution to knowledge see pages 188)

1.4 RESEARCH AIM

The research aims to propose a framework which can be used to enhance oil and gas exploration activities in Niger Delta. The resulting framework will highlight ways the Nigerian government can achieve and sustain its renewable energy obligations.

1.5 RESEARCH OBJECTIVES

At the end of this study, the following are the expected outcomes:-

- To analyse the impact of resource exploration on the environment of the oil producing communities in the Niger Delta. (Please see page 178)
- To review the literature and provide evidence based information showing the environmental cost of gas flaring as well oil spillage lost in terms of GDP. (Please see page 178)
- To compare technological advancements in the United Kingdom and identify areas of technological improvements and best practices in Nigeria. (Please see page 179)
- To examine existing legislative and institutional environmental policies and determine how the government can meet its renewable energy obligations. (Please see page 180)
- To evaluate how corporate social responsibility can be achieved in Niger Delta; (Please see page 180)

- To propose a framework which can be used to enhance oil and gas exploration activities in Niger Delta.
- To validate the findings and framework through literature reviewed as well findings from quantitative and qualitative data.

Suggest a framework or guideline under which Nigeria as can carry out oil and gas exploration activities with minor or no impact to the environment taken having lessons from the United Kingdom.

1.6 CONTRIBUTION TO KNOWLEDGE/NOVELTY

The research developed a framework based on qualitative and quantitative findings. The resulting framework highlighted or proposed ways the Nigerian government can achieve its sustainable energy obligations based on the findings and the review of relevant literature, as well findings from methodology adopted. The proposed framework can be applied both theoretical and practical. The research validated the conceptual/proposed framework on how to achieve sustainability during oil and gas exploration both in the UK and Nigeria based on the literature review and data analysis. Moreover the development of the variables identified, which are, corporate social responsibility requirement, management requirement, legislative requirement, technological requirement and environmental requirement, severed as the contribution to knowledge this in because Incorporating these requirement during oil and gas exploration activities would enhance economic growth and upholding the principles of sustainability and sustainable development.

1.7 STRUCTURE/OVERVIEW OF PHD THESIS

The Thesis or research is organised as follows:

Chapter Two: Literature review

In this chapter, I review a selected body of study considered relevant to inform the research. The review offers a refined analysis and insight for sustainable and sustainability during oil and gas exploration activities. This was drawn from relevant journals, books, newspaper published up to the time of this writing. This body of literature has been organised in addressing the research questions, Aim and Objective. The Review of relevant literature also served to inform this research study, providing evidence in relation to what has already been investigated and established in this field of research.

Chapter Three: Conceptual/Proposed framework

Having reviewed relevant literature related to the research, a conceptual/ proposed framework was suggested, because certain variables were identified to the cause of environmental impact of oil and gas exploration in Nigeria. These variables identified are as follows: Corporate social responsibility requirement, management requirement, legislative requirement, technological requirement and environmental requirement. The concept of sustainable development was also examined looking into its fact and fiction.

Chapter four: Research method and methodology

Chapter Four contains an elaborated discussion on the philosophical and methodological underpinnings of the research study. It presents a detailed description of the research method(Quantitate and Qualitative) used including my rationale for choosing the method to answers the research questions and objectives.it also contained the research design, the procedures of data collection, and questionnaire layout. This led to the research findings.

Chapters five: Research findings

The findings of the study contain two themes (UK and Nigeria Findings) which emerged from the analysis of the data collected through questionnaires, interviews and focus group methods. The findings presented by research participants, answered the research question (i.e.) the findings revealed a differences in oil and Gas exploration activities in the UK and Nigeria.

Chapter Six: Discussion of the findings, contributions, recommendations and limitation of the study

In chapter six, I situate the findings of the research in relation to the research question; discuss their relevance to the existing knowledge. I offer a critical evaluation of the research addressing important issues around its quality and limitations, and propose a number implications. The chapter concludes the thesis, by offering suggestions and recommendations for further research in the field.

1.8 SUMMARY OF CHAPTER

This chapter introduces the foundation and motivation (research problem) for this PhD research, as well as the aim and objectives of the research. In addition, the structure of the thesis is outlined. In the next chapter, the discussion of the secondary data (literature review) will be outlined in detail.

2.1 LITERATURE REVIEW

A reasonable number of studies has been carried on oil exploration and gas flaring by many researchers over the years. Some of the existing literature on this topic (past and present) will be reviewed to form a basis for the understanding and appreciation of the relevance of this study (Bruce, 1994). Some advantages of using a literature review in research include: A) it increases knowledge and understanding of the topic. B) It places one's research in a broader context, demonstrates an in-depth understanding of the subject, and identifies gaps in the existing literature

2.2 OVERVIEW OF OIL AND GAS EXPLORATION IN THE UNITED KINGDOM**2.2.1 Oil exploration**

Crude oil is regarded to be most important energy source in a global perspective, as approximately 35 per cent of the world's primary energy consumption is supplied by oil, followed by coal with 25 per cent and natural gas with 21 per cent (WEO 2006). The origin of oil exploration in the United Kingdom can be traced back to the early nineteenth century. In recognition of oil is importance and in an effort not to rely on importation during wartimes, its first oil exploration activity took place in 1918 (Woodward and Woodward 1973) this was largely unsuccessful. Years later due to the improvement of exploration equipment, the United Kingdom saw the need to look for an energy means to meet the demand of the growing population, It embarked on a major exploration search; this came under great criticism from the public but was highly rewarding when oil was later discovered in the valleys of Scotland and the Yorkshire area in the south England.

Arnold (1978), Upton (1996) contended that for oil exploration activities to take place in the United Kingdom there are conditions that must be satisfied, one there has to be a good chance that an oil reservoir exists, second an international legal framework allowing national jurisdiction over the continental shelf had to be in place and thirdly extraction or exploration must be seen to be economically feasible. The big question is do oil exploration companies truly follow these principles.

The United Kingdom continental shelf contains most of the country oil reserves (EIA 2011). The North Sea oil reserves were discovered in the early 1970s but weren't recognised by OPEC until the 1980s. Oil exploration and production in the North Sea is predominately made up of five countries namely, Denmark, Norway, Netherlands, Germany and the United Kingdom (North Sea oil and gas market 2008). However in recent years there has been a steady decline in the production of crude oil in the United Kingdom for example in 2004 the country produced 2.08 million bb/b , 13 per cent decrease from 2003 and a further 30 per cent decrease from 1999. Snyder (1999) , DTI (2002) and Robelius (2007) contended that the reasons for the decline range from the maturity of the country's oil fields, the application of new crude oil technology that leads to oil field exhaustion and increasing cost of production as it shifts to more remote and inhospitable regions. This decline posed a dilemma to the energy sector. There are six major refineries in the country; there are mapped out as shown below.

HISTORY: UK Oil Refineries

In 1979 there were 16 UK refineries in operation, today there are six.

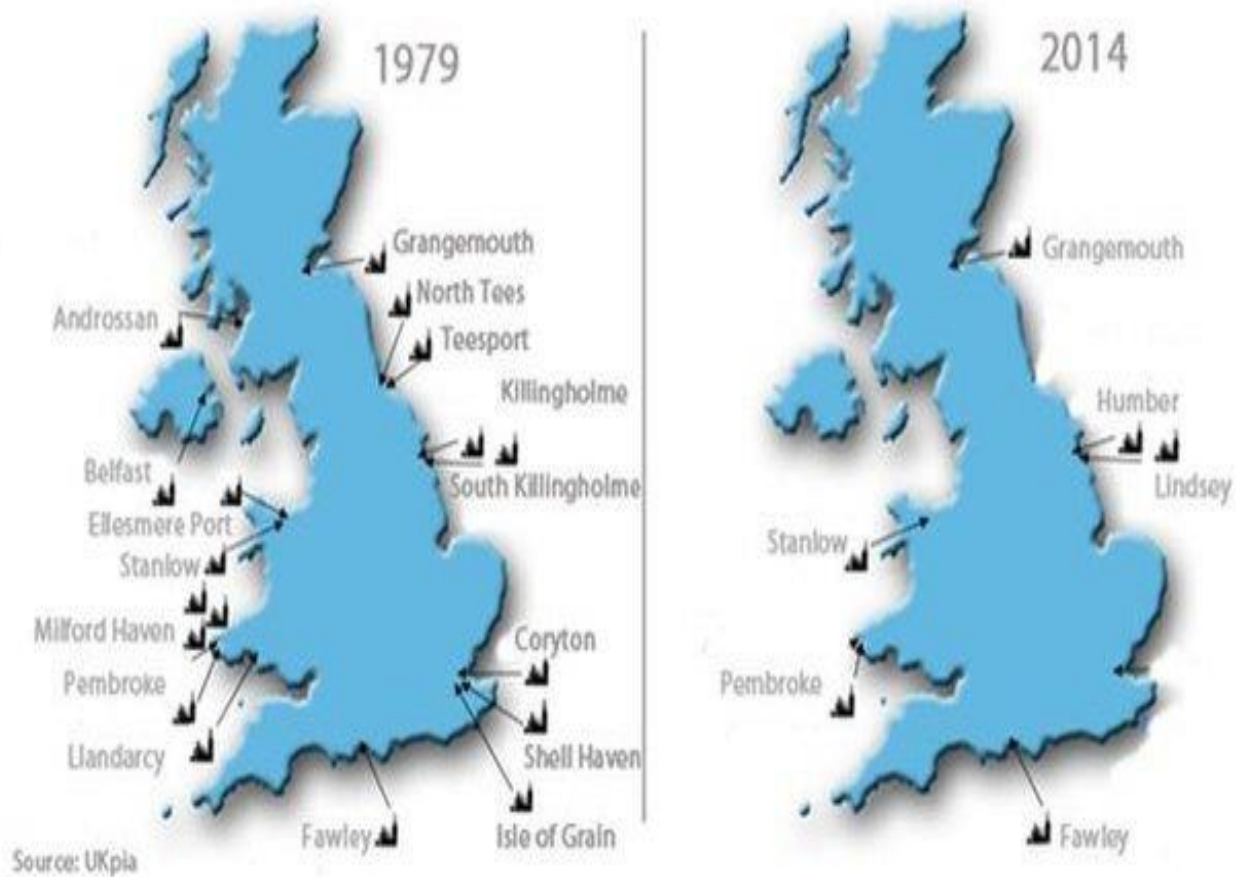


Figure 1 Major Refineries in the UK

Source: UKPIA .

All of which are located on the coastal areas of the country. UK oil sector currently supplies approximately 60% of UK energy demand, in 2008 the UK ranked 18th in the list of major oil and gas producing countries (DEC 2011). According to the richest people magazine (2011) the United Kingdom produces about 1.5 million barrels of oil per day and exports about 775,000b barrels. The UK oil sector supports about 350,000 jobs directly and indirectly (and another 100,000 are involved in exporting goods/services), the country has also benefited from the exportation economically as it provides around £8 billion annually to the Treasury in taxation (DEC 2011).

However due to the growing population the energy demand or crisis would be far greater than the oil peak itself (Raffle 2010) due to the fact that fossil fuel is on the decline and would eventually run out. For example in 2008 the population in the United Kingdom was approximately 60 million and the nation consumed approximately 268,628 thousand tonnes of oil equivalent (TTOE) of energy, of which 57 per cent was imported (ONS 2010) and (DECC 2010). Fossil fuel and oil covered 93 per cent and 34 per cent total energy consumed respectively. Energy created from fossil fuel created a large proportion of carbon emission. The United Kingdom is legally obliged to reduce carbon dioxide (CO₂) emissions by 80 per cent by 2050 (Climate Change Act 2008) and (Kyoto protocol 1997). The big question is by cutting down the use of fossil fuel will it reduce the energy demand of the population, how realistic are the underground storage process for example carbon storage and capture as (Rochon 2008) would carbon capture and trading be enough to reduce carbon emission and climate change, what are the alternative sources of energy in place and are these source of energy sustainable, these questions and more will be answered further in this research.

2.2.2 Causes of oil spillages in the United Kingdom

Environmental consideration have become an increasingly important topic to industrial and oil producing companies (Honkasalo et al., 2005; Mirasgedis et al., 2008; Schramm, 1998). With this in mind there is an increasing pressure from different stakeholders such as governmental and non-governmental agencies, and the public to address environmental concerns in relation to oil companies' activities (Ballesio et al., 2009; Ekins et al., 2007; PSA, 2008). This is because for any developmental project or oil exploration activities that take place, the environment is bound to be affected in one way or the other.

Hassol (2004) in his study explained that there are several factors that cause oil spillage. He stated that oil spillage is caused due to increased production and exploration at the same time; changing sea ice conditions are opening new navigational routes. USRC (2004) however contended that oil spillage probabilities or chances increase with a greater number of vessels and volume of oil transported as both cargo and fuel. The United States Protection Agency (2006) and Camphuysen (2007) stated that potential sources of oil spillage includes well blowouts during subsea exploration or production, acute or slow releases from sub-sea pipelines, releases from on-land storage tanks or pipelines that travel to water, or accidents involving oil transportation vessels or vessels carrying large quantities of fuel

oil. Anderson and Talley, (1995) also argued that arctic conditions, such as dynamic ice cover, low temperatures, reduced visibility or complete darkness, high winds, and extreme storms add to the probability of an accident or error that might cause oil spillage to occur. One can therefore say from the above that most oil spillage occurs either through “operation or accidents” however this agrees with Keisha Huijer (2004) who in his study stated that most oil spillage in the United Kingdom are caused as a result of either operation or accidents, operation he explained involves loading/discharge while accidents involves hull failure, collision and grounding. Since the United Kingdom imports and exports crude oil, it is important to note that the oil spillage is inevitable.

2.2.3 Impact of oil pollution in the United Kingdom

Having talked about the causes of oil spillage, its negatives abound. It is now over twenty years since the Brundtland Report drew the attention of the world to the need to re-examine our ways in the light of increasing use of resources with little or no concern for either the environment or future generations. Probably the world ignored the report thus leading to another call for a change of attitude five years later in what has come to be known today as the Earth Summit held at Rio de Janeiro. The summit produced the blueprint for sustainable development called ‘Agenda 21’. Ten years later, the World Summit on Sustainable Development held at Johannesburg came as a reminder to challenge the world for consciously ignoring the plea to protect the environment and use resources sustainably. By and large as the country strives to attain growth by through its oil exploration activities, so does the volume of waste relative to the limited capacity of natural environments and if not controlled would have an adverse effect for the generations still unborn.

According to the law of thermodynamics which states that we cannot destroy materials and energy but that they will always reappear as waste which will be discharged into the atmosphere, it implies that the amount of materials or energy (input) taken from the environment for the production and distribution of crude oil will always be equal to the waste (output) which will be discharged to the environment. One of the major negative effects of crude oil exploration is complications associated with oil spillage. Sebastian et al (2001) explained that oil exploration involves several environmental pollution or ecological violations (watts 2001) with this in mind there have been many studies stressing the environmental impact of oil spillage. For example a study carried out by Sanchez et al., (2006) and de la Huz et al., (2005) showed that oil spillage affects biodiversity, marine species like fish and has a social and economic impact on humans. Utvik, (1999) ; Boitsov et al.,(2007) agreed stating that waste

discharge during oil exploration contains chemicals these including alkyl phenols (AP), poly aromatic hydrocarbons (PAH), organic acids BTEX (Benzene, toluene, ethylbenzene, xylene) and heavy metals to name a few and these chemical have adverse effects on human life, wild life and marine life as well Khatib and Verbeek (2002) opined that exploration activities in offshore operations discharge large amounts of water to the surface since water is an inextricable part of every hydrocarbon recovery process. Several times, this contaminated water pollutes surface water and eventually find its way into rivers destroying aquatic life. Arukwe et al., (1997); Kortner and Arukwe, (2007) therefore stated more attention should be given to these issues as the resulting effect is a fragile ecosystem or maybe extinction of species. Likewise UNCTAD (2007) reported that environmental pollution caused by oil exploration also results in a destruction of livelihoods in local communities making it difficult for the present and future generations to enjoy life at its fullest. Bullard (2005) disclosed that the story is not different from what is experienced in some parts of Durban and Johannesburg, the oil and gas producing communities of Angola, Algeria, Qatar, Nigeria and Kuwait. The absence of a viable instrument of environmental legislation he argued has made transnational corporations to wage resource wars against native and indigenous peoples around the world, exploited the people, spoiled their land, inflicted health injuries on them and created environmental wastelands.

Today they cry for justice which is as a result of environmental injustice. However to address these issues there has been a great increase in the amount of legislation to curb this ugly trend (Moore 1999). Despite this legislation in place and improved exploration facilities Carpenter and Macgill (2003, 2005) reported that there still exist intentional oil spillages from oil exploration companies. UNCTAD (2007) Bloomfield (2008); Bisina (2004) stressed that the economic benefits which range from job creation, revenues from exportation, tax paid by oil companies and meeting the energy demand of the vast population, that exploration of oil literally should be stopped it results in poor health and diseases. The argument here is that crude oil is the main source of energy supply today. But the issue is that crude oil is non-renewable and should not be compared with the long lasting environment positives we enjoy.

2.2.4 Environmental legislation of oil exploration in the United Kingdom

Partidario (1996) contended that several governments as well as environmental assessment administrators at the end of the Rio summit started showing genuine concern regarding the probable

environmental effect. According to her, any authentic step towards achieving a sustainable society must among other things begin from the roots. This is because nearly all the organisations and companies that have come to be known as great or big today emerged either directly or indirectly through policies at one time or the other. Certain policies permitted their existence and survival to this day.

The environment is seen as a composite asset which provides a variety of services. Tietenberg, T. (1996) considers environment as a special asset because of its provision of a life support system which sustain our existence. The environment provides the economy with raw materials, which are transformed into consumer goods through production process, and energy, which fuels their transformation. Since the environment makes up the bases of human existence, we could therefore agree that there is a great need to protect it. Like every other country, the United Kingdom has legislation and regulations that oversee oil exploration. However, in the United Kingdom regulation is divided up into three national governments of Scotland, Wales and Northern Ireland (Boyes et al 2003); some of these laws includes the Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005; Offshore Chemical Regulations 2002; Food and Environment Protection Act 1985 (as amended); Merchant Shipping (Prevention of Oil Pollution) Regulations 1996 to mention but a few. These laws are dynamic and constantly developing because the laws are regularly amended to address new environmental concerns. They also serve as standards codes, guidelines and negotiated agreements with appropriate government agencies to facilitate the regulation of oil exploration activities.

Environmental legislation, regulation or laws operate through what may be seen as an open door process whereby environmental authorities, stakeholders and the community can offer their views and all results are incorporated and taken into account. In a study conducted by Leach et al (2002) to evaluate stakeholder partnership as emergent collaborative policymaking, it was revealed that their partnership has been most effective in thoroughly addressing local and serious environmental problems.

Consequently, Environmental regulation of the UK oil industry has become wider in scope and tougher in implementation (OPPC 2011). Since the oil exploration activities are closely regulated by the legislation above, oil companies are increasingly held accountable for their operations by means of environmental principles such as the precautionary principle, the polluter pays principles and

producer responsibility Edward et al (2001) further stated that oil companies exploring and developing the UK's oil resources are also subjected to European and international laws.

The United Kingdom is endowed with unquantifiable energy resources, these laws among others focus on better sustainable options during oil exploration activities. These laws or instruments will obviously compel oil multinationals in the country as they uphold the relevance of a holistic approach in facilitating the decision making processes while incorporating socioeconomic and environmental assessment elements. It will allow law makers, companies and government at all levels to weigh the environmental impact of any policy even at the point of formulation. One can therefore say that there assessment tools, regulations or laws are a dynamic procedure which ensures that the significant environmental effects arising from the energy and oil and sector (and other sectors) are identified, assessed, mitigated, monitored and communicated (www.trl.co.uk/main.asp?62).

2.2.5 Gas exploration and flaring in the United Kingdom

Gas is essential in the UK, it make up approximately 80% of the county total energy need. It mainly as a heat source to manufacture goods, Industries also uses natural gas as an ingredient in fertilizer, photographic film, ink, glue, paint, plastics, laundry detergent, and insect repellents. Synthetic rubber and manmade fibres like nylon also could not be made without the chemicals derived from natural gas to mention but a few (Oil and Gas UK 2006) figure 5 shows the production and consumption of natural gas in the United Kingdom. However the United Kingdom is also the third-largest indigenous gas resources within OECD Europe (NGI 2010). In the UK and like most developed countries that carry out oil exploration, gas flaring is mainly abhorred. Isishone (2004) explained that this act is possible because most developed countries have the technology advancement and also know the economic value of gas. For a better appreciation of this research, the concept of renewable energy, climate change, declined fossil fuel shall be reviewed. This is because a study on the UK oil and gas exploration is incomplete without making reference to the above listed issues.

2.2.6 The Legal Response to Gas Flaring In the United Kingdom.

The United Kingdom government came up with two main objective to curb gas flaring in the country. These are

- 1 To maximise the economic recovery of gas flaring during oil exploration activities.
- 2 To reduce greenhouse gases that contributes to global warming

These policies and objectives where put in place for maximising the economic recovery and was seen in the context of avoiding the waste of limited natural resources (Oil and Gas UK 2009). The second objective on the other hand aims to reduce greenhouse gas in the United Kingdom based on the Kyoto protocol by 12.5% below the level of 1990.

Although gas was flared at an alarming level in the United Kingdom during its industrial revolution, there was always an acknowledgement by the government that flaring of gas during oil and gas exploration was wasteful and not in the national interest. A succession of good legislation from the United Kingdom government over three decade has seen gas flaring reduced from approximately 90% to around 5 percent. Apart from the United Kingdom regulatory measures to curb gas flaring there are some non-regulatory factors or measures that have contributed, these include the opening up of the market for gas, private parties allowed to participate in the development of gas infrastructure and the provision of incentives (Gerner et al 2004).

2.2.7 Regulatory measures of gas flaring in the United Kingdom

To curb gas flared during oil exploration activities, the United Kingdom implemented two unique measures.

1 Direct regulation: This regulation was in the form of statutes and was put in place to prohibit gas flaring activities. Some of these statutes are as follows below.

- (A) Energy Act 1976: Section 12 of this Act prohibits the flaring or venting of gas without the consent of the Minister. Section 18(3) of this Act provides that criminal proceedings do not lie for noncompliance with section 12 but this is without prejudice to other methods of obtaining compliance with statutory obligations. This is an excellent piece of legislation in the sense that it adopts a flexible approach by strictly prohibiting gas flaring but at the same time, avoiding the use of criminal penalties to enforce the prohibition of flaring which would jeopardise the Petroleum industry which was nascent at the time of the enactment of this Act.
- (B) Petroleum Act 1998: Section 4(1) (e) of this Act requires the Minister to make regulations prescribing: “model clauses which shall, unless he thinks fit to modify or exclude them in any particular case, be incorporated in any such licence. *Malumfashi et al (2005)* explained that The Model Clauses are also provisions usually attached to a licence which defines the conditions in which the licence was granted. This legislation is detailed, flexible and gives a wide discretionary power to the minister and it is ideal for a developed country like the United Kingdom as it creates an avenue for checks and balances and this would be difficult in developing countries.
- (C) The model clause regulation: These are the Regulations made pursuant to section 4(1)(e) of the Petroleum Act 1998 by the minister. The most current is the Petroleum Licensing (Production) (Seaward Areas) Regulations 2008 which provides in paragraph 3 clause 23 that the Licensee shall not flare any gas from the licensed area or use gas for gas lift except with written consent of the minister. There is also the Petroleum Licensing (Exploration and Production) (Seaward and Landward) Areas Regulations 2004 and the Petroleum (Current Model Clauses) Order 1999 with similar provisions. This regulation gives detailed rules which give the minister power to prohibit any activity relating to gas flaring but also provide checks on the ministerial power providing the licensee shall be given a fair hearing by the minister.

INDIRECT REGULATIONS: These involve the use of fiscal measures and market Mechanisms to encourage the reduction of activities which cause the release of greenhouse gases into the atmosphere, these regulations were not created to specifically target gas flaring but because gas flaring contributes to greenhouse gases, it is embraced under these regulations. These are innovative

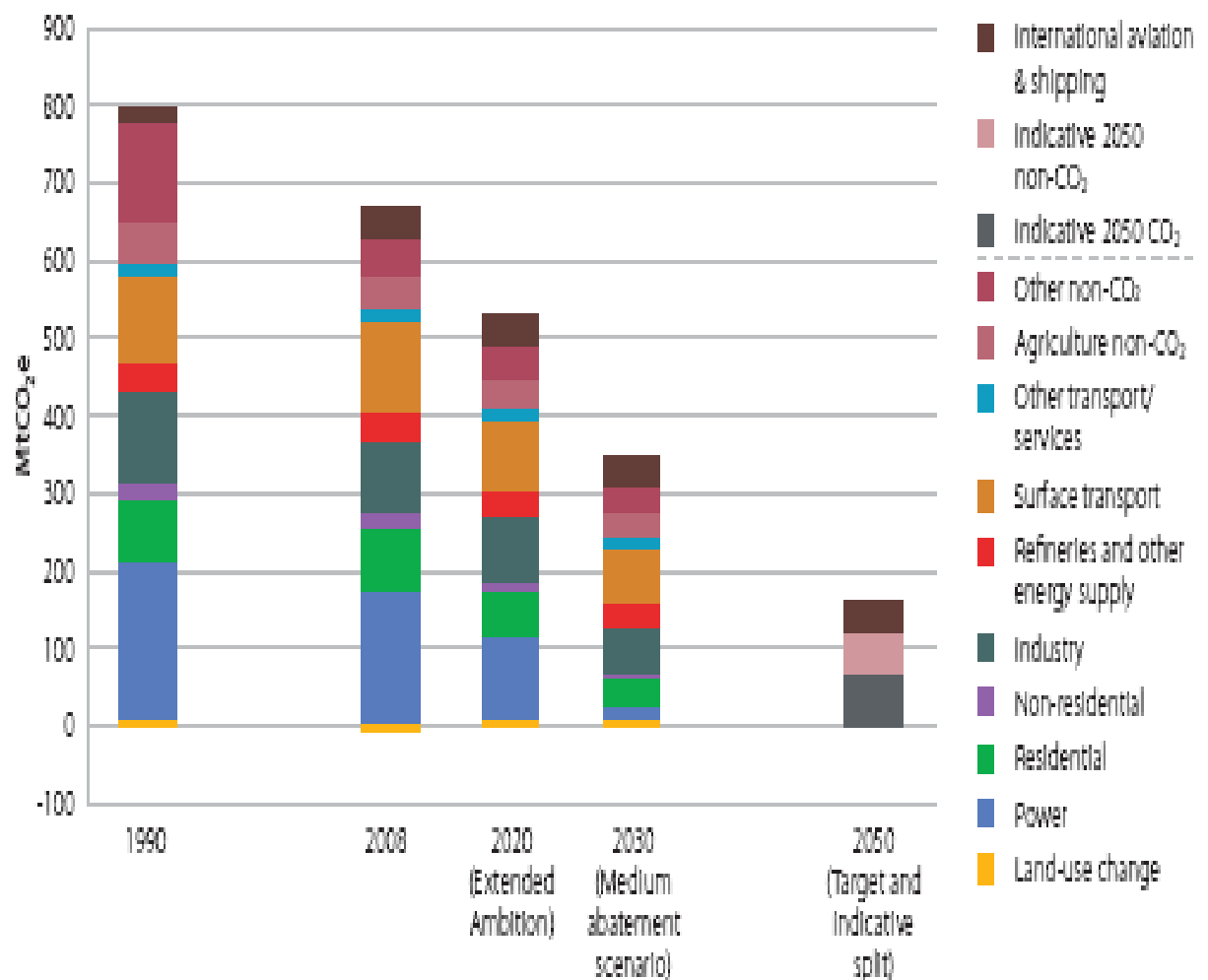
schemes that combine regulatory and non-regulatory Measures in the same policy. They are regulatory because they are enforced by the relevant authority. They are non-regulatory in the sense that their primary concern is not to prohibit the release of GHG into the atmosphere but to encourage people to reduce GHG emissions by providing incentives to invest in energy efficient technology. The fiscal measures include direct subsidies, financial incentives, tax credits and exemption to encourage development of new low-emitting technologies and energy efficient practices (Sierra Peterson 2007) and these measures are often applied with voluntary agreements entered into between the governments and actors in the energy intensive industries to reduce GHG Emissions. One such method is the use of tax to discourage the consumption of carbon intensive products applied under the Climate Change Levy of 2000, (Patricia Park 2006) resulting in a levy on all non-domestic use of energy.

However the market Mechanism is the European Union Emission Trading Scheme (EUETS) introduced in the European Union (EU) to help meet the EU greenhouse gas emission reduction target of below 8 % of 1990 levels under Kyoto Protocol. The notion is industries and companies are allocated emission allowances equivalent to the tonne of CO₂ which can be traded. The aim was to encourage industries and companies to reduce their emission level and by doing it cheaply to sell their unused allowances. It is the first mandatory international trading system for greenhouse gases in the world and regulates approximately 11,400 installations throughout the EU (Sierra Peterson 2007) Members of EU were given a target to come up with National Allocation Plans which determines the level of carbon emission and how many emission allowances each installation in their country receives. This gives the holder the right to emit one tonne of carbon and other greenhouse gases. The scheme was thereafter applied to in gas flaring and mean that to get a flaring permit, the operator must submitted a detailed monitoring and reporting plan which confirms the monitoring and reporting arrangement that would be implemented.

2.3 RENEWABLE ENERGY IN UNITED KINGDOM

Our planet is seriously threatened by a fast growing population and the accompanying impact for the environment (Arscott, 2003) The United State Department of Energy (2001) defined renewable energy to be energy sources which are continually replenished by nature. Renewable energy is the primary, domestic and clean or inexhaustible form of energy resources (Bilgen Et Al 2004) Kingston and Wagner (2004) state that fossil fuel still accounts for the highest percentage of energy use globally. Energy resources can be split into three categories: fossil fuels, renewable resources and nuclear resources (Demirbas A.2000) Renewable energy sources are those resources which can be used to produce continuously, e.g. solar energy, wind energy, biomass energy, geothermal energy, etc. and are also often called alternative sources of energy (Rathore 2007) Renewable energy sources that meet domestic energy requirements have the potential to provide energy services with zero or almost zero emissions of both air pollutants and greenhouse gases. However in accordance with targets of EU policy and the Kyoto protocol, 20% of all energy consumption across the EU must be from renewable sources by 2020. The UK energy white paper committed to curbing emissions and promoting sustainable energy consumption and came up with certain targets. These targets began at 3% in 2003 and is rising gradually to 10% in 2010 and 15% by 2015 (DECC 2011). As illustrated in Figure below, renewable energy accounted for 54 TWh (3.3%) DECC (2011) of the UK's total energy consumption in 2010, having increased steadily since 2005, and by 15% between 2008 and 2009.

Figure 8: Scenarios for UK greenhouse gas emissions (1990-2050)

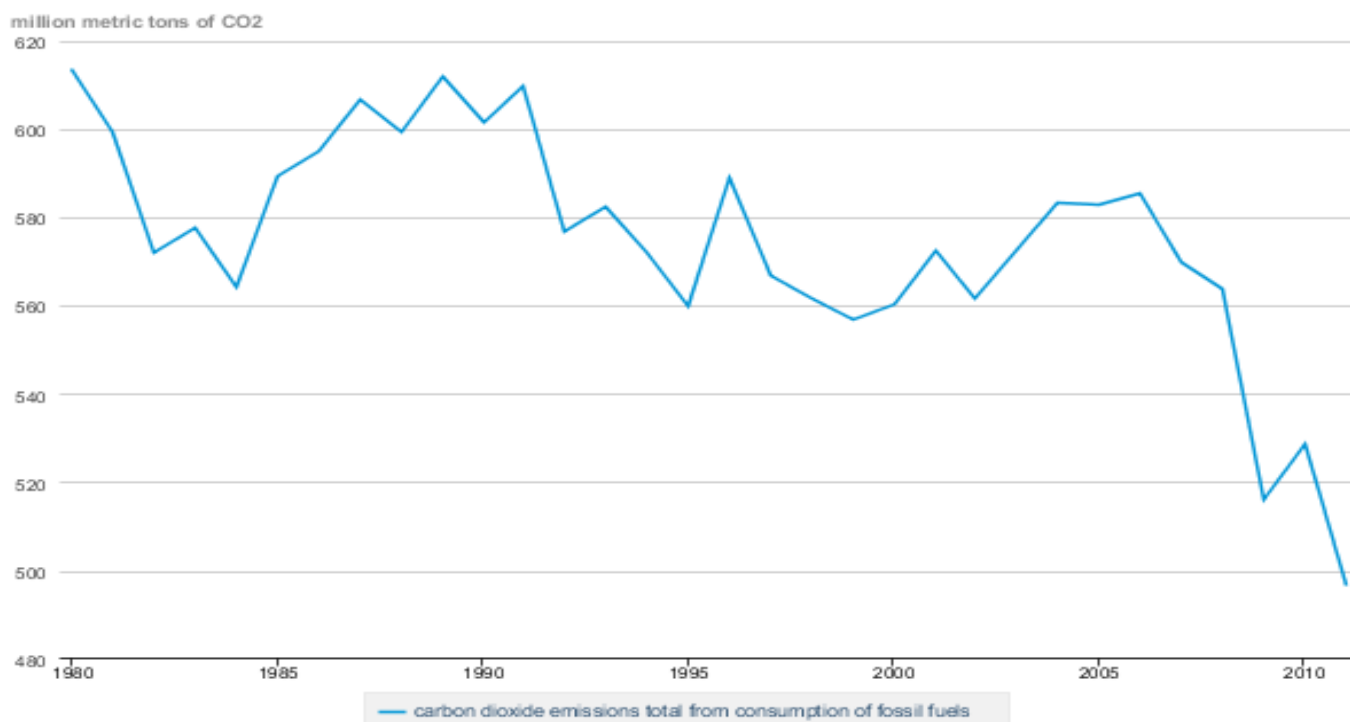


Source: NAEI 2010, CCC Calculations

Figure 2 Greenhouse Gas Emission forecast

Due to the commitment, investments and drive by the United Kingdom government to meet its renewable targets, the gradual decrease of fossil fuel has resulted. The figure below gives a clear insight.

United Kingdom carbon dioxide emissions total from consumption of fossil fuels (1980-2011)



Source: U.S. Energy Information Administration

Source: (DECC 2011)

Figure 4 UK Co₂ Emission graph from 1980-2011

2.3.1 Potentials of UK renewable energy resources

Like all well thought out concepts, renewable energy resource development is geared towards achieving the goals of energy security, carbon reduction and sustainable development. The UK has various renewable energy technologies they range from wind, solar, biomass to tidal and wave and each of them has both technical and economic potentials. The table 1 below shows an estimate of various renewable energy resources in the UK.

Table 1 Estimate potential's of some Renewable energy resource in UK

Technology Category	Technology Detail	Annual Potential
Wind power	Onshore	50 TWh
	Offshore	100 TWh
Bioenergy	Biomass	41 TWh
Geothermal	Ground source heat pumps	8 TWh
Hydro	Large scale	5 TWh
	Small scale	10 TWh
PV	Retro fitted and Building Integrated	1 TWh
Marine	Wave energy	33 TWh
	Tidal barrage	50 TWh
	Tidal stream	18 TWh
Total		~316 TWh

Source: Jamasb, Nuttall et al. 2008

Form the table above we can see that the United Kingdom is endowed with abundant renewable energy resources which will play a significant role towards its target to reduce carbon emission in the country. Nevertheless D Elliott and Toke, (2000) stated that various technologies to achieve these targets have impacts and this implies that there is a need to make a choice on the technology which seems fit and sustainable for further investment. But these renewable energy sources are not utilized to the maximum. Upreti and van der Horst (2003) contended that in Britain one of the main issues why it has not been able to maximize its renewable energy resource is in the planning process which as it stands is a major stumbling block. Local authorities and individuals are often so vigilant of their amenities for their sake and see them like a financial asset, signalling that wind turbines projects would disfigure their much loved landscapes and dispersed biomass conversion plants projects as well. These disagreement or objections have made new renewable energy projects of all sorts have proved vulnerable to further developments

2.3.2 Climate change

The development of various patterns of energy generation and use that can be sustained into the future is increasingly being seen as crucial, given growing concerns about the potential social and economic impacts of climate change. The most direct cause of climate change is known to be the burning of fossil fuel. In order to reduce this there are several options that could be taken. The simplest is for individuals to use a reduced amount of energy i.e. lower the use of energy devices in our homes by turning off our light when it's not needed, covering up under the duvet rather than putting on the heating all these goes a long way in the reduction of energy and carbon emission., this however means that our life style would be frugal in nature.

In this era of global warming and climate change, the UK government in its Energy White Paper 2007 pointed out its interest not only in saving energy and ensuring security of supply of energy resources but a very strong desire to significantly cut carbon emission. The Met Office (2007) explained the term climate change as the long-term change in climate and is usually used in the context of man-made change. The greenhouse effect is the term used to describe the warming of the earth due to human activities such as the burning of fossil fuels, greenhouse gases have increased and therefore also increased the heat trapped in the atmosphere. Parker et al., (1992) Parker and Horton, (2005) provide evidence of this, showing that 11 of the 20 warmest years between 1659 and 2009 have occurred since 1990. 2006 he further stated was the warmest year on record in the UK.

Climate change is regarded as a global issue. There have been various targets and frameworks set to tackle climate change. The Rio de Janeiro conference on sustainable development in 1992 saw the question of climate change being brought out into the international discussion. This led to the Kyoto Protocol (in 1997 and came into force in February 2005) shortly as this was the United Nations Framework Convention on Climate Change, which indicates that countries around the world should work together to cut emissions of CO₂ to help reduce the causes of climate change.

The effects of climate change are also experienced at a local level so it has been recognised that it's important to act globally, nationally and locally on this issue. Whilst a series of droughts during the

1990s and in 2003 (Beniston, 2004), and the extreme flooding in the UK during 2007 has led to a perception of climate change, trends in hydro-meteorological variables are obvious (Marsh and Hannaford, 2007). Other analysis carried out by Maraun et al. (2008) and Osborn et al. (2000) have shown a long-term increase in the intensity of winter precipitation within the UK, this corresponded with the projections from the UK Meteorological Office's Hadley Centre, of hotter and drier summers, and warmer and wetter winters (Hulme et al., 2002).

A number of international and national targets have been set to address the issue of climate change. In 2007 the UK became the first country to adopt a Climate Change Bill. The main aim of this bill was the UK's targets to reduce CO₂ emissions through local and international action by at least 60 per cent by 2050 and 26-32 per cent by 2020. If action is not taken to reduce greenhouse gases within 30 years there will be an irreversible effect on the global climate. In order for the government to achieve its target, local councils need to be involved as well by creating wider knowledge of climate change and sustainability through education and publicity.

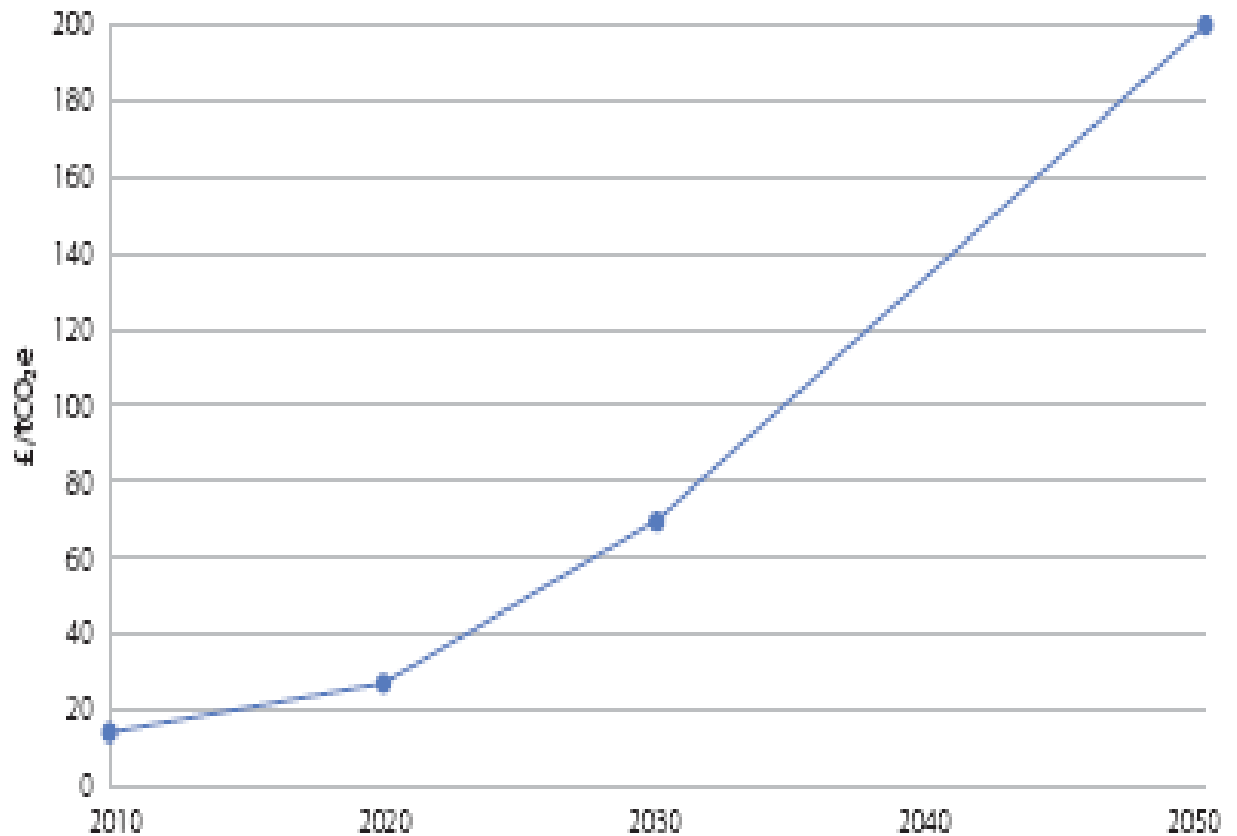
2.3.4 Carbon capture and trading

In recent years there have been intense and acute concerns over topical issues such as greenhouse gas emission control or reduction. This concern has led to various seminars, journal's and books on the subject of carbon emission. According to the 1997 Kyoto Protocol the European Union countries agreed to a cap on their CO₂ emissions to be achieved by 2008–2012, With particular commitment to overall reduction of 8% (from a 1990 base) in annual emissions. To achieve this various technology portfolio initiative have been implemented or invented to reduce carbon emissions in order to attain energy efficiency and conservation. Carbon capture and storage (CCS) could be referred to as an emerging technology to avoid GHG emissions. These technologies are used to separate CO₂ from natural gas and from the use of fossil fuel (MIT, 2007). Dooley et al., (2009) explained that carbon dioxide is captured from electric power plants or industrial sources, transported and injected into deep underground storage facilities, as it is estimated that carbon capture technology can reduce approximately 15% to 55% of greenhouse gases that cause climate change (IPCC 2005). However the IPCC (2001) stated that the capture of carbon is far from cheap and the estimated that it would lead to an increase in the price of electricity by 50 – 80% and would in turn reduce the efficiency of

electricity by another 10%. Moreover finding a place to store the captured gas is far from easy as well, this is where carbon trading can play a prominent role.

However to build on the Kyoto protocol the United Nations Framework Convention on Climate Change (UNFCCC) implemented a policy called the clean development mechanism and international trading there by creating a market for carbon trading and went fully operational on January 1st 2005, (European commission 2008). This means the scheme did not just enable companies and countries cut down their emission but also it created an avenue for incentives to invest in it like a business. According to Böhringer et al. (2005) in its initial stage free allowance allocation has been a necessary condition for the Emission Trading Scheme to be accepted by carbon-intensive industries with political clout. Henceforth Remond (2007) and Ellerman (2007) suggested that each member state should develop its own National Allocation Plan (NAP) which sets out a common objective and lays out a plan on how the emission trading scheme can be carried out. Furthermore Kruger et al. (2007) agreed saying first; this allocates the country's total BSA target between the trading sectors (those that initially participate in the ETS) and the non-trading sectors. Second, it specifies how the permits in the trading sector will be distributed among the individual sources. An example of how carbon capture, carbon trading or emission trading benefits companies, country and the environment? The European Union action against climate change 2005 answered this for example: If company A in the UK and company B in Netherlands both emit 100, 000 tonnes of carbon dioxide per year and in their national allocation plan their government respectively give them an emission allowance of 95 000 tonnes thereby leaving them with a shortfall of 50, 000 to cover. This now gives both companies an option either to reduce their emission by 50, 000, buy 50, 000 in the allowance market or taken a position in-between. And like every other company trying to maximise profit the most factor in cost before they make a decision on the option they would take. In the carbon market at the moment the cost or price allowance is 10 Euro per tonne of carbon dioxide so company A therefore calculates that cutting down its emission would cost 5 Euro per tonne of carbon so he does this rather than buying carbon allowance as it's cheaper. It might even go further and reduce its emission by 10, 000 given the opportunity. This is because based on recent calculation by DECC (2011) carbon prices are expected to take a dramatic increase. The graph/ figure 5 below gives more insight.

Figure 2: Carbon price projections (2010-2050)



Source: DECC 2010 CCC Calculations based on price for 2010.

Figure 5 Carbon Price projection (2010- 2050)

Company B in the Netherlands is in a different situation and adopts another means. Its reduction costs are EUR 15 per each tonne of carbon which is higher than the current market price, so it chooses to buy allowances instead of carbon reduction. This however means that company A would spend a total of EUR 50 000 on cutting down its emission by 10 000 tonnes at a cost of EUR 5 per tonne, but in turn receives EUR 50 000 from selling its allowances it no longer needs at the market price of EUR 10 each.

So company A has fully offsets its emission reduction cost by selling allowances, whereas without the emission trading scheme it would have had a total cost of EUR 25 000 to bear and assuming that it cut its emission by the 5 000 tonnes necessary. Company B spends EUR 50 000 on buying 5 000 allowances at the a price of 10 Euro each, so with the absence of the flexibility provided by the emission trading scheme it would have had its emission cut by 5 000 tonnes at a cost of 75 000 Euro. Carbon capture , carbon or emission trading now brings a total cost savings of 50 000 Euro for each company in the example above because company A chose to cut down its emission as it was a cheaper alternative, and the allowance that company B buys now represents real emission although it didn't reduce its own emission.

In spite of this, as Ellerman et al. (2007) pointed out, the world largest ever market for emissions or carbon trading has been established, and EU firms now face a carbon-constrained reality in the form of legally binding emission targets (Redmond 2007). Following this Laurikka and Koljonen (2006) suggested that there are some mechanisms that are likely to affect emission or carbon trading. Some of these mechanisms include emission allowance, monitoring emissions, and cost and how does it benefit non EU countries. Based on the various legislation, Acts and regulation in the United Kingdom stated above the graph below (figure 6) show a time line of how it would reduce its dependency on fossil fuel.

Figure 10: CO₂ emissions reduction to 2050 under Interim and Intended budgets

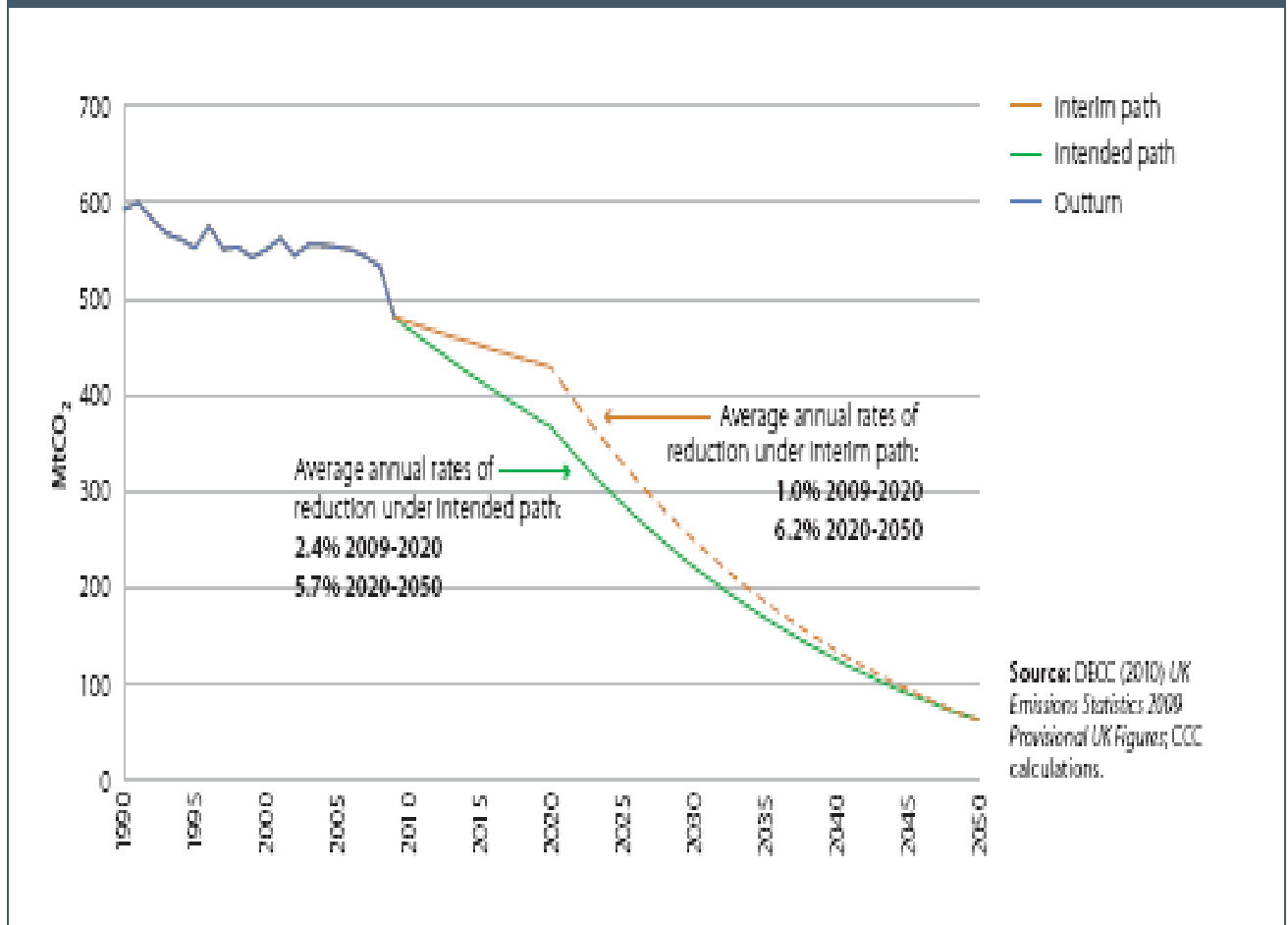


Figure 6 UK Co2 Emission reduction target by 2050

Figure 6 highlights the emission reduction target introduced by the UK government in order to achieve its sustainable development goals. Previous to that, an overview of oil and gas exploration in the UK was discussed and certain concepts were defined, explained i.e. renewable energy, climate change environmental impact from oil and gas exploration, legal and institutional framework in place etc. Next, an overview of oil and gas exploration in Nigeria would be examined in order to give a better understanding of the research.

2.4 OVERVIEW OF OIL AND GAS EXPLORATION IN NIGERIA

2.4.1 Background of Nigeria and Niger Delta

Nigeria is located in Western Africa on the Gulf of Guinea. The country has land borders with the Republic of Benin in the West, Chad and Cameroon in the East, and Niger in the north and has a coastline of at least 853km. Nigeria has a varied landscape, from the Obudu Hills in the southeast through the beaches in the south, the rainforest, the Lagos estuary and savannah in the middle and south west of the country and the Sahel to the encroaching Sahara in the extreme north. The country has two main rivers: Niger and Benue. The two rivers converge and empty into the Niger Delta, the world's largest river delta. Nigeria is a developing country, with a land area of 923,768 km², and a population of about 140 million with growth rate of 2.38. We can argue that Nigeria as a country plays a major role in the world energy market as the country is blessed with crude oil (Lawal 2004). But the oil belt is located in the Niger delta region which is located in the southernmost region of Nigeria. The figure 1. 6 below shows the Niger delta states:



Figure 7 Map Niger Delta States

Source: <http://ndwgnews.blogspot.co.uk/p/national.html>

Despite its high crude oil deposits, the majority of the Niger Delta's population lives in poverty. The United Nations Development Programme (UNDP) describes the region as a region suffering from "administrative neglect, crumbling social infrastructure and services, high unemployment rate, social deprivation, abject poverty, filth and squalor, and endemic conflict (UNDP 2006)

2.4.2 Oil exploration

Crude Oil is a main source of energy in Nigeria and the world in general (WEO 2006). Crude Oil being the main resource of the Nigerian economy, plays a vital role in shaping the economic and political destiny of the country (Onosode, 2003). Crude Oil was first discovered in Nigeria in 1956 at Oloibiri in the Niger Delta after years of exploration (Omofonmwa 2009). However the Niger Delta is one of the 10 most important wetland and coastal marine ecosystems in the world and has over 31 million people living in the region(NDTC 2008). The Niger Delta is also the location of massive oil deposits, which have been extracted for years by the Nigeria government and by multinational oil companies. Oil has generated an estimated \$600 billion since the 1960s Wurthmann (2006). Figure 1.1 shows the consumption, export and production of crude oil in Nigeria.

The figure 1.7

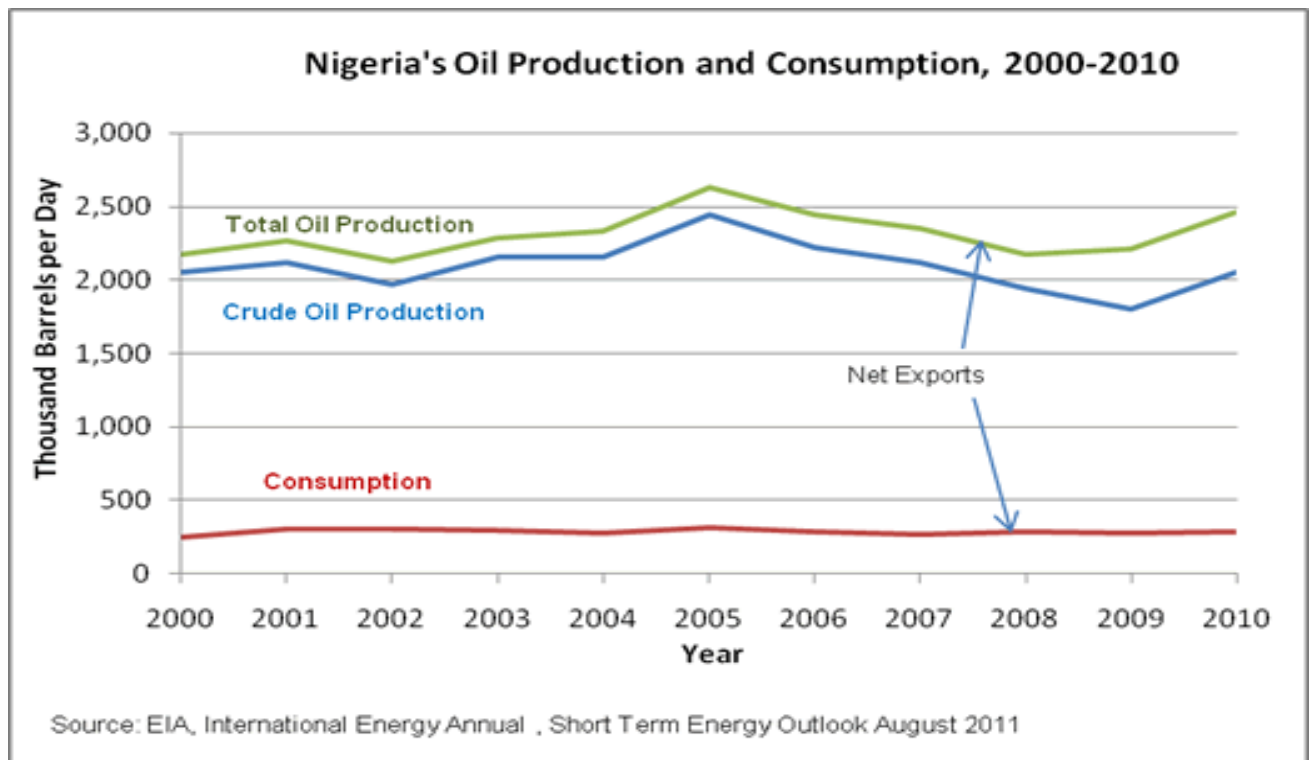


Figure 8 Nigeria Oil production and consumption from 2000-2010

According to the richest people magazine (2011) Nigeria produces 2.2 million barrels of oil per day, placing the country at 12th among oil producing countries, and the 4th biggest exporter, exporting 2.1 million barrels each day. Despite this, the majority of the Niger Delta's and Nigeria population lives in poverty. The United Nations Development Programme UNDP (2006) explained that the region suffers from administrative neglect, crumbling social infrastructure and services, high unemployment, social deprivation, abject poverty, filth and squalor, and endemic conflict. The majority of the people of the Niger Delta do not have adequate access to clean water or health-care.

However the fact that the people of the Niger Delta have not benefited from oil exploration activities and wealth is only part of the story. Widespread and unchecked human rights violations related to the oil industry have pushed many people deeper into poverty and deprivation, fuelled conflict and led to a pervasive sense of powerlessness and frustration (Aroh et al.,2010; Dadiowei, 2009); Osuji, Erondue, & Ogali, (2010) contended the area also has suffered from extensive environmental pollution affecting water and land due to oil spillages, resulting in a multi-dimensional calamity driven by the actions of

the security forces and militant groups, extensive pollution of land and water, corruption, corporate failures and bad practice and serious government neglect.

The big question is why there are a lot of environmental pollution issues in the Niger delta. The next section will focus on the environmental issues and factors responsible.

2.4.3 Causes of Oil Spillage in Niger Delta

The Niger Delta has endured and suffered for decades from oil spillage, which occurs both on land and offshore. Oil spillages on land destroy crops and damage the quality and the productivity of soil that individual communities use for farming. Oil in water damages fisheries and contaminates water that people use for drinking and other domestic purposes (Richard Steiner 2008). Nigeria has three refineries (Port Harcourt I and II, Warri, and Kaduna) that have a combined capacity of over 438,750 bbl/d, however there are a number of reasons why oil spillages happen so frequently in the Niger Delta, these spillages result from corrosion of oil pipes, poor maintenance of infrastructure, spills or leaks during processing at refineries, human error and as a consequence of deliberate vandalism or theft of oil (World bank 2005).

In previous years corrosion was acknowledged as a major problem with oil infrastructure in the Niger Delta. Infrastructure was old, and many pipes were above ground. Individual companies however renew aging facilities, to reduce the number of oil spillages in the course of its oil operations activities (SPDC 1995). However, today oil companies increasingly maintain that the majority of oil spills are caused by sabotage and not by their poor infrastructure or operational problems. The amnesty group (2008), Ehigie et al. (2005) and many NGOs, strongly disagree over the number of oil spillages that are attributed to sabotage, and they insisted the annual profit of oil multinationals is enough to acquire the necessary technology to stop oil spillages and accuse oil companies of designating controllable spillage as sabotage in order to avoid liability for compensation.

Moreover there is no doubt that sabotage, vandalism of oil infrastructure and thefts of oil are severe problems in the Niger Delta, though the scale of the problem is unclear. Sabotage issues ranges from vandalism by community members to theft of oil and deliberate attacks by criminal groups. Also people cause damage to pipes trying to steal small quantities of oil for sale at local markets or for their personal usage. Also damage is done to pipes and installations to extort compensation payments or

clean-up contracts from oil companies. In reflection of wider problems that exist in oil affected areas of the Niger Delta, for some of the individuals causing an oil spillage and getting a clean-up contract or compensation is the only way they see fit to access any benefit from the oil operations. Omofonmwan, S. I., & Odia, L. O. (2009), Adebayo, A., & Dada, A. S. (2008) blamed the government and oil companies for persistent oil spillages. They posited the government has not exhibited any sense of commitment to enforcing strong environmental legislation and pursuing an appropriate oil spillage policy and oil companies take advantages of these loopholes to gain more profit rather than doing what is right, stopping oil spillages that causes environmental impact, pollution and human health implications.

2.4.4 Impact of oil spillage in the Niger Delta and Nigeria

The continuous and unsustainable exploration, exploitation and production of crude oil is presently posing a threat to this essential resource in the Niger Delta region of Nigeria. Despite the region's tremendous potential to attain economic growth and industrialization, its future is threatened by worsening environmental and economic conditions that are not being sufficiently addressed by present governmental policies and actions (World Bank, 1995).

The Niger Delta as a region, though economically important in Nigeria, is ecologically fragile. The critical challenge therefore is how to minimise environmental damage and at the same time, promote social welfare amongst community members (Onosode, 2003). According to Onosode, the livelihood of people who inhabit the region, which derives essentially from farming the major resource activity in terms of finance, and undoubtedly environmental and socioeconomic impact, is oil and gas production. Pollution control and environmental laws are endorsed to protect human health and ecological objectives. In these laws, a substance is considered to be a pollutant if it has been perceived to have any adverse effects on human health and wildlife (Xu and Pang, 1992). In recent times, there are number of substances appearing to pose such threats (Pierce et al., 1997). Oil spillage and pollution first came to public attention with the Torrey Canyon disaster in 1967 (Pierce et al., 1997).

Opukri and Ibaba (2008) in a study on oil induced environmental degradation in the Niger delta region concluded that it results in internal population displacement. The study adopted a descriptive survey method of analysis using secondary data but it reflected only on one of the social effects of these activities on the people of Niger-Delta in Nigeria.

Aluko (2004) in a separate study on the environmental degradation and its impact on the Niger-Delta region used primary data sourced from thirteen different communities in the area and employed descriptive analysis. He went on to conclude that oil exploration activities in the region lead to environmental degradation and are it a responsible for the high degree of poverty in the area.

Gabriel (2007) in his study on environmental issues and challenges in the Niger-Delta focused on the impact on women is economic activities in the area. He used a theoretical approach and highlighted the emerging effects of the environmental hazards on the region and concluded that it has adverse effects on women is activities.

2.4.5 Impact on marine/aquatic life

Surface and ground water quality management are key issues having a profound impact on human's life. Crude oil contains some harmful substances that affect aquatic life and humans. Akpofure et al

(2000) contended that when oil spillage affects water, spreading immediately takes place. The gaseous and liquid components evaporate, of which some get dissolved in water and even oxidize, and also some undergo bacterial changes and eventually sink to the bottom by gravitational action. The soil is then contaminated with adverse effect upon the terrestrial life. Redondo and Platonov, (2009) agree that compared with other sources of pollution in the oceans, the risk of crude oil spillage into the sea presents the major threat for the marine ecology. The table 1.2 below highlights the World Bank report of some of the health and productivity consequences of water pollution.

Table 2 Health impact from Oil and Gas exploration in the Niger Delta of Nigeria

Source: World Bank report 1992.

Environmental problem	Effect on health	Effect on productivity
Water pollution and water Scarcity	More than 2 million deaths and billions of illnesses such as typhoid, cholera, river blindness and guinea worm are attributable to water pollution a year: poor household hygiene and added health risks caused by water scarcity.	Declining fisheries; rural household time and municipal costs of providing safe water; aquifer depletion leading to irreversible compaction; constraint on economic activity because of water shortages. Reduction in revenue and greater production costs.
Solid and hazardous wastes	Diseases spread by rotting Garbage and blocked drains; risks from hazardous wastes typically local but often acute.	Pollution of ground water resource

Fishing and agriculture is the main occupation of people from the Niger Delta area and careful management of the water resource is essential for development, industrialization and urbanization. Aigbedion & Iyayi (2007) argued that in many cases, community livelihoods are lost e.g. endangering fish hatcheries in coastal waters and as well as contaminating the flesh of commercially valuable fish. Fish in rivers in some cases die of pollution from oil spills, and groundwater pollution which is a main source of life and one of the main attributes for human existence. However in villages, communities where oil exploration activities are carried out, even when there has been no recent spill, an oily sheen can be seen on the water which makes potable water inaccessible or unhygienic for human consumption. Oil spillage also kills algae, disrupts major food chains and also decreases the yield of

edible crustaceans. It also affects birds, impairing their flight or reducing the insulative property of their feathers, thus making the birds more vulnerable to cold. Egborge (2000) Orubu *et al.* (2002), (UNDP, 2006) and Otukunefor and Biukwu (2005) all agreed that oil spillage and the pollution levels of aquatic ecosystems observed in the Niger delta region are a result of unregulated effluent discharges and unsustainable methods of petroleum extraction.

2.4.6 Agricultural impact

Before the discovery of oil in Olobiri Bayelsa state Nigeria in 1956, agriculture was the mainstay of the Nigerian economy and it contributed more than half of the Nigerian GDP but in recent years have seen it steadily decline whereas the oil industry now makes up most of Nigeria GDP (Omofonmwa and Odia, 2009).

The introduction of hydrocarbon into the soil environment can occur from pipeline blow-outs, waste deposition after drilling oil and gas wells, road accidents, leaking underground storage tanks, land farming and uncontrolled landfill (Chaineau et al., 2003). Inoni, Omotor, and Adun (2006) revealed that oil spillages could lead to a reduction in farm crop yield and decrease in farm income. Such impacts could possibly frustrate the locals as agriculture is their main occupation. This however is aggravated by unfulfilled promises of social responsibility by oil companies and the government. Baker, (1970); Kyung-Hwa et al., (2004) agreed that the presence of hydrocarbons from oil spillages can lead to lack of germination of the farm seeds (Dorn and Salanitro, 2000), and unsatisfactory soil conditions. Soil and fertility conditions may be poor due to insufficient aeration which is caused by decreased air filled pore space, and increased oxygen demand caused by oil decomposing microorganisms, as well as a reduction in the level of available plant nutrients.

2.4.7 Social impact and oil rent control

In Nigeria the coastal environment is very rich in mangrove ecosystem; the mangrove which is a source of fuel for the local habitants has now been destroyed due to the toxicity of oil spillage and has resulted in tension between oil companies and indigents living in the Niger delta region (Nwilo & Badejo 2005). Oil Pirates are stealing Nigeria's crude oil at a phenomenal rate, funnelling over 300,000 barrels per day and selling it illegally on the international and local markets.

(Nwilo and Badejo, 2005). Illegal fuel siphoning because of the thriving black market for petroleum products has resulted in an increased number of oil pipeline explosions in recent years. For example in July 2000, a pipeline explosion outside the city of Warri caused the death of 250 people. An explosion in Lagos in December 2000 killed at least 60 people, (Nigeria Country Analysis Brief, 2005). Also the other major oil spillage incident to affect the social life of people living in the Niger delta region was the Jesse fire incident in which thousands of lives were lost and the Idoho oil spillage in January 1998 where over 400,000 barrels of oil were spilled (Nwilo and Badejo, 2005) Another ugly aspect of the negative impact of oil spillage in the Niger delta and Nigerian economy is the constant and on-going dispute over the control of crude oil resources and oil rent. Evident distributive inequity, the neglect and bias in the sharing of oil rent against the oil producing areas and communities over the years, despite the severe negative environmental impact, have generated serious rancour which has been a source of immense threat to the unity of Nigeria.

However there also exist relentless conflicts between the Federal Government, oil producing states, and non-oil-producing states, the Federal Government and oil communities, state governments and local governments, state governments and the multinational oil corporations and the multinational oil companies and the oil communities. Worse still, intra-ethnic and inter-ethnic fights for oil-resource control are not uncommon. The current hostilities in the form of hostage taking, kidnapping of oil workers and wanton destruction of oil installations in the oil-rich Niger Delta are all evidence of this.

2.4.8 The Laws Governing Oil Exploration and Exploitation in Nigeria

In Nigeria there are a number of laws which already exist in the Nigerian oil industry. Most of these laws provide the conceptual framework for oil exploration and exploitation. However, only some of these laws provide guidelines on the issues of pollution (Salu, 1999). According to the Federal

Environmental Protection Agency, Lagos Nigeria, the following relevant national laws and international agreements are in effect namely:

The Mineral Oil (Safety) Regulations 1963: This deals with safe discharge of inflammable gases and provides penalties for contravention and non-compliance.

Petroleum Regulations 1967: This regulation was put in place to prohibit discharge or escape of petroleum into waters within harbour area and make provisions for precautions in the conveyance of petroleum and rules for safe operation of pipelines.

Petroleum Drilling and Production Regulation 1969: This regulation requires licence holders to take all practical precautions, including the provision of up-to-date equipment approved by the appropriate authority to prevent pollution of inland waters, river water courses, the territorial waters of Nigeria or the high seas by oil or other fluids or substances.

Petroleum Refining Regulations 1974: This regulation deals, among other things, with construction requirements for oil storage tanks to minimise damage from leakage.

Oil Pipeline Act 1956 (as amended by Oil pipelines Act 1965): This also deals with measure to ensure the pollution of land or any waters.

Oil Pollution Act 1990: The Oil Pollution Act 1990 provides guidance for the government and industries on the prevention, mitigation, clean up and liability. It also creates a comprehensive scheme ensuring sufficient financial resources are made available for oil spill clean-up and compensation. It ensures the federal system is adequately prepared to manage impacts and mandates the industries to implement prevention measures (Ukoli, 2005).

Nigerian law provides that all minerals, mineral oils and natural gas are the property of the federal government. Accordingly, the Petroleum Act requires a licence to be obtained from the Ministry of Petroleum Resources before any oil operation prospecting, exploration, drilling, production, storage, refining, or transportation is commenced. Only a Nigerian citizen or a company incorporated in Nigeria may apply for such a licence. The federal ministry of environment in Nigeria is responsible for making and enforcing this legislation and decree, as these documents are the framework to achieve

sustainable development (Ntukekpo, 1996). The minister of petroleum resources has general supervisory powers over oil company activities, and may revoke a license under certain conditions, including if the operator fails to comply with “good oilfield practice.” Good oilfield practice is not defined in the decree, but the Mineral Oils (Safety) Regulations of 1963, promulgated under the Mineral Oils Act (the predecessor of the Petroleum Act), states that good oilfield practice “shall be considered to be adequately covered by the appropriate current Institute of Petroleum Safety Codes, the American Petroleum Institute Codes, or the American Society of Mechanical Engineers Codes,” thus effectively binding oil companies to respect international standards in their operations in Nigeria. The Nigeria legislation, regulation as well as acts is quite sufficient and designed to safeguard the environment from the negative impact of oil spillage and exploration activities in the Niger delta region of Nigeria. So the existence of oil spillages during exploration activities in the Niger delta region is a fact that is still unknown with the various laws, regulations in place.

2.5 GAS FLARING IN NIGERIA

The constant increase in concentration of carbon dioxide and related greenhouse gases in the atmosphere since the industrial revolution has led to serious irreversible changes in the global climate. With global population growth and increase in living standards, especially in many developing countries, the greenhouse gas emissions will undoubtedly increase (Rahimpour and Alizadehhesari,

2009). Therefore, the petroleum industry has struggled with how to curb this age-old practice of burning the natural gas that often comes out of the earth during crude oil exploration and production.

In various oilfields, large volumes of gas are produced with crude oil when it is brought to the surface. Around the world where well-developed gas regulation, gas infrastructure and a gas market is lacking, this associated gas is often released into the atmosphere. This is particularly true in the Niger Delta area of Nigeria where much of the oil has a high proportion of this associated gas, so associated gas is usually burned off safely, a process known as gas flaring (Shell Oil, 2011). There has been a global call for its reduction because of the many negative consequences involved with it, some of which are reviewed in this section.

Gas flaring was defined by Al - Otaibi et al (2008) as the process of burning off excess combustible vapour from the well during oil exploration and production. Flaring, they also argued, is done either as either a safety initiative to relieve well pressure or a means of gas disposal. Beychok, 2005; Shore, (2006) however stated that gas flaring is the burning off of unwanted gas and liquids discharged by pressure valves during emergency over pressuring of plant equipment. This was further extended to include the burning off of unwanted gas in oil wells, rigs and refineries.

A general feature of these definitions above is that gas flaring is usually an intentional action to burn up waste natural gas. According to Ritter (2008) this action is embarrassing having in mind that the reduction of greenhouse gases still remains a high priority both scientifically and politically of various countries agenda around the world. Since gas flaring has consequences, many countries around the world are making a frantic effort to stop it, such as the introduction of carbon trading techniques. Gas flaring has caused destruction of natural resources, health issues, and reduction of economic resources which could be used as other means of energy to better the welfare of humans (Broere, 2008). This is a very important issues being faced by developing countries that carry out oil production of which Nigeria is one of them. Table 3 below shows the top twenty countries that flare gas in the world and topping the list is Nigeria as well graphical table

Table 3 list of top twenty counties that flare gas

Country	Total gas production	Gas flaring	Percentage flared
Nigeria	56.4	24.1	42.6
Russia	640.6	14.9	2.3

Iran	152.5	13.3	8.7
Iraq	11.4	8.6	75.4
Angola	8.5	6.8	80.00
Venezuela	57.8	5.4	9.3
Qatar	57.6	4.5	7.8
Algeria	186.8	4.3	2.3
Indonesia	88.9	3.7	4.2
Equatorial guinea	3.8	3.6	94.9
USA	664.2	2.8	0.4
Kuwait	15.1	2.7	17.9
Kazakhstan	26.5	2.7	10.2
Libya	19.7	2.5	12.7
Azerbaijan	5.8	2.5	43.1
Mexico	44.8	1.5	3.4
United Kingdom	95.1	1.6	1.7
Brazil	17.7	1.5	8.5
Gabon	2.1	1.4	66.7
Congo	7.1	1.2	16.9

Source: Energy International Administration (Energy Information Administration, International Energy Annual, 2007).Source: World Bank (World Bank report, 2008).

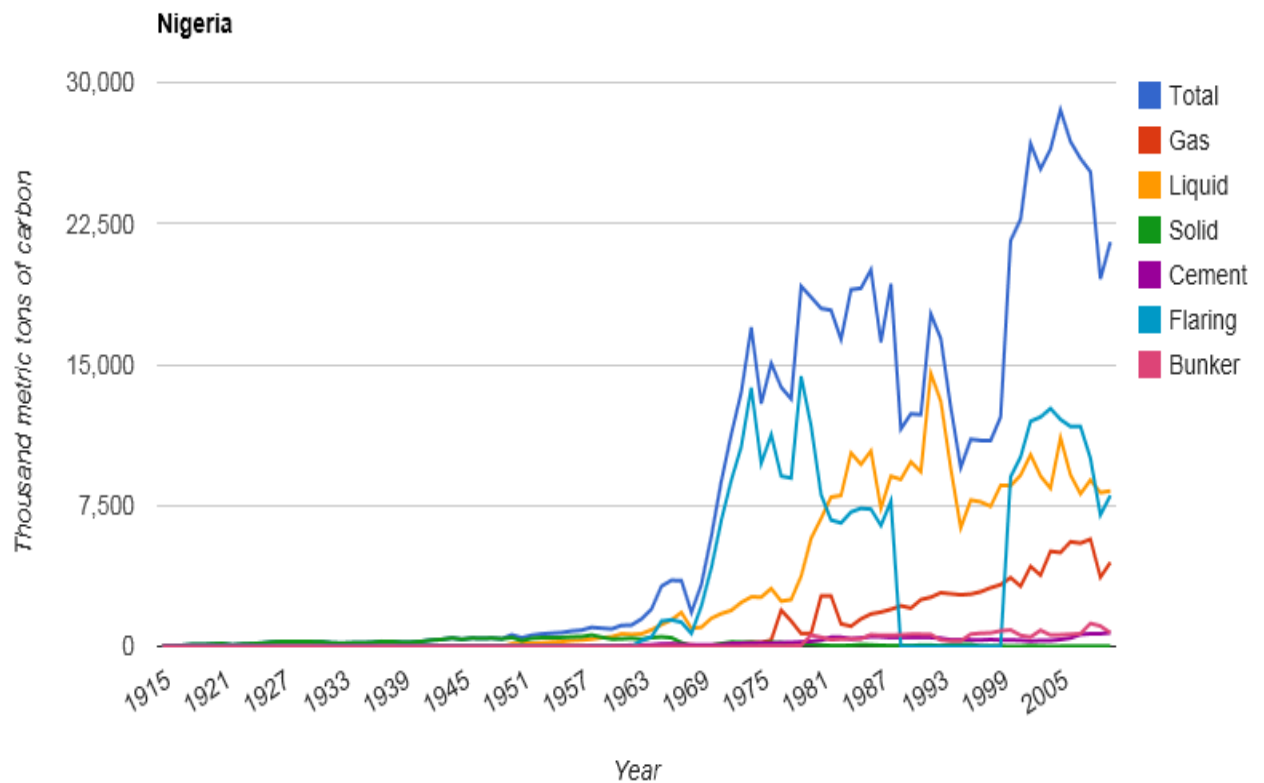


Figure 9 Nigeria Gas flaring graph from 1915 -2005

Carbon dioxide information analysis centre (http://cdiac.ornl.gov/CO2_Emission/timeseries/national)

Tolulope (2004) tells that there are several reasons given for gas flaring, which had led to controversial debate between environmental activists that argues it's not morally justifiable and oil multinational that think otherwise. The fact is in order to tackle gas flaring issues, there is a need to comprehend why natural gas has been flared. The next section attempts to identify the factors responsible.

2.5.1 Causes of gas flaring

Al- Otaidi et al (2008) identified that there are four major reasons why oil multinationals really flare gas. The study and investigation carried out shows that cultural belief plays an important role in prompting gas flaring. They further went on and argued that oil workers generally have the opinion that gas is a waste product that they can simply get rid of to pave the way for the most treasured resource oil. Secondly oil concession contracts regularly allow the flaring, so oil companies are not under an obligation to find a sustainable market for the gas. And closely linked with this is the fact that developing countries do not have a well-developed or sustainable market for natural gas. Furthermore the government has also failed to develop a viable and attractive incentive to maximise the economic use of gas which would be an alternative to control its emission. Other factors responsible for gas flaring are listed below

Lack of a strong and consistent fiscal, legal, and regulatory framework and institutions to interface with international investors (Energy Sector Management Assistance Programme (ESMAP), 2004; ICF 2006)

Lack of a clearly defined long-term vision for the natural gas sector due to the inadequate capabilities and overlapping responsibilities of government institutions (ESMAP, 2004; Gerner et al., 2004; Ishisone, 2004; Omakaro, 2009)

Failure of the government to redeem its financial obligation under the existing joint venture (Ishisone, 2004)

Low demand for gas in both the domestic and regional markets because of reduced industrial activities and low domestic oil price (Sonibare and Akeredolu, 2006)

The presence of an enormous amount of natural gas deposits makes it more economical for the government to use non-associated gas as an energy source rather than harvesting the associated gas (Ishisone, 2004).

Limited studies and low level of environmental awareness of the cost and impacts of gas flaring in the country (Ishisone, 2004)

In addition to the above Ashton et al (1999) and Watts (2001) contended that since oil and gas are mixed in every oil deposit, the natural gas which is also referred to as associated gas must be got rid of before refining can continue. Gas flaring and the burning of associated gas is often the preferred option for oil companies in an oil producing and developing country like Nigeria. They also strongly criticised the actions and procedures of the oil companies for deliberately flaring gas of which it could be re inject or recover the gas which in the practise in the developed country in which they operate also. On the other hand Osaigie et al (2010) disagree with claims from oil multinationals that lack of infrastructure and market is the main cause why associated gas is been flared. They insisted that individual companies should uphold the same procedure in developing countries in which they also operate. Sonibare et al (2006) and Yakubu (2008) went on and blamed oil companies and the government for flaring gas. They however posited the government to enforce or creating a viable legislation to put an end to the flaring of gas as well as a market to re-inject into other uses, as oil multinationals are taking advantage of the fragility of these loopholes to maximise their profit as this leads to environmental and health impact and implications.

2.5.2 Environmental impact of gas flaring

Nigeria as a country currently has proven natural gas reserves of approximately 182 TCF (trillion cubic feet), which makes the country's gas reserves the seventh largest in the world. Also the gas quality is high, virtually without sulphur, low in CO₂ and very rich in liquids (condensate) content. However, Nigeria is among the top gas flaring countries of the world, accounting for about 16% of global gas flares (Akachidike, 2008) also see table 1.3. Gas flaring is generally and continually recognised as a major environmental issue (Otaibi 2007) and it calls for immediate concern because of the continuous increase of greenhouse gases CO₂ in the atmosphere as it is the main causes of climate change. The World Bank (2007) also contended that gas flaring contributes to greenhouse gases and harms the environment; it could be used as a good source of energy which is wasted by most developing countries like Nigeria. The World Bank furthermore estimated that about 100 billion cubic meters of natural gas are flared annually, which is an equivalent of the gas consumption of France and Germany. The World Bank also submitted that the largest flaring country is Nigeria see table 1.3 for information.

Yakubu (2008) and Ojeifo (2009) in separate reports carried out on the environmental impact of gas flaring in the Niger delta region of Nigeria pointed out that gas flaring causes acidic rain in the region.

They highlighted that the combination of atmospheric moisture, sulphur dioxide (SO₂) and nitrogen oxide (NO₂) pollute the land, especially farmland and water resources. A report by the climate justice environmental rights action/friends of the earth (2005) quoted a government official saying that; For many years I and everyone in the community have been living with continuous flaring of gas, our farm lands have been polluted, we labour hard to plant our crops but at the end of the day nothing comes out. Our zinc roofs have corroded, our air is polluted. Our children are sick, even the rainwater we drink is contaminated with black soot from the gas flares. We cannot continue to live or suffering in this manner. We need legal action to protect our lives, our children and that of the generations yet to be born. This however summarises the general situation of pollution in the Niger delta area.

The above corresponded with a study carried out by Isishone (2004) who disclosed that people living in the Niger delta area of Nigeria or oil producing communities' residents have always had acid rain from gas flaring activities and this causes corrugation of their zinc roofs. Another report carried out by the US Energy Information Administration (2003) stated that the major constituent of gas flaring causes air pollution firstly from the sheer quantities of hydrocarbons being burnt off, but also because the gas being burnt is not only natural gas (mostly methane) it also heavier gas types and pollutants like hydrogen sulphide (H₂S), which give off more air pollution. In addition to nitrogen and sulphur oxides (which cause respiratory problems and acid rain) and un-burnt methane, the flaring also gives off cancer-inducing benzene and other toxic gases.

2.5.3 Health impact of gas flaring

Because of its rich oil deposits and massive exploration in the Niger delta the ramifications on human's health, environment, culture and indigenous value are very severe. And in most cases in developing countries the economic and political benefits are given more weight or priority resulting in damage to the environment and human health (O'Rourke and Connolly 2003).

Zadakbar (2008) and Isishone (2004) both contended that not only does gas flaring cause's environmental degradation but also causes a health risk to humans. Kindierski (2000) also added that gas flaring in the Niger delta region in Nigeria is characterised with incomplete combustion and emits a variety of compounds ranging from propane, methane and other hazardous air pollutants which include volatile organic compounds, polycyclic aromatic hydrocarbons and soot.



Figure 10 Gas flaring from Oil Multinationals Companies

Source: (Environmental Rights Action, 2004)

Ezzati, Kammen (2002) and Kindierski (2000) went on and argued that the effect gas flaring as shown in figure 1.4, has on human's health is related to exposure of humans to these hazardous pollutants causing or resulting in various health impacts which include acute respiratory infections, asthma, cancer, chronic obstructive pulmonary, tuberculosis and so on. Osuoka and Roderick (2005) also agreed saying that due to the exposure of humans living in the Niger Delta region to gas flaring, they are prone to diseases ranging from leukaemia, asthma and various blood disorder diseases. The exposure of individuals living in this region violates the Nigerian constitutional provision, for example the fundamental right act to life (article 33) and human dignity (article 34), also it violates the rights guaranteed in the African charter on humans and people's rights, i.e. that every individual has the right to enjoy the best attainable state of physical and mental wellbeing (article 16).

Thus, individual communities and people of the Niger Delta region are in a battle for their existence as the flaring of gas continues to assault their fundamental human right. Moreover as a result of this degradation of the environment over time has resulted in the communities in the areas affected agitating for compensation (Alakpodia 2000). This tension has in turn bred militancy in various form ranging from the attacks on oil facilities, kidnappings, assassinations to a general break down of law and order in the Niger-Delta; the violence and tension in the area have in turn had an adverse effect on the country's oil production output thus resulting in dwindling revenue from crude oil sales and exports (Ebiri 2010; Akasike and Adelokun 2010).

2.5.4 Economic impact of gas flaring

Arcott (2003) stated that Oil and gas production and extraction is a threat to sustainable development and that there should be a true and approximate balance between the environment, social and economic capital. Rajnauth (2003) asserted that the availability of an economic supply of energy is important for the economic and social pillars of sustainable development. Oil and gas still and will remain the major source of energy till alternative forms of energy become economically available for use. He went on further stating that during this period, which can also be referred as a transition period, the oil and gas industry needs to manage its operation safely and wisely to significantly reduce emissions, discharges and ecological impacts while at the same time providing energy at a very reasonable cost, this however is not the case in Nigeria (O'Rourke and Connolly 2003). Figure 11 and table 4 show in cubic feet which would have been of economic use flared in Nigeria.

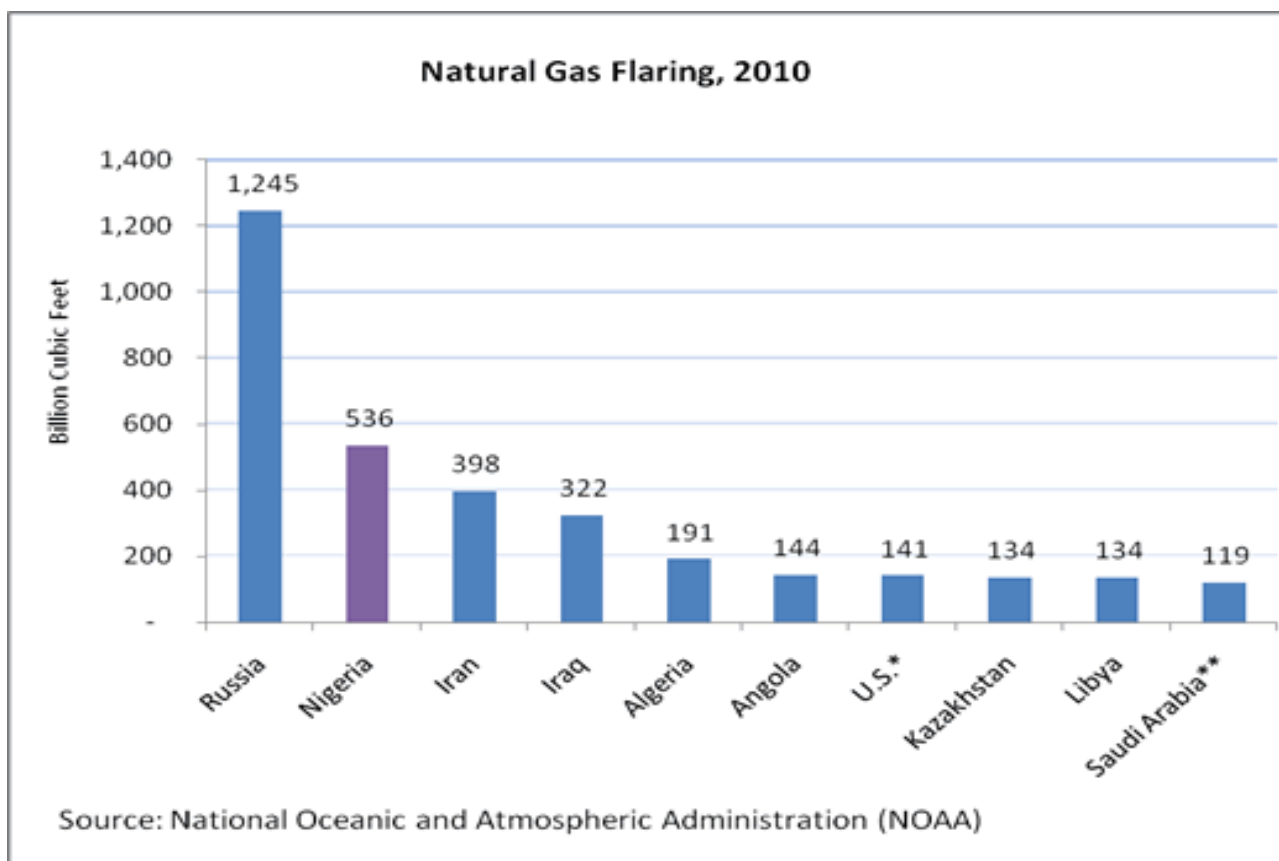


Figure 11 List of 10 top countries that flare Gas

Table 4 percentage of gas flare from 2000 -2008 in Nigeria

Year's	Gas produced	Gas utilised	Percentage of gas utilised
2000	12448	2194	17.6
2001	11211	2963	26.4

2002	12244	26203	21.4
2003	53379	30583	57.3
2004	69748	45156	64.7
2005	58247	34818	59.8
2006	57754	39375	68.2
2007	53509	36921	69.0
2008	57061	41084	72.0

Source: Nigeria statistical bulletin 2005 to 2008

Nigeria as a country flared approximately 536 bcf of associated gas during oil exploration in 2010 (NNPC 2010); this contributes to the world carbon footage as it goes on to put pressure on the Kyoto protocol to achieve its targets. On the other hand the NNPC claimed that flaring cost Nigeria US \$2.5 billion per year in lost revenue.

The flaring of gas is deemed a waste. An analysis carried out by the World Bank in 2008 shows that gas flaring in the Niger delta region of Nigeria continues unabated. Nigeria as a country is still among the top three countries that flare gas during oil exploration activities evidence and statistics are shown in table 1.3. at the same time most Nigeria find it hard to afford cooking gas and most companies in the country's lack the required energy resources to operate at full capacity (Alakpodia 2000). With this in mind Gulzhan (2006) contended that gas flared into the atmosphere can be used as an alternative source of energy and this would remedy Nigeria's energy issues as it's the practice in developed countries such as the United States, United Kingdom. The USEIA (1999) agrees with this stating that the amount of natural gas wasted in Nigeria represents about 24% of the country's energy consumption.

As part of the Nigerian government legislation, one of the requirements is that oil companies set up facilities to use the associated gas within five years of the commencement of oil production (Manby 1999). The government also enacted the Associated Gas Reinjection Act way back in 1979, which charged oil companies to stop the gas flaring within a five-year period (Manby 1999). However, oil companies in Nigeria preferred to pay the fine that the government later imposed as a penalty for gas flaring rather than stopping the flaring. Even though the fine for gas flaring has increased from Naira 0, 5 to Naira 10 (U.S. 11 ¢) for every 1,000 ft³ of gas in 1998 (Manby 1999, Project Underground 2003), this fine is still too low to have an impact on these companies' policy toward gas flaring. O'Rourke and Connolly (2003) stressed that rather than looking to developed countries' strategies to gain economic profit from natural gas, Nigeria as well as other developing countries that still flare gas attached more

importance to the political and economic benefits of oil revenue, more than the environment or human health.

2.5.5 Policy and legislation on gas flaring in Nigeria

The conceptual frame work of most legislation of gas flaring is based on the United Nations framework convention on climate which was produced at the United Nations conference on environment and development (earth summit) held in 1992 in Rio de Janeiro (Ozumba et al 2006). The main purpose of the summit was to stabilize the concentration of greenhouse gases in the atmosphere. However the objective of the UNFCCC was also highlighted in the Kyoto protocol to ensure that the emission of greenhouse gases reduced significantly.

The Kyoto protocol was adopted in December 1997 and was enforced in February 2005, with developed countries forced to reduce the amount of greenhouse gas by 5.2% during the first stage from 2008 to 2012. However one of the criticisms of the Kyoto protocol is that it gave no obligation to developing countries to monitor, report and reduce emissions. Omorodion (2004) and Okonta (2003) stated the annex 1 countries, Nigeria included, technically have no GHG emission restrictions, but have financial incentives to develop GHG ER projects in exchange for carbon credits and that this generosity given to developing country countries like Nigeria is partially responsible for the continuous emission of greenhouse gasses in the Niger delta. Below shows some legislation as well regulation put in place to curb gas flaring in the Niger delta region of Nigeria.

1969 - Petroleum (Drilling and Production) Act and Regulations: This encouraged the use of Associated Gas, by exempting multi-national oil companies from the payment of royalties (ICF 2006).

1979 - Associated Gas Re-injection Act (AGRA): This act prohibited flaring of AG after January 1, 1984 without the permission from the Minister of Petroleum. Since about 90% of Nigeria's foreign exchange comes from oil revenue, the government failed in implementing the 1984 deadline (Aghalino 2009; Sonibare and Akeredolu, 2006).

1992 - Associated Gas Framework Agreement (AGFA): This is a form of fiscal incentives for companies involved in gas utilization (Aghalino 2009; ICF, 2006).

1988/92 - The Federal Environmental Protection Agency (FEPA) Act: This act is principally for environmental management (Malumfashi, 2007).

1998 - Finance (Miscellaneous Taxation Provision) Decree: This is also a form of fiscal incentives for companies involved in downstream and upstream gas utilization, by reducing their tax burden (Sonibare and Akeredolu, 2006).

2004 - Associated Gas Re-Injection Act and the Associated Gas Re-Injection (Amendment) Act: This also prohibited flaring of AG without the permission from the Minister of Petroleum. It obligated all oil producing companies in the country to submit detailed plans for gas utilisation (Malumfashi, 2007).

If these laws or regulations were complied with, flaring would have been stopped now in Nigeria. Other legislation includes, hydrocarbons legislation: 1969 Petroleum Act and Regulations, Environmental legislation: Effluent Limitation Regulations 1991; DPR Environmental Guidelines and Standards for the Petroleum Industry 1991; FEPA EIA Guidelines for E&P Projects 1994, Decree No. 58/88. The above legislation has been put in place by the Nigerian government to combat the menace of gas flaring in the Niger Delta region and to assist in ensuring the environmental sustainability of the nation. But the big question is has this legislation achieved its purpose?

However, the oil companies through their financial advisers worked out that instead of putting a stop to flaring, it was cheaper paying the fine which is imposed by the Nigerian government. Even though the fine for gas flaring has increased from Naira 0, 5 to Naira 10 (U.S. 11 ¢) for every 1,000 ft³ of gas in 1998 (Manby 1999, Project Underground 2003) it is too low to have any reasonable impact on these companies attitude towards gas flaring. Uwalomwa & Uadiale, (2011) were angered by the lip- service of the Nigerian government to the issue of gas flaring as demonstrated by successive extension of the gas flaring deadline many times namely 2004, 2007, 2008, 2010 and lately December 31st, 2012 as the terminal date for gas flaring by the legislation, hence the country does not really lack law but the enforcement of the laws. He opined that that the 2012 target date still looked unrealistic as the government and oil companies are not sincere.

2.5.6 Nigeria's international response to phase out gas flaring

The gas flaring phenomenon practised in the Niger delta region of Nigeria as stated above contributes to GHG concentration in the atmosphere; the flaring phenomenon is blamed on, among other things

lack of technology for gathering flared gas and the market value of gas flared been a developing country. In an attempt to reduce and eliminate gas flaring the federal government of Nigeria has implemented a number of gas flaring reduction projects. These are:

The West African Gas Pipeline (WAGP): This is a 617 km pipeline designed to transport Nigerian natural gas from the Niger Delta region of Nigeria to power generation and industrial customers in Benin, Togo and Ghana. This project is being developed by Chevron Nigeria Limited, Shell Development of Nigeria Limited, NNPC, The Volta River Authority (interests formerly held by Ghana National Petroleum Corporation), SobeGas of Benin Republic, SotoGas of the Republic of Togo. The World Bank estimated that the amount of flaring would be reduced by 78 million ton of carbon dioxide equivalent (tCO₂e) (World Bank, 2003; Sonibare and Akeredolu, 2006).

The Nigeria Liquefied Natural Gas (NLNG) Limited: This is largest natural gas utilization project in Nigeria, located in Bonny Island in the Niger Delta region of Nigeria. It is jointly owned by Agip (10.4%), Nigeria National Petroleum Corporation (NNPC) (49%), Shell (25.6%), and Total FinaElf (15%) (Sonibare and Akeredolu, 2006).

West Niger Delta LNG: This is the second LNG plant to be developed by Chevron Texaco, Conoco, and ExxonMobil (Sonibare and Akeredolu, 2006).

Brass River LNG: This is the third LNG plant to be developed by the Federal government of Nigeria, Philips and Agip (Sonibare and Akeredolu, 2006).

Escravos gas-to-liquid Projects (EGP): This project is being developed by Chevron and will involve the exploitation of technologies to convert gas to synthetic fuels (diesel, kerosene, jet fuel, and naphtha) (Malumfashi, 2007; Sonibare and Akeredolu, 2006).

Studies has shown that gaseous pollutants (CO₂, CO, NO, NO₂, and SO₂ respectively) have been confirmed to be present in combustion reactions from gas flaring activities and they are detrimental to human health (Obioh et al., 1994; Sonibare and Akeredolu, 2004; Winter et al., 1999). Furthermore, chemical compounds such as NO_x, and SO₂ which react with water to form acidic compounds were reported to be responsible for the acid rain in the Niger Delta region of Nigeria (Sonibare and Akeredolu, 2004).

Abdulkareem, (2005), Dung et al., (2008) and Odjugo and Osemwenkhae, (2009), have also studied the effects of gas flaring on crops in the Niger Delta. Their discovery was that the growth of crops is particularly retarded by waste gas flares. Several other studies have been conducted to demonstrate the effect of gas flaring in Nigeria. These include the reduction of leaf chlorophyll content and internode length of some plants species in areas of gas flaring (Isichei and Sanford, 1976), the increase in surface temperature of about 3.7°C above the mean normal daily temperature within a radius of 270m of the flare site (Oseji, 2007). In a recent study carried out by Nwankwo and Ogagarue (2011), surface and ground water from the gas flaring region in Warri, Delta state, was found to have a high concentration level of heavy metals beyond the World Health Organization (WHO) maximum permissible limits.

From the above, the major livelihood of the people living in the Niger delta region, especially fishing and farming, has been significantly affected thereby leading to a high level of poverty (Nduka, et al., 2008; Omokaro, 2009). In addition, gas flaring results in the wastage of large amounts of Nigeria's second most valuable natural resource, an estimation carried out by the World Bank states it cost Nigeria approximately US \$2.5 billion annually (Ishisone, 2004; World Bank, 2002). Despite these consequences, oil companies operating in the Niger delta region will only reduce flaring when the marginal costs of gas utilization exceed the marginal benefits not considering the cost of its negative externality (Aghalino, 2009). Moreover, it seems that the Nigerian government puts the environment and human health as secondary, hence gas flaring has continued with little change.

2.6 RENEWABLE ENERGY IN NIGERIA

However it hasn't taken the initiative to exploit this huge available energy potential with less environmental and climatic impacts. On the contrary, the country lacks constant electrical supply resulting in a dependency on fossil fuels and firewood to meet energy needs (Omokaro, 2008). The development of renewable energy in the country will improve energy supply reliability; solving problems of local energy, increasing the standard of living and level of employment of the local population and also ensuring sustainable development of the remote regions in the desert and

mountain zones(Zakhidov 2008). Furthermore the development and implementation of renewable energy projects in rural areas can create job opportunities (Bergmann et al 2008). Nigeria as a country is endowed with numerous renewables energy resources, but majority of the national energy supply is still depends on fossil fuel. Fossil fuel usage in the country makes up approximately 82%. See figure below.

Total energy consumption in Nigeria, 2010

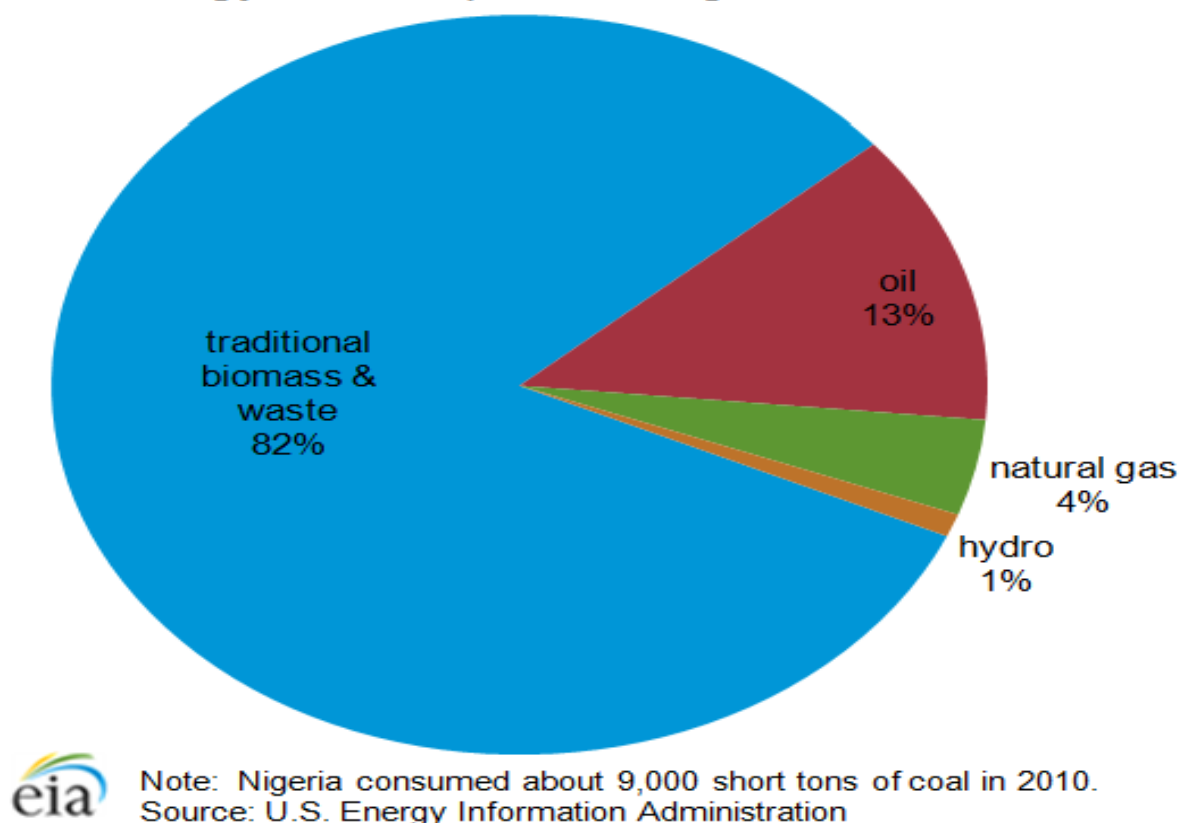


Figure 12 Pie chart of Nigeria Total Energy Consumption in 2010

Renewable energy in Nigeria dates back to 1960, when the first hydro power station (Kainji dam) was built. However due to electric power shortage in the country, the government came up with the renewable master plan. This was put in place to provide a framework for the effective implementation of renewable energy resources in the country. A draft national energy master plan (NEMP) was then developed by the Energy Commission of Nigeria with support of the United Nations

Development Programme (UNDP) Subsequently there have been several workshops and National Stakeholders Forum on Renewable Energy Technologies Development and different Memoranda of Understanding (MOUs) signed with private and foreign companies for technical assistance, training and establishment of demonstration projects. However, their implementation depends on investment (Nnaji et al., 2010) with the result most renewable energy targets for the projects were never met due to problems encountered, such as corruption, bureaucratic bottleneck; inadequate gas supply and obsolete infrastructures (CREDC, 2007).

There are many things that made Nigeria a place to reckon with in the world especially on the African continent. Prominent among them is its ever increasing population of over 140 million people (World Population Data Sheet, 2007) and the vast of energy resources i.e. oil, gas, coal, hydro, wind etc. Like the United Kingdom in Europe, it is the dreamland of many Africans. Leadership has been a major problem in the maximization of its potentials for economic, social and environmental benefit. This explains why all ideas of renewable energy policy by successive governments can be described as mere mockery. The Energy Commission of Nigeria charged with the responsibility of addressing the energy economy interface in recognition of the sensitive nature of energy issues and their impacts on governance was signed into law by Act No. 62 of 1979. That was all. Nothing happened until nine years later when another regime amended the Act to form an Energy Commission Act No. 32 of 1988 with the mandate of strategic planning and coordination of viable energy policies in the field of energy. The new commission was also charged with the formulation of the best energy planning framework that will give the country both national and international relevance as well as guaranteeing sustainable supply of energy to all corners of the nation at affordable cost and contribute significantly to national income while upholding the dignity of the environment. The Energy Commission Act No. 19 of 1989 emerged as an amendment again mandating the commission as the highest organ of government in respect of energy matters charged with the task of promoting diversification of energy resources as well as compliance with the national energy policy. About 18 years later (i.e. 2007), when the new government of Alhaji Umar Musa Yaradua came into power Nigeria was still looking for a viable energy policy since the problems that led to the forming of the energy commission in 1979 which would have emerged with a lasting policy were still confronting the nation. From the foregoing, one may be right to conclude that Nigeria has no viable renewable energy policy. The establishment of an Energy Commission is not the same as Energy Policy. Because of the relevance of oil and gas in the economic development of the country, politicians and successive administration simply attempt to show an interest in the energy sector in order not to be seen to be solely concentrating on the economic

benefits therein. The UK Energy Policy identified what the problems were and mapped out strategies through which these problems could be solved. That is what a giant nation like Nigeria needs to do in other to achieve its renewable energy obligations.

2.7 SOURCES OF RENEWABLE ENERGY IN NIGERIA

2.7.1 Hydro Energy

Nigeria as a country has various rivers and few waterfalls and maintains minimum discharge of water all year round. Hydro energy generation in Nigeria accounts for about 25% of the total energy needs of the country. A study that was carried out in twelve states and four (4) river basins, identified over

278 unexploited small hydropower sites with total potentials of 734.3 MW were identified (Aliyu and Elegba, 1990). This indicates that Nigeria possesses a potential renewable source of energy along her numerous river systems, a total of 70 micro dams, 126 mini dams and 86 small sites have been identified. Okafor and Uzuegbu (2010) stated that the Nigerian hydro energy base is high as the country's river estimate is about 11,000 MW of which only 19% is currently being tapped or developed. These rivers, waterfalls and streams have high potential for hydro energy and if properly harnessed will lead to decentralized use and provide the most affordable and accessible form of energy to services the country.

Disadvantages of hydropower projects in Nigeria:

- Hydropower projects in the Nigeria are associated with huge loans that lead to very high external debt levels and are plagued with allegations of corruption.
- Hydropower development is affected by drought and silting of dams which reduces the amount of electricity that can be generated over time.
- Building large dams and reservoirs often harms local ecosystems; involves displacing people and wildlife, and scatters human communities.

2.7.2 Solar Energy

As far as renewable energy sources are concerned solar thermal energy is the most abundant one and is available in both direct as well as indirect forms. Nigeria is squarely located in the tropics, with its huge land mass stretching between latitudes 5-degrees south and 15-degrees north of the equator. As a consequence, the country enjoys abundant amounts of sunshine. In fact, relevant studies on the potential and viability of solar energy sources in Nigeria show that Nigeria has

nearly 290 days of sunlight in a year. In a recent study carried out by Uzoma et al., (2011) their finding were, that since solar radiation is evenly distributed across the country, which is about 19.8MJm⁻² day⁻¹, given the average sunshine of 6 hours per day, and if solar collectors or modules were used to cover 1% of Nigeria's land area, it is possible to generate 1850 x10³ GWh of solar power per year; this is over one hundred times the current grid electricity consumption level in the country. This would thereafter lead to application of solar electricity in the country. These include low and medium power applications such as: water pumping, village electrification, rural clinic and schools power supply, vaccine refrigeration, traffic lighting and lighting of road signs.

2.7.3 Wind Energy

Of the renewable energy technologies applied to electricity generation, wind energy ranks second only to hydroelectric in terms of installed capacity and is experiencing rapid growth. Sambo (2009) stated that the wind speed in Nigeria on an annual level is approximately 2.0m/s at the coastal region and 4.0 m/s in the northern region of the country. Uzoma et al., (2011) explained that the wind energy resources still remain largely unexploited given the wind speed potential the country possesses with no commercial wind power plants connected to the national grid, Only a few number of stand-alone wind power plants were installed in the early 1960s in 5 northern states mainly to power water pumps and a 5 kW wind electricity conversion system for village electrification. For a power starved and developing country like Nigeria, wind power is the viable source of electricity, which can be installed and transmitted very rapidly, even in remote, inaccessible and hilly areas (Singh S, et al 2004). In recent times, numerous studies have been carried out to assess the wind speed characteristics and associated wind energy potential in different locations in Nigeria. Promising attempts are being made in Sokoto Energy Research Centre (SERC) and Abubakar Tafawa Balewa University, Bauchi, to develop capability for the production of wind energy technologies. These studies should be carried out with great urgency because electricity generation from wind never depletes. The electricity produced by wind

energy systems could save several billion barrels of oil and avoid many million tons of carbon and other emissions (Thomas 1996).

2.7.4 Municipal waste

Municipal waste is generated by households, commercial and industrial sectors. Millions of tonnes of household waste are collected each year with the vast majority disposed of in landfill sites. This waste takes many forms including plastics, paper, textiles, glass, metal, wood, and other organic waste. In the United Kingdom, EU and other developed countries due to the growing awareness of the environmental effect of throwing waste away, various legislations was set up to enhance effective waste management converting it to energy by direct combustion (Salman, 2008; Milbrant, 2009).

In Nigeria traditionally there is no organized system of waste management. Each household disposes of waste generated in its own way. On the whole, most wastes are either thrown in the water or dumped indiscriminately on landfill sites and left to decompose. Ogwueleka (2009) stated that about 25 million tonnes of waste is generated in Nigeria annually. The table below shows some cities in Nigeria and the amount of waste generated. The table 5 below shows the potential of waste disposed in Nigeria to be a vital form of energy.

Waste generation potential (2007)

Table 5 waste generation in some Nigerian cities

Cities	Population	Tonnage	Density	Kg/capital
--------	------------	---------	---------	------------

		per month	(kg/m ³)	/day
Lagos	8,029,200	255,556	294	0.63
Kano	3,248,700	156,676	290	0.56
Ibadan	307,840	135,391	330	0.51
Kaduna	1,458,900	114,433	320	0.58
Port-Harcourt	1,053,900	117,825	300	0.60
Makurdi	249,000	24,242	340	0.48
Onitsha	509,500	84,137	310	0.53
Nsukka	100,700	12,000	370	0.44
Abuja	159,900	14,785	280	0.66

Source : (Ogwueleka, 2009)

Currently in Nigeria waste produced is predominantly unmanaged and unexplored in landfill sites. Waste in landfill sites not only causes dirt and odour but when it gradually decomposes and generates greenhouse gases this contributes to climate change (Cointreau 2008). However there have been several studies carried out to show the environmental and economic benefit of utilizing waste generated and disposed of indiscriminately (Medina 1997) Some of these studies are the benefit of recycling was which was undertaken in Kano state(Nabegu 2008, 2009),Onitsha (Nzeadibe 2008) and Aba (Agunwamba2003). But we can arguably say that these studies carried out reaction to the environmental policy agenda at 1992 UN Rio conference as the reaction has not materialised into reality this is as a result of non-comprehensive governmental policies, equipment, technological improvement and funds allocation.

2.7.5 Other renewable Resources

Presently, the potential of some resources like geothermal, nuclear energy, waves, biomass, tidal and ocean thermal gradient still remain untapped and unqualified (Nnaji et al., 2010)

2.7.8 Challenges

Despite the recognition that renewable energy is important to the Nigeria economy, it has not attracted vital level of investment or tangible policy commitment. Nevertheless the energy reforms as well the national resources allocated to the development and publicising of renewable energy within the last decade appear substantial, but more still needs to be done because the country's population increases yearly and this put more pressure on fossil fuel usage. People in rural areas depend on burning wood and traditional biomass for their energy needs, causing great deforestation, emitting greenhouse gases, and polluting the environment, thus, creating global warming and environmental concerns. The success of renewable energy technology in Nigeria has been limited by the following factors: poor integrated institutional framework; inadequate policy implementation; lack of co-ordination and linkage in renewable energy programmes; pricing distortions which have placed renewable energy at a disadvantage; high initial capital costs of insulation; weak technology dissemination strategies; lack of skilled manpower; poor baseline information on location and weak maintenance service and infrastructure.

2.8 SUMMARY AND CONCLUSION

For a country or a region to become environmentally sustainable, it means that all the factors that confer environmental sustainability must have been adequately taken care of. It also means that

such country or region would witness: less poverty among its citizens, food security, less conflict and environmental impact, use of clean technology etc. however this findings are different from the present state in the UK. From the review of the literature, the present state of the Niger delta region are as follows:

- A) The general inability of the agencies responsible for the environment to enforce laws and regulations in relation to oil and gas exploration
- B) Gas flaring and the resultant problems of ecosystem destabilization, heat stress, acid rain and the acid precipitation-induced destruction of fresh water fishes and forests in the coastal areas of the country.
- C) Pollution from oil spills, oil well blowouts, oil blast discharges and improper disposal of drilling mud from petroleum prospecting have resulted in problems such as: The loss of the aesthetic values of natural beaches due to unsightly oil slicks; Damage to marine wildlife, modification of the ecosystem through species elimination and the delay in biota (fauna and flora) succession; and Decrease in fishery resources.
- D) Poverty as a cause and consequence of environmental degradation and lack of management as well corporate social responsibility
- E) Lack or low availability of clean technology

The next chapter would examine key variables that was identified from the literature reviewed and it would also highlight the requirements that need to be met to achieve sustainability or sustainable exploration of oil and gas in Nigeria and the Niger delta.

CHAPTER THREE

CONCEPTUAL FRAMEWORK

3.1 CONCEPTUAL FRAMEWORK

The conceptual framework can be applied across a broad spectrum of disciplines as a theoretical modelling tool. Biologist Bernd Heinrich (1984) and his associates carrying out a research once spent a summer conducting detailed and systematic research on ant lions, small insects that are capable of trapping ants in pits they have dug. However Heinrich was surprised to discover that his results were quite different from those that have been published by other researchers. Redoing the experiments over again the following summer to find and understand these discrepancies, he discovered that he and other researchers had been led astray by an unexamined assumption they had made about the ant lions' time frame: Their observations hadn't been long enough to detect some key aspects of these insects' behaviour. As he concluded, even carefully collected results can be misleading if the underlying context of assumptions is wrong.

However, there appear to be as many definitions of a conceptual framework and its uses as there are conceptual frameworks. In this paper we aim to clarify the definition and use of conceptual frameworks for this reason, Miles and Huberman (1994) defined conceptual framework as a visual or written product, that gives explanation, either graphically or in narrative form to the main variables, the relationship between them to be studied, concepts and key factors. Warmbrod (1986) stated, that conceptual framework can be defined as a systematic ordering of ideas about the phenomena being investigated or as a systematic account of the relations among a set of variables. In essence a conceptual framework is a structure of what has been learned to explain particular progression of an occurrences which have been studied and providing a new perspective to the knowledge base. Edwards, (1981) stated that a conceptual framework should be viewed as a kind of gyrocompass to help us in navigating our way through the self-interest and contending ideologies that always surrounded the debate about regulation.

Moreover (Fawcett 1997) suggested that conceptual frameworks can be used for the following purposes: to guide practise as a basis for the research project being carried out, for pedagogic purpose and in administrative situations. And in addition Nye and Berardo (1966) explained that the concept of a conceptual framework has various advantages; first the development of a conceptual framework provides an adequate definition concept which thereby leads to adequate measurement. Second, a conceptual framework facilitates the researcher is job by providing a collection of ideas. Third, it is

important that not only are the substantive results of research understood, but also that the essential concepts used are understood by those who are using the results. Fourth, the development of a conceptual framework allows effective communication between academics, who often speak different languages and make implicit assumptions and concepts unconsciously without consideration of other readers. From the literature reviewed above key variables were generated which are responsible for oil and gas exploration in the Niger delta region of Nigeria. The key variables generated are: legislative requirement, environmental requirements, technological requirements, management requirements and corporate social responsibility requirements and they will be elaborated on below.

Conceptual Framework Diagram

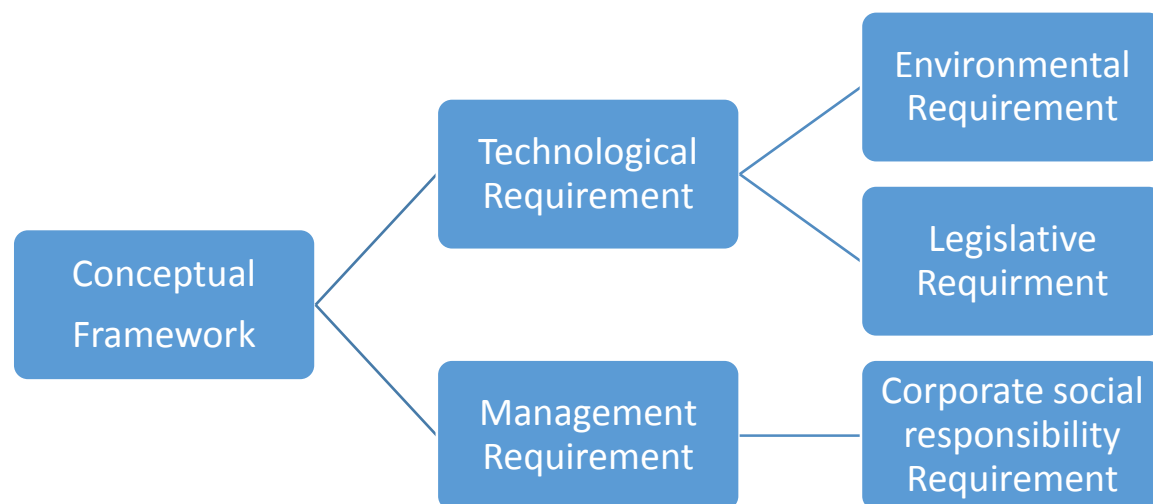


Figure 13 Conceptual Framework Diagram

This framework would be a model employed by the Nigerian government as well oil companies operating in the Niger Delta region of Nigeria. The variables identified from the literature reviewed above will now be examined below.

3.1.1 Technological requirement:

Technological application in the oil and gas industry thought-out the world as well in the Niger delta, this drive for technology could be dated back with Edwin L. Drake's 71 Feet drilling of an oil well which yielded 400 gallons of pure oil every 24 hours and was further reinforced by the development of the technology for the separation the oil and water. Ever since then the oil and gas industry has continued to develop in pursuit of different levels of technological advancement.

There have been various definitions of the term technology. Akaninwor (2008) sees it to be a systematic application of manufacturing methods and industrial arts to enhance efficiency in human activities, He went further to saying that technology could simply be described as the result of man's efforts to do things more efficiently and effectively. Drucker (2007) also defines technology as a way or means of accomplishing a task. A critical examination of Nigerian technological strength during oil and gas exploration activities shows that it lacks basic facilities and depends largely on foreign nations for her various technological and industrial needs.

Studies carried out about the Niger Delta region has shown that a great percentage of oil spillage is as a result of faulty equipment, rupture and ignorance of the staff of the oil multinational while sabotage accounts for a lesser amount. Most of the oil and gas facilities are quite old and some are about half a century old but still in full operation (Friends of the Earth Netherlands, 2008). When old oil pipelines are in full operation the risk of explosion is considerably high considering the high tropical temperature of the region. When oil pipelines are aged and have outlived the commercial life of their insulation they need to be overhauled and replace accordingly. Because when this is not done, the host communities and surrounding natural environment are endangered with consequences. For instance Johnson (2000) reported that in the Niger Delta region due to damage to the oil pipeline more than 300 people were killed and many of the dead were school children whose uniforms could be recognised on some of their charred remains. This explosion took place in a village called Adeje which is not far from the city of Warri. Another explosion due to pipeline failure took place in the town of Jesse where about 350 people were killed. Technological and equipment failure in the Niger Delta region has also resulted in the loss of biodiversity of plant and animals and different species and well ecosystem are either endangered or threatened (Amnesty International, 2009). This agrees with a study carried out by Salau (1993) stating that of the 4,600 plants species of which about 205 are endemic (not found elsewhere), about 484 plant in 112 families are threatened with extinction

alongside many animals and birds. Oil spillages affect agriculture as well which makes it difficult for host communities who are famous for their peasant and subsistence farming. People living in this region are now characterized by hunger and starvation and it's geared into violence and militancy. Similarly some of the people in the Niger Delta region are renowned and well known as fishermen but fishing has reduced dramatically due to oil spillages in their waters and fishing zones as oil spills on the water surface prevents oxygen from dissolving in water thereby suffocating living organisms therein.

Gas flaring in the Niger delta region is no longer breaking news as it has become a normal routine which is generally defended by oil multination also operating in the this region on technological or equipment grounds. Idris, (2007) contended that the flaring of gas from oilfield by oil multinationals as a by-product during oil and gas production is a common sight that dominates the skylines in the Niger Delta region. Gas flaring not only constitutes noise but toxic gases, excessive heat and radiant energy and the co₂ that is emitted is a major contributor to global warming and ozone layer depletion (Nenibirini 2004) Other forms of impact as a result of gas flaring in the Niger Delta region includes acidic rain, extreme weather and agricultural loss. For people living in these communities flaring may have serious health impacts on them as well in the form of respiratory illness, asthma, cancer, painful breathing amongst others (Environmental Rights Action/Friends of The Earth Nigeria 2008). Despite various efforts made by the Nigerian government after a court ruling which was against Shell and other oil multinationals :

Delivering a judgment brought against Shell by the Iwhrekan Community of Delta State, on the company's continued flaring in the community, a Federal High court sitting in Benin and presided over by Justice V. C Nwokorie, had on November 14th 2005 ordered the oil multinational to stop gas flaring in Iwhrekan, saying it violates the people's fundamental right to life and dignity of the human person. The judge ruled that gas flaring is a "gross violation" of the constitutionally-guaranteed rights to life and dignity, which include the right to a "clean poison-free, pollution-free healthy environment".

To end this awful behaviour which is blamed on technology, oil multinationals have done little or nothing to date, and which was meant to have stopped on Jan 1 2008. Osuoka, (2005) in his document stated that about 2.5 billion cubic feet of natural gas is flared every day during oil exploration activities in the Niger Delta region. These wasted resources should as well be used to generate electricity for host communities that suffer from electric power supply problems.

Oil multinationals operating in the Niger delta region should know that when equipment or technology they have in place is old, it becomes vulnerable and prone to corrosion. Hence replacing the aged or facilities or equipment when due helps to reduce frequent occurrences of oil spillages and helps curb gas flaring in the region. Oil and gas pipeline should be subjected to commercial usage based on the specified or designed time frame. Appropriate pressure controls, flow rate and climate conditions as well the age of the facility are of great importance in quality control and assurance of these installations. This is because the slightest ignorance or carelessness of operators can lead to a devastating environmental chaos and impacts that could result in leakage or even explosion as seen above. Old facilities should be replaced when due when carrying out a periodic check-up. Facilities designed for low pressure lines should not be used for high pressure operations as it may end up in chaos. In addition there should be an updated integrity report detailing the type of checks and jobs done on various exploration equipment pointing out the weakness and/or fatigue or areas of regular equipment failures. these should be noted and redesigned to a robust standard or even replaced with better components. This is why operators, technicians and engineers should not just relax and do business as usual. Carrying out an advanced periodic overhaul and preventive maintenance rather than corrective maintenance is recommended to save the environment while minimizing cost. For the record, 'Quality is very cheap however, ignorance is quite expensive'. Acquiring all health and environmental related certifications by oil multinational companies will not help the environment and will not bring peace and development to the people of Niger Delta, rather doing what the certification says alongside other related national and international legislation will go a long way to instilling peace and sustainable development in the Niger Delta of Nigeria.

3.1.2 Legislative requirement:

In modern society, the issue of the environment poses a great concern that policies are made by government mainly to ensure compliance and prevent flagrant abuse. Even in the global context it's problematic to regulate human activities without environmental laws through which the states

exercise their responsibility to protect the environment. The Niger Delta situation from the literature reviewed shows the region sustains the Nigerian economy yet it is embroiled in environmental degradation due to the environmental laws that do not favour the people in the oil producing communities. Okafor (2011) explained that environmental laws are laws that are put in place to mitigate or prevent threatening problems which originate from human activities in a quest for economic and developmental state. Owolabi (2012) contended that the activities of oil multinational companies in the Niger Delta region during oil and gas exploration causes environmental degradation which is due to carelessness on the part of government as well oil companies operating in the region.

According to the environmental law research institute, the role environmental legislation plays in inducing a responsible attitude and behaviour towards the environment cannot be overstated as it serves as an effective instrument for environmental protection, planning, pollution as well as prevention and control. It also outlined some the synopsis of laws and regulations on the environment in Nigeria; the following provides a summary of Nigerian legislation on the environment:

- The Constitution of the Federal Republic of Nigeria (1999)
- National Environmental Standards and Regulations Enforcement Agency (NESREA) Act
- Environmental Impact Assessment Act
- The Land Use Act
- Harmful Waste (Special Criminal Provisions) Act
- Hydrocarbon Oil Refineries Act
- Associated Gas re-injection Act
- The Endangered Species Act
- Sea Fisheries Act
- Exclusive Economic Zone Act
- Oil Pipelines Act
- Petroleum Act
- Petroleum Products and Distribution (Management Board) Act
- Nuclear Safety and Radiation Protection Act
- Nigerian Mining Corporation Act
- Quarantine Act
- River Basins Development Authority Act
- Pest Control of Production (special powers) Act

- Agricultural (Control of Importation) Act
- Animal Diseases (control) Act
- Factories Act
- Water Resources Act
- Niger-Delta Development Commission (NDDC) Act

Owolabi(2011) stated that in the constitution of the federal republic of Nigeria, the state shall protect and improve the environment and safeguard the water, air, land , forest and wildlife, also in section 33 and 34 guarantee fundamental human rights to life and human dignity. This we can arguably say is linked to the need for a healthy and safe environment as the essence of enforcing these laws is mainly to protect biodiversity and make life for the people of the Niger Delta region meaningful in a strive to actualising sustainable development. Frynas (1998) argues that the Niger Delta region of Nigeria has enormous potential to attain economic growth and sustainable development remains a big question and unfulfilled as its future is threatened by declining economic conditions that are not being addressed by present policies, legislation and acts of government (Owolabi2012). The basic laws in modern society are expected to be observed and implemented by policymakers in order to regulate human activities, but when such laws are not obeyed or followed, conflicts of interest are generated which lead to a different perception on the outcome. Some of these laws and legislation where remarkable these include: Niger Delta Development Commission Act (2000), Department of Petroleum Resources (DPR) 1991 directive on Environmental Guidelines and Standards for Petroleum operatives, the ratification of the African Charter on Human and Peoples Rights (ACHPR) in 1983 by Federal Government.

Owolabi(2012) argues that legal frameworks have proved ineffective in stemming Niger Delta's environmental problems and that it appears that many of our laws are seen on paper alone but not implemented in the real sense. For example Nigeria flares natural gas during oil and gas exploration activities, with an estimate suggesting that of the 3.5 billion cubic feet (100,000,000 m³) of associated gas (AG) produced annually, 2.5 billion cubic feet (70,000,000 m³), or about 70% is wasted via flaring. Though gas flaring in Nigeria and the Niger Delta region has been declared illegal since 1984 under section 3 of the Associated Gas Reinjection Act, the statutory condition seems to have enjoyed operation more in breach rather than actual execution of the law itself. Ahalino (2009) added that

while other oil producing countries both developed and developing have policies in place as well programmes to ensure associated gas produced during oil and gas exploration activities are economically utilised, Nigeria has allowed oil multinational companies to flare associated gas without punishment. He however questions if oil multinationals companies operating in the Niger delta region actual realise the effect of gas flaring and believes that they continue to flare gas because the penalty imposed on them is too low to serve as a deterrent.

The story is not different in terms of oil spillages, O'Neil (2007) Explained that in the Niger Delta region oil spills from pipelines contaminate soil and water. In the past oil multinational companies explained that oil spillage was as a result of pipeline leaks, sabotage and oil bunkering. But Udeke (1995) and Ndujihe (2012) disagree and challenged oil multinational companies to be more sustainable in their operation and as well to uphold the environmental laws in place rather than casting blame. Aghalino and Eyinla (2009) added that oil multinational companies carrying out oil exploration activities in the Niger Delta region have to adhere to international best practices in oil exploitation activities and should be more concerned about environmental conservation and the safety and maintenance of their facilities. If the issue of environmental conservation is not taken for granted even while carrying out their daily productive activities, it is possible that their host communities would establish a better relationship with them. The environmental practices of oil multinationals in the Niger Delta region during oil and gas exploration activities has caused suffering in at an alarming rate while little or nothing is done by policy makers to enhance the economic challenges facing the people in the region. The Nigerian government needs to evaluate or revisit the level of compliance of its existing environmental laws to ascertain adherence by oil multinational companies. Some of these laws include Oil Pipelines Act; Petroleum Act; Petroleum Products and Distribution (Management Board) Act; Environmental Impact Assessment Act; The Land Use Act; Harmful Waste (Special Criminal Provisions) Act; Hydrocarbon Oil Refineries Act etc. Also the enforcement mechanisms of the environmental laws have to be strengthened to ensure compliance. The presence of oil multinational companies should not be a misfortune to people in the Niger Delta communities that make the country economically viable.

3.1.3 Corporate social responsibility requirement

The oil and gas industry in Nigeria has undergone changes since the discovery of crude oil decades ago. The oil and gas sector has become the mainstay of the Nigerian economy accounting for over 80% of the GDP revenue. It is therefore not surprising that the oil and gas industry has become vital to the economic development of the country. Waste products and pollution are some of the negative effects of oil exploration in the country, however the burden of waste and pollution during oil exploration activities are not directly and necessarily borne by those who benefit from developments ushered in by the oil industry.

In the words of the famous economist Adam Smith he explained corporate social responsibility is described as an “invisible hand” in which firms or organisations provide benefits not only to shareholders in return on investment but also to their employees, suppliers and customer . However in the real world corporate social responsibility means more than just an invisible hand as it is linked to the idea that the company or organisation is obliged to its external stakeholders beyond those enshrined in the law. This is because “responsibility” implies a duty to someone or something and the word social implies that the company or organisation owes the society. The European Union green paper on corporate social responsibility defined it as a concept where companies integrate social and environmental concerns into the way they carry out their business operation and their interaction with their stakeholders. And more recently, McWilliams and Siegel (2001) defined corporate social responsibility as actions that appear to further some social good, beyond the interests of the firm and that which is required by law. In essence corporate social responsibility refers to the things oil companies operating in the Niger Delta region would do as because of the negative impact caused during Oil exploration.

At the same time corporate social responsibility has been criticized and viewed from different perspectives. On this hand some businesses or companies have a strong traditional view that corporate social responsibility is a misguided in principle. And according to their view by engaging or pursuing social and environmental objectives firms or companies will ultimately hurt shareholders and generate low profits, while firms or companies are said to lack the expertise to engage in solving social and environmental issues that may arise (Friedman, 1962; Henderson, 2001; Ottaway 2001) And on the other hand, recent studies have pointed to the limitations and relatively poor results of existing corporate social responsibility initiatives in terms of delivering social and environmental outcomes (Pegg,2006; Soares de Oliveira, 2007;Frynas, 2009;Gillies, 2010).

Apart from the degradation of the environment through oil spillage and gas flaring, there are other problems that have affected the relationship between the oil companies in the Niger Delta region of Nigeria and their host communities. The relationship between oil companies and host communities in the Niger Delta region has not been cordial in recent times due to different perceptions of the role that oil producing companies are expected to play in the development process of host communities. These communities where oil and gas exploration is carried out claim that oil producing companies are not doing enough considering the amount of wealth taken away from their lands. And on the other hand, oil companies in the region feel that they are doing enough and have even gone beyond the realm of normal corporate social responsibility. In a bid to stop the conflict relationship between host communities and oil multinationals, the oil multinational have embarked on various projects aimed to alleviate the suffering of the people living in the Niger Delta area that has been adversely affected by oil exploration activities and also creating an enabling environment for the continuation of business. So they build classrooms, hospitals, support education, roads, provide scholarships and in most cases create some level of employment. However Aderemi (2011) explained that in recent times oil multinationals idea of corporate social responsibility is now becoming an apology medium for flagrant abuse, as they view it as an avenue for maximizing profit; he went on to say that such a highly publicized charitable and philanthropic venture is not enough or able to rectify the abuse of people in Niger Delta region who have been neglected, starved marginalized, unemployed and environmentally crippled. This agrees with Frynas, (2005), Muller (2010); Eweje, (2006); Ed Kashi, (2010) stating that despite the pollution caused by gas flaring and oil spillages oil multinationals are overly interested in financial benefits without regards to the deprivation and violence traceable to their activities. As oil multinational companies are required or expected to pay tax and making standing commitments in the provision of developmental infrastructure it appears that even the requisite taxes are being avoided as expert accountant are employed to cover up the evasion (NEITI audit 1999-2004; 2005). Ejumudo (2008, 2010) contended that corporate social responsibility is like creating justice that seeks to achieve and also accommodate a balance between access to environmental costs (unemployment and social and economic dislocation and crime) and environmental benefits (health care, clean water, skills acquisition programme) however this has not been the case in the Niger Delta region for example, in Nembe, an oil producing community of Baylesa oil spillage have caused serious damage to the environment, there have been spillages from wells, flow stations and pipelines discharges, gas flared into the atmosphere, and farm land and fish ponds are destroyed. The impact of such environmental degradation results in most cases low farm produce, diseases, food shortage and polluted water.

All of us in this community are fishermen, we survive by fishing but there is always spillage from the Shell wells and the oil spillages have destroyed our marine life and our occupation. Our farmlands have been destroyed and no more fish in our rivers. Our people now travel to the high seas to fish, which is very dangerous (Nembe Indigene 2012)

Furthermore corporate social responsibility is exemplified by the social effects on local communities. The case of Nembe has become very significant as oil multinational companies their operations and community development programmes have resulted in conflicts where individuals and groups are fighting over the benefits or patronage from oil companies. Community funds are however mismanaged, misappropriated and embezzled by community leaders or shared amongst some community leaders excluding the rest of the community. In some occasion Watts (2004) explained that the several forms of social disorder such as proliferation of arms, increasing illiteracy, criminality, lawlessness and disintegration of core traditions and culture are sponsored by oil multinationals as they purchase arms and ammunition for youths to fight whoever that is fighting them, or against their corporate social responsibility policies or protesting for their human rights.

Based on the literature reviewed as well interviews carried out, it is apparent that oil multinational exploration activities in the Niger delta region have had destructive effects on the environment endangering their land, air and water. And oil multinationals have not done enough in giving back to the various communities where oil exploration activities are carried out given the pervasive nature of their activities on the environment and the profit they have accrued over the years from the region. Addressing the claims and facts by oil multinationals companies with regards to scholarships awards, training of contractors and entrepreneurs, micro credit assistance however access to such scholarships schemes, contract, programmes and loans depends largely on who your contact is in the board or oil companies in control of the corporate social responsibility scheme or programme. And in most cases the awardees are those who have a spouse or relatives or have access to influential stakeholders in the oil companies. What still stands out is the fact that poverty continues to feature prominently in the Niger Delta region which shows that most of the corporate social responsibility activities carried out by oil multinational companies are not reaching those that are affected by adverse effects of oil spillages and gas flaring. Oil multinational companies should be more committed to corporate social

responsibility. Jike (2004) and Aderemi (2011) are of the views that this should be the defining feature of corporate social responsibility. According to them since the main issues of contention between oil multinationals and host communities is the environmental degradation, oil multinationals should discontinue paying lip service and redefine the true concept of corporate social responsibility with a human face consistent with global standards. Also their double standards would only intensify outrage and uprising within host communities. Compensation for oil spillages and gas flaring should be commensurate with the environmental and social degradation caused. And as long as these issues or environmental problems are not properly addressed, the current corporate social responsibility carried out by oil multinationals in the Niger Delta region will count for nothing and will be ineffective in curbing the conflicts and violence directed against oil workers and communal clashes. Also most oil multinational companies in the Niger Delta region have a view that corporate social responsibility is an extension of willingness to provide humanitarian charity or aid host communities. This perception is wrong and what oil multinational should do is look beyond the past to the present to redefine and rebuild a new image of responsibility i.e. corporate social responsibly, one that take into consideration the various environmental issues be bedevilling the Niger Delta region.

3.1.4 Management requirement

Organisations or companies are made up of people and managing people is a key challenge of contemporary organisational life. In modern society management will be contingent on its basics which are leadership and organisation process. There are many definition of the term management Hellriegel, Jackson and Slocum (2005), Brauer (2006) and Dessler (2004) explained that management involves the planning, organisation, leading, selecting and placement of employees, training and the development of subordinates, accountability as well responsibility. In essence it could be classified under four broad terms shown below.

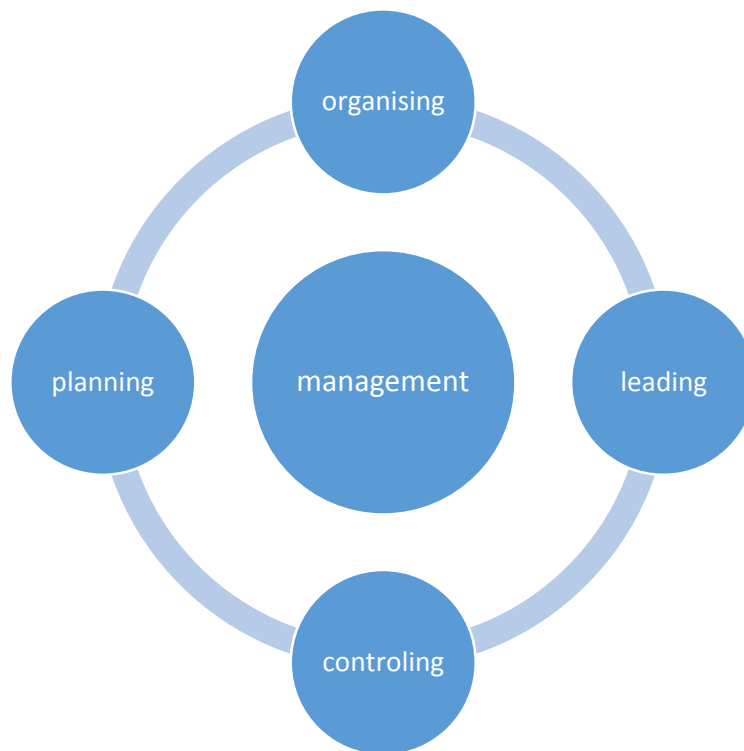


Figure 14 management Requirements in Nigeria Oil and Gas Sector

Source: Hellriegel *et al.* (2005)

Nigeria ranks among the top 10 countries that produce crude oil worldwide. And ever since the first producer or exploration company in the country (Shell 1958) there has been a constant increase in the number of oil companies in the country and the top four companies (these includes Shell Petroleum Development Company (Shell), ExxonMobil, Chevron Nigeria Limited (CNL) and Total (formerly Elf Petroleum Nigeria Limited or EPNL) accounted for nearly 83% of Nigeria's total petroleum production in 2008 and this is also an indication that the Nigeria petroleum industry is dominated by a few international firms. However the discovery of oil in the Niger Delta region has triggered different chain of events that has led to the political and economic marginalization of the inhabitants. Indeed, it has been argued that oil has been more of a curse than a blessing to the people who have been at the receiving end of horrendous government oppression and brutality, often resulting in fatalities. Despite 40 years of oil production and hundreds of billions of dollars of oil revenue, the local people remain in abject poverty without even the most basic amenities such as water and electricity. Oil and gas exploration in the Niger delta has resulted in damaging environmental impacts. Watts (2001) refers to the environmental impact as engendering ecological

violence. Sebastián et al (2001) and UNCTAD (2007) reported that oil and gas exploration in the Niger Delta affects the environment in numerous negative ways, oil spillage pollutes water bodies thereby threatening its consumption as well as usage and reduces fishing, farm lands are destroyed resulting in low agricultural production for consumption as well as sale. A member of the Escravos Women is Coalition in describing the environmental impact of oil and gas the activities in her community noted “Our farms are all gone, due to Chevron’s pollution of our water. We used to farm cassava, okro, pepper and others. Now all the places we’ve farmed are sinking, we cannot farm. We cannot kill fish and crayfish.” According to Turner and Brownhill (2005) this phenomenon is called the “Dutch disease” the resource curse has affect Nigeria and as well as the Niger Delta region and made its government or management ineffective. As government or leaders in this region have increasingly fallen short of providing welfare or security to or for the host community but instead resorted to using oil revenues for personal enrichment given little or no concern to how oil multinational companies operate in the region and it is as a result of corruption and lack of transparency.

Nigeria as a country has changed its structure of leadership from a military dictatorship to democratic rule in recent times (Ikien 1990) however each government, that was in power has been consistently characterized with a pervasive nature of corruption. The profound nature of corruption in Nigeria has resulted in the country been referred to as a kleptocracy which means thievery as a system of government (Segun 1996). Corruption was defined by Todaro and Smith, (2006) as the abuse of public trust for personal gain and it's a form of stealing. He went on and stated that the main hindrance to Nigeria and the Niger Delta region not being able to attain development is as a result of corruption. Osoba (2000) also contended that corruption is a form of anti-social behaviour by any individual or a social group which possesses unjust or fraudulent benefits, and its perpetrators go against established legal norms and agreed moral ethos of the society. The Federal Government of Nigeria’s Independent Corrupt Practices and other related offences Act (2000) agrees with this and stated that corruption includes bribery, fraud and other related offences. Osoba (2000) however stated that Nigeria as a country is ranked as one of the most corrupt countries in the world. Daily corruption activities are visible on the street; policemen extorting money from motorists to supplement their monthly wages. And it sometimes referred to as “*awuf*”. Amadi, (1982) stated that Nigerians have different perspective towards corruption. Although many believe that corruption is not in the best interest of the nation, others hold the idea that life is a battle for survival. For those who hold doggedly belief, it is a waste of time to talk about corruption; as they only smile when they come across opportunities to be corrupt. For several years the government has generated huge oil revenues, yet even now the country still suffers from lack of basic infrastructure, while the greater percentage of Nigerians live in poverty due to corruption. This is because the proceeds from the sales of crude oil are not used to

develop the various sectors of the economy, corrupt political leaders use the oil wealth for their selfish interest thus impoverishing the greater population (Eccker, 1981). The lack of diversification of the economy away from oil production is one of the main causes of the conflict in the Niger Delta, these conflict ranges from inter and intra community clashes, hostage taking and formation of militant groups.

Mismanagement and corruption seems to be a recurring phenomenon in most developing countries where oil and gas exploration is carried out. For example apart from the case of the Nigeria, in Angola over the last several years, oil multinational companies have made payment to government without actually disclosing the amount (Human rights watch 2004, Birdsall and Subramanan 2004). To curb this ugly trend the former president Olusegun Obasanjo set up the Nigerian anti-corruption agency, called Economic and Financial Crime Commission (EFCC) under the control and watchful eyes of Nuhu Ribau and he estimated that 70% of oil revenue which is more than \$ 14 billion was stolen or wasted. A case in point is that of the former governor of the oil rich state of Bayelsa DSP Alameiyesegha who stashed millions of dollars in foreign bank accounts buying mansions and cars in the United States and United Kingdom. Essentially oil revenue can be seen going to the government but none of it is reaching the ordinary people living in the Niger Delta region. Confirming why the people living in the Niger Delta region are unhappy, live in poverty and turn to militants fighting against the system and bad governance to Jeff Koinage of CNN, a leader of the foremost militant group operating in the Niger delta region, Movement for the Emancipation of Niger Delta (MEND), General God's Will said "we are in the middle of a struggle for the liberation of the Niger Delta, the most devastated and the most threatened region in the world". The insincerity of the federal government and oil multinationals in the management and control of oil revenue is the factor responsible for the crisis in this region. A commission like the Oil and Minerals Producing Area Development Commission (OMPADEC), which was created by the regime of General Ibrahim Babangida, for the development of the area did not achieve its aims due to poor funding on the part of the Federal Government, in spite of the huge number of dollars made from the area from crude oil. This gradually led to some leaders in the region to begin agitation for resource control. The government of Obasanjo however equally set up another agency, the Niger Delta Development Commission (NDDC), to bring development to the doorsteps of the people in the Niger Delta region, but the operation of the Commission is being hampered by lack of money to carry out its mandates, and it became a serious obstacle in pursuing the goals and developing the region. The main elements and action for reform are clear: the Nigerian government should enhance transparency, civil society participation and equality in translating large revenues

generated from oil exploration activities into improvement for the common welfare of citizens and adopt the management strategy recommended by Hellriegel et al. (2005).

3.1.5 Environmental requirement

The sustainable development doctrine concerns itself with utilizing the renewable and non-renewable resources in a manner considerate of economic, environmental and social implications for the present and future generations. The issue of sustainability takes a whole new dimension in the context of rich developing economies like Nigeria. Given the current economic situation in Nigeria and its dire need for economic growth and development, the exploration of crude oil resources for energy services and to meet the demand activities of its citizens has been on the rise. This is bound to have implications. The Niger Delta environment today is faced with many problems, arising from the impacts of human activities and natural phenomena. The environment is an interactive, indispensable medium, within and through which man's life performance is carried out. Man's life in his present nature is unimaginable without the environment to supply him with his needs such as air (to breathe), water (to drink and wash with), food (to eat), and solid materials for fashioning weapons, building shelters and clothing (Atolagbe 2002).

According to Energy information analysis (EIA), Nigeria has an estimated 36.2 billion barrels of proven oil reserves. The majority of reserves are found along the country's Niger River Delta and offshore in the Bight of Benin, the Gulf of Guinea and the Bight of Bonny. In 2008, Nigerian crude oil production averaged 1.94 million bbl/d, making it the largest crude oil producer in Africa. EIA also holds that Nigerian production could have reached 2.7million bbl/d in 2008. As a member of the Organization of Petroleum Exporting Countries (OPEC), Nigeria has agreed to abide by fixed crude production limits that have varied over the years but do not appear to have an impact on production volumes or investment decisions to the same degree as unrest in the Niger Delta. The major foreign producers in Nigeria are Shell, Chevron, ExxonMobil, Total, and Eni/Agip. Nigeria's striving for economic growth, development and industrialization for the improvement of living standard of its citizens has led to environmental degradation and pollution in the Niger delta region where oil and gas activities are carried out. The uncontrolled manner of oil exploration has resulted in a legacy of deterioration of health quality, pollution of water resources and destruction of traditional economic infrastructures

within the host communities. The table below shows the potential effect or impact of oil and gas exploration activities

Table 6 Potential Environmental impact of Oil exploration

Potential Environmental Impact of oil exploration Activities

Production Activity	Potential Environmental Impact

All activities	Loss of vegetation/arable land Hydrological changes Disturbance of communities/flora/fauna Waste pits in the field Oily waste burned in the flare pit Soil, water pollution
Well operations	Disturbance of communities/flora/fauna Soil, water pollution Disturbance of communities/flora/fauna
Flow lines, pipelines	Ambient air quality Acid rain Soot/heavy metal deposition
Flow stations	Pollution/fire affecting flora Soil/surface water pollution Disturbance of communities/flora/fauna Soil/surface water pollution Disturbance of communities/flora/fauna
Terminals	Poor ambient air quality Ozone depletion (firefighting agents) Soil, water, air pollution Waste problems Soil pollution.

Source: van Dessel (1995)

There have been various researches on the environmental consequences of oil and gas exploration in Nigeria as well the Niger Delta region. These including Awobanjo (1981), World Bank (1995), Moffat and Linden (1995), Grevy (1995), Olomo and Omene (1995), NDSE (1997) Famuyiwa (1998), Eromosele (1998), Chukwe et al. (1998), and Onosode (2003) and the environmental impact as a result of oil exploration activities has wider implications for sustainable development. This is because every aspect of oil exploration activity has a significant negative impact or implication on the environment, the impacts on the environment are caused by single operations or by combinations of a number of different operations by oil multinational companies. The resulting environmental consequences impose economic effects on the local people in the region. Finally, social tension tends to result from

compensation disagreements arising from environmental damage claims by the host communities. For examples records shows that between 1976 and 1990 alone about 2,796 oil spill incidents occurred resulting in 2,105,393 barrels of oil being released into the environment. The UNDP in its report in 2006 agrees with the above and stated that the productive and the environmental impacts of the numbers of oil exploration activities in the Niger Delta region are at the increasing every day.

However literature reviewed above has shown that there is evidence of the clear and present danger of environmental degradation of air, land and water resources from gas and oil exploration activities in the Niger Delta. What is more, there are enough resources being generated to allow for internalization of the environmental costs. The environmental regulation in place also acknowledges that Nigeria as a country has taken serious steps to develop effective environmental protection strategies as well as guidelines, yet during oil and gas exploration in the Niger Delta the immediate environment is affected which holds no good for the future generation. Other factors for the weakness of the environmental state other than poor enforcement include, culture, weak governance and lack of funding. The relevant regulators (administrators) should be well supported and, for effective compliance monitoring and enforcement, stiffer sanctions and penalties should be recommended and strictly adhered to it. This way environmental requirements will be met and maintained. Compliance should be tied to renewal of licences and consents, and proponents should ensure that staff are highly motivated with adequate equipment and capacity building programs vigorously pursued not only by the administrators but also the proponents. But how do all these factors affect sustainable development? Next we look into key even as that lead to sustainable development as well as fact and fiction.

3.2 SUSTAINABLE DEVELOPMENT

3.2.1 Key Events in the formulation of sustainable development

One of the first main publications looking at the ability of the earth to sustain its population was '*An essay on the principle of population*' which was written in 1798 by Thomas Malthus. In his essay Mathus proposed that the future growth in population was unsustainable, as population grew

exponentially while resources grew arithmetically, so at some point the population would outgrow the resources available to them for use leading to famine, war and plagues.

This however did not happen as was predicted due to various advances in sanitation, technology, food distribution and population growth slowing down, but the overall theory is still relevant in the 21st century. The Human populations is still growing and while technology is still advancing, non-renewable resources are still being consumed reducing the resources that are available to future generations. Malthus' essay implied that there was a maximum number of people that the earth could sustain and after this point was reached various forces such as famines would intervene to reduce this imbalance. This theory since then has been widely used in ecology using the terminology of carrying capacity, which implies that an ecological system can only carry a critical limit, and overshooting this limit results in overuse of resources and eventual collapse of the population. In 1968 Garret Hardins published an article 'The Tragedy of the Commons', which considered the problem again of overuse of natural resources. This article emphasized the need for a moral stance to maintain public resources and reported that technological advances were no longer enough. The tragedy of the commons is about the individuals use a public good, but do not pay for the full cost of it. The example used is a pasture in which farmers can graze their cattle. As each individual seeks to maximise their individual utility while at the same time not paying the full cost for it, as individuals or humans the best way to maximise utility is to use as much of the public good as possible, and as we all pursue this strategy the finite public good is used up and in the case of the farmers there is no longer any grass to graze their cattle. The main point highlighted in this article is the need for society to play a role in educating its citizens in the morals of sustaining their environments, as it was no longer sufficient to rely on technological advances to provide indefinitely for the future. This was however not taken seriously not until the 1960s when the environmental citizens groups became a major political force and this was due to the people starting to recognise that pollution was pervasive and the countryside endangered (Munn R 1992). The next major event in the history of sustainable development was at the World Conservation Strategy set up by the UNEP in 1980, which acknowledged the need for long term solutions and the integration of environmental and development objectives. It is this strategy that first used the terminology 'development that is sustainable'. The strategy stated that: *This is the kind of development that provides real improvements in the quality of human life and at the same time conserves the vitality and diversity of the Earth. The goal is development that will be sustainable. Today it may seem visionary but it is attainable. To more and more people it also appears our only rational option*'. It important to point out that one of the issues with this strategy was that it dealt specifically with issues relating to conservation and didn't provide a holistic or specific view of what we now understand as sustainability. This Holistic view of sustainability was realized seven years later

in the Brundtland Report 'Our common future'. This report had drawn on the conclusion from the 1984 International Conference in London on Environment and Economics which was that the environment and economics should be mutually reinforcing. The Brundtland report considered the ways in which the world's growing population could meet its needs over the next century. In doing this it defined the term sustainable development as "*economic and social development that meets the needs of the current generation without undermining the ability of future generations to meet their own needs*" (WCED, 1997).

3.2.2 The concept of Sustainability and Sustainable Development: Facts Verses Fiction

The meaning of sustainability varies according to context (Shearman, 2006). This notion was however challenged by Hay (2006) who submitted that it is not really the meaning of sustainability that changes with context but the understanding of the context itself. The latter therefore suggested that rather than wasting energy trying to figure out the meaning of sustainability, the focus should be on its implication for every sector of the society. This explains why a discussion of sustainability has to do with ways of making human the economic system last longer with very minimal impact on ecological systems and emphasis on concern over very significant global issues ranging from climate change to depletion of natural resources. In the field of environmental science, it refers to a very long lifespan of human ecological systems i.e. industry, agriculture, forestry and fisheries as well as several human communities. In the past two decades, sustainability had a new word added to it: 'development' with interest in making every aspect of human life usefully productive.

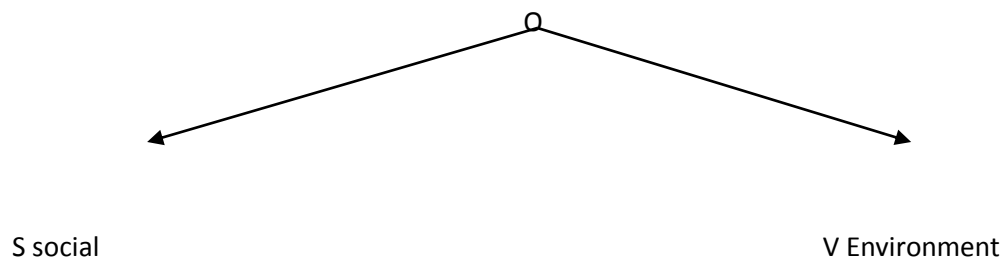
It is now over twenty years since the Brundtland commission came forward with its famous definition of sustainable development: "a development that meets the demand of the present generation without compromising the ability of the next to meet theirs." Most of the definitions of the concept today borrow one thing or another from it. Developments in various sectors and differences in specializations have led to the emergence of several definitions.

Sustainable development is concerned with integrating a balance between economic, social and environmental aspects of activities as well as balancing short term wants with long term needs (Bradley and Hartog, 2000). The challenge is to better understand, appreciate and anticipate how decisions affect these three aspects (IISD, 2007). The mission statement of several oil companies i.e. Shell, ExxonMobil, Conoco etc agree with this definition and by extension the Brundtland definition. However, to many of them this nod of approval is only in principle. What appears to be the norm is

the acceptance of the first part of the famous definition: 'a development that meets the demands of the present generation'. Meeting this need means more income and profit for oil multinationals. This led to deliberate disregard for the environment and human lives through several years of exploration. One can therefore say without mincing words that what we have seen twenty years after the famous conference of the World Commission on Environment and Development is pure hypocrisy on the part of oil companies. Be that as it may, the emphasis of Orecchini (2007) on zero consumption is not practicable in the short term in the oil industry. That is the desire of everyone but the full deployment of alternative and cleaner energy sources is yet to be achieved on a large scale. In addition to accepting the definition of Bradley and Hartog (2000) and Brundtland (1987), oil exploration companies should also see sustainable development as the creation of cleaner fuel through less polluting engine technology that will reduce the amount of pollutants like sulphur from gasoline and ultimately invest in renewable energy technology. Considering the various definitions, and explanation of principles of sustainable development above, there are three operational criteria. These criteria should evaluate each objective of the triple bottom line (environment, social and economic)

E Economic





Sustainable development equilibrium: $OE = OS = OV$

Source: adaptation after Rogers (2008) – An Introduction to Sustainable Development, p.45

In essence from the figure above the true and appropriate balance of environmental, social and economic capital is the challenge of sustainable development (Arscott, 2003). There is no doubt as asserted by Rajnauth (2003) that the availability of an abundant and economic supply of energy is a requirement for the economic and social pillars of sustainable development. Oil and gas will incontestably remain a major element of the global energy mix for many years to come until alternative sources of energy becomes available on a very large scale and economically affordable. During this time which can be referred to an evolution period, the oil and gas industry he argued has an important role to play in managing its operations safely and significantly reducing emissions, discharges and ecological impacts while at the same time providing energy at reasonable cost. Exploration companies have not lived up to expectation in this area. Oil multinationals have ignored the environment which holds the hope for the next generation. By not making significant efforts to harness alternative and more environment friendly energy sources, we are jeopardizing the survival of our children when we have all died.

Labelle (2000) contended that production of energy is one of the fundamental components of economic development and societal wellbeing. But the development and use of fossil fuels deplete non-renewable natural resources and are not without cost to society thus making sustainable development a necessity in the energy sector. Oil companies should determine to live up to the their notion of sustainable development as maintaining a balance between environmental, social and economic dimensions while neither depriving the present society nor the next generation of its supply of energy. Oil companies in the country we are guilty of contributing to global warming through

flaring rather than conversion to a viable product for economic benefit as suggested by Ishisone (2004) thereby causing Nigeria economic loss of over \$3b annually aside from the environmental and social implications which negates the principle of sustainability. Oil companies should begin to invest in Wind and Hydrogen Energy in the face of the negative consequences of fossil fuel production and use. We haven't thought of investing in such renewable alternatives. The time is now ripe to start developing the skills because knowledge is like money (Arango, 2006). Since hydrocarbon products from the oil industry (and known as sources of greenhouse gases) are non-renewable, the issue of recycling doesn't come in, However, the development of renewable energy (though a long term project) holds the solution.

3.3 ENVIRONMENTAL COST AND ECONOMIC POTENTIAL OF GAS FLARING IN NIGERIA

As a visitor to a gas flaring site during the course of this research I was shaken to watch the endless burning of this gas continuously for hours without stop. Even though Nigeria has grown to be fairly dependent on crude oil and it has become the centre of current industrial development and economic activities, we rarely consider how oil and gas exploration and exploitation processes create environmental, health, and social problems in local communities near oil producing fields.

Gas flaring in the Niger Delta is not only the cause of economic loss, but also the cause of environmental degradation and health risk. Theoretically it is the combustion processes with complete combustion that create relatively innocuous gases such as carbon dioxide and water (Leahey and Preston 2001). Gas flared in the Niger delta is being increasingly seen as a viable alternative source of energy to speed up development needs in Nigeria, Africa and other part of the world. But In Nigeria, while the gas is wasted through the air, creating harmful air pollutants, biomass is still the mainstay of cooking and other heating. As matter of fact, statistics showed by Goldemberg (2000) explained that the amount of natural gas currently flared in Nigeria can serve the cooking needs of 320 million people not served by modern fuels. The World Bank (2007) also contended that gas flaring contributes to greenhouse gases and harms the environment; it could be used as a good source of energy which is wasted by most developing countries like Nigeria. The world bank furthermore estimated that about 100 billion cubic meters of natural gas are flared annually, which is an equivalent of the gas consumption of France and Germany. Also Zadakbar (2008) and Isishone (2004) both contended that not only does gas flaring cause environmental degradation but also causes a health risk to humans.

Kindierski (2000) also added that gas flaring in the Niger delta region in Nigeria is characterised with incomplete combustion and emits a variety of compounds ranging from propane, methane and other hazardous air pollutants which include volatile organic compounds, polycyclic aromatic hydrocarbons and soot. With this in mind Gulzhan (2006) contended that gas flared into the atmosphere can be used as an alternative source of energy as this would remedy Nigeria's energy issues as is the practice in other developed countries like the United States and United Kingdom. (The USEIA 1999) agrees with this stating that the amount of natural gas wasted in Nigeria represents about 24% of the country's energy consumption. With all these studies, literature and statistics, the big questions are why would oil multinationals pay fines for gas flaring during oil and gas exploration rather than curb it? Next we examine the relationship between the naira and the pound to give an in-depth perspective.

3.3.1 Relationship between the naira and pound

Oil multinational companies through their financial advisers calculated that instead of putting a halt to flaring gas, it was cheaper to pay the fine imposed by the Nigerian government as a penalty. Even though the fine for gas flaring has increased from Naira 0, 5 to Naira 10 (U.S. 11 ¢) for every 1,000 ft³. In 1984, the exchange rate was N2 to £1 and N1 to approximately \$2. But now £1 is about N230 and \$1 to N120 for every 1,000ft³ (Manby 1999, Project Underground 2003), this fine is still too low to have an impact on these companies' policy toward gas flaring. Below is a graph of the British pounds to the Nigerian naira



Figure 15 Relationship between the Nigerian Naira and the British Pounds

Based on the graph (figure 14) above we notice that within the last 2 years £1 = N 235.00 this was the lowest, where in the United Kingdom £1 can only get you a bottle of coke but in Nigeria N235.00 would be enough to get an individual food for a day.

The African business magazine in 2001 reported that the Nigerian government is reluctant to increase the fines for gas flaring further because of her huge indebtedness to the oil multinational companies. The government according to the report has been unable to collect significant part of the fine for gas flaring as a result of her inability to redeem its obligations. Uwalomwa & Uadiale, (2011) were angered by the lip-service of the Nigerian government to the issue of gas flaring as demonstrated by successive extensions of the gas flaring deadline many times namely 2004, 2007, 2008, 2010 and lately December 31st, 2012 as the terminal date for gas flaring by the legislature, hence the country does not really lack law but the enforcement of the laws. He opined that that the 2012 target date still looked unrealistic as the government and oil companies are not sincere. O'Rourke and Connolly (2003) stressed that rather than looking to developed countries strategies to gain economic profit from natural gas, Nigeria as well other developing countries that still flare gas, attached more importance to the political and economic benefits of oil revenue, more than the environment or human health. Recently, there has been more attention on the introduction of modern energy on a small-scale as a key strategy for

promoting sustainable development in rural areas (Goldemberg 2000) this is because the lack of adequate energy services in rural area has serious environmental and health effects.

Smith (1999) contended that simple household fuel such as fuel wood and crop residues stoves do not obtain high combustion efficiency so that they emit a large number of pollutants including particulate matter, CO, carbon dioxide, methane, nitrogen dioxide, formaldehyde, and PAH such as benzo[a]pyrene (Ezzati and Kammen 2002). The emissions due from incomplete combustion not only contribute to climate change as greenhouse gases (GHG), but also have major adverse health impacts including acute respiratory infections, chronic obstructive pulmonary disease, asthma, nasopharyngeal and laryngeal cancer, tuberculosis, perinatal conditions, adverse pregnancy outcomes, and eye irritation (Ezzati and Kammen 2002). For instance, CO and other particulate levels are 10 times higher than the standards (Uma and Kim Oanh 1999). Consequently, the reduction of gas flaring during oil and exploration activities for small-scale utilization would benefit not only local communities in the Niger delta but also an investor, oil producer, or owner of the associated gas. Although the reduction of gas flaring itself is usually accompanied by high costs, when the economic benefits of improved health as well as the environment are counted, there is a net economic benefit for industries, agriculture, the government, oil exploration companies, and for those household energy options involving a shift from traditional use of coal and biomass. Living standards in the Niger Delta can be significantly improved by promoting a shift from flaring the associated gas to collecting it for gaseous fuels and electricity. An important means to achieve this is associated gas recovery; however, is not an easy job to do in a country like Nigeria. Like other developing nations, Nigeria has slower rates of economic development, higher levels of corruption, higher military spending, and is more vulnerable to economic shock (Ross 2001). Oil and gas exploration has the power to weaken a nation and to strengthen a nation. Although the effort to reduce gas flaring is crucial to global, national and local environment and for human health, oil multinational companies operating in the Niger Delta region still continually delay, and procrastinate plans to stop gas flaring in the area. Thus, this current political, economic, and social system that exists between the government and oil multinational companies is required to change significantly. Greater public disclosure of data on the environmental, social, and financial impacts of gas flaring is needed from the Nigerian government and oil multinational companies. The government needs to strengthen its capacity to act as a regulator and facilitator of oil and gas exploration and provide better transparency mechanisms. On the part of oil companies, they should support small-scale projects for utilizing associated gas which may be good for their reputation within and outside Nigeria. This will also improve economic activities in the Niger Delta, leading to more employment and therefore less violence in the area. There is also a need for more and better data on parameters for economic analysis as well as on dangerous pollutants released into the

environment from gas flaring. Additionally, there is virtually no toxicological data available on exposed communities from gas flaring in Nigeria and Niger Delta. Therefore a comprehensive research is required to better measure and to evaluate impacts of gas flaring in the Niger Delta and provide local communities with education on the importance of a reduction of gas flaring by non-government organizations; this is essential to make communities united to stop gas flaring. Although the political structure in Nigeria poses a significant hurdle, economic and energy initiatives need to be strongly integrated with other policies that promote development.

3.4 SUMMARY AND CONCLUSION

In this Chapter the concept of sustainable and sustainable development was identified and discussed. It also provided a background of the key issues affecting sustainable exploration of oil and gas exploration in Nigeria and the UK. It also addresses some of the research objective. Furthermore a conceptual framework was formulated, these requirement need to be present in order to achieve suitability and sustainable development. This led to the next chapter research methodology. In this section, I will define and explain the research design. Further, I will discuss the rationale for the research method adopted, analysis of data collected, findings and T test analysis.

Research Methodology

The research had two case study areas and included a total of 13 focus group, 86 questionnaires and 7 interviews. Analysis of this data showed that the oil and gas exploration activities in Nigeria are different from that in the UK. The empirical evidence equally suggests that the lack of technological advancement, management, legislation and corruption are strongly related to incidence of environmental impact during oil and gas exploration. This thesis further discusses the need to strive towards a balance between environmental sustainability and economic growth. Sustainable environment and growth can only be achieved through the integration of policies that connect the environment, the economy and the society. As Such a framework was suggested, which will not only protect the environment and people from the impacts of oil and gas exploration, but will also protect Nigeria crude oil resource saving lives and livelihoods over the coming years. Also the research analyses a number of strategic initiatives, which can be adopted in Nigeria, taking lesson from the UK to achieve the balance between environmental sustainability and growth through the integration of policies, management, technology that connect the environment, society and economy

4.1 INTRODUCTION

This chapter is concerned with and presents the nature, type and source of the information, the sampling design and technique as well as data collection and analytical techniques that are used in the study. The research had two case study areas and included a total of 13 focus group, 86 questionnaires and 7 interviews. Analysis of this data showed that the oil and gas exploration activities in Nigeria are different from that in the UK. The empirical evidence equally suggests that the lack of technological advancement, management, legislation and corruption are strongly related to incidence of environmental impact during oil and gas exploration. This thesis further discusses the need to strive towards a balance between environmental sustainability and economic growth. Sustainable environment and growth can only be achieved through the integration of policies that connect the environment, the economy and the society. As Such a framework was suggested, which will not only protect the environment and people from the impacts of oil and gas exploration, but will also protect Nigeria crude oil resource saving lives and livelihoods over the coming years. Also the research analyses a number of strategic initiatives, which can be adopted in Nigeria, taking lesson from the UK

to achieve the balance between environmental sustainability and growth through the integration of policies, management, technology that connect the environment, society and economy

4.1.1 Meaning of research

Research was defined by The Advanced Learner's Dictionary as "a careful investigation or inquiry especially through search for new facts in any branch or form of knowledge". Redman and Mory (1923) also define research as a "systematized effort to gain new knowledge" or it can be viewed as a logical and systematic search for new and useful information related to a particular topic of interest. But in recent times academics as well as lay people are of the view that research is a movement, in essence a movement from the known to the unknown, this is because when the unknown challenges us, human inquisitiveness make us probe to attain the full meaning of the unknown. This human inquisitiveness is the basis of all knowledge and the method which is adopted for obtaining this knowledge of what is unknown can be referred to as research. Here knowledge means the information about the subject matter; this information that is collected could be in different forms like experiments, books, journals, nature and so on. But the main purpose of a research is that it can either lead to a contribution of knowledge or add to existing knowledge.

Research is done either by study, experiment, analysis, observation or comparison. For example, we know that cigarette smoking is dangerous to health; heroine is addictive; cow dung is a useful source of biogas; malaria is due to the virus protozoan plasmodium; AIDS (Acquired Immuno Deficiency Syndrome) is due to the virus HIV (Human Immuno Deficiency Virus). But how did we know all these? We became aware of all these facts only through research. More precisely, it seeks prediction of events giving detailed explanations, relationships and theories for them. But what makes people undertake or carry out research?

4.1.2 Motivation for Research

What makes people undertake or carry out research? This is a question of fundamental importance. The possible motives for doing or carrying out a research work may be either one or more of the following:

1. Desire to get a research degree along with its consequential benefits;

2. Desire to face the challenge in solving the unsolved problems, i.e., concern over practical problems initiates research;
3. Desire to get intellectual joy by doing some creative work;
4. Desire to be of service to society;
5. Desire to get respectability.

However, this may not be an exhaustive list of factors motivating people to undertake research studies. Other factors such as directives of government, employment conditions, curiosity about new things, desire to understand causal relationships, social thinking and awakening, and the like may well motivate (or at times compel) people to perform research operations.

This research was thus motivated by the observation of the continuing environmental impact from oil and gas exploration in the Nigerian oil and gas industry, and the local communities that are affected. The most notable case is the Shell and Ogoni case (Boele et al., 2001). This research is interested in how the oil companies carry out oil and gas exploration activities in Nigeria with comparison to the United Kingdom. The motivation to embark on this research arose in September 2010. The research started with a proposal stage that focused mainly on the research objectives and a plan for its eventual completion. This was followed by an exploration of relevant literatures for broader understanding of theories and philosophies underpinning the research. Next was the development of interview guides and group discussion checklists and the fieldwork trip to Nigeria. The fieldwork lasted from December 2011 to April 2012 and began with a week-long access negotiation and reconnaissance survey prior to Group discussions and interviews. The initial field survey carried out before the research began helped in obtaining the consent and cooperation of the local people and also provided information necessary for the improvement of the discussion and interview guides. During this period, the prevailing situations in the field were observed; the research also made the acquaintance of the field assistant who was responsible for leading the researcher to the gate keepers and translation (where necessary) during the group discussions and interviews; and tested the group discussion guides with two randomly selected households, with a view to setting the stage for the first group discussion. This allowed a final modification to be made to the questions.

4.2 RESEARCH METHODS VERSUS METHODOLOGY

4.2.1 Research methods:

Research methods can be explained as the various procedures, schemes and algorithms used in research (Crotty 1998:3). In other words all the methods or techniques used by a researcher during a research study are termed as research methods. They are essentially planned, scientific and value-neutral. (Yin 2003) They include all theoretical procedures, experimental studies, numerical schemes, statistical approaches, etc. the research methods helps the researcher to collect samples, data and finding a solution to a problem. Particularly, scientific research methods call for explanations based on collected facts, measurements and observations and not on reasoning alone. They accept only those explanations which can be verified by experiments (Pauline V. Young 1945) also (Bernard Ostle and Richard W. Mensing, (1954) agree and explained that research methods refer to the behaviour and instruments used in selecting and constructing research techniques. For instance, the difference between methods and techniques of data collection can better be understood from the details given in the following chart below.

Table 7 Different research methods techniques

Type	Methods	Techniques
Library Research	1) Analysis of historical records 2) Analysis of documents	Recording of notes, Content analysis, Tape and Film listening and analysis. Statistical compilations and manipulations, reference and abstract guides, contents analysis.
Field Research	1) Non-participant direct observation 2) Participant observation 3) Mass observation 4) Mail questionnaire 5) Opinionnaire 6) Personal interview 7) Focused interview 8) Group interview 9) Telephone survey 10) Case study and life history Small group study of random behaviour, play and role analysis	Observational behavioural scales, use of score cards, etc. Interactional recording, possible use of tape recorders, photo graphic techniques. Recording mass behaviour, interview using independent observers in public places. Identification of social and economic background of respondents. Use of attitude scales, projective techniques, use of sociometric scales. Interviewer uses a detailed schedule with open and closed questions. Interviewer focuses attention upon a given experience and its effects. Small groups of respondents are interviewed simultaneously. Used as a survey technique for information and for discerning opinion; may also be used as a follow up of questionnaire. Cross sectional collection of data for intensive analysis, longitudinal collection of data of intensive character. Use of audio-visual recording devices, use of observers, etc.
Laboratory Research		

Source: <http://limat.org/data/research/Research%20Methodology.pdf>

From what has been stated above, we can say that methods are more general. It is the methods that generate techniques.

4.2.2 Research methodology

Bernard Ostle and Richard W. Mensing, (1954) explained that research methodology is a way to systematically solve the research problem. It is a science of studying how research is done or carried out scientifically. Essentially, the procedures by which researchers go about their work of describing, explaining and predicting phenomena are called research methodology. It is also defined as the study of methods by which knowledge is gained. Its aim is to give the work plan of research.

It is also necessary for the researcher to know not only the research methods/techniques but also the methodology. Researchers not only need to know how to develop certain indices or tests, how to calculate for the mean, the mode, the median or the standard deviation or chi-square, how to apply particular research techniques, but the researcher also needs to know which of these methods or techniques, are relevant and which are not, and what would they mean, indicate and why. Researchers also need to understand the fundamental assumptions or various techniques and they need to know the criteria by which they can decide that certain techniques and procedures will be applicable or appropriate to certain problems and others will not. All this means that it is essential and important for the researcher to design his methodology for his problem as the same may differ from problem to problem. For example, a structural engineer, who designs a building, has to intentionally evaluate the basis of his decisions, i.e., he has to evaluate why and on what basis he selects particular size, number and location of doors, windows and ventilators, uses particular materials and not others and the like. This is applicable in research work as well as the researcher needs to expose the research decisions to evaluation before they go into implementation or are implemented. The researcher needs to specify very clearly and precisely what decisions he selects and why he selects them so that they can be evaluated by others also. From what has been stated above, we can say that research methodology has many dimensions and research methods do constitute a part of the research methodology. The next topic would now look into the source and nature of data that would be used for this research.

4.2.3 Importance of Research Methodology in Research Study

It is necessary for a researcher to design a methodology for the problem chosen or highlighted. It is important to note that even if the method considered in two problems is the same, the methodology may be different. It is important for the researcher to know not only the research methods necessary for the research work undertaken but also the methodology. For example, a researcher not only needs to know how to calculate mean, variance and distribution function for a set of data, how to find a solution of a physical system described by a mathematical model, how to determine the roots of algebraic equations and how to apply a particular method but also needs to know

- (i) Which is a suitable method for the chosen problem?
- (ii) What is the order of accuracy of the result of a method?
- (iii) What is the efficiency of the method?

The next topic would now look into the source and nature of data that would be used for this research

4.3 PHILOSOPHICAL POSITION AND THEORIES

According to Burrell and Morgan (1979), "all social scientists approach their subject via explicit or implicit assumptions about the nature of the social world and the way in which it may be investigated." The most significant of these assumptions are those relating to ontology and epistemology. Ontology is concerned with questions about the nature of reality: "social scientists, for example, are faced with a basic ontological question: ... whether „reality“ is a given „out there“ in the world, or the product of one's mind" (Burrell and Morgan, 1979). Epistemology is concerned with questions about how and what is possible to know; particularly how to justify claims to knowledge. In the social and behavioural sciences field, epistemological debates are divided into two main camps, the positivists and the interpretivists (Onwuegbuzie and Leech, 2005). Proponents of both camps maintain the view that there is a dichotomy between quantitative and qualitative research; they are referred to as purists (Rossman and Wilson, 1985). Purists believe that an essential distinction exists between quantitative and qualitative research methods with respect to

ontology, epistemology, axiology, rhetoric, logic, generalisations and causal linkages (Johnson and Onwuegbuzie, 2004). Rossman and Wilson (1985) have observed that three major schools of thought have evolved from the quantitative-qualitative divide, namely: *purist*, *situationalist* and *pragmatist*. They identify the differences between these three perspectives as related to the extent to which each camp believes that quantitative and qualitative approaches co-exist and can be combined. Rossman and Wilson (1985) conceptualised these three perspectives as lying on a continuum, with purists and pragmatists at opposite ends, and situationalists somewhere in between. For purists, the assumptions associated with both paradigms are incompatible, specifically regarding how the world is viewed and what is important to know. For example, purists, such as Smith (1983) and Smith and Heshusius (1986) contend that quantitative and qualitative approaches cannot and should not be mixed. They advocate mono-method studies. Situationalists maintain the mono-method stance of the purists, and hold the view that both methods have value. They, however, believe that certain research questions are better addressed through quantitative approaches, and others by qualitative methods. Thus, whilst representing very different orientations, the two approaches are viewed as being potentially „complementary“ (Vidich and Shapiro, 1955). Pragmatists on the hand view the qualitative and quantitative divide as a false dichotomy (Newman and Benz, 1998). They suggest that quantitative methods are not necessarily positivist, nor are qualitative techniques necessarily hermeneutic (Cook and Reichardt, 1979, Daft, 1983, Miller and Fredericks, 1991, Sieber, 1973). Pragmatists thus recommend routinely integrating the two methods within a single study (Creswell, 2009); because, as Sieber (1973) pointed out, both approaches have inherent strengths and weaknesses and so researchers should ideally utilise the strengths of both to better understand a social phenomenon. Therefore, rather than approaching a research problem from fixed epistemological positions, researchers holding this worldview, approach the problem with their own research questions and then select the most appropriate methods to answer them (Tashakkori and Teddlie, 2003).

This research adopts a pragmatic worldview, and the research strategy employed reflects this position. Biesta (2010) pointed out, “Pragmatism should not be understood as a philosophical position among others, but rather as a set of philosophical tools that can be used to address problems.

4.4 STUDY AREAS

The Niger Delta region of Nigeria is the largest wetland and also believed to maintain the third drainage area of Africa (Yakubu 2008). This area consists of four ecological zones: lowland rainforest, freshwater swamps, mangrove swamp forest and coastal barrier island which are part of the naturally endowed ecosystem acclaimed as having one of the highest concentrations of biodiversity on earth. The wide variety of crops, fresh water fish and economic tress (forest) sustained by the Niger delta ecosystem is incomplete with any other on the entire African continent. However with a broad network of over 900 oil producing wells, over 1500km of trunk lines, 100 flow station/gas plants as well over 45,000km of oil and gas flow lines, researcher contended that the Niger delta has become synonymous with oil pollution (Osuji 2002; Osuji and Onojake, 2004) which pollutes the soil, air and water and poses serious health hazard to residents or people living in the region. The main study area focuses on Uzere formerly known as "Uzei" and is located in Isoko south Local Government Area (LGA) of Delta State of Nigeria. Uzere has two oilfields (Uzere West and Uzere East) with a total of 43 oil wells producing about 53,000 barrels per day (8,400 m³/d). Uzere has nine communities: Uhei, Ezede, Uweye, Afikioko (London Base), Uhroko (Paris), Ekregbesi, Abale, Iwre-Ezede, and Iboro.

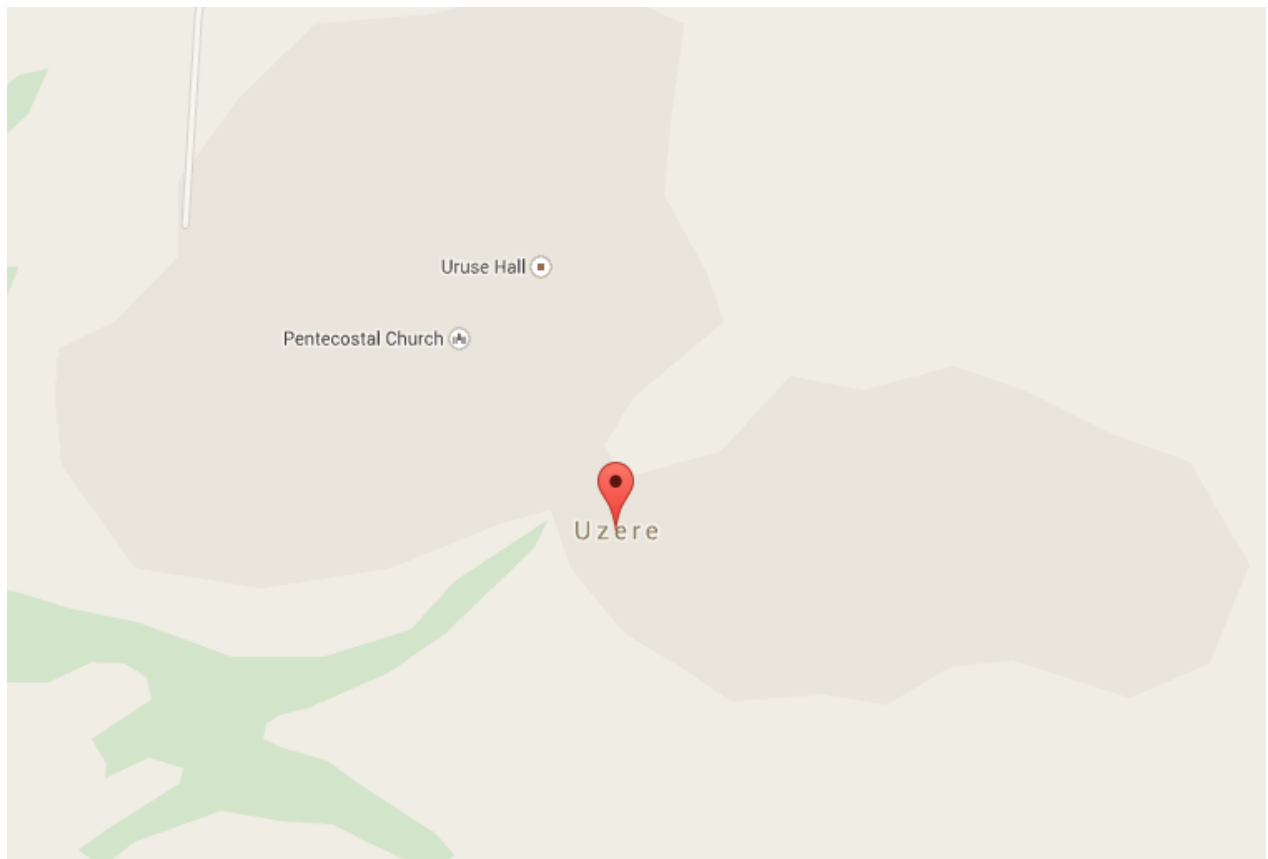


Figure 16 Map of Uzere (Study Area)

Source: Google map

The people are predominantly engaged in small scale agriculture. A handful of their numbers are civil servants (government workers). The main ethnic groups in the community are Uhrobo's, and Pidgin

English which is a corrupted form of the English language is very common with the less educated not only in Nigeria but the rest of West Africa and widely spoken.

Based on available data collected, the study area belongs to the humid hot topical climate located on the Niger Delta plains and has fairly high temperature throughout the year. The lowest temperature experienced in the area is about 20°C which is usually in September. Rainfall is observed throughout the year with the flooding of streams, during the peak of the rainy season (June- November). The minimum rainfall occurs between January and March. Since the soil of the area is loam and clay loam, the seasonal swampy areas are heavily cultivated. Common crops include cocoyam, cassava, maize, plantain and banana. Yields are however low since it has been discovered that gas flaring and oil spillage destroys the crops before maturity while in other cases oil spillage destroy the soil nutrients. Vegetation in the community has however been affected significantly by the deforestation via oil exploration activities.

Gas flaring and oil spillage in Uzere and other part of the Niger Delta has been going on almost uninterrupted for four decades and little is being done to contain this awful act (Polgreen 2008), ironically the community name is translated as “place of light”. The decision to carry out this research in the study area is informed by the long history of oil pollution and gas flaring in the community. Oil Exploration Company in this area through their financial advisers and means to maximize profit has neglected the people and led to a great deal of environmental, social and economic impact. Though they provide various forms of corporate social responsibility like hospitals and the building of schools, ironically most of the hospitals and school lack adequate qualified personal. Like many across the country the area is poverty stricken and many cannot even afford three set meal in a day, basic amenities like water and electricity. This set of residents may become missing elements in a quest to examine oil and gas exploration in the area.

4.5 SOURCES AND NATURE OF DATA

The study would be based on primary and secondary data collected from Uzere formerly known as "Uzei" and which is located in Isoko south Local Government Area (LGA) of Delta State of Nigeria as well as oil and gas personnel carrying out exploration activities in the north sea of the United Kingdom.

First there is a need to collect data on the environmental impact of oil and gas exploration activities that have been authenticated by qualified personnel. This will insure against frivolous complaints by people to make a political or economic point. In this scenario it may probably take into consideration the high degree of agitation in such communities in the region over the operation of oil companies.

Secondly individuals affected offer the best opportunity to collect authentic data on the impact of oil and gas exploration complaints, and with adequate permission from relevant bodies, organizations and communities data can be collected and retrieved.

Thirdly it would be preposterous to assume that all environmental impacts during oil and gas exploration are caused by oil multinationals, consequently only environmental impacts and complaints that are directly linked with oil multinationals carrying out exploration activities in this region would be retrieved.

Fourthly questionnaire and interviews were sent and carried out to get more insight on the nature and impact that oil exploration activities by oil multinationals have on the environment as well as individuals within the host community.

Finally, there is usually the problem of data storage in most developing countries. Most data are paper-based and manually stored. It is therefore often very difficult to identify and retrieve data entered and stored many years ago. Data more recently entered and stored are quicker to retrieve. Three or five years is a reasonable time period to expect data to be available and easy to retrieve from such manual systems of storage. Added to this problem of manual data collection, each item will have to be meticulously examined and only cases that may be of interest will be retrieved. This takes much time and cost.

4.6 PROCEDURE OF DATA COLLECTION

4.6.1 Data collection procedure involves several stages.

First, a list of all reported environmental impacts was collected irrespective of what might be the probable cause. And suspected environmental complaints linked with oil and gas exploration activities are also obtained from local government, hospitals, and environmental bodies through personal interviews. It is hoped that any environmental impact complaints that may be localised and suspected to be linked to oil and gas exploration activities in the locality may be captured in this group.

Secondly the environmental impact of oil and gas exploration would be examined and analysed for spatial distribution. Only records of environmental impacts are drawn up (of probable oil and gas exploration impact complaints) and retrieved. A spreadsheet is designed to collect data of each complaints, the sex of the participant, age, the home and location of the participant. It also important to note that the name and street of the participants will not be provided for privacy reasons, this ensures the anonymity of the participant as spatial analysis of the data would be carried out.

It is important to note that the data collection exercise was undertaken by a qualified local government person recruited from among the staff of the local government where environmental impact of oil and gas exploration is experienced. In Nigeria, it is not difficult to recruit a lower ranked staff as research assistant for a stipend, especially when they are officially off duty. This has several advantages. First, it is easier for local government to release documents that will be worked on by their personnel. Secondly the local government personnel are more conscious and conversant with ethical issues involved in such data collection. Thirdly, the local government personnel will understand better the various environmental complaints from oil and gas exploration activities and record them more accurately. Fourthly the cost and time involved in training field assistants will be greatly reduced. Only minimal instructions are given as the instruction session was conducted and proper supervision of the data was collected. Actual data collection between was carried out between January and May 2013 at Uzere formerly Known as "Uzei" and is located in Isoko south Local Government Area (LGA) of Delta State of Nigeria by local government personnel. The data are entered into the computer to enable easy access for processing and analytical purposes.

Finally to get a thorough insight of the research work various face to face interviews were carried out will oil and gas personnel operating in the UK (Aberdeen) to examine how environmental impact issues and procedures during oil and gas exploration which result in less or minimal impact on the

environment as a whole. This is because most oil and gas exploration activities in the UK take place in the North Sea and there is little or no immediate community directly affected by oil multinational companies. Since it not possible to interview individuals living in the area where oil and gas exploration activities are carried out, a total of 90 questionnaires where sent out to staff of four oil and gas exploration companies. This was done as I wanted standardization and didn't want to be biased in terms of the feedback or response from the participants. And the qualitative data interviews conducted necessitated the use of semi-structured interviews in order to further elaborate on themes emerging from the survey and the literature. The interviewees include two managers and four environmental impact consultants in the oil and gas industry. However due to the inability to get reasonable access to conduct the interviews due to logistics and location of platforms, the initial proposal of 10 interviews with offshore installation managers and first line supervisors became impossible. The concern of organisations about the tight schedule of participants made it further impossible to get approval for more telephone interviews. Though there are other forms of collecting qualitative data such as focus group which was used in the qualitative data collected in Nigeria, in-depth interviews, the use of the semi-structured interview was adopted. This is because it allows the questions to have enough structure to make it easy to go back to the original question. Especially when the answers are not on track while still allowing the researcher the opportunity to ask spontaneous questions and follow up on things said by the interviewee (Punch 2005). The profile of the company would be represented alphabetically (A, B, C, D) the reason for doing this is to maintain anonymity of the companies or organisations in question. The profile of each company would now be explained below.

Company Profiles

Table 8 Alphabetical representation of companies

Alphabetical representation	Brief company profile
Company A	Company A is situated in the northwest of Scotland UK and is one of the world's leading engineering and construction companies servicing the oil and gas industry and supports or carries out operations in the North Sea, North America, Brazil, Africa and Asia-Pacific.
Company B	Company B is situated also in the northwest of Scotland UK and specialises in the development, construction and operation of Semi-Submersibles and Jackup Drilling Platforms, FPSOs and Mobile Drilling and Production Platforms
Company C	Company C is situated also in the northwest of Scotland UK and its engages in the acquisition, development, and production of oil and gas fields primarily in the UK and different part of the world.
Company D	Company D is situated in the northwest of Scotland, and it is leading provider of oil and natural gas exploration and production. Their main goals are to reduce accident, no harm to people and no damage to the environment during oil and gas exploration activities.

4.6.2 Techniques of Data Analysis

Several analytical techniques are applied to data. Descriptive statistics such as sums, mean, percentages may be used to describe that data collected, which could be analysed by two distinct methods: quantitative and qualitative research methods. However the to choose a specific method or methodology actually depends of its suitability to answer the research question that is established by the researcher (Bryman, 1988). Denzin and Lincoln (1998) asserted that the qualitative research method or methodology process focuses on the discovering how the social meaning is constructed and stresses the relationship that exists between the investigator and the topic being studied. While the quantitative research method or methodology is based on the measurement and the examination of spontaneous relationship between variables identified by the researcher. Berg (2001) however distinguished between qualitative and quantitative research and argued that qualitative research referred to the meanings, concepts, definitions, characteristics, metaphors, symbols and descriptions of things, while on the other hand quantitative research referred to the measures and counts of things.

4.7 QUALITATIVE AND QUANTITATIVE RESEARCH

Data collection and analysis methods can be classified into qualitative and quantitative methods. This is however a conventional classification is as a distinction can be helpful to the writers but it can also be misleading. The debate between the qualitative and quantitative approach methods to research in essence centres on the impact of various methodologies on the reliability and validity of the research results. Those in favour of a quantitative approach method or methodology, such as Mintzberg (1973) and Hodgson, Levison and Zaleznik (1965), based their arguments on the objectivity and internal validity of results obtained via a qualitative approach. They consider bias on the part of the researcher as an inescapable part of the qualitative method or methodology as the validity of the results may therefore be questioned, and it would be difficult to compare the results of studies conducted by different researchers (Gill & Johnson 1997:156). Whereas those who support the qualitative method, such as Neustadt (1960) and Burgess (1993), base their criticism of the quantitative approach methodology on whether quantification is possible under all circumstances and the possibility of uncontrolled bias. As a result of this debate in relation to the research method, it would be highly important and essential to critically examine both methods in-depth to highlight and get a better understanding.

4.7.1 Quantitative Research Approach

Quantitative research emerged many years ago and was driven by investigators with the need to quantify data. Ever since then the quantitative research method has dominated the western culture as the research method to create meaning and new knowledge. Leedy and Ormrod (2001) alleged that the quantitative research method is specific in its surveying and experimentation, as it helps builds upon existing theories. The methodology of a quantitative research maintains the theory of an empiricist paradigm (Creswell, 2003). The research itself is independent of the researcher. As a result, data is used to objectively measure reality. The quantitative research method creates meaning through objectivity uncovered in the collected data.

When you think of quantitative research methods, you will probably have specific things in mind. You will probably be thinking of statistics, numbers. Hussey and Hussey (1997:12) explained that the quantitative research approach provides objective and unbiased results that have not been influenced by the researcher. A quantitative result focuses on numerical results and the influence of human factors is limited. Also Aliaga and Gunderson (2000), describe quantitative research methods very well: Quantitative research is 'Explaining what the phenomena is by collecting numerical data that are analysed using mathematically based methods (in particular statistics)'. Quantitative research methods are frequently described to be deductive in nature, in the sense that inferences from tests of statistical hypotheses lead to general inferences about characteristics of a population. Quantitative research methods are also frequently characterized as assuming that there is a single "truth" that exists, independent of human perception (Lincoln & Guba, 1985). However Trochim and Land (1982) on the other hand defined quantitative research as the glue that holds the research project together. This is because it's a method or design which is used to structure the research, to show how all of the major parts of the research project the samples or groups, measures, treatments or programs, and methods of assignment work together to address the central research questions.

When a researcher sets out to do research on a particular subject, we are always looking to explain something. In education, this could be questions like 'why do lecturers leave teaching?', 'what factors influence student achievement?', and so on. In quantitative research, we collect numerical data. In order to be able to use mathematically based methods, our data have to be in numerical form. This agrees with Manheim and Rich (1995) stating that quantitative research is essentially is about collecting numerical data to explain a particular phenomenon and specific questions seem immediately suited to being answered using quantitative methods. For example how many males get a first-class degree at university compared to females? What percentage of teachers and school

leaders are from black ethnic back groups? Has pupil achievement in English improved in schools in our local council in the last year? These are all questions we can look at quantitatively, as the data we need to collect are already available to us in numerical form. So in general terms we could say that Quantitative research, on the other hand, is more concerned with questions about: how much? How many? How often? To what extent. An example is when large scale, formalised questionnaires are distributed in an impersonal manner (by post or e-mail) and the responses are coded and statistically analysed.

There are three broad classifications of quantitative research method: these are descriptive, experimental and causal comparative (Leedy and Ormrod, 2001).

The descriptive research method : The descriptive research method approach is a basic research method that examines the situation, as it exists in its current state. In other words descriptive research involves identification of attributes of a particular phenomenon based on an observational basis, or the exploration of correlation between two or more phenomena.

Experimental research methods: In the experimental research methods, the researcher investigates the treatment of an intervention into the study group and then measures the outcomes of the treatment. There are three types of exploratory approaches: pre-experimental, true experimental, and quasi-experimental (Leedy & Ormrod).

Causal comparative research method: In the causal comparative research method, the researcher examines how the independent variables are affected by the dependent variables and involves cause and effect relationships between the variables. This focuses on two or more categories with the independent variables as compared to the dependent variable (Vogt, 1999). The causal comparative research design provides the researcher the opportunity to examine the interaction between independent variables and their influence on dependent variables.

4.7.2 Strengths and Weaknesses of Quantitative Research

Strengths

- Testing and validating already constructed theories about how and why phenomena occur
- Testing hypotheses that are constructed before the data are collected
- Can generalize research findings when the data are based on random samples of sufficient size
- Can generalize a research finding when it has been replicated on many different populations and sub populations
- Useful for obtaining data that allow quantitative predictions to be made
- The researcher may construct a situation that eliminates the confounding influence of many variables, allowing one to more credibly establish cause-and-effect relationships
- Data collection using some quantitative methods is relatively quick (e.g., telephone interviews)
- Provides precise, quantitative, numerical data
- Data analysis is relatively less time consuming (using statistical software)
- The research results are relatively independent of the researcher (e.g., statistical significance)
- It may have higher credibility with many people in power (e.g., administrators, politicians, people who fund programs)
- It is useful for studying large numbers of people

Weaknesses

- The researcher's categories that are used might not reflect local constituencies' understandings
- The researcher's theories that are used might not reflect local constituencies' understandings
- The researcher might miss out on phenomena occurring because of the focus on theory or hypothesis testing rather than on theory or hypothesis generation (called the *confirmation bias*)
- Knowledge produced might be too abstract and general for direct application to specific local situations, contexts, and individuals

4.7.3 Qualitative Research Approach

There are about as many definitions of qualitative research as there are books on the subject. So getting a specific definition for Qualitative research method is ambiguous, this is because the theory and methodology used are closely interrelated. Qualitative research is carried out or conducted through contact with a field or real life situation. These situations are usually banal or normal and it reflect the everyday life of individuals, groups, societies or organisations (Miles and Huberman 1994) Qualitative research method is a holistic approach that involves discovery. Merriam, (2009) stressed that Qualitative researchers are interested in understanding the meaning people have constructed, that is, how people make sense of their world and the experiences they have in the world. Others like (Parkinson & Drislane, 2011) emphasize an epistemological stance Qualitative research is a research method using methods such as participant observation or case studies which result in a narrative, descriptive account of a setting or practice. Sociologists using these methods typically reject positivism and adopt a form of interpretive sociology.

Denzin & Lincoln, 2005 also contended that Qualitative research method situates an activity that locates the observer in the world. It consists of a set of interpretive, material practices that makes the world visible. These includes a series of representations, including field notes, interviews, conversations, photographs, recordings, and memos to the self. Here qualitative research involves an interpretive, naturalistic approach to the world. Which means that qualitative researchers study things in their natural settings in an attempt to make sense of, or to interpret, phenomena in terms of the meanings people bring to them. For example qualitative research here is referred to as motivation research which discovers the underlying motives as well desires of human beings using interviews. Other techniques can be employed as well, such as story completion test, sentence completion test and word association test. This is highly significant in the context of behavioural science which aims to discover the motive for human behaviour. And it also helps to analyse the factors that motivate human beings to behave in a particular manner, besides contributing to an understanding of what makes one like or dislike a particular thing. This agrees with Hiatt, (1986) who explained that Qualitative research methods focus on discovering and understanding the experiences, perspectives, and thoughts of participants that is; qualitative research explores meaning, purpose, or reality. In other words Creswell, (1994) explained Qualitative research is also described as an unfolding model

that occurs in a natural setting that enables a researcher to develop a level of detail from high involvement in the actual experiences. He however stressed that one of the identifiers of a qualitative research is the social phenomenon being investigated from the participant's viewpoint and what constitutes qualitative research methods involves purposeful use for describing, explaining, and interpreting collected data.

However Leedy and Ormrod (2001) alleged that qualitative research method is less structured in description because it formulates and builds new theories. Despite this Creswell, (2003) explained that the Qualitative research method can be an effective model that occurs in a natural setting that enables a researcher to develop a level of detail from being highly involved in the actual experiences. He went on to list five strategies of inquiry in qualitative research which could be treated as synonymous with research design: narratives, phenomenological studies, grounded theory studies, ethnographies, and case studies. Creswell also described six phases embedded in each research design this also agrees with those suggested by Crotty (1998), but still encompass virtually all aspects of a study:

- (1) Philosophical or theoretical perspectives;
- (2) Introduction to a study, which includes the purpose and research questions;
- (3) Data collection;
- (4) Data analysis;
- (5) Report writing; and
- (6) Standards of quality and verification.

Moreover it is worth noting that a Qualitative research method builds its premises on inductive, rather than deductive reasoning. It is from the observational elements that pose questions that a researcher endeavours to explain. The strong correlation between the observer and the data is a marked difference from quantitative research, where the researcher is strictly outside of the phenomena being investigated. There is no beginning point of truth or any established assumptions from which the researcher can begin (Leedy and Ormrod, 2001).

4.7.4 Strengths and Weaknesses of Qualitative Research

Strengths

- Data based on the participants' own categories of meaning
- Useful for studying a limited number of cases in depth
- Useful for describing complex phenomena
- Provides individual case information
- Can conduct cross-case comparisons and analysis
- Provides understanding and description of people's personal experiences of phenomena (i.e., the emic or insider's viewpoint)
- Can describe in rich detail phenomena as they are situated and embedded in local contexts
- The researcher almost always identifies contextual and setting factors as they relate to the phenomenon of interest
- The researcher can study dynamic processes (i.e., documenting sequential patterns and change)
- The researcher can use the primarily qualitative method of grounded theory to inductively generate a tentative but explanatory theory about a phenomenon
- Can determine how participants interpret constructs (e.g., self-esteem, IQ)
- Data are usually collected in naturalistic settings in qualitative research
- Qualitative approaches are especially responsive to local situations, conditions, and stakeholders' needs
- Qualitative researchers are especially responsive to changes that occur during the conduct of a study (especially during extended fieldwork) and may shift the focus of their studies as a result
- Qualitative data in the words and categories of participants lend themselves to exploring how and why phenomena occur
- You can use an important case to vividly demonstrate a phenomenon to the readers of a report
- Determine idiographic causation (i.e., determination of causes of a particular event).

Weaknesses

- Knowledge produced might not generalize to other people or other settings (i.e., findings might be unique to the relatively few people included in the research study).
- It is difficult to make quantitative predictions.
- It is more difficult to test hypotheses and theories with large participant pools.
- It might have lower credibility with some administrators and commissioners of programs.
- It generally takes more time to collect the data when compared to quantitative research.
- Data analysis is often time consuming.
- The results are more easily influenced by the researcher's personal biases and idiosyncrasies.

4.7.5 Mixed or Balance Method Approach/ Justification of Research method

It is vital to describe a research method as specifically as possible (Crotty, 1998). This research will use both the quantitative and qualitative methods to answer the research question and to get a better understanding as well as knowledge of the true nature of oil and gas exploration in Nigeria and the United Kingdom. The reasons for the choice was based on the data collected with the aim of producing a more rounded description and analysis of the evidence. (See Berry & Otley, 2004; Laughlin, 2004). Various literature and studies have shown that both quantitative and qualitative methods are complementary and when carrying out a research work both methods should be mixed. Tashakkori and Teddlie (2003) discussed the mixed methods approach to research, which emerged in the mid-to-late 1900s and is still used today. They explained that in the mixed methods approach to research, researchers combine methods of collecting or analysing data from the quantitative and qualitative research approaches in a single research study (Creswell, 2003; Johnson & Onwuegbuzie; Tashakkori & Teddlie).

The research collected and analyse not only numerically, but also in a narrative form in order to address the research questions defined for a particular research study. To collect a mixture of data, the researcher distributed a survey that contains closed ended questions to collect the numerical, or quantitative, data and conduct an interview, focus group using open ended questions to collect the narrative, or qualitative, data. This Baker (2010) argues, that stakeholders are likely not to be partial

in their judgment because they are self-interested. On the other hand Johnson and Onwuegbuzie (2004) hoped that the mixed methods approach to research provided researchers with an alternative to believing that the quantitative and qualitative research approaches are incompatible and, in turn, their associated methods cannot and should not be mixed. This agrees with other authors like for example, Miles and Huberman, (1994); Eisenhardt, (1989); Yin, (1994) who advocated for the use of a single methodology when carrying out a research work because the mixed method is characterized with time constraints and there is also the need to limit the scope of the study. But Rossman and Wilson (1991) answered that there are several reason why a researcher would link or mix qualitative and quantitative data when carrying out a research work and consider these to be: to enable confirmation or corroboration of each other via triangulation; to elaborate or develop analysis, providing richer details; and to initiate new lines of thinking through attention to surprises or paradoxes, "turning ideas around", providing fresh insights.

The quantitative method used in the research helped with the qualitative side of the research during design by finding a representative sample and locating deviant samples, while the qualitative data helped the quantitative side of the research during design by aiding with conceptual development and instrumentation. For example In relation to quantitative and qualitative methods, to find out what people feel about oil and gas exploration both in Nigeria and the UK. Stakeholders or participants were interviewed or engage in conversation. Alternatively using a series of focus groups was organised in which their feelings about the work and the organisation could be recorded in their own words.

The attitude survey approach was a useful in the collection of data. One advantage of it is that because the questionnaire is very structured, it is easily replicable, and so it is possible to compare the results with surveys that have been previously undertaken. The staff or workers who are interested in the results are not physically close to those who fill it in, so it also allows for anonymity, thus enabling people to respond in a more honest way. As a result of both of these factors (structure and detachment) data generated in this way can be analysed to identify relationships between different variables (such as different branches of the armed forces or different levels of employee) in the organisation. On the other hand it might be possible that the questions in the survey can be interpreted differently by people with different backgrounds (cultural and organisational). Although people filling in the survey will tick boxes, this may not really reflect what they feel about the organisation or the main reason for the research. Also the depth of their replies is very limited. Where the researcher is more involved, it would be possible to probe for meanings and clarifications and to ask why the respondent feels the way that they do in relation to a question. In consideration of these issues, we could therefore say that it a mixture of methods, that is qualitative and quantitative data,

were used it would be helpful. Indeed, it is hard to say what method of gathering data would be 'best' because each has advantages but also limitations. Johnson & Onwuegbuzie (2004) stated that the main goal of a researcher using both methods when carrying out a research work is to draw from the strengths and minimize the weaknesses of the quantitative and qualitative research approaches and they went on to say that the mixed method approach to research is an extension rather than a replacement for the quantitative and qualitative approaches to research, as the latter two research approaches will continue to be useful and important. The mixed methods approach to research used provided researcher with the ability to design a single research study that answers questions about both the complex nature of phenomenon from the participant's point of view and the relationship between measurable variables. Carr, (1994; Creswell, (2003); Johnson & Onwuegbuzie, (2004); Mingers, (2001); Sale, Lohfeld, & Brazil, (2002); Tashakkori & Teddlie, (2003) that the proponents of the mixed methods approach to research advocate doing what works" within the precepts of research to investigate, to predict, to explore, to describe and to understand the phenomenon .Quantitative and qualitative research methods investigate and explore the different claims to knowledge and both methods are designed to address a specific type of research question. While the quantitative method provides an objective measure of reality, the qualitative method allows the researcher to explore and better understand the complexity of a phenomenon.

4.7.6 Sampling

The sample for this study or research was drawn from stakeholders, such as the government, oil and gas exploration multinationals and the local communities. The study focused on these because the Overall aim of the research was to investigate sustainable exploration of oil and gas in Nigeria and United Kingdom, to discover how oil exploration activities are carried out in Nigeria in comparison to the United Kingdom.

4.7.7 Pilot Study

After the first draft of the questionnaire, which consisted of 32 questions, was generated it was Piloted with individuals from the three case study companies, and 28 individuals from Uzere community in the Niger delta region of Nigeria. All of whom were found to be knowledgeable about the content of the research. The pilot questionnaire was sent via email to the participants from the oil company, and hand delivered to the participants in Uzere community.

4.7.8 Feedback on Pilot Study

The participants in the pilot study were requested to provide feedback on the content, layout, and topics covered in the questionnaire. They identified questions that were ambiguous as well as those that needed to be rephrased. The themes covered in the pilot questionnaire were judged to be relevant to the department the researcher planned to conduct the study in. They also pointed out that the questionnaire was too long and suggested that the items be reduced to encourage participation in the main study. The feedback from the pilot study was considered and the necessary corrections made for the final version.

4.8 QUESTIONNAIRE LAYOUT

In order to realise the objectives of the current research and to test the hypotheses, the research strategy was divided into two main components, namely primary and secondary sources.

4.8.1 Nigeria

4.8.2 Primary Sources:

The primary sources of data in this research focused on a selected number of people from the main population of at Uzere formerly Known as "Uzei" and is located in Isoko south Local Government Area (LGA) of Delta State of Nigeria by local government. The sample size included those who are well educated and those with basic formal education. This accounted for about 150 people. Data was collected by means of a structured questionnaire, which was divided into three sections. The various sections are explained below.

Section 1

Section one from the questionnaire included biographical questions such as age, gender, marital status, what kind of business activity each fell under and how long they have worked in this sector. There were demographic questions to make sure that the researcher captured the views and needs of each participant responding to the research questioned asked in Uzere formerly Known as "Uzei" and is located in Isoko south Local Government Area (LGA) of Delta State of Nigeria by local government.

Section 2

This section was divided into two sub-topics which is section 2A and section 2B. Section 2A looked at or reflected on corporate social responsibility in the community. Also if they had access to credit facilities either from commercial bank, money lenders and so on. Here the respondent according to the extent or situation were asked to tick (YES) or (NO). The reason for this question steams from

Watts (2004) who explained that the several forms of social disorder such as proliferation of arms increasing illiteracy, criminality, lawlessness and disintegration of core tradition and culture are sponsored by oil multinationals as they purchase arms and ammunition for youths to fight whoever is fighting them or against their corporate social responsibility policies or protesting for their human right.

While section 2B was to find out their opinion and awareness regarding oil and gas exploration in their community, and the respondents were asked to tick (YES) or (NO). This was followed by 15 questions or statements asked about the benefit of oil and gas exploration activity in the community. The statement or questions asked contained three (3) sub- statements. Respondents were requested to rank or the 3 sub-statements according to the extent to which they agree (highly needed), (little needed) or (not needed)

Furthermore section 2B of the questionnaire also looked into the negative impact of oil and gas exploration in the community which is in Uzere formerly known as "Uzei" and is located in Isoko south Local Government Area (LGA) of Delta State of Nigeria by local government. The impact conditions here were divided into three: health impact, physical environment and socio- economic environment. For the health impact from oil and gas exploration six (6) questions, for the physical environment eight (8) were asked and for the socio-economic environment ten (10) question where asked. For each impact condition (health impact, physical environment impact and socio- economic environment) the respondents were requested to rank the 3 sub-statements according to the extent to which they agree (highly needed), (little needed) or (not needed). What this question or statement is about was highlighted by Akachidike, (2008) stating that the activities in the field include drilling which contaminates ground water and increases the chances of flooding, burning, flaring as well as fossil fuel transportation cost in terms of GDP for Nigeria as a country. As commented by Wolff et al (2000) and Drapier et al (2000) Nigeria as a country requires that environmental protection be taken into account at every stage of each exploration and production project looking into technology and legislation in place and how the government can meet its renewable energy obligations.

Section 3

In section three (3) questions or statements asked the participant if they were satisfied with oil and gas exploration in their community. The Respondents were requested to rank the sub-statements according to the extent to which they agree (1=very satisfied), (2= satisfied), (3= fairly satisfied and (4= Not satisfied). Next we would explain how the questionnaire that was sent out in the United Kingdom was structured.

4.8.3 United Kingdom

The primary sources of data in this research focused on four oil and gas exploration companies in the United Kingdom. The sample size included those who are well educated and those with basic formal education. This accounted for about 90 people. Data was collected by means of a structured questionnaire, which was divided into two sections. The various sections are explained below.

Section 1

Section one question from the questionnaire included biographical questions such as age, gender, marital status, what kind of business activity each fell under and how long they have worked in this sector. The demographic questions are to make sure that the researcher have captured the views and needs of each participant responding to the research questioned.

Section 2

The other section of the questionnaire also looked into the personal views of staff working for oil multinational companies and assessed the negative impact of oil and gas exploration of the individual companies (ABCD). This is because most oil and gas exploration activities in the United Kingdom take place in the North Sea and there is little or no immediate community directly affected by oil multinational companies. The impact conditions here were divided into three: health impact, physical environment and socio- economic environment. For the health impact from oil and gas exploration six (6) questions, for the physical environment eight (8) where asked and for the socio-economic environment ten (10) questions were asked. For each impact condition (health impact, physical environment impact and socio- economic environment) the respondents were requested to rank the 5 sub-statements according to the extent to which they (strongly Agree), (Agree) (no opinion) (Disagree) and (Strongly disagree). What this question or statement is about was highlighted by Arnold (1978), Upton (1996) who contended that for oil exploration activities to take place in the United Kingdom there are conditions that must be satisfied, one there has to be a good reason that an oil reservoirs exists, second an international legal frame work allowing national jurisdiction over the continental shelf had to be in place and thirdly extraction or exploration must be seen to be economically feasible.

4.9 VALIDITY, RELIABILITY AND REPLICATION ISSUES

Yin (2003) has observed that validity is particularly problematic for case studies, mainly because of the difficulty of defining the construct being investigated. However, Bryman (2004) has pointed out that problems related to validity in case study research can be mitigated through using multiple methods of data collection and sources. In this study, the question of validity was addressed by the

mixed methods research strategy employed, which enabled triangulation. Hussey and Hussey (1997) defined triangulation as “the use of different research approaches, methods and techniques in the same study to overcome the potential bias and sterility of a single-method approach”. In addition, Saunders et al. (2009) defines triangulation as “the use of different data collection techniques within one study in order to ensure that the data are telling you (the researcher) what you (the researcher) think they (the participants) are telling you.” Easterby-Smith et al. (1991) identified four methods of triangulations namely: data, investigator, methodological, and theoretical. Data triangulation is the collection of data from different sources, or in different time frames. Investigator triangulation is achieved when different investigators are used to collect the same data. Methodological triangulation has to do with using different methods to collect data (e.g. quantitative and qualitative methods). Theoretical triangulation is achieved when different theories are brought to bear on the same results. In this current study, triangulation at the level of data collection and methodology was employed.

Ordinarily conditions for reliability are met by the replicability of a study (Gray, 2009). According to Bryman (2007) case study generalization is made more feasible by team research approach where a group of researchers investigate a number of cases. This of course can only be achieved if researchers conscientiously document procedures through what Yin (2003) calls case study protocols and case study databases. For interview, group discussion and focus group data, reliability can be increased through the use of standardized schedule (Yin, 2003). In this current study the reliability of the data was increased by the standardized nature of the schedule (see Appendices). Furthermore, the reliability of the research findings from the qualitative data was tested using the quantitative data. The feedback received not only confirmed most of the findings made in from the qualitative data but also gave a better understanding of the issues investigated.

4.9.1 Ethical Considerations

The research methods employed in the research was interactive, that is, the researcher interacted with the participants in the face-to-face interviews and focus groups. The main ethical issue surrounding data collection through interviews is that participants are not harmed or damaged in any way by the research (Gray, 2009, Silverman, 2005). Much of qualitative work depends on the personal views and stories of others, who may risk exposure and embarrassment, as well as loss in more extreme cases of standing, employment, and self-esteem (Denzin and Lincoln, 2005). In view of these issues, the researcher took deliberate steps to mitigate such outcomes, by explaining in

detail the nature of the research and its intended use. The researcher also provided the informants with a participant informant sheet, and a consent form, see Appendix, to ensure that they understood the purpose of the study and confirmed their willingness to participate.

4.9.2 Summary of Chapter

This chapter has discussed the research methodology underpinning this study, bringing to the fore the issues of rigour and relevance in management research. It outlined the epistemological debates that have reinforced the seeming divide between qualitative and quantitative research, and identified a pragmatic approach to research. A sequential mixed methods design was developed and deployed in this study. A case study approach was employed to focus the study and enhance sustainable exploration of oil and gas in Nigeria. This approach allowed the researcher to focus on a few case study companies in the United Kingdom and other relevant participants. The chapter also discussed the research methods employed in detail, and highlighted the ethical issues involved. The next chapter reports and discusses the results from the quantitative study and the findings of the study.

CHAPTER FIVE

DATA ANALYSIS AND FINDINGS

5.1 DATA PRESENTATION AND QUANTITATIVE ANALYSIS FINDINGS OF NIGERIA DATA

5.1.1 Analysis of Data collected from Nigeria

This chapter will deal with the presentation and the analysis of data collected. A format of the data collected will be adopted and presented to produce a seamless flow of data and to enhance understanding of the issues involved. First data on the demographic characteristics (age and gender)

of the participants were presented showing their age and gender categories. The data was represented by bar and line graph.

5.1.2 Demographic characteristics of data

The figure below shows the number of participants that took part or that were interviewed respectively across age groups. From the figure we can see that the (31-40) and 41-50) age groups accounted for the highest percentage of the study area, which means this age groups are the most active category.

Table 9 Quantitative Demographic data Nigeria

Age

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 21-30 years	11	22.4	22.4	22.4
31-40years	17	34.7	34.7	57.1
41-50years	13	26.5	26.5	83.7
51-60 years	7	14.3	14.3	98.0
61 and above	1	2.0	2.0	100.0
Total	49	100.0	100.0	

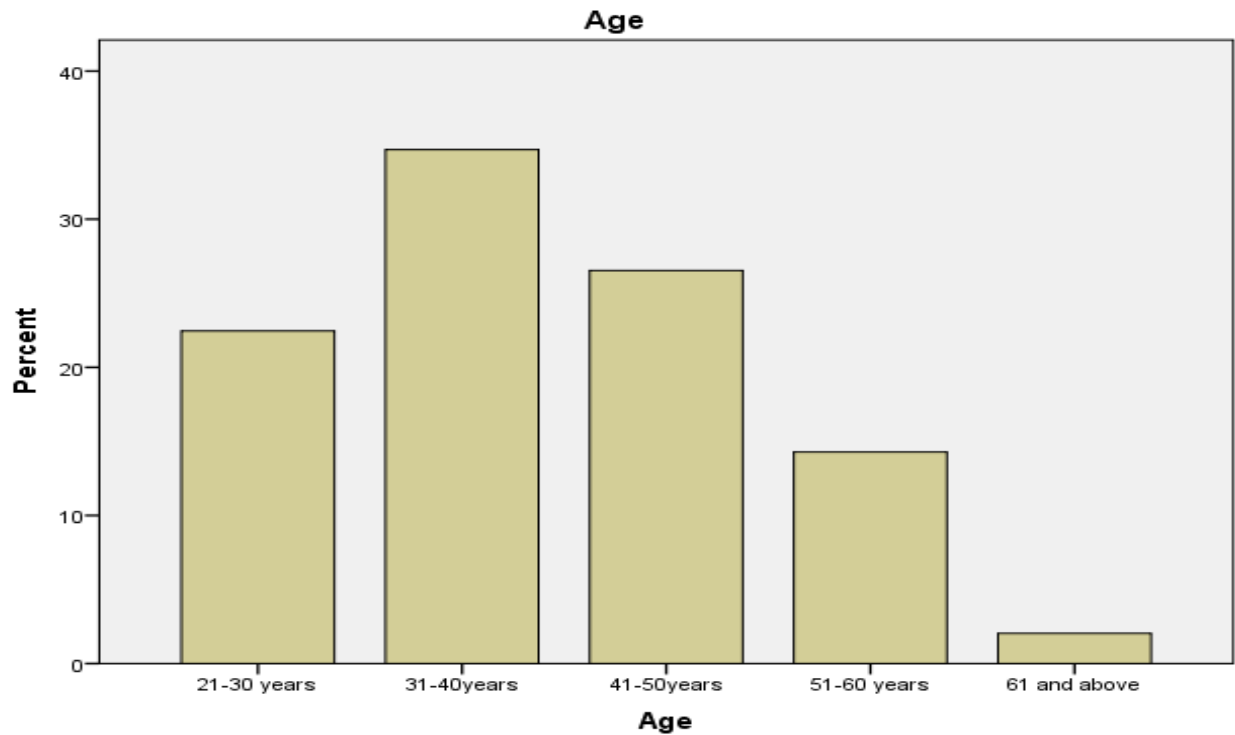


Figure 17 Quantitative Demographic data (Nigeria)

It may also be of interest to note that despite the increased response between (31-40), (41-50) and (21-30) age categories, all other age groups in this study or research area are still vulnerable to various impacts from oil and gas exploration. The main reason why the middle age group (21-50) (31-40), (41-50) is more viable and the percentage is considerably higher is that the facts suggests the middle aged in the Niger Delta are more economically visible and more involved directly or indirectly in the daily activities of the community. Another reason why the middle age group is high (21-60) is because they are generally the labour force of the community and earn more money than groups below and above them.

The figure below shows the percentage of response in terms of gender. From the bar chart below we can see that the female number of respondents and participants was higher than male.

Table 10 Quantitative sex data Nigeria

Sex		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	20	40.8	40.8	40.8
	Female	29	59.2	59.2	100.0
	Total	49	100.0	100.0	

Figure 2.7

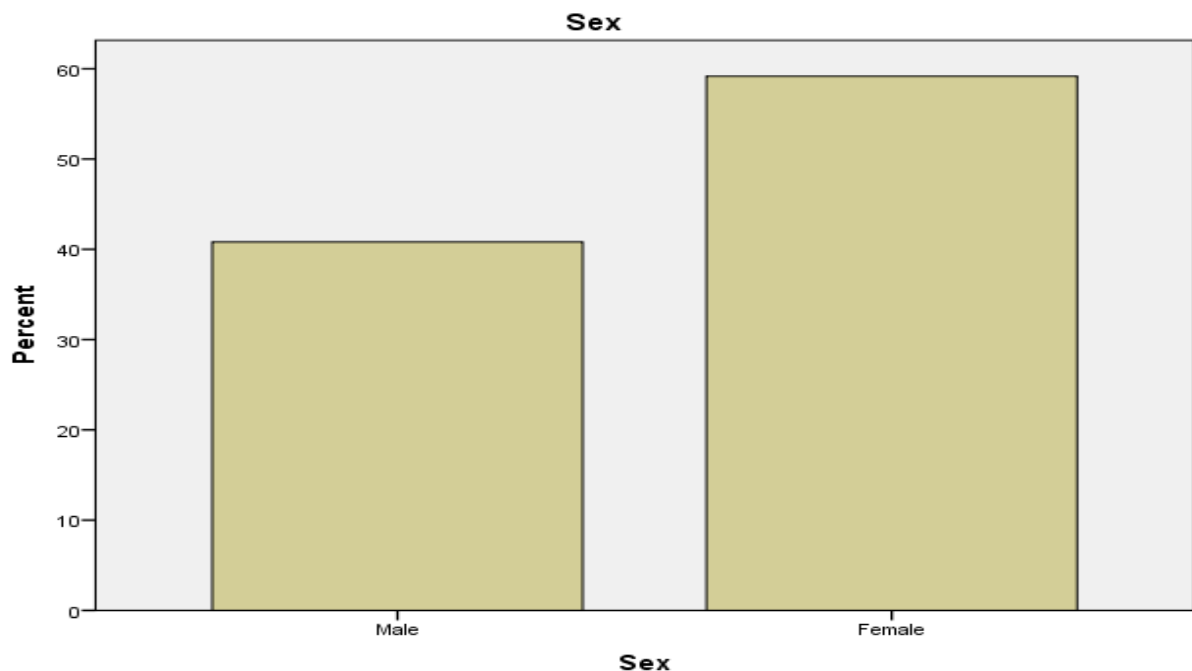


Figure 18 Sex Demographic data (Nigeria)

Out of the total respondents from the study area females accounted for 59.2 while males accounted for 40.8 %. The reason for this is that generally, women in the Niger Delta are known to be ignored bread winners of their families.

This is because they are involved in all aspects of the economy. Following the devastation of their farmlands and pollution of streams and rivers which were fishing grounds, source of water and

irrigation, which could be argued to be the two most important source of living in this area, consequently, women engage in petty trading activities to fend for their families. Omorodion (2004) earlier studied the implication of oil and gas exploration on women in the Niger delta region of Nigeria. The finding of the showed that women in oil producing communities are the main source of income for the family. The economics of survival resulting from the long term environmental degradation and government neglect makes it imperative for the womenfolk to take up added responsibilities to support and fend for their families. This is because oil spillage and gas flaring have sent the men out of their hitherto predominantly fishing and farming occupations following the destruction of aquatic life and farmlands. The women or female in Uzere in order to raise their children embark on menial jobs ranging from being office cleaners in oil companies to operating kiosks or beer parlours within walking distance of the exploration companies. These businesses attract high patronage from oil workers despite severe heat from gas flaring and spillage point. Other women fry bean cakes close to these point because they are sure of customers buying their products. Another probable reason for the higher number of females in the study may be ascribed to their meticulous and sensitive dispositions as they are more prone to accept changes in the society. These are some of the reasons why there were more women in the study or research.

5.1.3 How was the Quantitative data Analysed

The Statistical Package for Social Sciences (SPSS) was used to analyse and interpreted the data from 90 questionnaires returned. The SPSS is a widely used programme for statistical analysis in scientific and social studies. There is range of different analyses available in the programme to explore relationships in data sets, these vary according to the type of research question that needs to be addressed and the type of data available. This type of statistical analysis has previously been applied to Niger Delta studies (for example, Banks and Sokolowski, 2010; Osagie et al., 2010; Nriagu, 2011). The results were entered into data sets that conform to the SPSS programme. The data sets consist of cases and variables. The cases are the basic units of analysis such as one person replying a questionnaire survey. The variables are all the things which are measured and recorded for each survey. Some of the statistics techniques used includes;

Descriptive statistics

These statistical methods can be used for summarizing or describing a collection of data, such as comparisons and frequencies. Descriptive statistics explores ratios and predictions for numerical outcome such as linear regression; it provides a means for drawing conclusions from data that are subject to random variation. To assess the propositions being investigated further, the conclusions are tested as well, as part of the scientific methods. Outputs include mean, standard error and standard deviations.

Regression analysis

Regression analysis in statistics is among the many techniques for modelling and analysing several variables, when the focus is on the relationship between a dependant variable and one or more independent variables. More specifically, regression analysis helps one understand how the typical value of the dependent variable changes when any one of the independent variables is varied, while the other independent variables are held fixed.

T-test analysis

The test statistic in the t-test is known as the t-statistic. The t-test looks at the t-statistic, t-distribution and degrees of freedom to determine a p value (probability) that can be used to determine whether the population means differ. The t-test is one of a number of hypothesis tests. To compare three or more variables,

5.2 QUANTITATIVE ANALYSIS FINDINGS OF NIGERIA DATA

5.2.1 Result of Physical and Health impact represented in a scatter dot chart

5.2.2 Health implication

The health implication of the chart below shows that the study carried out on individuals in Uzere formerly Known as "Uzei" and is located in Isoko south Local Government Area (LGA) of Delta State of Nigeria by local government may end up with or develop chronic obstructive pulmonary diseases if they have a cough and live close to a gas flaring site.

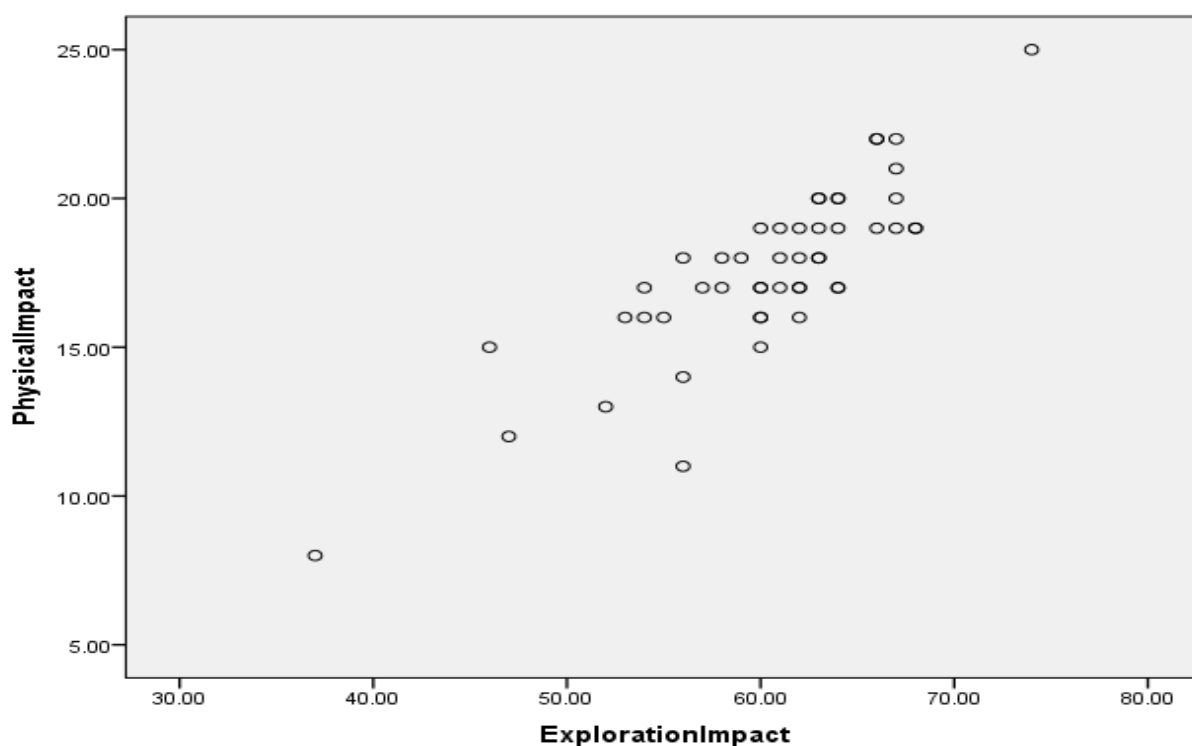


Figure 19 Scatter Dot Chart

Table 11 Physical Impact correlation table

Correlations

		Physical Impact	Exploration Impact
Physical Impact	Pearson Correlation	1	.845**
	Sig. (2-tailed)		.000
	N	49	49
Exploration Impact	Pearson Correlation	.845**	1
	Sig. (2-tailed)	.000	
	N	49	49

** . Correlation is significant at the 0.01 level (2-tailed).

In this section we will be investigating the relationship between two continuous variables, such as physical and exploration impact during oil and gas exploration. The tools used to explore this relationship, correlation analysis. This tool can be used to find out if the outcome from one variable depends on the value of the other variable, which would mean a dependency of one variable on the other. Pearson's correlation (named after Karl Pearson, 1857-1936) is a number between -1 and 1 that measures the strength of a linear relationship between two continuous variables. The absolute value of the coefficient measures how closely the variables are related. The Closer it is to 1 the closer the relationship. A correlation coefficient over 0.8 indicates a strong correlation between the variables. So we could agree from the scatter dot/plot diagram that there is a significant or strong correlation in terms of physical impact during oil and gas exploration.

The above also agrees with the findings of Ishisone (2004) and Leahey et al (2001) who asserted that gas flaring not only causes economic loss, but may pose severe health risk to humans. Researchers have disclosed that flaring during oil and gas exploration activities which is due to incomplete combustion releases a variety of compounds including propane, methane and hazardous air pollutant such as polycyclic aromatic hydrocarbons, volatile organic compounds as well as soot. This position was equally reported by Kindzierski (2001). So from the respondents and individuals who participated in this research if they continue to be exposed to toxic gases from gas being flared it might result in causing severe obstruction to their lungs. Some of the symptoms are coughing and breathlessness as explained by (Ward et al., 1999) the adverse health effects of air pollutants from gas flaring are now commonly accepted as ranging from mortality and hospital admissions to respiratory symptoms and

decrements in lung function, bronchitis, emphysema and so on. The illustration in the diagramme below shows how residents living close gas flaring site is capable of causing severe obstruction in lings as shown in the figure below.

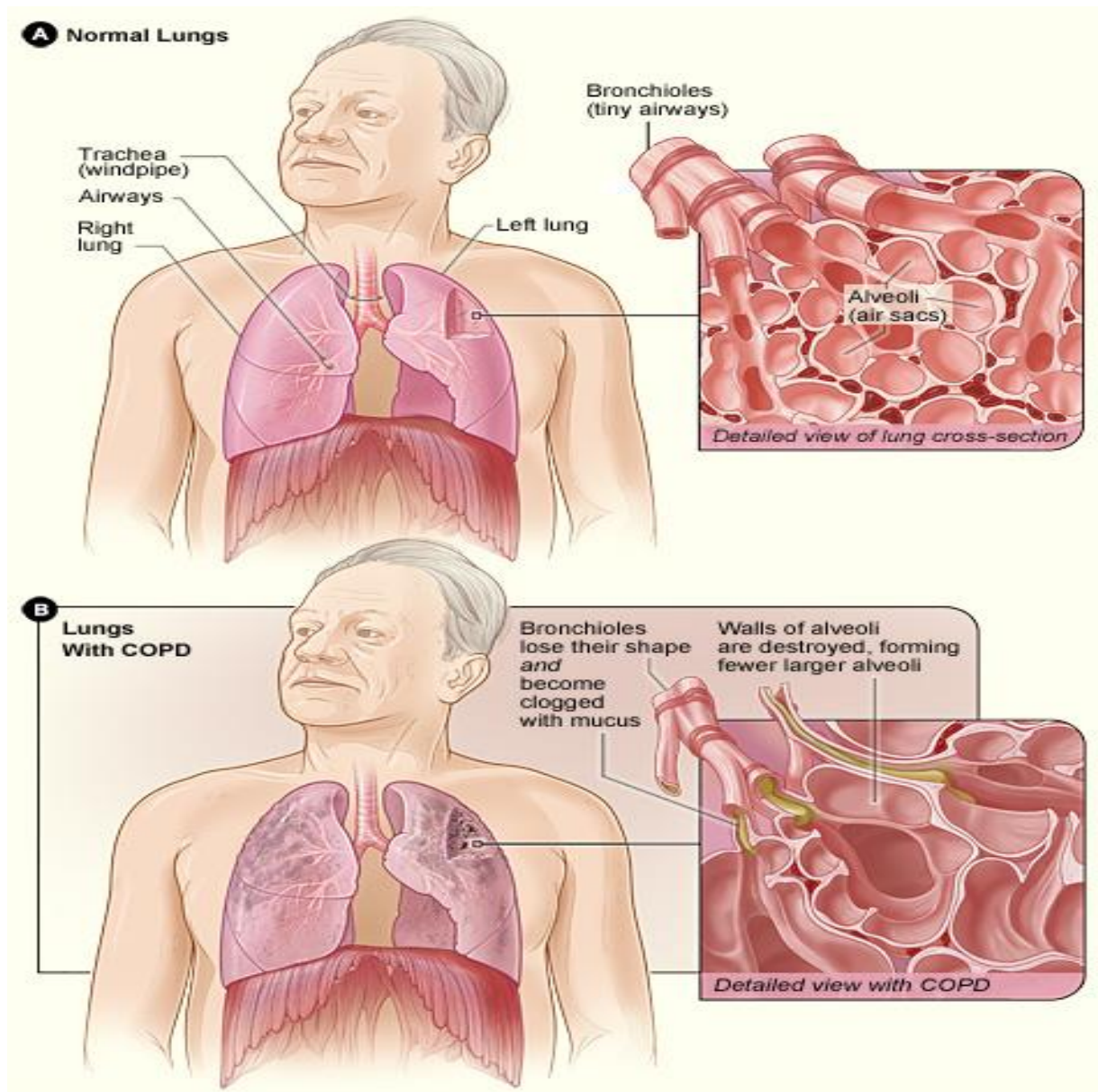


Figure 20 Effect of gas flaring to human

Source: <http://www.nhlbi.nih.gov/health/health-topics/topics/copd/printall-index.html>

As illustrated and to validate the above statement certain questions were asked in the questionnaire which I sent out. The total number of participants as mentioned earlier where 49 and one of the

questions that was asked was whether during oil and gas exploration activities they experienced issues like cough, skin diseases and other respiratory disease (CSDORD). Of the total 49 participants 42.9% said it was fairly serious while 34.7% and 20.4% had serious and very serious respectively.

Table 12 Respiratory, cough and skin diseases

CSDORD					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	VERY SERIOUS	10	20.4	20.4	20.4
	SERIOUS	17	34.7	34.7	55.1
	FAIRLY SERIOUS	21	42.9	42.9	98.0
	NOT SERIOUS	1	2.0	2.0	100.0
	Total	49	100.0	100.0	

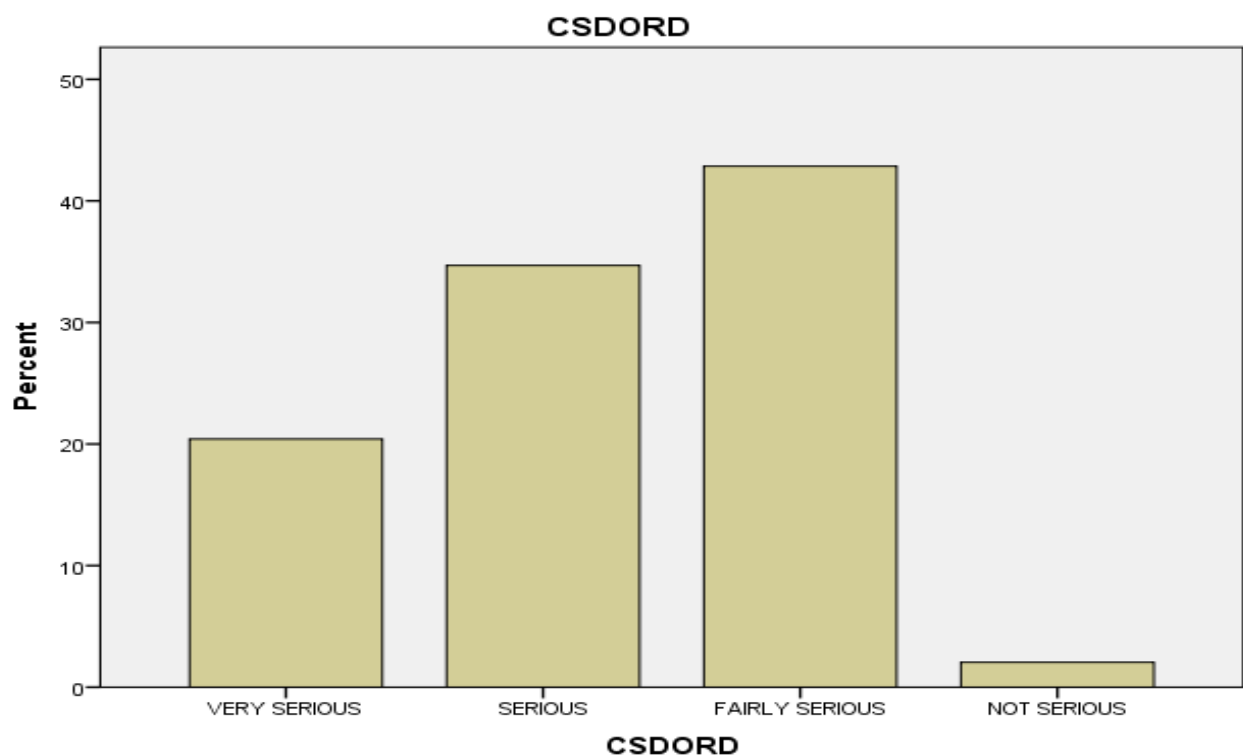


Figure 21 respiratory diseases from gas flaring

Although from the chart above most of the respondents or participants had different but closely related views about the severity of gas flaring i.e. (21- fairly serious, 17- serious and 10 – very serious).The reason for this could be attributed to the fact many people are unwilling to report cases since many care less, or have lesser capacity to pay hospital bills and therefore do not report or think they are been punished from the gods as a result of their sins due to their cultural beliefs. And the implication here is that a good health policy is needed and urgently. The continuous flaring of natural gas in the Niger Delta without any effort to either relocate residents or permanently putting a halt to the activities put every residents of Uzere at risk. The facts that coughs are common within the research area which is due to the weather condition, if this trend continues there could be an epidemic of respiratory ailments in Nigerian oil producing regions not just that of Uzere and that will certainly be a great health impact.

Following up on the illustration to validate the above statement certain other questions were asked in the questionnaire which I sent out. The total number of participants as mentioned earlier where 49 and one of the questions that was asked was if during oil and gas exploration activities if they experience issues like poor health condition as a result of CO₂ emission (CO₂) from gas flaring sites. 65.3% and 34.7% reported that it was very serious and serious respectively and no other report of data was retrieved for this particular question

Table 13 Poor health condition from gas flaring

CO₂

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid VERY SERIOUS	32	65.3	65.3	65.3
SERIOUS	17	34.7	34.7	100.0
Total	49	100.0	100.0	

Figure 3.1

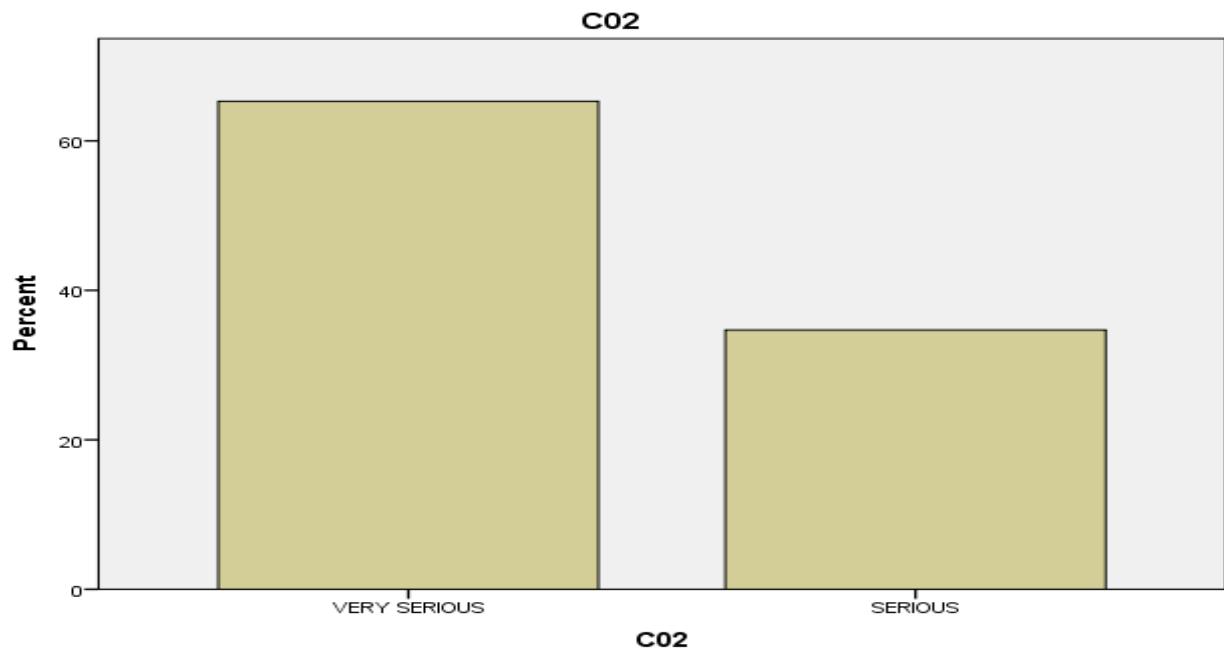


Figure 22 CO2 emission from gas flaring

An interesting pattern to note from the above chart or finding is that the result of the participants or respondents for the entire study group agrees with the study carried out by Castleman, (2005) and Ologunorisa, (2001). The Niger Delta region of Nigeria has suffered from different forms of pollution and degradation from oil and gas exploration activities. The impact of these include a decrease in agricultural yield, depression in flowering and fruiting in crops and palm trees, deformities in children, lung damage and skin problems, increasing concentrations of airborne pollutants, acidification of soils and rainwater, corrosion of metal roofs and significant increases in concentrations of sulphates, nitrates and dissolved solids, with associated socio-economic problems. The characteristic of the impact and ailments of Co2 emission during oil and gas exploration in this study and that of other researchers i.e. (Castillejos et al., 1992; Leonardi et al., 2000) (Castillejos et al., 1995; Romieu et al., 1997; Stvendsen et al., 2007; Gauderman et al., 2007) are the many thing oil multinational companies as well the government need to correct. This injustice to which residents of the Niger Delta have been subjected over the last five decades have reduced their capacity to levels where health care has been relegated to the background in their own priorities. Since over 65% of Nigeria revenue comes from oil and gas exploration activities we expect that healthcare facilities to treat these ailments stated above should be in every neighbourhood. It's a common practice in Africa, Nigeria to be precise, to spend hours in the queue before being seen by doctors to look at the various ailments especially in remote communities where the population patients significantly outnumber the medical practitioners . The country medical doctors in a bid to chase greener pasture abandon their fatherland for developed

countries where they are being properly remunerated. Also a number of qualified doctors are scared to work in the Niger Delta for fear of being kidnapped or killed since the region has become very violent in recent years. Amongst all this, it is fair to say that no in depth study has yet to be carried out or undertaken to establish the nature and depth of the linkage(if any)between gas flaring and ill-health in Nigeria. Oil multinationals companies and the federal ministry of energy and environment may indicate an unspoken but obvious acknowledgement by the government of the suspected disastrous consequences of gas flaring activities on human health in the Niger Delta region. One very big question this research seeks to tackle is the cost of gas flaring, its economic loss in terms of GDP, this will be examined in subsequent chapter.

Water pollution as a result of oil spillage in the Niger Delta region is rampant from oil and gas exploration activities from oil multinational companies. The finding from the research or study below shows that 79.9% of the participants were unhappy and explained the situation to be very serious.

Table 14 Water pollution from oil and gas exploration activities

WPOR

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid VERY SERIOUS	39	79.6	79.6	79.6
SERIOUS	7	14.3	14.3	93.9
FAIRLY SERIOUS	2	4.1	4.1	98.0
NOT SERIOUS	1	2.0	2.0	100.0
Total	49	100.0	100.0	

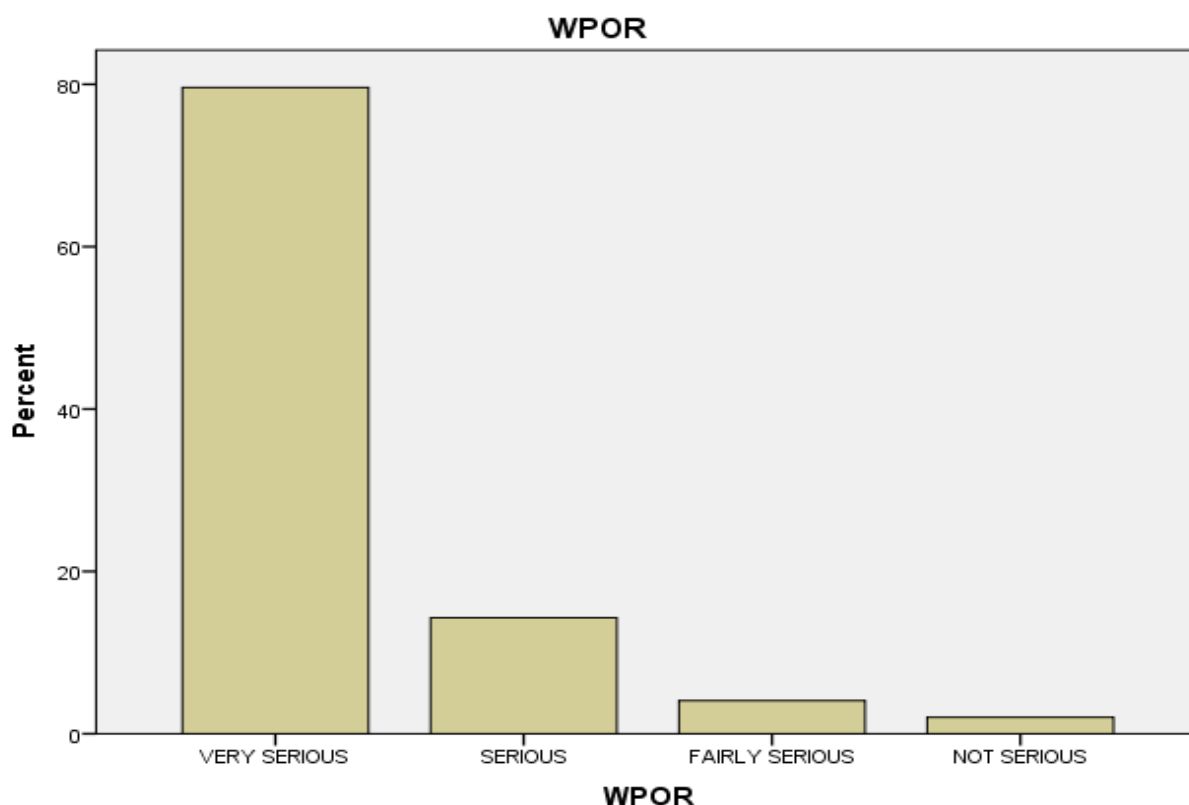


Figure 23 water pollution from oil spillage

Water is said to be polluted when it is impaired by anthropogenic contaminants and it's not fit for human use like drinking, cooking and so on, and/or undergoes a marked shift in its ability to support its constituent biotic communities, such as fish. The UNDP and Environmental experts have in fact identified oil spillage as the major variable which has impacted negatively on the communities of the Niger Delta region. The impact of these oil spillages on the communities is varied and devastating. A mass of empirical evidence generated by scholars as well as the research support this position. Some of such studies have pointed out that:

All of us in this community are fishermen, we survive by fishing but there is always spillage from the Shell wells and the oil spillages have destroyed our marine life and our occupation. Our farmlands have been destroyed there are and no more fish in our rivers. Our people now travel to the high seas to fish, which is very dangerous (Nembe Indigene 2012).

Oloibiri as a community is now a shadow of its former self. Farming which used to be the pillar of the community's economy has been paralysed as our farmlands has been destroyed, fishing activities

grounded and aquatic life virtually destroyed by many years of oil prospecting and exploration." (Ibaba, 2001)

The above connotes with the finding above as well the Uzere community and quoting one of the participant interviewed " When I go for fishing, I have to paddle for about four hours through several rivers before I can get to where I can catch fish and the oil spill is lesser ... some of the fishes we catch, when you open the stomach, it smells of crude oil". Omofonmwan and Odia (2009) in a separate study confirms this and stressed that the amount of deprivation and damage from oil and gas exploration in the Niger delta region can be dated back to over three decades ago, and these impacts are low agricultural production, water pollution destruction of aquatic life and home displacement. As Eteng (1996) rightly noted, the negative impact of oil and gas exploration activities in the Niger Delta region has given rise to intense land degradation, rapid agricultural decline, fisheries depletion, rampant and destructive oil spillages among others. This study and findings has been able to establish with the help of other literature the fact that oil exploration and exploitation in the Niger Delta region by multinational oil corporations have wreaked havoc on the people of this region since 1958 when crude oil was discovered. Water pollution from oil spillage leads to damage to human health. Disease carrying agents such as bacteria and viruses are carried into the surface and ground water. Drinking water is affected and health hazards result. Direct damage to plants and animals nutrition also affects human health. Plants nutrients including nitrogen, phosphorus and other substances that support the growth of aquatic plant life could be in excess causing algal bloom and excessive weed growth. This makes water have odour, taste and sometimes colour. Ultimately, the ecological balance of a body of water is altered. Sulphur dioxide and nitrogen oxides cause acid rain which lowers the pH value of soil and emission of carbon dioxide causes ocean acidification, the ongoing decrease in the PH of the Earth's Oceans as CO₂ becomes dissolved. The effects of all of these on productivity and health needs of the people of the region cannot be quantified. Indeed, the combined effects of these problems routed in mismanagement and neglect on the part of the Nigerian government and the multinational oil corporations have resulted in poverty. The implications of the economic hardship on oil communities in the Niger delta region during oil exploration activities are adversely manifesting as confrontation or restiveness between the oil producing communities and government in Nigeria as well as oil pipeline vandalism, indiscriminate attacks, killing and kidnapping of oil workers.

5.2.3 Socio Environment impact

From the below chart shows that the respondents are of same opinion that oil and gas exploration in Uzere and the Niger Delta region has a great impact on the socio economic life of its citizens.

Figure 3.4

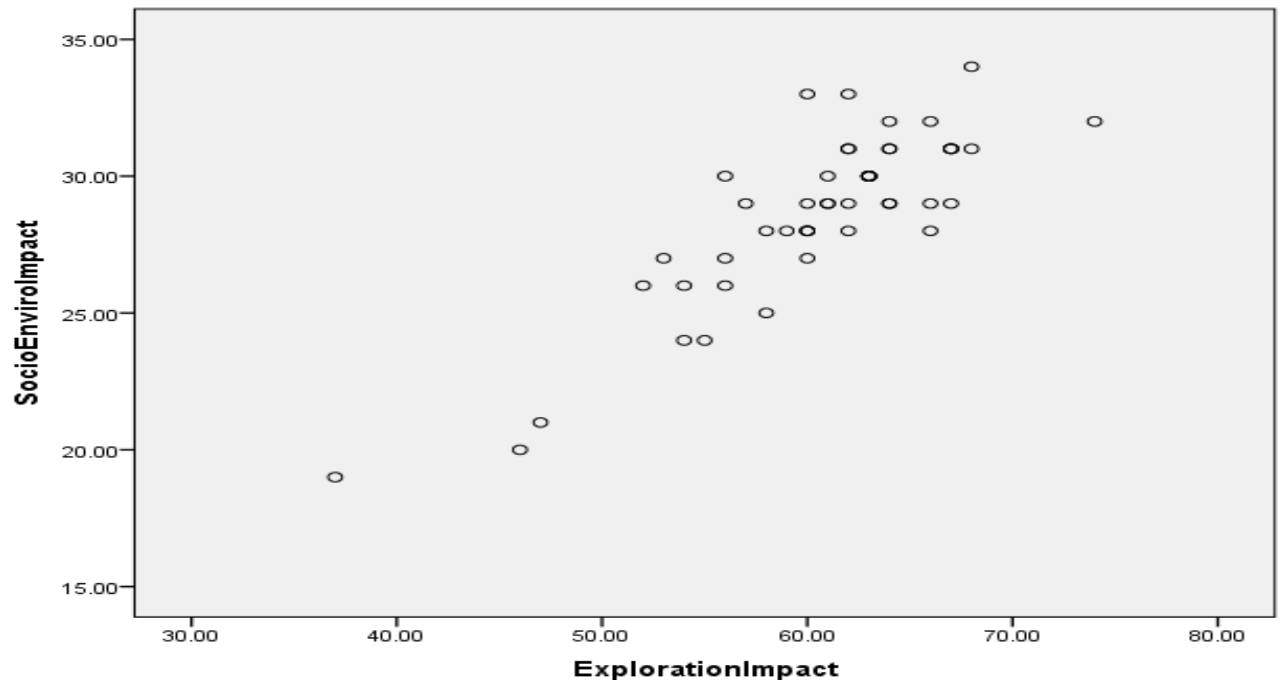


Figure 24 Scattered Dot Graph of social impact

Table 15 Social impact correlation from oil and gas exploration

Correlations

		Exploration Impact	Socio Enviro Impact
Exploration Impact	Pearson Correlation	1	.852**
	Sig. (2-tailed)		.000
	N	49	49
Socio Enviro Impact	Pearson Correlation	.852**	1
	Sig. (2-tailed)	.000	
	N	49	49

**. Correlation is significant at the 0.01 level (2-tailed).

This finding supports previous studies by Ehigie (2005) and Nwankwoala and Georgewill (2006) who asserted that oil and gas exploration activities engender environmental degradation which has direct consequences on human health. And according to them, the problems identified with Nigeria's Niger Delta region, (in particular Uzere which is in the Niger delta), that oil and gas projects in this region have left the host communities in a worse position of sickness, poverty, hunger, lack of basic infrastructure, high illiteracy, high unemployment and marginalization due to poor governance from leaders. The people, Ehigie (2005) argued are relegated to primitive houses of mosquito infested swamps where frequent emissions from gas flare and oil spills leads to acid rain and disastrous health consequences on both man and aquatic life. The setting up of a project by oil multinationals in close proximity to human's habitation, Omorodion (2004) contended, it leads to socio economic and health consequences. The degree of these impacts from oil multinationals on the host community affect not only the physical environment but the social aspect (Chukwu 2005).

Ehigie et al (2002) also revealed that deprivation and deliberate injustice by successive government as well multinationals oil companies in the Niger Delta region of Nigeria has compelled residents in oil producing communities like Uzere to take up arms. In the past, some of the very vocal leaders were murdered by the government for agitating for their rights. The continuous pollution of lands in the Niger Delta region through oil spillage and gas flaring by oil companies and laxity in calling the oil companies and government to order through very stringent legislation, is responsible for the unending crisis in the Niger Delta region. The finding from the study in relation to social impacts from oil and gas exploration also supports a study carried out by Osuji (2004) and he asserted that unemployment is rampant as well in Nigeria and the Niger Delta region because gas flaring and oil spill during exploration activities pollutes farmlands rendering them almost useless. The location of government owned general hospitals in gas flaring and oil spillage sites is an awareness of the negative effects associated with. But despite the very few medical facilities, affordability is another big issue. As a significant proportion of residents affected with one form of illness or another due to oil and gas exploration activities, cannot afford to go to hospitals because of the high cost of the medical care. And even if they go, there are no viable health insurance policies in place or that they could rely on. In the United Kingdom, health care is provided free of charge through the National Health Service which began operation over sixty years ago (July 1948). Yet the oil in the North Sea is not up to half of the quantity produced in the Niger Delta region. One might be tempted to say this is a pathetic situation.

Osuji and Omorodion (2004) explained that Niger Delta region is saddled with problems of lack of social facilities and educational opportunities. In 1992, the Nigerian government established the oil mineral producing area development commission (OMPADEC), and supplanted it with the Niger Delta Development Commission (NDDC) in 2000, to oversee the development of the region but inadequate planning and rampant corruption undermined their successes (Omorotionmwan 2005 and Omotola 2007). We could say that the success of the Niger delta region depends greatly on the government commitment to living up to its fundamental duties. However on the part of oil multinationals they claim to have tried to contribute to the community development by providing infrastructure and facilities to alleviate economic and social hardship, and have continued to pledge their commitment to living up to their corporate social responsibilities. Laudable as these projects appear to be, the communities including Uzere are largely unimpressed. Generally cooperate sponsored development initiatives are perceived as corporate attempts to achieve legitimacy in their extractive relations with a corrupt state and pursue economic gain (Peluso and Reed 2005). The agitation for environmental justice has continued unabated; this could mean that there is something fundamentally wrong. Transportation is mainly by canoe while oil feeds the rest of the country. The researcher of this study during a visit to an oil producing community in 2013 found it very difficult to understand why oil multinationals and the government cannot construct bridges across the river. All this points to the fact that oil companies in the Niger delta have not done enough in their corporate social responsibility activities even though they have billions of dollars profit reported every year. The Nigerian oil producing region is saddled with setbacks and injustice over five decades after oil discovery, exploration and production means that there is something fundamentally wrong and requires a very urgent and sustainable solution and the time is now. The characteristics of various impacts as well social economic impacts from oil and gas exploration identified in the study are among the many wrongs that must be corrected, because lack of educational opportunities means less future social, economic and political opportunities. Lack of employment because fishing and farming have become unproductive due to pollution means less economic means to sustain people. Population growth exerts its influence and crime become rampant. Lack of social facilities such as transportation routes or networks means that the costs of travel are very high and risky, especially as they rely on canoes, the implication of all this is that the data collected for this study from people in Uzere community reiterate the and support the socio- economic impacts that plague the Niger Delta people during oil and gas exploration activities.

5.3 QUALITATIVE ANALYSIS OF NIGERIA DATA

5.3.1 Presentation and analysis of focus group

5.3.2 Demographics

The focus group was based on 13 people who were of residents of Uzere Isoko south Local Government Area (LGA) of Delta State of Nigeria. 38.5% male and 61.5% female.

Table 16 Qualitative Demographic sex data

Sex

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Male	5	38.5	38.5	38.5
Female	8	61.5	61.5	100.0
Total	13	100.0	100.0	

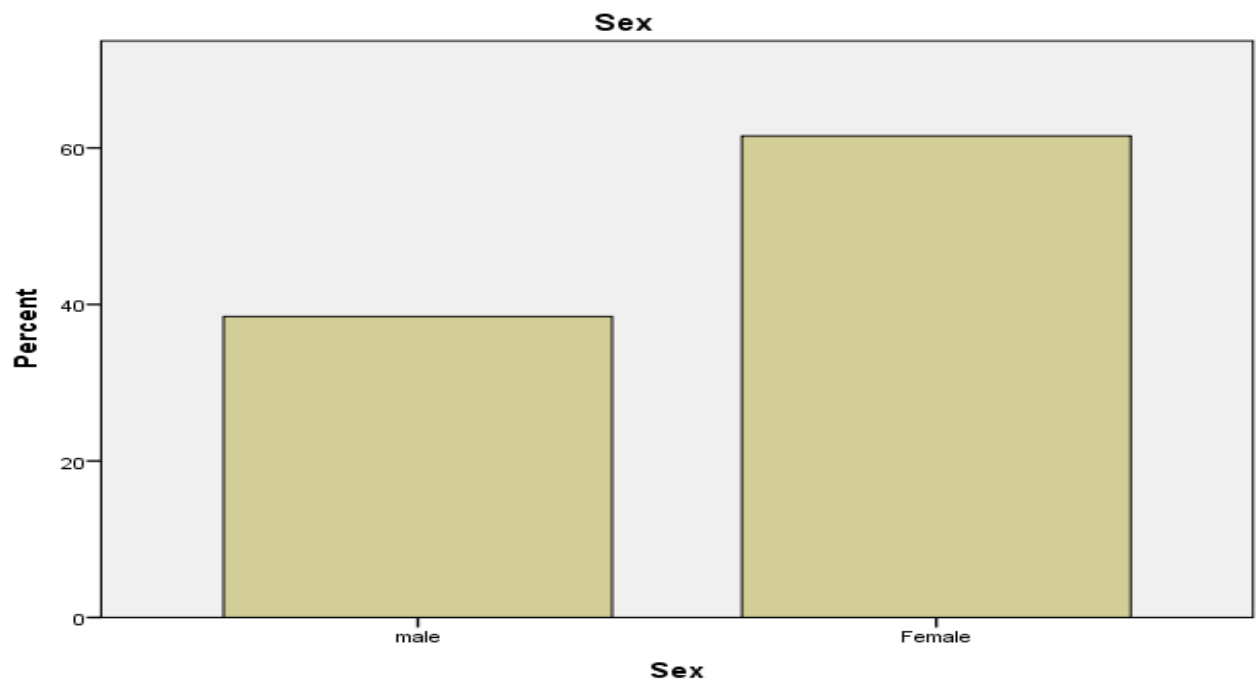


Figure 25 Qualitative Sex Demographic

The table and bar chart below shows the age groups ranging from under 21 years of age to 51years and above.

Table 17 Qualitative Demographic age data

Age		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 20years	1	7.7	7.7	7.7
	21-30 years	3	23.1	23.1	30.8
	31-40years	4	30.8	30.8	61.5
	41-50years	5	38.5	38.5	100.0
	Total	13	100.0	100.0	

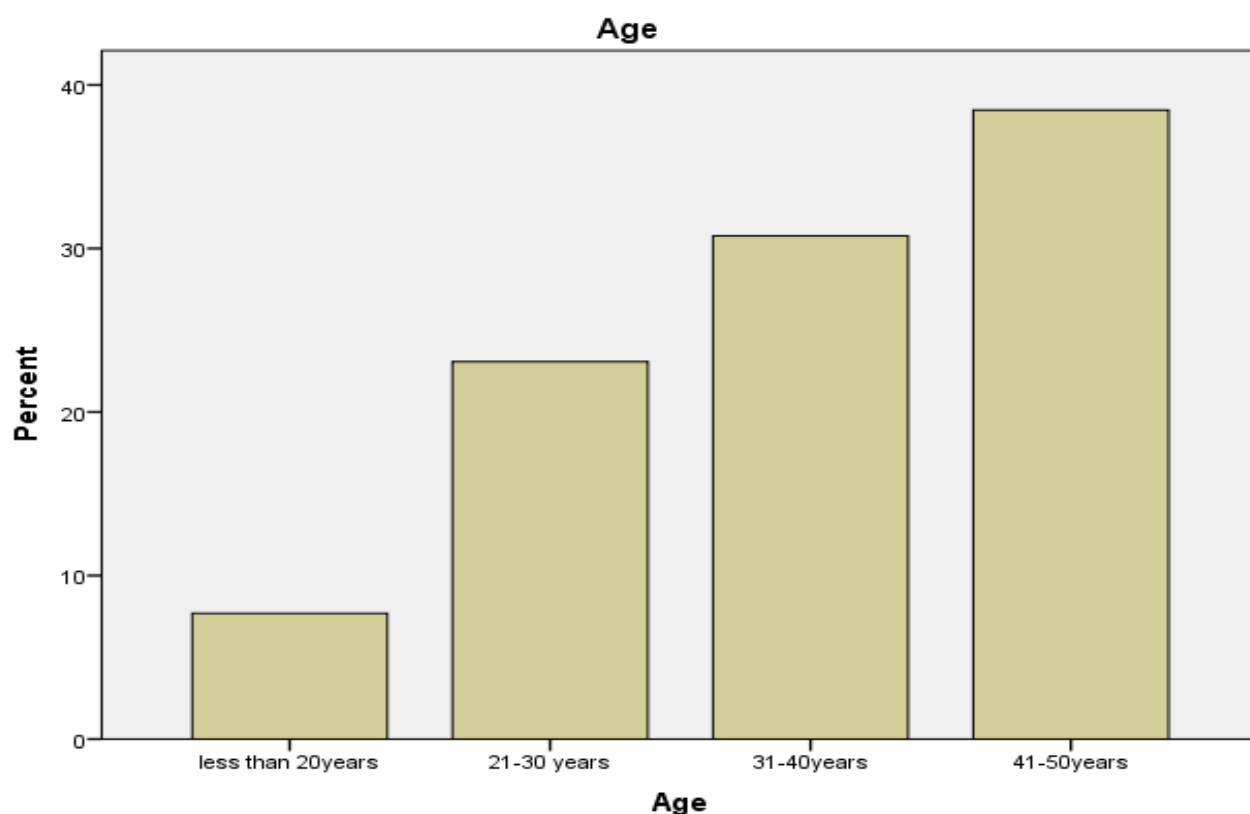


Figure 26 Qualitative Age Demographic

The question what is your preferred language includes 69.2 % pidgin English 23.1% English and 7.7% for Urohobo. Pidgin is a corrupt form of English language very common with the less educated in Nigeria and widely spoken in West Africa this is not to say they can't speak the English language but speaking pidgin is more comfortable for many in this area.

Table 18 Language spoken in the study area

Language		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	English	3	23.1	23.1	23.1
	Pidgin English	9	69.2	69.2	92.3
	Urohobo	1	7.7	7.7	100.0
	Total	13	100.0	100.0	

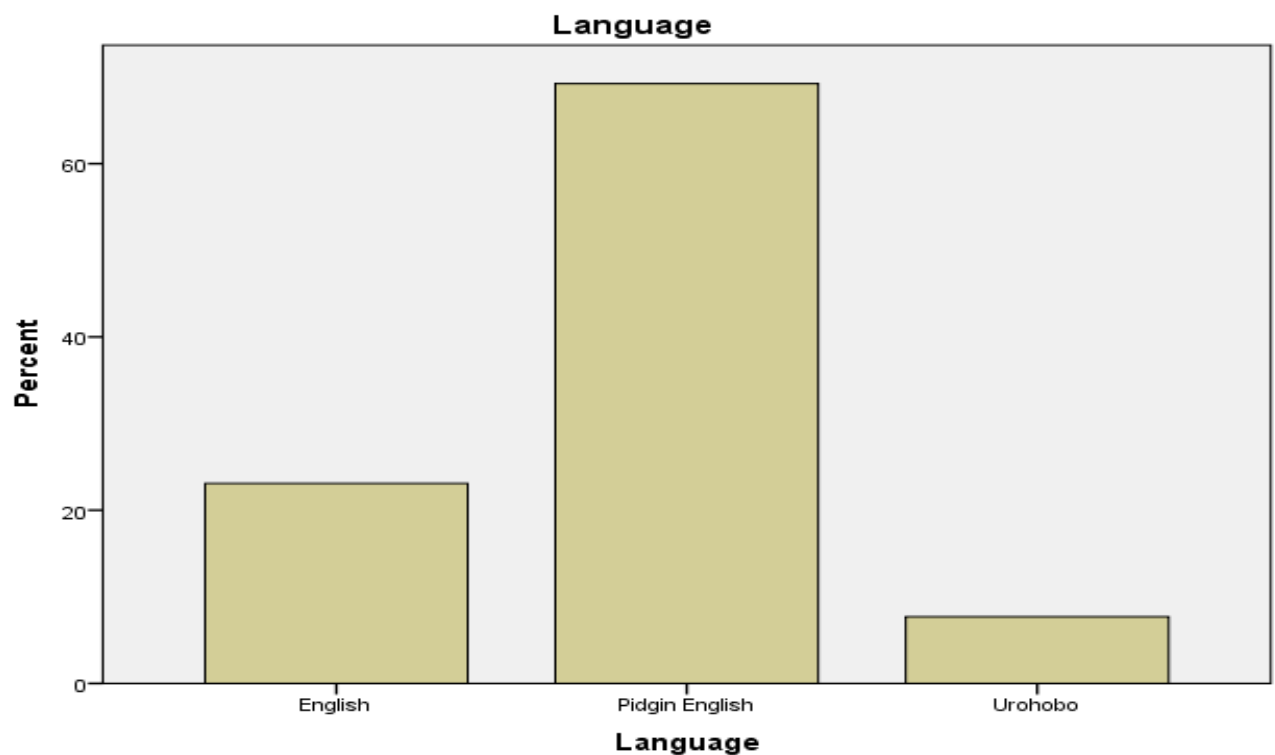


Figure 27 language spoken in the study area

5.3.3 How was the Qualitative data Analysed

The tape-recorded interviews were partially transcribed, with particular attention given to relevant sections of the interviews; and then the notes were typed. The tape-recorded interviews were partially transcribed because some of the issues the interviewees talked about were not directly related to the focus of the study. The researcher carefully identified relevant information by listening to the tapes at least three times, and then transcribing accordingly. Analysis of the data began with a careful reading and re-reading of the transcripts and field notes to attain overall familiarity with the data.

5.4 QUALITATIVE ANALYSIS FINDINGS OF NIGERIA DATA

5.4.1 Respondent perception, response based on discussion

5.4.2 Discussion results

The participants were generally quite responsive when answering “do you think oil multinational companies are responsible for environmental pollution. This was abbreviated on SPSS as (OMEF)

Table 19 Environmental pollution by oil multinational's companies

OMEF

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid strongly agree	7	53.8	53.8	53.8
Agree	6	46.2	46.2	100.0
Total	13	100.0	100.0	

Figure 3.8

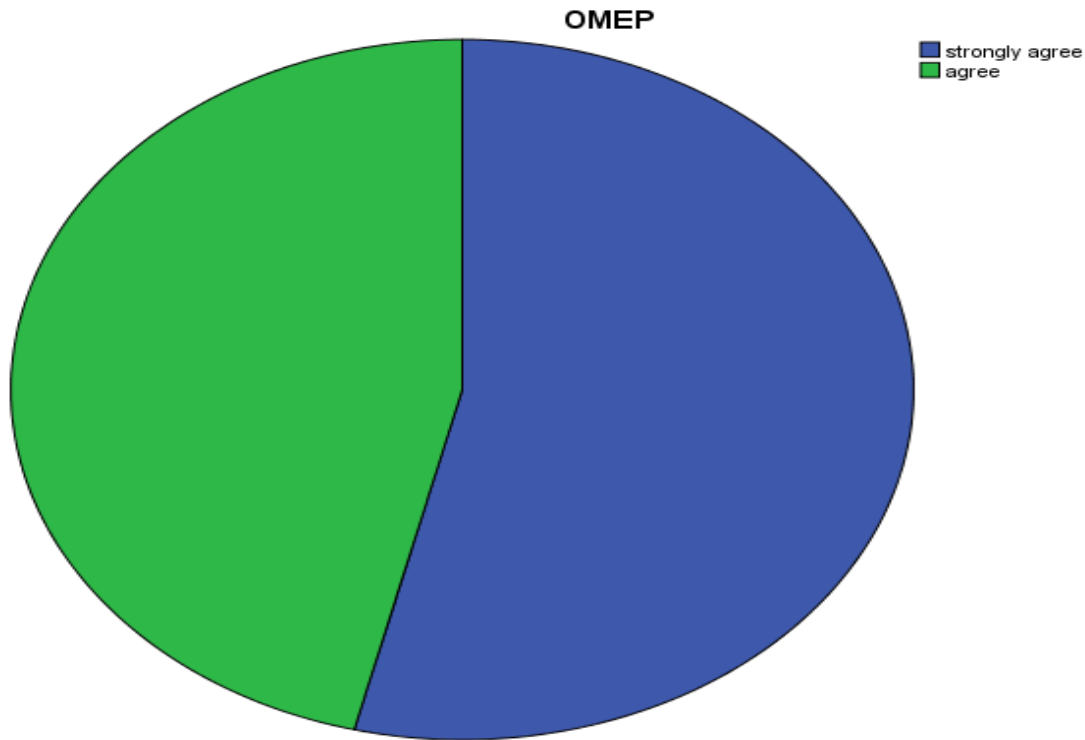


Figure 28 pie chart of qualitative findings

From the 13 respondents, 53.8% (strongly agree) commented that multinationals oil companies were responsible for oil and environmental pollution while 46.2 % (agree) and no response to (No Opinion, Disagree and Strongly Disagree).

The participants were generally quite responsive when answering “do you think multinational oil companies breach environmental laws. This was abbreviated on SPSS as (BELE)

Table 20 Breach of environmental laws by oil multinationals companies

BELE

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid strongly agree	10	76.9	76.9	76.9
Agree	3	23.1	23.1	100.0
Total	13	100.0	100.0	

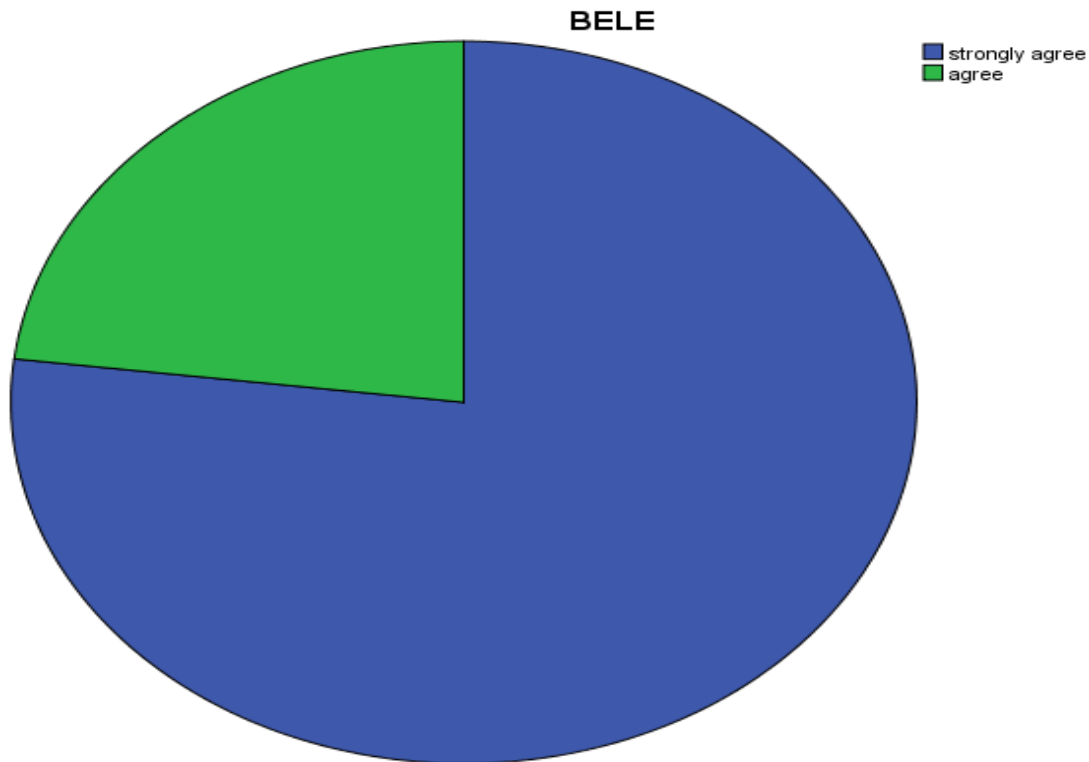


Figure 29 pie chart of qualitative findings

From the pie chart above we could see that the respondents both strongly agree and agreed that multinationals oil companies do break environmental laws when carrying out oil and gas exploration activities. That is out of 13 respondent 76.9 % strongly agreed and 23.1% agreed.

The other part was the Focus group, consisting of 8 participants (6 male and 2 female), lasting approximately 2hours. There were two predominant themes: general perception of oil and gas exploration in the community/ environmental impact experienced from oil and gas exploration

Key points:

- Physical impact
- Air pollution
- Noise pollution
- Biological impact
- Social cultural and economic impact.

The participants were generally quite responsive when answering “do you think oil multinational oil companies are responsible for environmental pollution. Very few people hesitated or chose not to answer. However, began their response by saying, "I don't know very much but . . ." and then gave their opinion. It was often a very detailed opinion. The following are Representative responses:

All they (oil multinationals) care about is making money and pollute our environment, farms for us.

Respondent 5: In the 1970s, we didn't have much environmental degradation and the community people still had their sources of livelihood intact” but ever since oil exploration started by these oil companies the environment has been destroyed totally.

Surely it's the oil companies that are responsible for the environmental pollution. Even the government doesn't care what happened to the people;

5.4.3 Environmental laws

There were very few responses to the question, “do you think multinational oil companies breach environmental laws during oil and gas exploration?

Respondent 8: The oil companies and government do not handle the environmental laws in the Niger Delta and Nigeria with care. As I am talking to you there are people in my village who do not have Farmlands anymore because of the way that oil companies grab these lands for oil and gas exploration.

Respondent 2: The oil companies neglect every law on earth and what happens to our land, as long as they continue oil and gas exploration, which has affected us a lot and the Government is slow to respond to the effects.

Respondent 4: These oil companies in the Niger Delta are heartless. Shell, Agip Chevron, Elf and others are hurting our people with spillage and gas flare. They do not do this in their own countries, but they

have seen a country where laws do not work so they do it with impunity. But God will not allow it any more. They will pack and leave the Niger Delta by force or by fire.

5.4.4 Physical environment Impacts

Has Oil and gas exploration caused physical impact? They answered: *The last oil spillage that occurred in our community had large quantities of crude oil pumped into the land and river of our community, causing destruction to the people.*

Table 21 impact of Oil spillage on soil quality

NIOQ

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid strongly agree	12	92.3	92.3	92.3
Agree	1	7.7	7.7	100.0
Total	13	100.0	100.0	

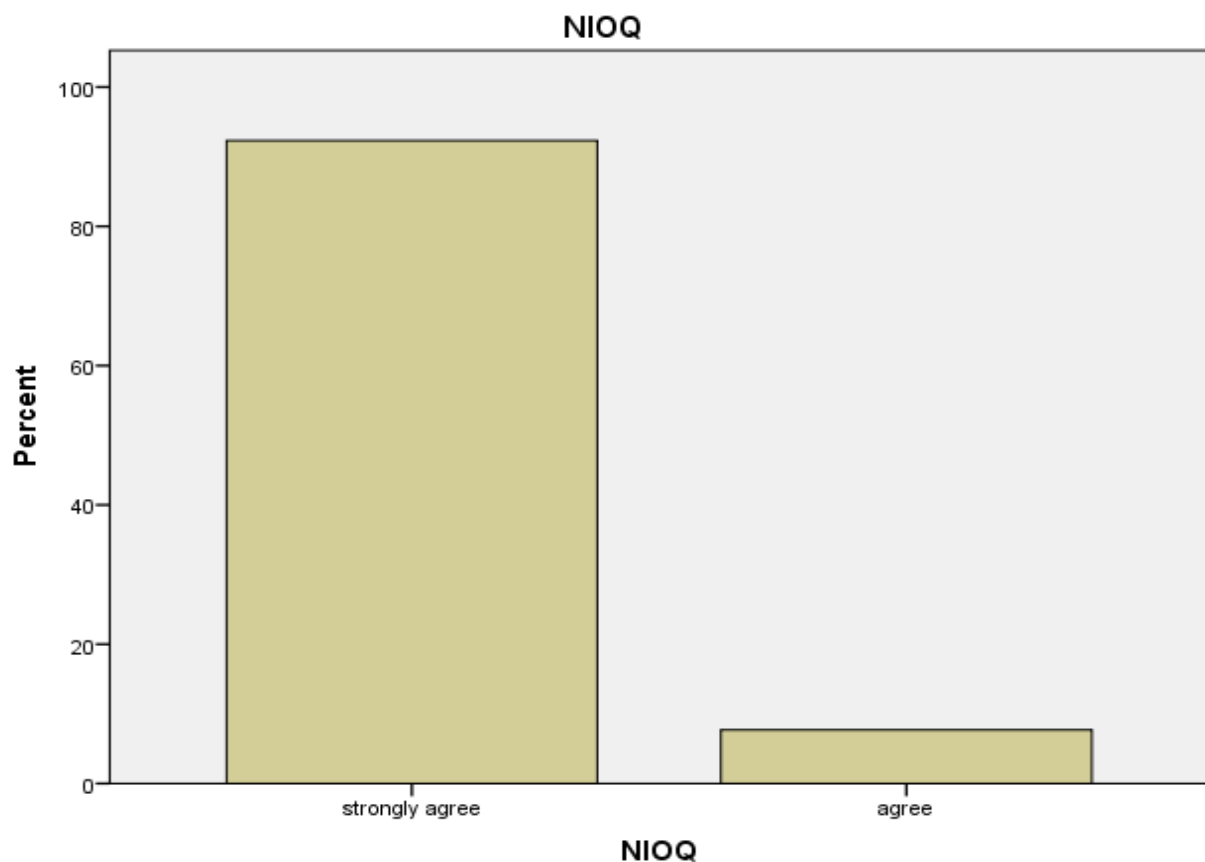


Figure 30 Negative impact from oil and gas exploration

One of the sub questions that I put forward to the participants was that oil and gas exploration activities have resulted in negative impacts on soil quality(NIOQ) from the above chart we could see that 92.% of the respondent strongly agree and this validates this comment made in the focus group and as well the quantitative analysis

Respondent 1: Our only source of water was polluted while farmlands with crops, as well as economic trees were destroyed by the oil spillage

A few participants then added answering their questions and linking the physical impact to economic lose: *We have families to feed, when oil spillage occurs, it pollutes the entire water and damage our cassava soaked in it, causing hunger and waste of food, time and money.*

The question relating to environmental impact was asked and the following was a participant's response:

Respondent 10: We are not actually gaining anything from oil resource, but misery. In those days before the exploration of oil, our normal daily activities was either farming or fishing. We depended on our products, which were abundant but today the reverse is the case. There are oil spillages from these companies, which destroy our rivers and farmland.

Respondent 3: At a certain time in the lives of our communities, fish, wild animals and food were abundant, people had food and enjoyed themselves, but now in these communities, there are no fishermen because you cannot catch fish in the streams again. The chat below shows response from participant discussion.

Table 22 Impact of oil spillage on wildlife

NIOQ

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid strongly agree	8	61.5	61.5	61.5
Agree	5	38.5	38.5	100.0
Total	13	100.0	100.0	

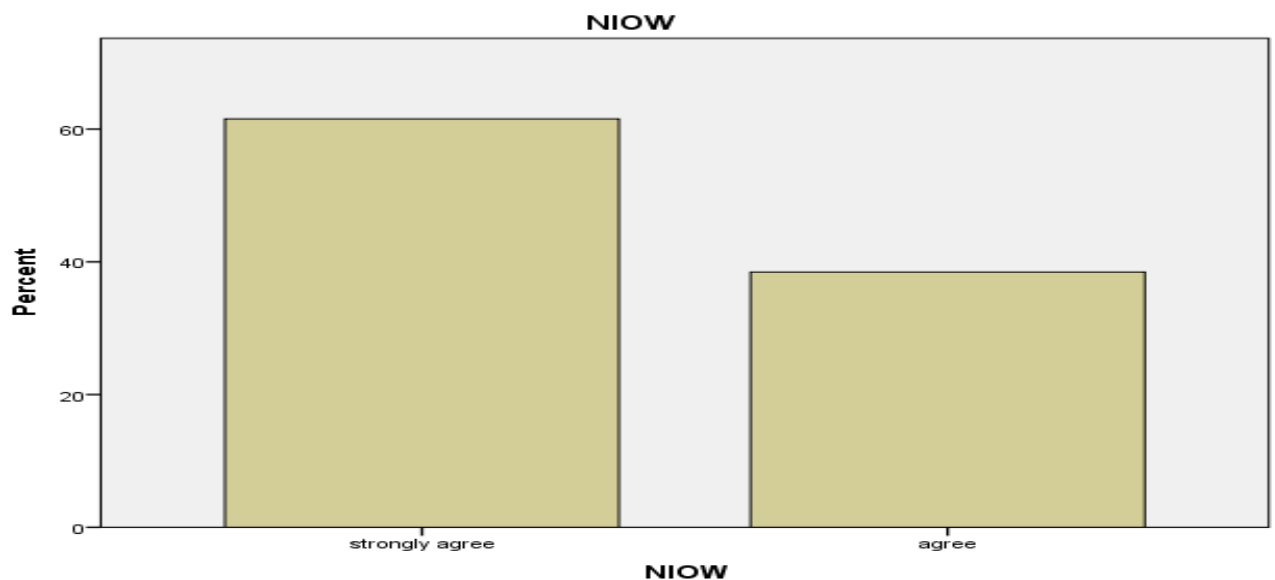


Figure 31 Impact of oil and gas exploration on wildlife

However the response was the same from the participant information form which I asked them to fill out. One of the questions that were asked was that oil and gas exploration activities have caused negative impact on wildlife. Out of the 13 participants 61.5 % strongly agree while 38.5 % agree. Other subtopics I discussed with the participants during the group discussion were the depletion/degradation of their water supply, negative impact on vegetation, amenity loss and deterioration of the water quality as a result of oil and gas exploration in the community. From the participant information form their responses are as follows below.

5.4.5 Physical impact caused by oil and gas exploration participant

Table 23 physical impact caused by oil and gas exploration

Information form response

Question asked	Strongly agree	Agree	No opinion	Disagree	Strongly disagree
depletion/degradation of their water supply	23.1%	76.9%	Nil	Nil	Nil
negative impact on vegetation	69.2%	23.1%	7.7%	Nil	Nil
amenity loss	46.2%	46.2%	7.7%	Nil	Nil
deterioration of the water quality	92.3%	7.7%	Nil	Nil	Nil
Negative impact of health of locals	61.5%	38.5	Nil	Nil	Nil

Other comments made by participants includes:

Respondent 13: These pipelines have devastated even the small land that is remaining for us for development. It is very disruptive, but we cannot do anything about it, the pipelines have to pass through the community”

What we could see here is that the respondents are very candid in speaking about the physical impact oil and gas exploration. One lady in particular responded by saying: *the important contribution and point is that of the exposed oil and gas pipelines in the middle of the community, indicating the danger being posed to the people. Exposed gas pipelines pose the greatest threat to people, because it is difficult to detect when there is a leak, unlike crude oil that can be seen when there is a spill.* Studies have shown that crude oil in the Niger Delta has low metal content, but if it’s exposed in the

environment through oil spillage and combustion of refined crude can pose serious health problems (Ajayi *et al.*, 2009: 67). One study which was conducted by Essoka *et al.* (2006) found out that heavy metals contained in crude oil or added during the refining process can be released to the environment and be harmful to health.

5.4.6 Air pollution/ Impacts

Participants were asked what where the impacts they experienced from air pollution from oil and gas exploration has caused? The following where the response:

Once it is midnight, they increase the fire (gas flare), and houses around would be shaking, the vibration of the fire disturbs everyone in the community.

It is all these flames that are affecting the health of the people. People don't live for long in this area" by day, oil company keep the flaring low, so that people will think that that is how it is, but once it is late in the night, they increase it to the highest.

A participant said that it is necessary that they get checked regularly because he doesn't know the symptoms associated with respiratory diseases. *"We should go for an exam because I or we don't really have any symptoms, so if we do we can tell and find out early and look for solution or treatment which would be expensive"*

for many years people in the community have been living with continuous flaring of gas, our farm lands has been polluted, we labour had to plant our crops but at the end of the day nothing comes out. Our zinc roofs are corroded, out air is polluted. Our children are sick, even the rainwater we drink is contaminated.

In the night, we cannot differentiate it from the day. The zinc roofs in our houses leak every year and one has to replace leaking ones every year. Below show respondents percentage to the above question.

5.4.7 Air pollution caused by oil and gas exploration participant

Table 24 air pollution caused by oil and gas exploration

Information form response

Question asked	Strongly agree	Agree	No opinion	Disagree	Strongly disagree
Cough and skin diseases/Respiratory diseases	30.8%	53.8%	15.4%	Nil	Nil
Poor health conditions from CO ₂ emission(gas flaring)	46.2%	46.2%	7.7%	Nil	Nil

Other comments made by participants about air pollution caused during oil and exploration includes:

The weather is constantly hot from the gas that is flared everyday

When you stand close to the smoke that comes from the exhaust of a vehicle, you can tell that the air is contaminated and can harm you when you continue breathing the air.so gas flaring affected us as well as the air we breathe in is contaminated.

The statement above corresponded with the finding made above and UNDP, (2006: 79); Dung *et al.*, (2008) which explained that most of the gas flaring activities takes place in localised region in the Niger Delta and they are almost never turned off. Ndubuisi & Asia (2007) went to say that as a result of gas flaring many residents in the Niger Delta are living in deteriorating conditions

5.4.8 Biological environmental/ impacts

Participants were asked about the biological pollution or impact from oil and gas exploration has caused. The initial reactions to the question were that they were no responses at all. But when probed further and asked if they had heard or experienced of a number of biological impacts. The following where the comments, but their responses were often tentative:

If you go to our farms and see the extent of damage on our livelihoods, oil has devastated the area in a very criminal manner, and leaving the people in poverty situation.

Participants were asked other questions to get more insight about the biological impact, below are the questions that were asked as well as their responses in percentages.

5.4.9 Biological impact caused during oil and exploration participant

Table 25 Biological impact caused by oil and gas exploration

Information form response

Question asked	Strongly agree	Agree	No opinion	Disagree	Strongly disagree
Negative impact on wildlife and its habitat	53.8%	46.2%	Nil	Nil	Nil
Negative impact on vegetation	84.6%	15.4%	Nil	Nil	Nil
Negative impact on livestock	69.2%	23.1%	7.7%	Nil	Nil

Other comments made by participants on biological impacts caused during oil and exploration includes:

Oil has taken away the natural nature of the area, life and farming this has now made buying thing difficult

The source of the river has been blocked by chemicals from oil, so the river here is no longer flowing, it is now dead. That river used to be a source of fish for us, but the fishes have swum away because the water is now shallow and filled with water hyacinth. No fish can live in such pollution”

This for example agrees with a study carried out , by Ndubuisi & Asia (2007) in which they conducted interviews, provided surveys and interacted with stakeholders to identify community attitudes and perceptions of Delta State residents concerning their environment. They found that about 31 percent of respondents to the surveys believed that oil spills have damaged their living conditions.

Other studies which have been conducted on the metal content in crude oil and how its exposure to the environment can cause long-term health consequences. One such is Ajayi *et al.*, (2009) the study revealed that metals such as arsenic and cadmium are carcinogenic when exposed to the environment and act as enzyme inhibitors that disrupt the metabolic process of organisms (Essoka *et al.*, 2006).

5.4.10 Health related problems/impacts

People or participants were generally in agreement that gas flaring is dangerous for health. They associated the gas being flared with cancer, specifically lung, throat, and brain cancer. And one of the participants associated gas flaring with heart disease. And some participants associated gas flaring with tuberculosis.

"They say that gas flaring is the reason people get tuberculosis. It is a disease that causes people to die from coughing.

There is no good hospital to give quality health care to the community. At a point in time, government brought medical personnel to treat the whole community for just three days, which was inadequate compared to the poor health conditions of the people

One of the participants felt that health brochures often contain language that is not easily understood. *"There are pamphlets in many places in the hospital that we go to? We don't read them because we*

see words that are kind of odd. We do not understand them. If the pamphlets were written using a language that we speak, we would be more likely to understand the message."

With regards to oil pipelines, Depending on the area the pipeline traverses, for example, if it is through water, it normal causes water pollution and deny us access to water in that area, and if it is through land, it causes loss of ownership and availability of the land.

5.4.11 Socio economic environment/impacts

There was an overwhelming response to the question "socio cultural and economic impact from oil and gas exploration"

Most of the participants were generally unhappy talking about this: *The oil companies influenced our life styles, and it had a short duration. People are paid while the oil processions are on, and after that, nothing! They drill and go away, destroying the land and waters.*

The country have made so much money from oil and so much is claimed or believed to have been released for development, but you turn around without seeing what the money is used for. The money has ended up in private pockets of those entrusted with its management or execution of the project for public goods. Public service today is about 'eating' the oil money

The worse of it all is that each passing day we are descending more into poverty conflict and environmental damage while the money goes to Abuja"

The village or community is wired all through with electricity but no electricity supply.

We have to go to the same stream to wash our cloths, this serves as source of drinking water and most at times it's even polluted.

We suffer the effects of oil spills on our communities today because of the oil companies' continuous use of pipelines that have exceeded their lifecycles and their inability to maintain their pipelines properly"

It is a common feature with the Niger Delta region to see temporary settlements and social amenities depending on the duration of the oil and gas pipelines constructions"

Many of the job opportunities that were open to us were transient and unskilled jobs. This frustrated some of us seeking permanent work”

Participants where asked other questions relating to the socio- economic impact caused during oil and gas exploration, below were the questions that where asked as well as their responses in percentages.

5.4.12 Socio economic/ environmental impact caused during oil and exploration participant

Table 26 Socio-economic impact from oil and gas exploration

Information form response

Question asked	Strongly agree	Agree	No opinion	Disagree	Strongly disagree
Increased commercial activities in the area/community	15.4%	7.7%	Nil	53.8%	23.1%
Negative impact on agricultural activities	61.5%	38.5%	Nil	Nil	Nil
Raised the economic conditions of the locals	15.4%	7.7%	Nil	46.2%	30.8%
Solved Unemployment problems to some extent	15.4%	7.7%	Nil	61.5%	15.4%
Negative impact on the socio cultural environment	53.8%	46.2%	Nil	Nil	Nil
Land degradation	79.9%	23.1%	Nil	Nil	Nil

Other comments made by participants on socio economic/ environmental impact caused during oil and exploration includes:

There was also the question if oil and gas companies have solved unemployment issue to some extent, the response was overwhelming:

“Yes I agree the companies do sometimes provide infrastructure for the communities, but how long do these infrastructures last, and how many of us can those infrastructures serve?”

We manage to send our children to school to acquire education. Upon the completion of their education, they are unable to get gainful employment. They are managing the fishing activities with us in order to sustain themselves

However, some of the youths of the area have been employed by the oil companies on a temporary basis.

Local men are hired to work in oil dredging, laying of oil pipes, security guards, and so on.

Oil companies pump out thousands of barrels of oil a day and yet, neither I nor my family have benefited”.

The country have made so much money from oil and so much is claimed or believed to have been released for development, but you turn around without seeing what the money is used for. The money has ended up in private pockets of those entrusted with its management or execution of the project for public goods. Public service today is about ‘eating’ the oil money

The money that is coming out of this community through crude oil and the development you see in the community is not something that makes anyone happy. If you go inside the community, you won’t believe the level of poverty you will see there”

The above comments indicate that there is a gap in community expectations that has not been filled. Taking into consideration the oil revenue that accrues to the country as a result of the activities of oil companies in this particular community, the high incidence of poverty observed is becoming an issue fuelling resentment towards not just the oil companies, but also to the Federal Government, which receives and distributes the oil revenues.

“As young girls in the ‘70s and ‘80s, we were buying clothes and other things with money we got from the selling of ‘Ogbono’ seeds gathered from the forest. But oil companies have constructed roads roads to help use which has caused the death of most of the ‘Ogbono’ trees and even the few ones that are still alive have become impossible for people to reach them, because the creeks and rivers we used to

ply have been blocked. One cannot gather 'Ogbono' seeds into bags and trek from very far distances to the village.

The focus groups that were conducted presented an opportunity to comprehend the ways resident of Uzere viewed oil and gas exploration in their community and its risk factors and impacts. Although these groups were not representative of everyone in the community (Uzere) the opinions obtained provides a foundation and validate the finding that was made from the quantitative data. The information obtained in the focus groups is critical to the development of a framework and solution about environment related issues from oil and gas exploration.

This is because the focus group has given more insight into various concepts not well understood. More importantly, it have given an awareness of the issues most relevant to or of consequential effect to the people of Uzere.

Many participants from the focus group expressed their appreciation of having the opportunity to finally talk about the impact they have experienced over the years. They also were glad to be able to vocalize their opinion on this subject. Because of this enthusiasm, the participants were asked to write their name, address, and telephone number if they were interested in becoming involved in a future campaign (e.g., receiving information, participating in discussion groups). Every person who participated in the focus groups willingly provided this information. A few people said that they would like to help out in any aspect of the program even if they were not paid. Moreover, several focus group participants telephoned the coordinator from the local council and reiterated to him that they would like to become involved in this campaign. This enthusiasm should be embraced, and active participation by members of the Uzere community should be encouraged. The community's involvement is critical to the success of the general fight or campaign against environmental impact of oil and gas exploration in the Niger Delta., because these are the people who can best determine what motivates them and what would help them to lead a healthier life. More importantly, they can provide insight on the perceived barriers that keep them from having a sustainable environment.

5.5 QUANTITATIVE ANALYSIS OF UNITED KINGDOM DATA

5.5.1 Demographic characteristics

The demographic characteristics of individual company (ABCD) are explained below.

The demographic characteristics of the four companies above were composed of both onshore and offshore groups and there were a few differences between them.

Table 27 UK Quantitative demographic

Companies	Age	Sex
Company A	21- 30 years(7), 31-40 years(1) and 41-50 years(2)	Male(8) female (2)
Company B	21-30 years(1), 31-40(6),41-50 years(3)	Male(10)
Company C	Less than 20 years(1), 21-30 years(1), 31-40years(5),41-50years(2) and 51-60 years(1)	Male(8) female(2)
Company D	31-40years (3), 41-50years(3) and 51-60years(1)	Male(5) female(2)

An important thing I noticed was that onshore workers were predominately older and female while those that go off offshore were younger. Most of the respondents were in the oil and gas industry and some of their main duties include maintenance personnel and technicians, production and process operators, drillers, supporting staff, and some were administrators. This corresponds with a study carried out by (Opito, 2011) who in the survey found that female workers made up only 4% of the total UK oil and gas workforce. Women are particularly under-represented in the engineering, technical and scientific professions, and relatively over-represented in onshore admin and secretarial jobs. Of all the women employed to work offshore in 2010, over 40% worked in catering. A summary to respondent satisfaction on how their company carries out oil and gas exploration activities based on (very satisfied), (satisfied),(fairly satisfied) and (not satisfied), had the majority of respondents satisfied and very few satisfied with no response for fairly satisfied and not satisfied.

5.5.2 Quantitative analysis findings of United Kingdom Data

From individual companies (ABCD) there was a total of 37 respondents, company A (10), company B (10) company C (10) and company D (7). From the data analysed we see that the response rate on environmental impact from oil and gas exploration in the United Kingdom (North Sea) is less. However this is not to say that there isn't any environmental impact from oil and gas exploration over the years. For example media images of dead and dying oil covered marine wildlife have sparked considerable public concern as oil spillages or leaks and chronic discharges may be of greater significance for animal populations (especially endangered) and migratory sites for birds and marine mammals.

Boesch and Rabalais, (1987) in a study carried out explained that oil spillage causes of mortality in seals, sea otters, several species of whales, and sea turtles. Edwards, (1989) also agreed that oil spillage in the North Sea or occurrences around production sites, and pipeline damage can all expose wildlife to crude oil or refined petroleum hydrocarbons and the ingestion of petroleum hydrocarbons by wildlife can cause sudden death. So we could agree that in the United Kingdom as well, companies have huge positive and fewer negative impacts during oil and gas exploration compared to Nigeria and the Niger Delta environment because as DTI (2001) stated all stages of the exploration activities, development, production and decommissioning life cycle are subject to Environmental Impact assessment. As stated above we saw that the response from the participants had a different view or perception about health, physical and socio economic impact from gas flaring. An important question we should ask is what the United Kingdom oil companies have done to achieve less or minimal impact during oil and gas exploration activities? This would be elaborated on below which shows the various respondents from individual companies in the UK and the various environmental impacts experienced during oil and gas exploration.

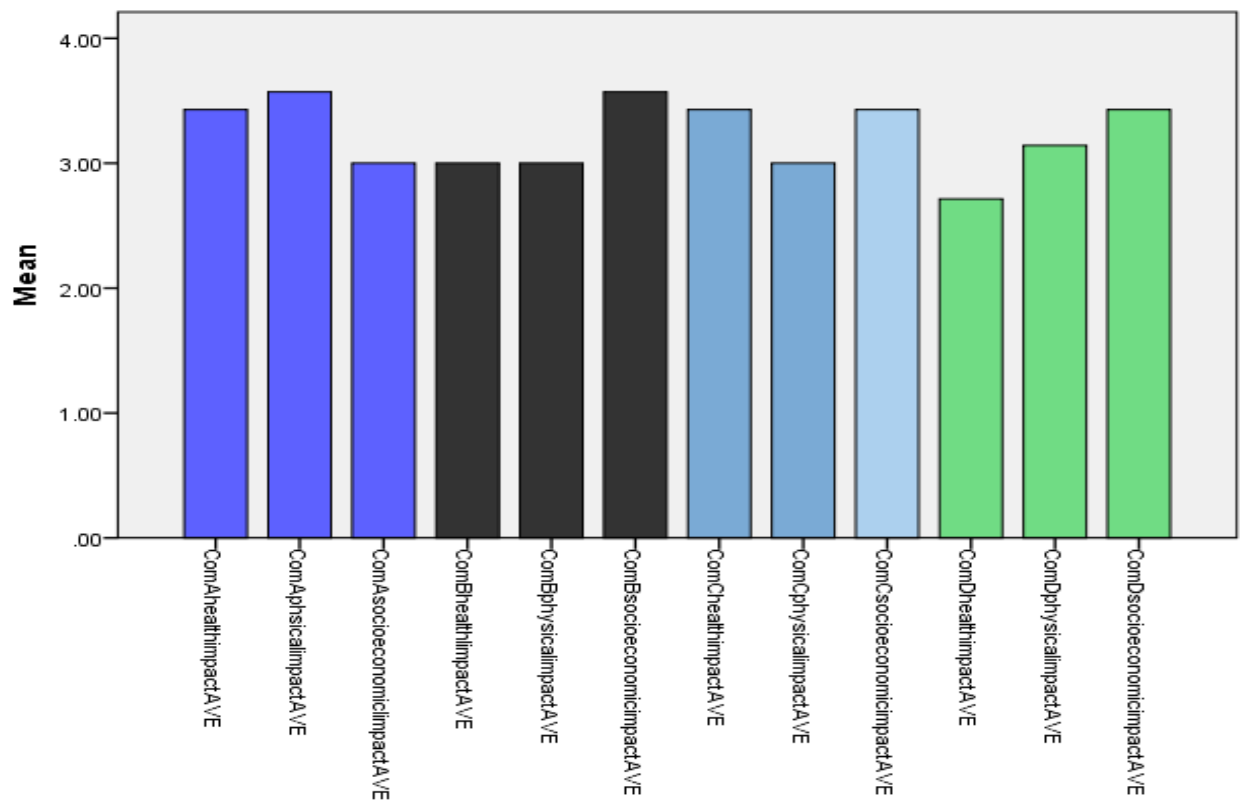


Figure 32 Quantitative finding UK

The average of environmental impact related questions for an individual company (A, B, C, D) is 1 =very serious, 2= serious, 3= fairly serious and 4= not serious. From the individual companies in the figure above, we can see that the respondent response towards environmental impact question in the UK during oil and gas exploration was between 2.8% to 3.8%. This falls under the fairly serious and not serious categories. This trend is different from the Nigeria data collected and analysed however below explains why there is difference the two data or countries and also a T-test analysis would be carried out to validate the data as well.

5.5.3 Socio-economic positive and negative impact

Oil and gas provides many benefits to society as energy is necessary for all our activities. Meanwhile each stage in the lifecycle of oil and gas exploration carries hazards for ecosystems, wildlife and humans. Through multiple pathways, oil and gas exploration result in ecological changes, losses to biodiversity, introduction of infectious diseases, air pollution, acid rain and climate change. Oil & Gas UK (2009) contended that there are direct and indirect social and economic benefits from the oil and gas industry in the United Kingdom. Information provided by DECC in 2009 explained that the oil and gas industry has created about 264000 job, £12.9 billion taxes and improved expertise of the UK supply chain making it well established internationally and better with the energy security from the use of indigenous resources. In terms of employment in 2007 the UK government estimated that the oil and gas industry has provided about 34000 jobs and approximately 230000 sub-contractors on a wider supply chain level. However about 100.000 people during this period were also employed in export activities by multinationals oil companies but these are not directly related to domestic oil and gas exploration and production. We should also bear in mind that part time jobs across the oil and gas industry were not included, some of these jobs included financial and legal services, design, engineering, environmental and geo-sciences, health and safety, IT, management, operations, sales and marketing

Another positive effect from oil and gas exploration on the socio economic state of the country was in the taxes paid by oil multinational. DECC 2009 reported that the Exchequer benefited by £12.9 billion in oil and gas taxes for the 2008-09 fiscal year; an increase from £7.8 billion in the 2007-08 fiscal year. Exportation by UK companies is on the rise as well some examples such as: subsea engineering where the UK is recognised as a world leader; high pressure, high temperature (HPHT) field developments; oil and gas process machinery, equipment and technology; deep water oil and gas developments; design, project management and the delivery of new field developments; integrated services for the operation and maintenance of oilfields; late life operation of mature fields; light weight, slim line structures; economic and technology led consultancy services and so on. Their negative presence associated with the socio economic impact of oil and gas exploration in the United Kingdom as well as oil and gas activities also have the potential to impact on the seabed and its associated features, in particular through the trenching of cables and pipelines into the seabed and through rig and other vessel anchoring, oil exploration has direct effects on health due to population movements. This is because oil exploration activities attracts workers and their families to sparsely

inhabited areas, sometime causing rapid urbanization and the introduction of infectious diseases and mental health disorders (McMichael et al., 1996) and (Wolfe et al., 2000). However, the potential impacts are addressed through the licensing system. The licences require the appointment of a Fisheries Liaison Officer and the removal of debris resulting from activities carried out under the licence, legal and policy framework

5.5.4 Physical/Environmental positive and negative impacts

Despite the low response from participants to physical and environmental impacts from oil and gas exploration in the United Kingdom, there have been various cases of oil spillage reported. For example DECC 2011 reported that leak was at the BP Gannet Alpha production platform, 112 miles off Aberdeen discharged about 218 tonnes, or 1,300 barrels, the cause was later reported as an equipment failure. Anderson and Talley, (1995) also argued that arctic conditions, such as dynamic ice cover, low temperatures, reduced visibility or complete darkness, high winds, and extreme storms add to the probability of an accident or error that might cause oil spillage to occur. Other spillage incidents include the Torrey Canyon sank which after hitting rocks off Cornwall in 1967, a slick measuring 270 square miles contaminated 120 miles of the Cornish coast and 50 miles of French coastline; 15,000 sea birds died. In 1993, 85,000 tonnes of crude oil were spilled when the MV Braer ran aground off Shetland. Only a small amount of oil reached land. It was biodegradable, which helped to lessen its impact on wildlife and the Sea Empress tanker ran aground off the Welsh coast in 1996, spewing 73,000 tonnes of oil. Some of these were as a result of accident and this corresponds with Keisha Huijter (2004) who in his study stated that most oil spillages in the United Kingdom are caused either by operation or accidents, operation he explained involves loading/discharge while accidents involves hull failure, collision and grounding.

However DTI (2001) reported that the main stages of oil and gas activity (including natural gas storage) are: Exploration, including seismic survey and exploration drilling, development, including production facility installation, generally with construction of an export pipeline, and the drilling of producer and injector wells, production/operation, with routine supply, return of wastes to shore, power generation, chemical use, produced water, and re-injection of reservoirs, monitoring, maintenance, decommissioning, including cleaning and removal of facilities. Nevertheless it's important to note that all stages of the exploration, development, production and decommissioning life cycle are subject to

Environmental Impact Assessments (EIAs) and all discharges and emissions are subject to permit. Some of this Legislation includes: Offshore Petroleum Production and Pipelines (Assessment of Environmental Effects) Regulations 1999 (as amended) (SI 1999/360) application of the EU Environmental assessment Directive to certain categories of offshore oil and gas exploration activities. The Regulations require DECC to make an assessment of environmental impact before deciding whether or not to authorise various offshore activities these including the drilling of wells, the installation of pipelines and most categories of field development. If there is a significant measure of environmental impact, it is likely a full EIA must be carried out, including the submission of an Environmental Statement. For certain developments (where production is more than 500 tonnes of oil per day or more than 500 000 m³ of gas per day or for pipelines greater than 40 km in length and with a diameter greater than 800 mm). the Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001 (SI 2001/1754) and amendments (2007) – application of the EU Habitats and Birds Directives to all oil and gas activities on the United Kingdom. Under these Regulations, DECC is required to take account of the potential impact of offshore oil and gas activities on listed habitats and species, which may be protected by ‘relevant sites’ or given more general protection in UK waters. As a result, survey consents, well consents, and oil pipeline and development consents, must be supported by an environmental case (a stand-alone environmental narrative or a formal Environmental Statement) this is made to demonstrate that the proposed operations are unlikely to have a significant or adverse effect on important habitats or species, or the conservation objectives of any potential or existing ‘relevant site. Under the Offshore Chemicals Regulations (OCR) 2002 (SI 2002/1355) all use and discharge of offshore chemicals (including drilling fluids) require a permit. This covers activities such as oil and gas production operations, drilling of wells, discharges from pipelines and discharges during decommissioning activities. Reliable data from DECC and OSPAR on discharge of chemicals from 2003 onwards shows the amount of chemicals discharge during oil and gas exploration and that shows there has been an overall reduction in the total discharge of chemicals of about 8% from 274 000 tonnes in 2003 to 253 000 This is largely due to the common effort among multinationals oil companies. However the environmental and safety laws put in place by DECC and OSPAR’s are good practice put in place a principal guide to procedure and practice of oil and gas exploration in the United Kingdom. To maintain a good and professional regime based on the environmental laws put in place in the United Kingdom all multinational oil companies came up with best practice during oil and gas exploration activities. BP indicates three principles at the heart of its safety approach: (1) Fostering a culture focusing on safety, on managing and reducing risk and on safe, reliable and compliant operations; (2) establishing an operating management system (OMS) with expectations of conduct and leadership approach; (3) independent, effective checks and balances and

self-verification being carried out at all levels of the organization (BP 2011). Shell on the other hand also wishes to create a culture of safety, incorporating ongoing training for employees. The company identifies three principles central to safety: (1) do no harm to people; (2) protect the environment; and (3) comply with internal health, safety, security, and environment laws and regulations (Shell 2013) These practice employed by the two companies above as well as others are laudable as notable multinationals oil companies with the principles of sustainability in mind generally concentrate on continuous improvement of environmental performance, internal responsibility, and preservation of wildlife.

5.5.5 Health/Gas flaring positive and negative impacts

The finding on gas flaring in the United Kingdom was dramatically low compared to that in Nigeria. As response from participants shows that there are few or no health impacts from gas been flared during oil and gas exploration activities. This because In the UK and most part of the developed world where oil is produced, gas flaring is greatly abhorred. The oil companies in these countries flare gas in rare cases and it is usually a minute aspect of their operation process. This corresponded with Isishone (2004) explaining it is made possible because of the technological advancement and the recognition of the economic value attached to the gas. This Al-Otaibi et al (2007) agreed and argued the developed countries have increasing recognition that gas flaring is a significant environmental issue contributing to total global CO₂ emission. This is not to say that gas is still not flared in the United Kingdom. For example a report by the Red Orbit News in the UK in 2005 disclosed that the residents of Grangemouth threatened to take legal actions against British Petroleum (BP) Innovene plants who kept them perpetually awake for hours as a result of thunderous noise from gas flaring. One of the residents likened the noise to an enormous jet taking off continuously for more than forty eight hours. The community challenged the Scottish Environmental Protection Agency and Falkirk council for not taking stringent measures against the company. Though the agency argued that the pollution control regulation in place then did not cover noise, the community blamed the authorities and declared that they have failed in their responsibility to curtail the pollution in all forms. Another example was when more than 200 staff were evacuated from the Total's Elgin platform, 150 miles off the Aberdeen coast, when a leak was found. The platform's flares, which burn off excess gas as a deliberate safety measure, remained alight a short distance away from the leak.

The flaring activity in the plant, BP argued only takes place as part of safety measures or maintenance work. This was achieved through various regulations in the United Kingdom some of which are the Voluntary Flare Transfer Pilot Trading Scheme which was launched in 2001 but has been superseded by the EU ETS from 2008 onwards. This aims to reduce emissions and gas wastage further. The Energy White Paper (DTI, 2007a) sets out the UK Government's international and domestic energy strategy to respond to the key long-term challenges of tackling climate change, gas flaring and in ensuring a secure supply of clean and affordable energy, i.e. economic use of gas flared or development of renewable energy. The strategy had four key goals which are as follows: (1) to put ourselves on a path to cutting CO₂ emissions by some 60% by about 2050, with real progress by 2020; (2) to maintain the reliability of energy supplies; (3) to promote competitive markets in the UK and beyond; and (4) to ensure that every home is adequately and affordably heated. And in addition to all these was the European Union Emissions Trading Scheme (EU-ETS), the EU Directive on integrated pollution prevention and control (IPPC) (2008/1/EC), the EU Directive on national emission ceilings for certain atmospheric pollutants (2001/81) and the UN Economic Commission for Europe's (UN-ECE) Convention on Long-Range Transport of Air Pollution

5.6 T TEST ANALYSIS

T-test is a test mostly and typically used to test and compare means Huntsberger and Billingsley (1989, p. 290). That is T- tests are used when you want to test the difference between two groups on some continuous variable. A good example here would be the difference in yearly income between black and whites in a particular local government area. *T-tests* however can also be used when testing the same group of people at two different times; for example, when testing whether there was a significant increase or decrease in the test scores of the same group of students at two different times (parsons 2001).

There are three types of *t*-tests each would be explained below.

1. one-sample *t*-test, which is used to compare a single mean to a fixed number

Or "gold standard"

2. two-sample *t*-test, which is used to compare two population means based on independent samples from the two populations or groups

3. Paired *t*-test, which is used to compare two means based on samples that are paired in some way.

Moreover having given a brief overview of what T- test is all about and the different types, I would be using the *independent samples t-test* (comparing two different groups) since I am comparing environmental impacts from oil and gas exploration in the United Kingdom to that of Nigeria. Environmental Impact here includes (health, physical and socio-economic impacts). Below shows the t test carried out.

Table 28 T- Test table UK and Nigeria

Group Statistics					
	Nigeria and UK Data	N	Mean	Std. Deviation	Std. Error Mean
Health Impact Questions	Nigeria Data	39	2.3077	.61361	.09826
	UK Data	10	3.0000	.00000	.00000
Socio Economic Impact Questions	Nigeria Data	39	2.5897	.54858	.08784
	UK Data	10	3.4000	.51640	.16330
Physical Impact Questions	Nigeria Data	39	2.1026	.59802	.09576
	UK Data	10	3.1000	.31623	.10000

From the table above we see that the mean and standard deviation for the Nigeria health impact questions is 2.3 and Std deviation is 0.61, while UK data is 3.0 and 0.00, for socio economic impact Nigeria mean 2.6 and std deviation is 0.5, while the UK data is mean is 3.4 and 0.5 for the std deviation. For physical impact Nigeria data the mean is 2.1 and the std deviation is 0.5 and 3.1 mean 0.31 standard deviation for the UK data.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Health Impact Questions	Equal variances assumed	32.672	.000	-3.540	47	.001	-.69231	.19557	-1.08574	-.29887
	Equal variances not assumed			-7.046	38.000	.000	-.69231	.09826	-.89122	-.49340
Socio Economic Impact Questions	Equal variances assumed	.146	.704	-4.213	47	.000	-.81026	.19232	-1.19715	-.42336
	Equal variances not assumed			-4.370	14.671	.001	-.81026	.18543	-1.20626	-.41426
Physical Impact Questions	Equal variances assumed	2.745	.104	-5.068	47	.000	-.99744	.19681	-1.39337	-.60151
	Equal variances not assumed			-7.204	27.581	.000	-.99744	.13846	-1.28124	-.71363

Table 4.0

5.7 QUALITATIVE ANALYSIS FINDINGS OF UNITED KINGDOM DATA

The results of the interviews conducted are presented below with verbatim responses to the questions transcribed and presented. The 4 interviewees are hereafter referred to as interviewee A, B, C and D to ensure anonymity and to represent the company as stated in my methodology. As earlier mentioned, the interviews were conducted to explore further themes emerging from oil and gas exploration in the United Kingdom. The survey and the questions were grouped into four sections A-D. Section A is around demographic information and year of experience in the oil and gas sector. Section B explores employee understanding of the various legislation and international law relating to oil and gas exploration. Section C further explores employee involvement, techniques and processes in handling health and physical impact from oil and gas exploration and lastly section D explores the questions around socio-economic impact of oil and gas exploration.

5.7.1 Demographic characteristics

Table 29 UK qualitative Demographic data

Companies	Sex	Age	Years in Oil and Gas industry.
Company A	Male(1) & Female(1)	Male(51)years and Female(36) years	Male (28)years and female (10)years
Company B	Male (1)	32 years	4 years
Company C	Male (1)	29 years	5 years
Company D	Male(1) female(1)	Male(46) years and Female(31) years	Male(22)years and Female(7)years

From the above table we can see that males make up majority of the respondents. As the respondent to the interview comprised of 4 male and 2 Females. The target respondents were elected safety representatives, OIMs and first line supervisors working, environmental advisory and EIA representatives in the UK offshore oil and gas industry. So we can say that the responses to the survey have shown a mixture of various roles. Though as safety representatives fall in the category of environmental engineers, advisory technicians and managers. In as much as this can be seen as a limitation to the sampling technique, the researcher has chosen to take this as an advantage. This is mainly because it provides a wider range of responses and the whole workforce has a role to play.

The interviews were carried out individually and below are some of the questions that were asked and the individual responses from the respondents.

The impact of oil and gas exploration in the United Kingdom and North Sea can be seen differently from various perspectives. The positives ranges from revenues, jobs creation but on the other hand as in from the environmental point of view there are negatives as well.

When asked how is oil pipeline project assessment was conducted and EIAs? Respondent replied saying:

I'd say yes. But what we doing in our company is like a biodiversity action plan, which incorporated eco system services. And what other developments are doing. Well, actually they call and Environmental Social Health Impact Assessment, so an [ESHA]. They do one of those per project phase, so they'll do that for the seismic exploration that they're going to do, and they'll do one probably for the enabling work. So that will assess the impact on the roads and if they can afford the stuff they need to get the project side done. Then they will do it for exploration, drilling and then production, drilling and they might have another massive pipeline, an export pipeline. Do you see what I mean? So they're doing it in stages. I guess it's done any time money becomes available to do the project. So there's an awful lot of impact assessment going on, definitely

Is there anything else do you think unique about the UK oil and gas industry and operations that makes it beneficial or unique? Because there are high-impact, short-term potential impacts through construction, and then there's also very low risk occurrence, but high-impact risks through either gas explosions or oil spills in developing country like Nigeria?

It's weird because I suppose that in the UK they do everything to mitigate those impacts anyway. And those accidents, emergency type impact things, they need to be doing everything to prevent those from happening obviously by developing carefully designed infrastructure to international standards and stuff. So I'm not totally sure that there's anything about oil and gas the Nigeria oil and gas procedure as if they should follow the international standard, legislation and have the right technology in place don't see why oil and gas project or exploration would result to frequent oil spillage.

In terms of Technology advancement of the UK compared to that of the Niger delta and Nigeria at large below was some of the response:

A respondent from one of the interviews carried out when asked about the influence of technology on oil and gas exploration explained that technology and equipment advancement plays an optimal role during oil and gas exploration activities in the UK and North Sea. As its part of an organisation mission, it is a key factor in the overall business / project strategy; and is a huge part of the corporate / project strategy. Given that the economic environment is marginally more important than the technology environment it can be concluded that oil and gas companies operating in Nigeria are more focused on return on investment this was validated by respondents suggest that technology has probably been a major contributing factor to the continuous use of defective technologies in the industry which over the years have resulted in the environmental rot experienced in Nigeria's oil and gas sector

Notwithstanding, an examples provided by one of the managers interviewed suggests that there is significant innovation and use of technology in the oil and gas industry in the UK, saying that in his company the essence of the oil and gas exploration is all about the appropriate technology on extracting oil and gas as cost effectively and safely as possible. On further probing interviewees agreed that solving environmental problems in a new and effective way was at the heart of what is carried out in the different parts of the oil and gas industry on a daily basis in the UK.

"He said that difficulty in working in the North Sea offshore is that it is more difficult than onshore. Innovation technological methods had to evolve over the years"

He also mentioned that in Norway the government intervenes more in respect of funding, development and requiring use of technology

This however takes the burden off some multinationals oil companies as collaborating with government could be helpful in developing technology to curb in the environmental impact from oil and gas exploration. Other comments made during the interviews were:

One example is what we have done recently, as operators, we have met some exceptional challenges, made groundbreaking achievements and set the global standard. Another example of how we have broken new technological ground is our in one of our field, which can be arguably said to be one of offshore field in the world to feature electrically trace heated pipe-in-pipe. This innovative technology would help to achieve flow assurance by avoiding pipeline blockages due to wax or hydrate formation.

The UK is acknowledged for its excellence in many technological areas most notably in subsea and deep and ultra-deep water developments. Technology has already led to many fields in the North Sea extending beyond their initial shelf life and additional millions of barrel of oil and gas is been produced

A major challenge is to ensure that technology comes to market more quickly in the future to improve recovery and aid efficiency in oil and gas exploration.

From the respondent above we can argue that the UK as a country is a frontier when it comes to technology breakthrough in oil and gas exploration and still not satisfied with its achievement. Therefore for a developing country like Nigeria, the oil industry's future depends on continuous technological improvement, but expert commentators have noted that international oil and gas companies (apart from oilfield service companies) are slow to adopt new technology (NPC 2007) as there are many technological elements have been patented and others are still the subject of innovation, particularly with the aim of reducing environmental impacts due to the use of water. One of the reasons as mentioned in Chapter two, for the slow adoption of new technology by major oil and gas operating companies in Nigeria and the Niger Delta region may have been aversion to the risk of applying it in the large projects typical of their operations. There are many other reasons such as economics, and field depletion and reservoir management practices. Some small companies have been more aggressive. This agrees with Managi et al, (2005). Who contended that's technological change in oil and gas exploration play a significant role in the offshore industry increasing reserves and lowering cost

Furthermore the interview and questions relating to technology now lead to another important variable that was highlighted in the literature which formed a major part in the development of the framework.

“How competitive are the Laws in the UK compared to other countries”

On a global basis the UK is competitive in its environmental law as oil companies we included need to abide to them to avoid sanctions.

And he continued saying:

“The regulatory and legislative regime that is in place today or that is in place now is vastly different than that was in place before, when the moratorium was put in place”.

The respondent from the interviews clearly shows that there are tough regulators for offshore and onshore oil and gas industry in the UK. This is true, because a modern and efficient oil and gas industry, regulatory schemes are impossible to imagine nowadays. It is important to point out that in the United Kingdom regulations are divided up into three national governments of Scotland, Wales and Northern Ireland (Boyes et al 2003) some of the these laws includes the Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005; Offshore Chemical Regulations 2002; Food and Environment Protection Act 1985 (as amended); Merchant Shipping (Prevention of Oil Pollution) Regulations 1996 to mention but a few. These laws are dynamic and constantly developing because the laws are regularly amended to address new environmental concerns. They also serve as standard codes, guidelines and negotiated agreements with appropriate government agencies to facilitate the regulation of oil exploration activities. Environmental legislation, regulation or laws operates through what may be seen as an open door process whereby environmental authorities, stakeholders and the community can offer their views and all results are incorporated and taken into account. In a study conducted by Leach et al (2002) to evaluate stakeholder partnership as an emergent collaborative policymaking, it was revealed that their partnership has been most effective at thoroughly addressing local and serious environmental problems. This is not to say that the regulation in place now was achieved over night during its industrial revolution gas was flared and there were reasonable account and incident of oil spillage, but there was always an acknowledgement by the government that flaring of gas during oil and gas exploration was wasteful and not in the national interest. A succession of good governance from the United Kingdom government over three decade has seen gas flared reduced from approximately 90% to around 5 percent. Apart from the United Kingdom regulatory measures to curb gas flaring there are some non-regulatory factors or measure that have contributed, these include the opening of market for gas, private parties allowed to participate in the development of gas infrastructure, and the provision of incentives (Gerner et al 2004). The Nigeria legislation however, regulation as well as acts are quite sufficient and designed to safeguard the environment

from the negative impact of oil spillage and exploration activities in the Niger Delta region of Nigeria. So the environmental impact from gas flaring and of oil spillage during exploration activities in the Niger Delta region is a fact that is still unknown.

“There are several legislation and regulation some governing hazardous chemical, as set out in the Seveso II Directive and the subsequent amended Planning (Control of Major Accident Hazards) Regulations 1999 (also referred to as COMAH)”

“When asked why you think the UK government and developed oil and gas policies” the response was:

Interviewees considered that focus on oil and gas stemmed from concerns about energy security and the importance of the ongoing tax revenue which comes from oil and gas.

Indeed the UK law has been developed to regulate and control any issues relating to oil and gas impact to prevent environmental degradation and protect habitats and species located in areas. In order to achieve this goal, the Nigerian government must shun its lackadaisical attitude and be more proactive in the enactment and amendment of the present oil and gas laws. Over the years, the Nigerian government has expressed little or no concern in enacting laws to control the adverse effects of oil and gas exploration activities. In fact the main priority of the Nigerian government has been the achievement of economic growth rather than environmental regulation of oil and gas activities. Over the past 15 years, no law with appropriate environmental standards for regulating the oil and gas industry has been enacted. Even where the laws are amended, it takes the government a considerable amount of time to make such amendments. This is rather disheartening because Nigeria is a major oil and gas exploration country and environmental impact is inevitable. As such, the government ought to be proactive just the way the UK in its environmental regulation of oil and gas activities is so as to ensure the protection of the environment. The experience in the UK is relevant to this study in the sense that it has added another dimension) to the principles of environmental law and regulation which correlates with the socio-economic impacts of the oil and gas exploration on the people of the Niger Delta communities as explored in the study.

5.8 SUMMARY OF CHAPTER

This chapter has disused and analysed both qualitative and quantitative data collected, transcribed interviewed questions was looked into, and SPSS was also used. The quantitative findings was used to validate the qualitative findings and both of the finding corresponded with the literature that was reviewed. The next chapter would then disuse the result from the finding above, implications, contribution to knowledge, conclusion and recommendation and finally suggestions for further studies.

CHAPTER SIX

DISCUSSION OF RESULTS

6.1 DISCUSSION OF RESULTS

The collective analysis of the results of the survey conducted on the different groups by the researcher has a direct response to the deliverables expected of this research work that, they would however be supported by literature, personal knowledge of the conditions in the study area region as they affect the result of the study. The study started with the main aim to propose a framework which can be used to enhance oil and gas exploration activities in Niger Delta of Nigeria. Several issues to be discussed in this chapter have been introduced either in chapter three or chapter five whilst carrying out this research.

1. One of the objectives of this study was to analyse the impact of resource exploration on the environment of the oil producing communities in the Niger Delta. This is evident in the fact of the total 49 participants in Uzere 42.9% said it was fairly serious while 34.7% and 20.4% had serious and very serious respectively. Similarly this was the same with the group discussion carried out, that gas flaring in the region or area causes respiratory illness and other health related issues. Of course it is one thing to know that an activity or a source (gas flaring) can cause certain types of illness and it is another to prove that the illness reported or perceived by the individuals or respondents was actually caused by the activity or source. Since this study does not involve a controlled experiment, the impact of gas flaring during oil and gas exploration in this region would be looked at from the point of the association or correlation between the qualitative finding and the quantitative findings. Chronic obstructive pulmonary disease which is a term for people with chronic bronchitis, emphysema or both is normally caused by smoking or severe inhalation of toxic substance emitted from industries and the main symptom is cough, this is why measures should be put in place to address the situation. So we can say that with gas flaring, from the findings and literature presented above that there are health implication involved. The result from the finding of this study also revealed soil, water pollution from oil spillage activities. This in turn has an adverse effect on lives and the immediate environment. Visible signs of oil spillage were reported during the course of this study which is different from what has been experienced or practised in the United Kingdom, these effects include decrease in fishing resources, damage to marine flora and fauna, loss of biodiversity, deforestation, coastal and marine erosion and flooding. Agricultural activities are also seriously affected, or almost practically impossible.

2. Another objective of this work was to examine existing legislative and institutional environmental policies and determine how the government can meet its renewable energy obligations. The participants from the study were asked “do you think oil multinational companies breach environmental laws. This was abbreviated on SPSS as (BELE) that is out of 13 respondent 76.9% strongly agreed and 23.1% agreed. Like Okafor (2011) explained that Nigerian environmental laws are laws that are put in place to mitigate or prevent threatening problems which originate from human activities in a quest for economic and developmental state. From the study as well the result has shown a lack of collaboration between government and the oil and gas companies operating in the Niger Delta region and the attainment of sustainable development as a key goal of the environment policy of the government. This validates Owolabi(2012) who argues that legal frameworks have proved ineffective in stemming Niger Delta’s environmental problems and that it appears that many of our laws are seen on paper alone but not implemented in the real sense. The scale of pollution and the environmental damage has never been properly assessed. Nevertheless, it is widely known that hundreds of spills occur each year and several cubit feet’s of gas is been flared. So we can arguably say that the regulatory system in the Niger Delta is deeply flawed. Nigeria has laws and regulations that require companies to comply with internationally recognized standards of good oilfield practice as shown in chapter 2 of the review of Nigeria’s environmental laws. These laws and regulations were meant to protect the environment, but these laws and regulations are poorly enforced. In addition, there is the need for the Nigerian government to overhaul some of the country’s environmental laws to address modern day challenges experienced in the Niger Delta, and also, ensure a synergy between all the laws and the norms and culture of the society. In terms of achieving its renewable energy obligations though the cost is high. The Nigerian government should ensure or put in place fiscal or non-fiscal policies for private investors that are interested in investing. And this development should be directly or indirectly linked with other sectors of the economy such as agriculture or small scale industrial to achieve sustainable development and the achievement of millennium development goals. The linkage to this sector is to create a high rate of success as the high demand by the various sectors above provides and may attract funding. Experience has shown that most renewable energy technologies (especially those that can be locally manufactured) require subsidies only in the initial stages, and can become financially sustainable in the short to medium term after a certain level of technology dissemination has been attained and subsidy would be gradually withdrawn. Nigeria as a country has a published energy policy and this policy did emphasize the need to develop renewable energy. However, integrated policy

and a vigorous implementation strategy is needed to facilitate rapid diffusion of renewable energy in the nation's energy mix. Another important aspect is the information Nigeria holds on renewable energy which is inadequate. The demonstration projects on various renewable energy forms should be established widely so that the performance and efficiency with which services are delivered can be exhibited as this would This will sensitize the public as well as assist in the creation of markets for renewable energy systems. There is also the need for capacity building both at institutional and personnel level for acquiring technical, organizational, and managerial skills required for increased development of renewable energy. Various activities such as entrepreneurship and managerial skills development training programmes, as well technical courses on Renewable Energy with a view to developing Energy Service Companies for providing services to rural areas, need to be introduced. The existing Research and Development centres and technology development institutions should be adequately strengthened to support the shift towards increased renewable energy utilization.

3. To evaluate how corporate social responsibility can be achieved in the Niger Delta it is important to note that the concept or principles of corporate social responsibility of developed countries may not be really effective in a developing country like Nigeria. This is because each country has different policies, development strategies in place. For example if a community has access to good networks, potable water supply, healthcare facilities, energy and good maintenance culture for sustainability, corporate social responsibility in places like these will not add much value and could be seen by critics as a *green wash* venture or mere public relations (Matten et al, 2003; Frankental, 2001) and may not add value or impact on the companies' profit margin (Vance, 1975). But in a developing country for example Nigeria and the Niger Delta region where basic infrastructural facilities are lacking, the need for a true corporate social responsibility cannot be over emphasised. As most of the Niger Delta state where oil and gas exploration are carried out lacks most of the fundamental amenities of livelihood some of which include electricity/energy supply, road networks, bridges, medical facilities, education, employment and food, we can therefore say that the Niger Delta region suffers and lack necessities. These necessities could hinder development, corporate social responsibility and so on. To achieve corporate social responsibility in the Niger delta region, all stakeholders, the government as well as oil and gas exploration companies should set up sustainable initiatives to provide at least the basic and important needs of livelihood. As this initiative would create a peaceful environment within the Niger Delta area while the struggle for development and economic growth continues. Moreover the government for a start has

a lot to do in the area of policy amendment, in the advanced nations of the world for example UK where there are provisions for the basic amenities by the government, oil and gas companies have little or nothing to do or contribute and when they do make efforts, they are usually perceived as mere public relations. Also despite these oil companies having a general model for corporate social responsibility their impacts are not felt as much as the emerging economies. This is so different from a developing country like Nigeria where there is little input from the oil and gas exploration companies on corporate social responsibility matters and the people or individuals living in the region appreciate it. The major problem in the developing nations like Nigeria is the lack of infrastructural development and initiatives. In other words when there are no structures on the ground it is difficult to see the extent and value of corporate social responsibility. However critics and some scholars believe that if a proportion of multinational oil companies community development projects are working and still exist, then there wouldn't be need for compensation for the illegal and environmental, social devastation caused by their routine oil spills, gas flaring and over-reliance on the Nigerian security forces (Amunwa, 2010).

4. The study finds from the T-test analysis carried out that Nigeria's oil pollution problem is uniquely different from oil pollution occurring elsewhere in the world for two general reasons. Firstly, the federal institution is so poor to such an extent that it banks on foreign assistance for military and economic support and therefore shall always lower its law enforcement powers to sustain the foreign investors. Secondly, the federal government is structured in what is called a semi-unitary format whereby it centre does not share fiscal control and law enforcement powers with the periphery. The centralised form of control facilitates corruption enabling the foreign companies.

6.2 CONTRIBUTIONS TO EXISTING BODY OF KNOWLEDGE AND THE RESEARCH CHALLENGES

The unique contributions to knowledge and some of the challenges of this study have been noted. In so doing, the research aim and questions earlier which were articulated in chapter one were compared with the gap in knowledge gained through literature reviewed and the findings from the case studies. The knowledge gained and the findings suggest that this research contributes to knowledge from both a theoretical and practical applications. However, the study has met with some challenges. Below

shows the contributions of the study to knowledge and provides some account of the research challenges followed with answers to the research questions.

Research Questions and Answers

A) What has been done by the Nigerian government and other national and international bodies to control the environmental problems in Nigeria? :

The cry for sustainable development has led to Environmental concerns. These concerns has resulted to the adaptation of the United Nations Framework Convention on Climate Change (UNFCCC) 1992. This convention has as its objective the stabilization of GHG Emissions at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system. The greenhouse gases (Nitrous Oxides, Carbon Dioxide, PFCs Methane, CFCs and Ground level methane), contributes significantly to Climate Change. Also, the 1997 Kyoto Protocol to the UNFCCC was adopted to Strengthen commitments under UNFCCC. This Protocol gave targets to the UNFCCC Annex 1 countries targets to reduce emission by at least 5.2% below 1990 levels over 2008 to 2012.

On the other hand in Nigeria the following were set up:

National Oil Spill Detection and Response Agency (NOSDRA): A National Oil Spill Detection and Response Agency (NOSDRA) was approved by the Federal Executive Council of Nigeria. The Ministry of Environment, which initiated the Agency, has also forwarded to the Federal Executive Council for approval, the reviewed draft National Oil Spill Contingency Plan (NOSCP) which the Agency would manage (Alexandra Gas and Oil Connections, 2006). The establishment of the contingency plan and the agency was in compliance with the International Convention on Oil Pollution Preparedness, Response and Cooperation to which Nigeria is a signatory. The draft bill on the NOSDRA has been forwarded to the National Assembly for deliberation and enactment into law (Alexandra Gas and Oil Connections, 2006). Apart from intensifying efforts towards compliance monitoring and enforcement of oil and gas regulations and standards, the ministry is also mounting pressure on the oil and gas operators for a gas flare-out. Effort is also being made, according to the sources, to ensure the use of environmental-friendly drilling fluid and mud systems (Alexandra Gas and Oil Connections, 2006)

The Niger Delta Development Commission (NDDC): To reduce the rate of oil incidents along the Nigerian Coast particularly as a result of vandalism. The Federal Government through an act of the National Assembly in 2000 passed into law the Niger Delta Development Commission. (NDDC). The Act among other things, established a Commission to carry out among other things the following tasks:

- 1) Cause the Niger-Delta area to be surveyed in order to ascertain measures, which are necessary to promote its physical and socio-economic development;
- 2) Prepare plans and schemes designed to promote the physical development of the Niger-Delta area;
- 3) Identify factors inhibiting the development of the Niger-Delta and assist the member states in the formation and implementation of policies to ensure sound and efficient management of the resources of the Niger-Delta;
- 4) Assess and report on any project funded or carried out in the Niger-Delta area by oil and gas producing companies and any other company including non-governmental organizations and ensure that funds released for such projects are properly utilized;
- 5) Tackle ecological and environmental problems that arise from the exploration of oil in the Niger-Delta area.
- 6) Liaise with the various oil mineral and gas prospecting and producing companies on all matters of pollution prevention and control. Essentially, items (E) and (F) deal with issues pertaining to oil exploration and production and the NNDC act is a strategic way of dealing with all forms of pollution from these activities in the Niger Delta.

The Environmental Impact Assessment (EIA) decree No 86 of 1992: The Environmental Impact Assessment (EIA) decree No 86 of 1992 was promulgated to protect and sustain our ecosystem. The law makes the development of an EIA compulsory for any major project that may have adverse effects on the environment (Ntukekpo; Olagoke 1996). It sought to assess the likely or potential environmental impacts of proposed activities, including their direct or indirect, cumulative, short term and long term effects, and to identify the measures available to mitigate adverse

environmental impacts of proposed activities, and assessment of those measures (Ozekhome 2001). The carrying out of EIAs is policed by the Federal Environmental Protection Agency, and by state environmental protection agencies.

B) What are the factors affecting gas flaring phase-out regulations as well oil spillage in Nigeria? : A major challenge to the effective enforcement of gas flaring phase out is the lack of autonomy and independence of the regulatory agencies. The agencies that exist are subject to political control from their respective supervising Ministers. These agencies lack adequate technical manpower and funds to efficiently discharge their statutory duties. The agencies do not have access to the best available scientific technology to accurately measure, adopt appropriate rules, and enforce gas-flaring regulations. They mostly rely on funds appropriated and remitted to them by their supervising Ministries. In most cases oil and gas companies fund most of the agencies activities thereby raising serious conflict of interest issues. There is also the problem of jurisdictional conflict between these agencies. The functions given to the agencies by the various statutes are overlapping, and thereby create conflicts in regulating and enforcing gas flaring laws. There is lack of gas infrastructure, and it takes time and huge resources to build the required pipelines, and gas gathering and treatment plants in the country. The oil and gas companies are not showing interest in committing investments to build the needed infrastructures, and gas pipelines that will transport the gas to domestic and international markets. Although the government, in partnership with some international oil companies, are building pipelines, they appear to be grossly inadequate for the country.

Another factor affecting gas flaring phase-out is the enforcement of gas flaring regulation. the fact that only federal agencies are empowered to regulate and enforce the laws on gas flaring. Petroleum resources is within the exclusive legislative list in the Nigerian Constitution, which vest special legislative powers to the National Assembly. Although issues relating to the environment is with federal and state government jurisdiction to enact, however the laws have virtually vested powers solely to federal agencies and these agencies lack the capabilities to establish offices in all the states where oil and gas exploration are going on, in order to effectively monitor and enforce the laws. Companies and the federal government in the Niger Delta region of the country where the majority of the oil and gas is produced.

C) Do the operating companies carrying out oil exploration in Nigeria comply with the stipulated environmental guidelines and standards in their operation and waste management? : From the literature review, interviews, group discussion, analysis and available statistics shows lackadaisical attitude expressed by the government and oil multinational over the years towards environmental laws, regulations and guideline. From the feedback of the questionnaires respondent feels that most of the laws set out by the Nigeria government for oil multinational are not realistic. An example of that was the elimination of gas flaring by 31st December, 2010. So having environmental policies and laws that are not been adhered too is a gap identified and needs to tackled. Therefore, there is a need to develop strategies to close out these gaps that allow the full Compliance to the environmental policies in other to achieve a less environmental impact in the oil and gas sector during oil exploration activities in the Niger Delta.

D) What are the available legislative and institutional framework and enforcement strategies in Nigeria and United Kingdom? : From the literature review in chapter three we could see that Nigeria has good environmental laws and policies. According to the Federal Environmental Protection Agency, Lagos Nigeria, the following relevant national laws and international agreements are in effect: (A) Endangered Species Decree Cap 108 LFN 1990. (B) Federal Environmental protection Agency Act Cap 131 LFN 1990. (C) Harmful Waste Cap 165 LFN 1990. (D) Petroleum (Drilling and Production) Regulations, 1969. (E) Mineral Oil (Safety) Regulations, 1963. (F) International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971. (G) Convention on the Prevention of Marine pollution Damage, 1972.(H) African Convention on the Conservation of Nature and Natural Resources, 1968. (I) International Convention on the Establishment of an International Fund for the Compensation for Oil Pollution Damage, 1971. But most of these are never or not enforced properly. There is an overall lack of knowledge of these laws even among those agencies entrusted with enforcing them. Even when the laws are well known, there is little capability to enforce them. This has led to a fragile, ecosystem of the Niger Delta.

Although Oil multinational are statutorily required to observe the highest international environmental safety standards in their activities, the limited technical capacity of the federal regulatory agencies (Department of Petroleum Resources, National Environmental Standards and Regulations Enforcement Agency, and National Oil Spill Detection and Response Agency), and the shallow rule of law context, have meant that such requirements are weakly enforced or respected.

The Legislative and political frameworks for environmental management and protection in Nigeria require further work; considerable gains in improved environmental management could be made by effectively enforcing existing regulations, both in regards to oil spill pollution control, biodiversity conservation and gas flaring. Any credible change in

Nigeria's enforcement of environmental legislation and regulations will require more than simple capacity building; it will require building the political support or the political will to see the regulations enforced. These types of changes are long term and require raising the awareness of a wide range of stakeholders for example (resource users, judges, etc.) as to the interrelated nature of environment, economics and health. The judiciary system needs to be strengthened especially in oil spill and gas flaring related issues. This might first involve raising environmental awareness among court officials, both in a general sense and vis-à-vis the existing legislative framework. This might serve to help strengthen the application of environmental legislation among the judiciary. Environmental education and awareness can be part of critical long-term strategies focused on promoting behavioral change to support a sustainable environment. Programs can be developed to target all audiences ranging from the general populace to children in schools, to public servants in government, to private institutions. These actions can easily accommodate environmental messages without drawing significantly on additional resources. By simply weaving in topics about environmental quality, actions being taken by Nigerians at the local level related to conservation, and drawing on the growing NGO community can be conscious steps that will lead to increased awareness.

E) How can the Nigerian government achieve its renewable energy obligations? : A country like Nigeria were there no detailed and comprehensive renewable energy policy, the presence of a legislative framework would the enabling environment for renewable energy growth. The renewable energy legislation should include and provide identification of the existing types of renewable energy sources, potentials and promotion of their use. The law should also prescribe product safety standard relating to the manufacturer, installation and operation of renewable energy technologies; There is also to create a renewable energy agency or commission vested with powers and duties to initiate policies and enforce the provisions of the law; establishment of renewable energy funding/ financing agency; establishment of testing and standard laboratory for renewable energy technologies in Nigeria; there also the need to promote tax incentives to granted to renewable energy companies

seeking to invest in Nigeria; apart from putting in place legislative framework for renewable energy development, implementation and enforcement of the policies and laws must be seen as important and given attention to else the presence of the law will be rendered ineffective.

In general the research also contributes to work on environmental impact from oil and gas exploration that promoted recognition to its core dimensions. In this case, the negative impacts of oil and gas exploration (as already analysed in chapter two and five) on the environment and socio-economic activities, affect largely the local people of the Niger Delta region; also the lack of recognition causes some psychological and emotional harms, for example, the thoughts of the damages done to their sites of cultural values and heritage, living the rest of their lives in an environment which is subjected to continuous pollution and the high level of poverty even though their land is blessed with abundant petroleum deposits. Also, in cases when the people are not recognised for corporate social responsibility, apart from the facts that they cannot participate fully, it also subjects them to some levels of status-based injuries such as disrespect and lack of attention to the impacts of oil and gas exploration on the culture and social values of the local people by the oil companies and government agencies. As gathered from the group discussion, this happens most often when the Nigerian government deploys soldiers to attack and deal with the local indigenes with the aim of protecting the oil facilities and when the oil companies fail to adequately compensate the damages to cultural features in the course of pipelines networking.

Secondly, the research also contributes to knowledge in the methods used for data gathering, which helped to overcome some challenges faced as collecting data in Nigeria could be quite challenging. Some of these challenges include access to the people, oil and gas workers and managers in the UK, local communities visited during the fieldwork and the issue of getting the right representations from the local people for the purpose of group discussion.

Thirdly, the research adopted a framework in the context of the Niger Delta region of Nigeria which was developed based on the findings and the review of relevant literature in chapter two and also interviews carried out in the UK. Based on this, the research and framework can be applied both theoretically and practically as some key variables were identified to be the root cause leading to the continuous oil spillage and gas flaring in the Niger delta region.

The framework below represents a sustainable approach towards oil and gas exploration based on key elements of best practices identified and practiced in the UK, which can be effectively adopted to suit the Nigerian sector.

CHAPTER SEVEN

PROPOSED/CONCEPTUAL FRAMEWORK

7.1 INTRODUCTION

This chapter presents the proposed/conceptual framework for sustainable exploration of oil and Gas in Nigeria and the United Kingdom. The framework is advocated as a tool most suitable to facilitate sustainability and sustainable development during oil and gas exploration activities. The framework can be applied both theoretically and practically. The framework centres on five key variables, technological, legislative, environmental management and corporate social responsibility requirements. It also presented the motivation for coming up with this framework and finally the validation of framework.

7.2 DISCUSSION

Fawcett (1997) suggested that conceptual/ proposed frameworks can be used for the following purposes: to guide practise as a basis for the research project being carried out, for pedagogic purpose and in administrative situations. And in addition Nye and Berardo (1966) explained that the concept of a conceptual framework has various advantages; first the development of a conceptual framework provides an adequate definition concept which thereby leads to adequate measurement. Second, a conceptual framework facilitates the researcher is job by providing a collection of ideas. Third, it is important that not only are the substantive results of research understood, but also that the essential concepts used are understood by those who are using the results. Fourth, the development of a conceptual framework allows effective communication between academics, who often speak different languages and make implicit assumptions and concepts unconsciously without consideration of other readers. The below diagram shows the framework that was suggested in the research.

Framework for sustainable oil and Gas exploration In Nigeria

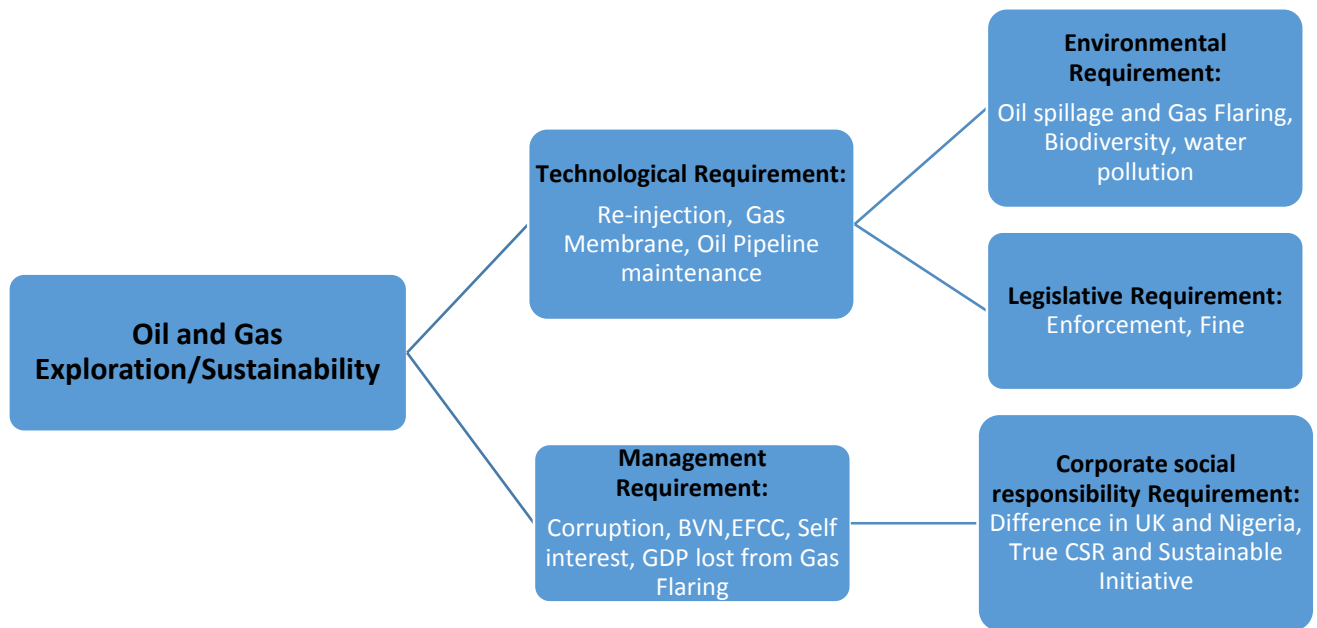


Figure 33 framework diagram

Hopp and Spearman (2001) are of the opinion that a framework needs to be thoroughly scrutinized to ensure that it provides a sufficiently accurate representation of the real problem in this case is environmental impact from oil and gas exploration. Therefore, the variables in figure 33 need to be addressed to achieve sustainable development and sustainability.

The proposed frameworks serves as best practice for the sustainable exploration of oil and gas. The standards and the argument presented and identified in the findings of the study. As discussed in chapter 3, 5 and 6, outlined principles and guidelines for the oil and gas industry and governmental bodies. This research finding indicates major scope for improvement of 5 key variables. The key message suggested in this research is the government and industry co-operation of these variables can achieve long lasting improvement of its immediate community and environment. Environmental issues are missing components of this approach. The findings of this study have indicated that there is major room for improvement with respect to the assessment of ecological implications during business environment assessment. Furthermore, the findings in this study indicate much room for improvement with respect to the technology used for production and exploration activities.

Furthermore the findings and result from the analysis carried out validates the finding from the literature review, this is because the variables identified above was consistency with the requirement in chapter three.

7.3 MOTIVATION AND VALIDATION OF PROPOSED/CONCEPTUAL FRAMEWORK

The main aims to propose a framework which can be used to enhance oil and gas exploration activities in Niger Delta. The resulting framework will highlight ways the Nigerian government can achieve and sustain its renewable energy obligations. The proposed framework was validated using the literature review and the theoretical data collected.

From the interviews, and focus group carried out, indicated that there is a relationship between the literature reviewed and the findings from the data collected. Oil and gas activities in Nigeria have impact on communities with respect to, environment, H&S, and disruption of the eco-system and corporate social responsibility. This is where emphasis from the participant engagement becomes valuable in as indicated in the framework, and also various studies that have been carried out in the Niger Delta region of Nigeria. The framework validates issues relating to cooperate social responsibility with the development of infrastructures that could provide benefits for the community as a whole. In their words essentially transforming the local community from simply 'hosts' to 'partners'. This is because infrastructure, institutional and human resources development remain weak. Legislation, technology and management requirement was also validated from the interviews, as investigating accidents, planning, and training were some of the key factors highlighted.

Furthermore, the research is limited in terms of the coverage in relation to the community (Uzere) given the wide variations of culture over the vast territory and states that make up the Niger Delta region. So it was impossible for the researcher to collect data from all the communities and stakeholders from all the Niger Delta states. Irrespective of that, efforts were made to extrapolate the data and research findings notwithstanding. Also, in terms of generalisation of the research findings, as the case studies try to show relationship and processes in the manifestations of the negative impacts of the oil and gas exploration on the Physical environment, health and the socio-economic lives and activities of the people in the Niger delta communities. The next Conclusions, recommendation and future work to follow in the next chapter

8.1 CONCLUSIONS, RECOMMENDATION AND FUTURE WORK**8.1.1 Introduction**

This chapter provides, conclusions and recommendations. It also states the areas for further research. The research aims to propose a framework which can be used to enhance oil and gas exploration activities in Niger Delta. The resulting framework will highlight ways the Nigerian government can achieve and sustain its renewable energy obligations. The following were the resulting objectives of the research.

- To analyse the impact of resource exploration on the environment of the oil producing communities in the Niger Delta.
- To review the literature and provide evidence based information showing the environmental cost of gas flaring as well oil spillage lost in terms of GDP.
- To compare technological advancements in the United Kingdom and identify areas of technological improvements and best practices in Nigeria.
- To examine existing legislative and institutional environmental policies and determine how the government can meet its renewable energy obligations.
- To evaluate how corporate social responsibility can be achieved in Niger Delta
- To propose a framework which can be used to enhance oil and gas exploration activities in Niger Delta.
- To validate the findings and framework through literature reviewed as well findings from quantitative and qualitative data/ theoretical data.

The next page would highlight the answers to this questions, lesson for Nigeria as country and suggestions for further studies.

The research had two case study areas and included a total of 13 focus group, 86 questionnaires and 7 interviews. Analysis of this data showed that the oil and gas exploration activities in Nigeria are different from that in the UK. The empirical evidence equally suggests that the lack of technological advancement, management, legislation and corruption are strongly related to incidence of environmental impact during oil and gas exploration. This thesis further discusses the need to strive towards a balance between environmental sustainability and economic growth. Sustainable environment and growth can only be achieved through the integration of policies that connect the environment, the economy and the society. As Such a framework was suggested, which will not only protect the environment and people from the impacts of oil and gas exploration, but will also protect Nigeria crude oil resource saving lives and livelihoods over the coming years. Also the research analyses a number of strategic initiatives, which can be adopted in Nigeria, taking lesson from the UK to achieve the balance between environmental sustainability and growth through the integration of policies, management, technology that connect the environment, society and economy

Owolabi(2012) argued that legal frameworks have proved ineffective in stemming Niger Delta's environmental problems and that it appears that many of our laws are seen on paper alone but not implemented in the real sense. It is widely known that hundreds cubit feet's of gas is been flared. So we can arguably say that the regulatory system in the Niger Delta is deeply flawed. Nigeria has laws and regulations that require companies to comply with internationally recognized standards of good oilfield practice. These laws and regulations were meant to protect the environment, but these laws and regulations are poorly enforced. In addition, there is the need for the Nigerian government to overhaul some of the country's environmental laws to address modern day challenges experienced in the Niger Delta.

Lack technological advancement has been recognised as one for issue for continuous gas flare in Nigeria. To achieve it renewable energy obligations, the Nigerian government should invest in gas Membrane technology systems. The Continuing enhancements in technology developments of membrane systems are a natural choice for the future. Gas separation modules operate on the basis of selective permeation. The technology takes advantage of the fact that gases dissolve and diffuse into polymeric materials. The development of associated gas infrastructure or the reinjection of associated gas may prove very expensive in the current term as experienced by the Nigerian government but in the long run it would prove more economically beneficial than gas flaring. A perfect example of this was the Drogue Field which had no gas transport solution nearby when the oil production started in 1993. It was decided to re-inject the associated gas into water reservoir for

disposal. However at that time, this was an expensive solution, today the produced gas from Draugen is being transported by pipeline and delivered to the market and is of great economic value.

Developing countries like Nigeria can learn from Norway that the Gas flared and the Crude Oil Industry are integral, the facilities of which should be developed together from the beginning. An example is the Ekofisk Field experience which shows that by reducing oil production until a gas export solution was found and by refusing to develop fields until the development of oil infrastructure the government was unwilling to produce oil at the expense of associated gas. In Canada the total associated gas production for Canada was 23.7 bcm, 94% of which was utilized in domestic heating and power generation as well as industrial and commercial use. Canadian provincial regulators require annual and public reporting of flaring volumes from each oil producer, and strict compliance with fines and licence cancelations. In the USA: Onshore and offshore producers of oil and associated gas are required to manage associated gas through transportation to a market, power generation, re-injection. The well-established gas pipeline system and high national demand for gas makes it economically feasible to use associated gas instead of flaring it.

The main aim of this research was to propose a framework which can be used to enhance oil and gas exploration activities in Niger Delta. An attempt was also made that the resulting framework will highlight ways the Nigerian government can achieve and sustain its renewable energy obligations. Presented in this chapter therefore are the general summary of the findings made in this research or study, conclusion and recommendations based on these findings and measures needed to achieve a more sustainable environment during oil and gas exploration in the Niger delta region of Nigeria.8.1.2 Summary of Findings

The study also has adopted an environmental justice and conceptual framework and its basis for assessing and managing the impacts of oil and gas exploration on the environment and socio-economic activities of the rural oil producing communities in the Niger Delta region of Nigeria. It has been shown that oil and gas exploration impacts have some significant overall effects on their environment and the livelihoods of the local people.

- 1 Out of the total 49 respondents from the qualitative survey carried out in the Niger Delta oil producing region 32 agreed that CO₂ from gas flaring cases reported has affected them in one way or another.

- 2 39 respondents aged between 18- 65 accounted that water pollution from oil spillage at the time this research was done has affected farming, fishing and other livelihood.
- 3 Cough also accounted for highest known disease as a result of gas flared while other diseases like reproductive disorder were minimal or not really talked about.
- 4 Reports from company A, B, C, D were also analysed. And showed a low rate of complaints or issues from oil and gas exploration that result in health, environment and socio economic impact.
- 5 A healthy and uncontaminated environment is an essential element in the quality of everyday life. Although the quality of environment varies between different areas and communities, people who are socially and economically disadvantaged often live in the worst environments. For example, as the study has argued in chapter two and supported by empirical evidence in chapter five, many communities in the remote parts of the Niger Delta region are experiencing alarming rate of environmental pollution and have little access to infrastructure and social amenities.
- 6 In this study, the analysis of oil and gas exploration impacts in relation to the environment and socio-economic status of the Niger Delta region, has carefully tried as much as possible to compare its weaknesses by taken lesson from the U.S., UK, and elsewhere. The results show clear forms of undesirable and unsustainable oil and gas exploration impacts (environmental and socio-economic) when analysed across the Niger Delta region as whole.
- 7 Environmental injustice is often still rampant. This injustice sometimes affects new development of the Niger Delta. And the literature review and findings show that the environmental problems result directly from the actions of those who do not live in the affected communities; while those who are most affected have not been included in decision-making that affects their settlements and the quality of their immediate environment. Resolving environmental injustice and ensuring that all people have access to a good quality environment in the present and future are crucial steps towards sustainable development.

- 8 From group discussions carried out there was the concern at the growing rate of poverty, infrastructure underdevelopment and dysfunctional social services in the Niger Delta region. A visit to the Uzere community showed that even though poverty is a common phenomenon in Nigeria, the gaps between the poor and the rich are easily seen in the study locations and this corresponds with UNDP (2006) reports that the rate of decline in the human development indicators is higher in the region, compared to other parts of the country. We could say that since the oil multinational's operations are mainly capital intensive, one would expect the level of unemployment and underemployment to continue to be higher in the states of the Niger Delta, where the oil activities are concentrated, than other parts of Nigeria. Moreover , apart from the fact that the analysis in chapter five shows that environmental impact has had a significant impacts on agriculture and other occupations, the high wages of many of the oil company staff have led to high prices of local products, which have affected the abilities of people in the region to afford these products. As a consequence, it has become very difficult for many to afford their essential needs like education, housing, healthcare and transportation.
- 9 Literature and evidence reveals that there is a statutory requirement from all oil companies operating in Nigeria, this stipulates that they should abide by the highest standards in all matters of safety in the course of their oil and gas exploration activities. This includes particularly, adopting certain measures to limit pollution and oil spill and gas flaring incidents. Chapter two presents a good number of the laws and regulations guarding oil and gas operators in Nigeria. However, both the ineffectiveness of the national regulatory agencies and the shallow legal institutions, have contributed to the non-enforcement of such requirements.
- 10 The appropriate technology to curb oil spillage and re-injection of gas flared was also lacking in Nigeria when compared to that in the UK and other developed countries around the world. Still nobody has taken the initiative to address this. Thus, this thesis partly agrees with Ekwo (2011) that technology advancement was one of the issues that hinders oil pipeline spillage as well gas flaring.

8.1.3 Lesson for Nigeria and Other Developing Countries from UK Framework.

- 1 Developing countries like Nigeria can learn from Norway that the Gas flared and the Crude Oil Industry are integral, the facilities of which should be developed together from the beginning. An example is the Ekofisk Field experience which shows that by reducing oil production until a gas export solution was found and by refusing to develop fields until the development of oil infrastructure the government was unwilling to produce oil at the expense of associated gas.
- 2 The development of associated gas infrastructure or the reinjection of associated gas may prove very expensive in the current term as experienced by the Nigerian government but in the long run it would prove more economically beneficial than gas flaring. A perfect example of this was the Drogue Field which had no gas transport solution nearby when the oil production started in 1993. It was decided to re-inject the associated gas into water reservoir for disposal. However at that time, this was an expensive solution, today the produced gas from Draugen is being transported by pipeline and delivered to the market and is of great economic value.
- 3 The Nigerian Government's regulators and operators must work and collaborate closely in developing policies and strategies that are consistent with the country resource management and its environmental objectives as well companies' objectives in ensuring that projects were commercially viable and did not jeopardize future oil production
- 4 Nigeria should emulate the UK and must set its face firmly against gas flaring. The government has so far shown a half-hearted dedication in enforcing laws that prohibit gas flaring. This has been blamed on the fear that enforcing strict environmental legislation will discourage oil multinational companies from investing in Nigeria and thus reduce government revenue. But this is not entirely true as the experience of Norway shows that providing appropriate laws and enforcing them is to the advantage of both a host country and oil multinationals. Nigeria must exhibit the political will to enforce these laws.
- 5 In many developing countries like Nigeria, environment and health ministries are understaffed and notably weak. The strengthening of environment and health ministries, and related government agencies that advocate regulations to protect the public interest, can help to address citizen concerns about the impact of oil and gas exploration and therefore reduce prospects for conflict

8.2 RECOMMENDATIONS

The analysis of the data points to the fact that unsustainable exploration of crude oil in the Niger delta region of Nigeria hold nothing good for the present generation and that to come. The following recommendations are made.

1 There is a need for oil companies to stop gas flaring and re-inject the gas back into the oil well or adopt chemical alternative to gas flaring. This chemical conversion is attractive in cases where pipeline transportation networks are unavailable. Sandal et al (1998) reported one of such examples which a two stage process is involving a conversion to synthetic gas closely followed by Fischer- tropsh coupling to make paraffin waxes.

2 The national health insurance scheme already in place by the Nigerian government should be strengthened to accommodate the plight of poor residents in the Niger delta.

3 Private initiatives should be encouraged with government helps towards provision of education and other social amenities.

4 There is a need for a proper environmental impact assessment before establishment of oil companies so as to guide the risk to which residents are perpetually exposed.

5 It would be necessary and important to still channel natural gas utilisation into power generation. The implication of this is enormous. A stable power supply in Nigeria holds the key to many industries working effectively. It is equally very important to channel projects into agricultural and non- oil sectors to reduce the country's over-dependence on crude oil.

6 There is still the need for government to liaise with oil companies towards the establishment of more gas utilisation projects. Such liaison is necessary since the cost of laying pipeline is quite expensive. With natural gas reserves of over one hundred and fifty trillion standard cubic feet (Oguh 200), Nigeria is revenue will increase significantly if this natural gas is properly utilised.

7 Formulation of more effective protection guideline policies for oil pipelines to avoid product losses through vandalism and fire out break and regular maintenance of oil pipelines to reduce incidences of rupture.

8 Increased participation or partnership with communities where pipelines are located in pipeline protection.

9 Government privatisation and industrial policies in Nigeria should be fine-tuned to encourage more local ownership and joint venture in the oil and gas sector. The bank of industry, the small and medium scale industry equity investment scheme (SMIEIS) and the micro-finance banks should also be strengthened to accommodate small and medium scale enterprises. In general, the cost of capital (interest rate) should be reduced to encourage indigenous investment in the oil sector. Indigenous entrepreneurs should be encouraged by government to partner with foreign firms in the delivery of services to the oil and gas sector.

10 Existing environmental laws in Nigeria should be enforced by the Federal Government.

11 importantly, a comprehensive economic stimulus package for the Niger delta region should be implemented. It's common knowledge that the economic base of a majority of the population has been eroded, which has resulted in several economic, social and political problems. The regional economy, in spite of the oil exploration in the region, is heavily dependent on agriculture and fishing activities. Oil spillage have devastated the fishing industry. Fish stock in rivers, streams and lakes have drastically reduced, farmlands have been destroyed by oil spillages and consequent fires, as well as gas flaring activities. The increased competition for these resources has heightened communal conflicts. Unemployment, crime, ill health and social vices are rampant. Long term neglect by successive government has further led to deteriorating living conditions. Political agitations have also taken a dangerous turn as armed rebellion is being pursued as a means of drawing attention to the plight of the people of the Niger Delta region and a demand for social justice. All these means are pointers to the need for an organised effort to address the myriad problems of the region. Restore peace and stimulate economic growth. Educational institution and employment opportunities, medical facilities and health insurance packages, social engineering and industrial investment need to be the watchword. The need for social justice in the region cannot be overemphasized.

8.3 SUGGESTIONS FOR FURTHER STUDIES

- 1 There is a need to undertake a more in-depth study, not only in the variables but also in the coverage of the Niger Delta region to ensure that this association found in the study is not spurious or and false.
- 2 More gas flaring points and villages needs to be incorporated in further studies and socio-economic and demographic variables can be collected to better model the relationship associated with gas flared and health hazards
- 3 The call for a permanent halt or stop to gas flaring has been on in Nigeria for nearly four decades now. That we are still talking about gas flaring today means something is fundamentally wrong. There is a need for an investigation into the hidden factors militating against the stopping of gas flaring in Nigeria
- 4 There is an urgent need for further studies aimed at designing and developing a framework to investigate development initiatives, sponsorships and community involvement in the Niger Delta region. This is necessary given the claim of huge investment by successive governments to the developments of the region without putting an end to the crisis and agitation for environmental justice.
- 5 Project implementation should be developed. Until recently, the issue of environmental strategies could be said to be completely sidelined in our policy formulations. It may not even be entirely wrong to affirm that even up till now that the nation's oil and gas industry still lacks a holistic oil and gas strategic development plan. Other aspects of the oil and gas industry in Nigeria lacks well detailed strategic plan and implementation. The development of a strategic plans and implementation for the industry is necessary to spur the level of efficiency for the environmental laws and policies were crafted to achieve. However, the fundamentals of the principles of the strategies currently

REFERENCES

Akachidike, K., (2008) Remote Stranded Gas-Challenges and Opportunities for Development, pp. 3. In: Proceedings of the 38th Annual Conference of NSChE, 30th Oct.e1st Nov., 2008 Effurun, Delta State, Nigeria.

Adeniji G (2008) Nigeria Gas Master-Plan, Legal, Regulatory and Policy Issues' Aelex, Lagos

Argo, J (2000). Unhealthy Effects of Upstream Oil and Gas Flaring. Available from http://www.saboteursandbigoil.com/Unhealthy_Effects.pdf .(accessed on april 10 2012)

Arscott, L. (2003). Sustainable Development in the Oil and Gas Industry. A paper presented at the SPE/EPA/DOE Exploration and Production Environmental Conference. March 10 – 12.

Ashton, N.J., Arnott, S Douglas, O. (1999). The Human Ecosystems of the niger delta – An ERA Handbook. Environmental Rights Action Lagos.

Beychok M.R. (2005) Fundamentals of Stack Gas Dispersion, Fourth edition, self-published. ISBN 0-9644588-0-2.

Bilgen M., Karaca M., Onus A. N. and Ince A. G. (2004) A software program combining sequence motif Searches with keywords for finding repeats containing DNA sequences. Bioinformatics 20, 3379–3386

Bradley, A.S. and Hartog, J.J. (2000), Sustainable development – implementation strategy for aGlobal exploration and production business”, paper presented at the SPE International Conference on Health, Safety, and the Environment in Oil and Gas Exploration and Production, paper SPE, 61106.

Broere, W (2008) The elusive goal to stop flares, Shell World. <http://www.shell.com>.

Brundtland, G (1987) Our Common Future: The World Commission on Environment and Development. Oxford: Oxford University Press.

SUSTAINABILITY REVIEW 2011, BP, 31, (2011), available at http://www.bp.com/assets/bp_internet/globalbp/STAGING/global_assets/e_s_assets/e_s_assets_2010/downloads_pdfs/bp_sustainability_review_2011.pdf (stating BP’s approach to safety).

Dadiowei, T. (2009). Environmental impact assessment and sustainable development in the Niger Delta: The Gbarain oil field experience. Berkeley, USA: Institute of International Studies, University of California. Working Paper No. 24

Drapier, M., Sutton, C. and Morillon, A. (2000). Environmental Protection in Oil and Gas Industry: A gateway to Sustainable Development. A paper presented at the Abu Dhabi International Petroleum Exhibition and Conference. October 13 – 15.

Elkington, J. (1999), The link between accountability and sustainability + theory put into practice' 'Conference on the Practice of Social Reporting for Business, ISEA, 19 January, Commonwealth Conference Centre, London.

Friends of the Earth (2005). Gas Flaring in Nigeria: A Human Rights, Environmental and Economic Monstrosity. http://www.foe.co.uk/resource/reports/gas_flaring_nigeria.pdf Accessed on 12th January, 2012.

Hay J, (2006). Supporting climate change vulnerability and adaptation assessments in the Asia-Pacific region: An example of sustainability science. Sustainability Science 1: 23–35.

Ishisone, M. (2004). Gas Flaring in the Niger Delta: The Potential Benefit of its Reduction on the Local Economy and Environment. <http://socrates.berkeley.edu/~es196/projects/2004final/Ishone.pdf>. Accessed on 11th January, 2012.

Khatib, Z. and Verbeek, P. (2002) Water to value— Produced water management for sustainable field development of mature and green fields. SPE paper No. 73853 presented at SPE Intl. Conf on HSE in Oil & Gas Exploration & Production Kuala Lumpur, Malaysia, 20- 22 March 2002.

Labelle, R.P (2000)OCS Resource Management and Sustainable Development. A paper presented at the SPE International Conference on Health Safety and Environment in Oil and Gas Exploration and Production. Stavanger – Norway. 26 – 28 June.

Rahimpour K. Alizadehhesari (2009) Enhancement of carbon dioxide removal in hydrogen-perm Selective methanol synthesis reactor International Journal of Hydrogen Energy pp. 1349–1362

Rajnauth, J.J (2003). Towards Sustainability: the Trinidad and Tobago Scenario: Focusing on Strategic Environmental Planning and Energy Policy. A paper presented at the Society of Petroleum Engineer Latin American and Caribbean Petroleum Engineering Conference. Trinidad and Tobago. 27 – 30 April.

Rogers Peter, Jalal K., Boyd J. (2008) – An Introduction to Sustainable Development, Earth scan, London

National Petroleum Council (NPC), *Global Oil and Gas Study*, Topic Paper 26, 'Oil and Gas Technology Development', 2007.

Okonta, Oronto Douglas & George Monboit (2003): Shell human rights and the oil in the Niger Delta (providing the history of Britain's interest in Nigerian oil and describing various ordinances related to Nigerian oil that were intended to benefit Shell

Ojeifo S.N (2009) Gas flaring in Nigeria and its impact on the environment. Robinson publ. press, Lagos Nig. pp 24-28.

Omorodion, F.I. (2004). The Impact of Petroleum Refinery on the Economic Livelihood of Women in the Niger Delta Region of Nigeria. JENDA: A Journal of Culture and African Women Studies. Issue 6.

Orecchini, F. (2007) The era of Energy Vectors, Int. J. Hydrogen Energy. 2006, 31, 1951-1954.

Opito (2011) *Labour Market Intelligence Survey 2011*. Available at: http://uk.opito.com/uk/library/Labour_Market_Intelligence_Survey_Report.pdf

Osuji, L. C., Erundu, E. S., & Ogali, R. E. (2010) upstream petroleum degradation of mangroves and Intertidal shores: the Niger Delta experience. Chemistry & Biodiversity, 7, 116e128

Shearman, R. (1990) the Meaning and Ethics of Sustainability, Environmental Management. Vol. 14, No.1, pp. 1-8.

HSSE in Shell, SHELL, 2, available at http://wwwstatic.shell.com/static/environment_society/downloads/safety/hsse_in_shell_lr.pdf (last visited Mar. 14, 2013).

Shore D. (2006) A Proposed Comprehensive Model for Elevated Flare Flames and Plumes," Flare gas Corporation, AIChE 40th Loss Prevention Symposium.

UNDP (2006) united nation's development programme: Niger Delta Human Development Report

Udofia, D. (2007). Effective and Efficient Management of Niger Delta Conflict: A Precursor to Optimization of Oil and Gas Potentials Sustainable Development in Nigeria. A Paper Presented at the Nigerian Annual International Conference and Exhibition, August 6 – 8.

Uwalomwa, U., & Uadiale, O. M. (2011). Corporate Social and Environmental Disclosure in Nigeria: A Comparative Study of the Building Materials and Brewery Industry. *International Journal of Business*, 6(2), 258-264.

Wagner, J.P. and Jones, M.G (2004). Strategic Assessment of Oil and Gas Activities: Looking beyond EIA / SIA. A Paper Presented at the Society of Petroleum Engineers International Conference on Health, Safety and Environment in Oil and Gas Exploration and Production. March 29 – 31.

Watts, M (2001). Petro- violence: community, extraction and political ecology of a mythic commodity. Pp 182- 212 In *violent environments*. Watts, M and Peluso, N.eds. Cornell university press.

Wolff, R., Zaring, O., Furuholt, E., O’Leary, H., Gaasbeek, A.P and Thoem, T. (2000). Indicators of Sustainable Development. A paper presented at the Society of Petroleum Engineers International Conference on Health, Safety and Environment in Oil and Gas Exploration and Production. Stavanger. June 26 – 28.

Wurthmann, (2006) *Ways of Using the African Oil Boom for Sustainable Development*”,

African Development Bank, Economic Research Working Paper Series, No. 84.

Yakubu (2008)available at: <http://milieudefensie.nl/publicaties/rapporten/gas-flaring-assaulting-communities-jeopardizing-the-world> assessed on the 24th Jan 2012

INVESTIGATING THE SUSTAINABLE EXPLORATION OF OIL AND GAS IN UK AND NIGERIA

Focus Group Discussion Guide

WARMUP AND EXPLANATION

A. Introduction

1. Good [morning, afternoon, or evening], and welcome to our discussion. My name Oghenemarho Inomiesa. On behalf of in Isoko south Local Government Area (LGA) of Delta State of Nigeria, Mr Tigbo Ubueme and myself, I would like to thank you for attending this Discussion.

2. This discussion is part of a research project conducted in the UK at Liverpool John Moore University to investigate sustainable exploration of oil and gas in the UK and Nigeria. By finding out how much you know or what are the impact of oil and gas exploration activities in your community, this would enable me develop a framework to better your living conditions, reduce environmental impact and economic growth.

3. During this discussion, I will ask you a series of questions related to oil and gas exploration in your community. When you answer, please express your thoughts and concerns about each of the questions or any other related issues. Your opinions and ideas are very important to us.

B. Ground Rules

1. Please remember that there are no right or wrong answers to any of these questions. Also, feel free to state your own viewpoints, feelings, and personal experiences.

2. We want and need to hear from everyone here today. The more information we get from you, the more it will help us to develop a framework that would answer the environmental impact inflicted during oil and gas exploration.

3. All comments are welcomed both positive and negative. If you don't have an answer or do not understand the question, it is okay to tell me so. It helps us even when you don't have an answer to a

question. So please don't be ashamed to say, "I don't know" or "I'm not sure what you're talking about."

4. Please feel free to express yourself if you disagree with someone else's opinion. We want to have many different points of view.

5. It is important to be honest, but please realize that you don't have to say anything about yourself that makes you feel uncomfortable.

C. Procedure

1 A tape recorder will be used during the discussion because I need to pay close attention to what you are saying. Later, I will review the tape and listen carefully to your responses to my questions. I will then take the information I obtain from each group and write a report. Please remember that you will not be identified in any way. We will begin the tape recording after our introductions.

2. This discussion is strictly confidential. What you hear and what you say should not be shared with anyone outside this room. This information should stay here. Are we all in agreement?

3. This is a group discussion, so you don't have to wait for me to call on you. Please speak one at a time because that way everyone will hear what you say and it will make it easier for me when I review the tape. Also, please be considerate of your fellow participants and give each other an opportunity to speak. If you have a soft voice, please speak a little bit louder so that your comments will be clear on the tape.

4. We have a lot of information to go over, so I may have to change the subject at times or move ahead in the middle of our discussion. Please stop me if you want to add additional information that you feel is important to our discussion.

5. Our session will last about 10 – 15 minutes. We will not take a break, but please feel free to get up and use the restroom.

D. Self-Introductions

1. Let's start by introducing ourselves. As I said before, my name is Oghenemarho Inomiesa. I am 29 years old, and I was born in Abraka Delta State Nigeria. I have lived in the United Kingdom Now. I am single, and I have no children.

2. Now, please introduce yourselves. Give your name, age, sex, marital status, and number of children. We will start with Yvonne, continue with the person on her right, and go around the room.

3 Before we begin our discussion, please take a few minutes to complete the form we have handed out. This information will help us to learn more about the people who participate in the discussions. It asks questions like, age, marital status. It also asks a few questions about environmental impact of oil and gas exploration. If you do not know the answers to environmental related questions to of oil and gas exploration related questions, it is all right to write down, "I do not know." Also, it is not necessary to write your name.

Please take a few minutes to answer these questions about environmental impact of oil and gas exploration. Your answers will help us to more insight and a framework on how to reduce or curb environmental impact during oil and gas exploration

Discussion topics

Historic land use and occupancy

.....

Archaeological and culturally important sites

.....

Cultural significance

.....

A general description of the community in terms of

Population and its distribution, Demographic profile (age, sex, caste/ethnicity, labour force etc)

.....

Community characteristics in terms of literacy, poverty, employment and major occupation etc

.....

Existing infrastructure and services (roads, school, hospital, water and sanitation, parks, drainage and other community buildings etc)

.....

Livelihood assets and options (productive land, forest area, wetland, marginal land agriculture, Business, livestock raising etc)

.....

Employment opportunities and commercial activities in the area (has it increased because oil and gas exploration???)

.....

Increase the options and living standard

.....

Issues like conflict, cohesiveness due to oil and gas exploration

.....

Does the community have any specific concerns about the environment? Specifically ask about water and air pollution and other hazards, and recent changes to environmental conditions and sources of those changes.

.....

Discuss on general information about oil and gas exploration:

Established since:

Types of waste discharge systems

Type of pollution caused

Discussion on,

Community perception on oil and gas exploration and its impact on their community

.....

Community perception on impact of oil and gas exploration on the heritage site

.....

Is there any conflict ongoing between community vs. oil multinational and community vs. heritage?

Conservation, if so then, please explain in detail

.....

Discuss on the impact caused by solid waste from the oil multinationals companies on

Sanitation and drainage problem:

Water quality (ground/surface water):

Existing water bodies like rivers that could be potentially affected by pollution and floods

.....

Air quality and its related health hazards from gas flaring:

Flora and fauna existing in the area:

Wetland vegetation:

Sources of water for agriculture, impact on agriculture land/soil and agriculture

Production:

Source of water for Livestock, impact on livestock health and livestock

Production:

Household water sources, impact on human health:

Impact on wildlife and its habitat (birds, including waterfowl and mammals)

What is their perception of the oil industries has breached environmental Law during the operation and generated from Carbon emission?

Location:

Date:

INVESTIGATING THE SUSTAINABLE EXPLORATION OF OIL AND GAS IN UK AND NIGERIA

Participant Information Form

Please take a few minutes to answer these questions about environmental impact of oil and gas exploration. Your answers will help us to more insight and a framework on how to reduce or curb environmental impact during oil and gas exploration. Please keep your answers short. If you do not know the answer to one of the questions, please write "I don't know."

Please tick or complete the following information for each question.

1. Sex: ☐ Male ☐ Female

2. How old are you?): Less than 20 years ☐ 21 – 30 years; ☐ 31 – 40 years; ☐ 41 – 50 years; ☐ 51 – 60 years; ☐ 61 above

3. Marital Status: ☐ Single ☐ Married ☐ Divorced; ☐ Widowed; ☐ others specify ☐

4. What is your preferred language? ☐ English ☐ Pidgin English ☐ Urohobo ☐ Other:

5 A five category scale will be used to indicate how much the respondent agrees or disagrees with the statement and the environmental issues. (Rating Scale: Strongly disagree=1, Disagree=2, No opinion=3, Agree=4, strongly agree=5)

	General perception about	Strongly agree	Agree	No opinion	Disagree	Strongly disagree
--	--------------------------------	-------------------	-------	---------------	----------	----------------------

	Environmental issues Do You think that.....?)					
1	Oil multinational are responsible For environmental pollution					
2	Oil multinationals pollution has affected the Heritage site					
3	Breaching of environmental Law during Oil and gas exploration activities?					
4	Oil and gas companies has solved the unemployment problem to some extent					

Specific Assessment

	Physical environment from oil and gas exploration has caused	Strongly agree	Agree	No opinion	Disagree	Strongly disagree
--	--	----------------	-------	------------	----------	-------------------

5	Depletion/degradation of available water supply					
6	Deterioration/depletion of surface water quality					
7	Negative Impact on the health of the locals					
8	Negative Impact on the wildlife					
9	Negative Impact on the vegetation					
10	Negative impact on soil quality					
11	Amenity losses					
	Air pollution from oil and gas exploration has caused					
12	Cough and skin diseases and other respiratory diseases					
13	Poor health conditions as a result of Co2 emission					
	Noise pollution from oil and gas exploration has caused					
14	Amenity losses					
15	Irritation and loss of concentration					
16	Health related problem					

	Biological environment from oil and gas exploration					
17	Negative Impact on wildlife and its habitat					
18	Negative Impact on vegetation					
19	Negative impacts on livestock					
	Socio-culture Environment from oil and gas exploration					
20	Increased commercial activities in the area					
21	Negative Impact on the agricultural activity					
22	Raised the economic condition of locals					
23	Solved the unemployment problem to some extent					
24	Negative Impact on the socio cultural environment					
25	Land degradation					