

Assessing The Risks of Oil Spills and Other Environmental Hazards in Bonny and Ogba/Egbema/Ndoni Local Government Area of Rivers State, Nigeria

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ABSTRACT: *This study assessed the emergency and risk drivers in oil exploration activities in Bonny Local Government Area, Rivers State, Nigeria. The descriptive research survey design was adopted for the study. Five research questions were raised to guide the study. The data for the study were collected using a five-point likert scale questionnaire containing a total of 25-items and utilized as a major instrument for the study. In all, three hundred and sixty (360) respondents made up the sample for the study. Arithmetic mean and standard deviation were the major statistical tools used for the data analysis. The results of the study showed that fire outbreak, destruction of crops and farmland, pollution of water bodies and marine lives, destruction of mangroves and increase in the cases of health threatening are the risks and environmental hazards associated with oil exploration in the study areas. The findings of the study also revealed that oil exploration greatly impact the economic, social and cultural wellbeing of the people as well as the health of the people and the environment of the study areas. Based on the above findings, the study recommended among other things, that oil exploration should be operated within stringent regulations designed to safeguard the welfare of employees, the environment, and nearby communities, oil companies operating in the areas should ensure regular monitoring and maintenance of their equipment and facilities so as to reduce the occurrence of pollution due to faulty oil and gas facilities, that oil companies should formulate and practice clearly defined emergency response strategies to manage potential incidents like oil spills or fires effectively.*

KEYWORDS: assessment, emergencies, risk divers, oil and exploration

INTRODUCTION

Given the likelihood of occurrence of operational accidents or incidents that have devastating effects on the safety of humans, properties and the environment; Hopkins (2012) assert that “the concepts of safety, risk, and environmental management are currently receiving a lot of attention in the global oil and solid mineral exploration industries”. He noted that “a typical illustration of the dangers posed by petroleum industry operations is the Deep-

water Horizon accident that occurred in the Gulf of Mexico in 2010 and involved British Petroleum”. Also the Courrières mine disaster that took place in Europe resulting in the loss of over 1,099 miners (including many children) in Northern France on 10 March 1906 and the Benxiyu Colliery accident in China on April 26, 1942, which killed 1,549 miners are some of the recorded disasters associated with oil and gas exploration (Hopkins, 2021). However, despite these problems, Hopkins (2021) notes that “the global oil and gas industries are prone to high risk and disaster because it has been meeting human energy needs for centuries, couple with the challenge of balancing the urgent need for energy supply with safe and sustainable operations.”

Mining of oil and gas provides a variety of socio-economic benefits to Nigeria; its environmental and social costs, if not well handled, can be massive in terms of land conversion and degradation, habitat alteration, water and air pollution. In Nigeria, the oil and solid mining sector is generally thought to be the largest source of environmental pollution. The sectors are resource intensive and generate high concentrations of waste and effluents. Environmental impact arising from oil exploration in Bonny and Ogba/Egbema/Ndoni LGA, results in the pollution of air, water, soil and general environment which interferes with human health, the quality of life and the natural functioning of the ecosystem (Adekoya 2003; Nnabo and Taiwo, 2001). It also results in the defacement of the landscape, increased rate of soil erosion and deforestation. The noise and vibration caused by blasting of rocks with explosives (dynamite) have caused adverse effect on buildings and people living within the surrounding communities.

Efforts to improve the standard of living of man through the control of nature and the development of new products have also resulted in the pollution or contamination of the environment. Most of the world’s air, water and land are now partially poisoned by chemical wastes from industrial processes, including those of crude oil and gas. The pollution exposes people to new risks from diseases. Many species of plants and animals have become endangered or are on the verge of extinction. As a result of these developments, governments have passed laws to limit or reverse the threat of environmental pollution. The effects of environmental pollution are diverse and varied, and the physical, biological, chemical and socio-economic effects or impacts have been very well documented. While some of these may be observed, the major impacts as they affect microorganisms and ecosystems may never be fully estimated or completely understood.

Bonny and Ogba/Egbema/Ndoni play host to a number of oil exploration and production companies with trunk lines and oil and gas carrying pipelines transversing the entire Bonny kingdom and Ogba/Egbema/Ndoni have caused adverse effect on the people and ecosystem within the surrounding communities thereby posing as a threat to human and the environment. Oil spillage resulting from oil exploration in the study areas had caused untold hardship on the livelihood of the people and the environment. This situation has increased the vulnerability of households thereby affecting their wellbeing adversely, with a threat on the areas’ future means of sustenance; while governments response and remediation efforts aimed at restoring the areas ecosystem have not being very effective, hence the motivation for the present study. .

Oil exploration and production operations in the areas have caused devastating effect on human and the environment. In Bonny Kingdom as well as Ogba/Egbema/Ndoni, fishing as a source of occupation of the people has being greatly affected leading to increase in the rate of poverty among the local inhabitants. Also, the exploration and production of oil and gas in this areas has resulted in air and land pollution, defacement of the landscape, increased rate of soil erosion and deforestation The emergencies and risk drivers associated with oil

and gas operations in the areas has being attributed to a lot of factors. Also, the effects of the oil and gas operation in the area have caused untold hardship on the people. It is however unfortunate that the oil exploration and production companies in the areas are not concerned and have refused to put in place measures that will reduce the negative impact of their operations on the people.

Aim and Objectives of the Study

The aim of this study is to assess the emergencies and risk drivers in oil and gas exploration in Bonny and Ogba/Egbema/Ndoni, Rivers State Nigeria. The specific objectives of the study are to:

- i. Assess the risks of oil spills and other environmental hazards in the study areas.
- ii. Examine the economic, social and cultural impacts of oil exploration on the livelihood of people in the study areas.

Research Questions

1. What are the risks of oil spills and other environmental hazards on the study areas?
2. What are the economic, social and cultural impacts of oil exploration on the livelihood of people in the study areas?

LITERATURE REVIEW

Oil and gas exploration encompasses the processes and methods involved in locating potential sites for oil and gas drilling and extraction. Early oil and gas explorers relied upon surface signs like natural oil seeps, but developments in science and technology have made oil and gas exploration more efficient. Geological surveys are conducted using various means from testing subsoil for onshore exploration to using seismic imaging for offshore exploration. Energy companies compete for access to mineral rights granted by governments by either entering a concession agreement, meaning any discovered oil and gas are the property of the producers, or a production-sharing agreement, where the government retains ownership and participation rights.⁴ Exploration is high risk and expensive, involving primarily corporate funds. The cost of an unsuccessful exploration, such as one that consisted of seismic studies and drilling a dry well, can cost \$5 million to \$20 million per exploration site, and in some cases, much more. However, when an exploration site is successful and oil and gas extraction is productive, exploration costs are recovered and are significantly less in comparison to other production costs.

Concept of Safety in Oil Exploration and Production

Hollnagel (2014) defined “safety is as a situation in which nothing goes wrong or, more cautiously, as a situation in which the number of things that went wrong is acceptable”. It should be noted that “since safety is defined by what happens when it (safety) is absent, this definition was found to be an indirect explanation of safety, thus, from a practical standpoint; this definition is the definition of unsafe (unsafe)”. It is clear that “safety, according to this definition, focuses on what went wrong; consequently, safety cannot be measured when safety is present. However, “this does not mean that this definition is incorrect; rather, it makes practical sense to concentrate on unforeseen events that may result in losses and have negative repercussions”. Hollnagel (2014) noted that “perhaps defining safety in terms of risks is a more practical approach but this does not resolve the question of whether the existence of unsafe or safe situations should be used to define safety, it does provide a means of measuring safety since safety cannot be measured in and of itself”. Suddle (2009) “provides a definition of the connection that exists between risk and safety”.

Concept of Risk and Risk Management in Oil Exploration and Production

Aven and Renn (2010) defined risk management as the methodical amalgamation of risk assessment and judgment made during risk characterization from the input material upon which risk management options are evaluated, assessed, and chosen. In risk management, the processes for making decisions are driven by these outcomes". Hence, "risk management is referred to as a process of decision-making and such independent direction requires evaluation and prioritization in light of a strategic methodology that coordinates a gamble theory". It should be noted that "the various definitions of risk are guided by a variety of philosophical perspectives. Ontological realism has been used to describe risk as an objective state of the world". Eugene and Rosa (2003) noted that "this philosophical approach to research methodology holds that risk must exist independently of perception, knowledge, and subjective judgment about what is at risk and how likely a risk will manifest". They noted further that "by allowing risk an ontological status, risk standards banter is put into a field of conflict over inquiries of information, discernments, and understandings of hazard, versus the comprehension of how gatherings and social orders decide to be worried about certain dangers while disregarding others".

Aven and Renn (2010) posit that cultural theory and constructivism, on the other hand, assert that risk and perception are identical in a more extreme perspective". Dawotola et al., (2012) noted that "the method for risk assessment of pipeline and truck tanker operations was based on this idea". In line with the above, "perceptions regarding risk management ought to be guided by the risk property that was discovered by Aven and Renn (2010) and is thought to address stakes".

Concept of Environmental Pollution

Amiriheobu (2019) defines environmental pollution as the unfavorable alteration of our surroundings that occurs entirely or largely as a result of human activity which happen directly or indirectly as a result of changes in energy patterns, radiation levels, the chemical and physical constitution of organisms, and their abundance". Environmental pollution "could also refer to the introduction of contaminants into the natural environment, which has negative effects on humans, nature, and its resources. He "went on to say that environmental pollution is any unnatural and harmful change in the chemical, physical, and biological properties of any ecosystem component, such as air, water, or soil, that can harm a variety of living things and property". According to him, "the malicious tension in the Niger Delta has decreased as a result of the administration of President Umaru Musa Yar'adua's amnesty and other social rehabilitation programs". According to Roya, (2015), "environmental pollutants have a variety of negative health effects starting in early life and some of these negative effects include prenatal disorders, infant mortality, respiratory disorders, allergies, cancers, cardiovascular disorders, an increase in stress oxidative, endothelial dysfunction, mental disorders, and other negative effects. Roya went further to note "that though, short-term effects of environmental pollutants are usually highlighted, wide range of hazards of air pollution from early life and their possible implication on chronic non-communicable diseases of adulthood should be underscored". Roya also assert that "numerous studies have exposed that environmental particulate exposure has been linked to increased risk of morbidity and mortality from many diseases, organ disturbances, cancers, and other chronic diseases". Hence, "it is time to act and reduce pollution. Otherwise, the environment will be damaged by the waste products of consumption, heating, agriculture, mining, manufacturing, transportation, and other human activities".

Nigeria's Oil and Gas Industries and the Framework for Risk Management

Notably, the developed world's risk management frameworks combine human and technical components to create proactive and reactive strategies for accident prevention and response at all regulatory and commercial levels. In

the context of accident risk reduction and response, the application of risk management concepts to downstream operations in other developed nations is on the rise. These nations are adapting risk management concepts to their particular circumstances and using them to manage environmental and safety risks from downstream petroleum operations. In addition, the concepts are utilized as a means of achieving specific regulatory objectives while also achieving a balance between stakeholders involved in petroleum operations' perception of risk and business profitability. The United States (ICF, 2000), the United Kingdom (Energy Institute, 2007), and Italy (Bubbico et al., 2006). Chapter 1: An illustration of a risk-based framework that is incorporated into a guideline for petroleum distribution operations in the United Kingdom is the Environmental Guidelines for Petroleum Distribution Installations (EGPDI) developed by the Energy Institute in 2007 with the goal of maximizing environmental and safety performance.

Risk Assessment of Petroleum Products Transportation by Truck and Pipeline

Roed-Larsen, et al. (2004) posits that “a pipeline accident is a sudden, unplanned event that results in injury, death, or loss, reduces material value and environmental quality, and increases liability. Hopkins (2012) noted that the possibility of loss of containment (LOC) poses a risk during pipeline operations with the potential for environmental harm as well as the dangers of fire and/or explosion, hence, a comprehensive assessment of the pipeline's risk is necessary for the creation of appropriate mitigation measures”. Citro and Gagliardi, (2012) opine that understanding two aspects of safe pipeline operation—the risk posed by pipelines and the causes of pipeline failure or accident/incident—is necessary for the development of mitigation measures”. Risk assessment's first component consists of: defining the acceptability of the risk posed by the pipelines by comparing risk values to established limits and analyzing failure likelihood or frequencies and failure consequences quantitatively or qualitatively. Also, “understanding pipeline failure or accident/incident causal factors as suggested by accident causation models is the second component (Hale, 2002; Leveson, 2004)”.

Environmental Impact of Pollutants from Oil Exploration and Production

Efforts to improve the standard of living of man through the control of nature and the development of new products have also resulted in the pollution or contamination of the environment. Most of the world's air, water and land are now partially poisoned by chemical wastes from industrial processes, including those of crude oil and gas. The pollution exposes people to new risks from diseases. Many species of plants and animals have become endangered or are on the verge of extinction. As a result of these developments, governments have passed laws to limit or reverse the threat of environmental pollution. The effects of environmental pollution are diverse and varied, and the physical, biological, chemical, and socio-economic effects or impacts have been very well documented. While some of these may be observed, the major impacts as they affect microorganisms and ecosystems may never be fully estimated or completely understood.

Environmental Threats from Oil and Gas Operations

According to Corner (2015), “oil and gas industry operations occur in every corner of the globe, in a diverse range of habitats and ecosystems”. He explained that “these operations often place large pressures on the local environment and inhabitants, and as global population growth continues to rise, so too does the demand for useable energy and resources”. According to Statistical Review of World Energy (2021), “in 2021, consumption and production increased for all fuel types, surpassing previously record high levels for all fuels except nuclear. For fossil fuels, global consumption rose more rapidly than overall production, resulting in further production pressure for oil and gas companies”. Corner assert that “meeting the rising global energy demand comes with high risks and costs to both society and the environment, hence, oil and gas companies are thus faced with the challenge of

meeting the world's expanding energy demands while minimizing the negative externalities associated with these operations".

Goals of Environmental Risk Management

The primary goal of internalizing environmental risks is to reduce corporate environmental impacts by limiting the number and severity of incidents that occur from the exploration, production and refining of oil and gas. Minimizing the number of incidents and mitigating their environmental impacts if and when they do occur may help address environmental concerns such as pollution, industrial accidents and global climate change. There is a large capacity for oil and gas companies to internally improve their practices to prevent future stringent legislation as well as increase profitability by restricting the number of fines paid annually for environmental degradation. Integrating risk management practices into all aspects of business should be an industry-wide objective as improving environmental performance has proven to create a competitive advantage for oil and gas corporations (Sache.org, 2013). Energy companies should seek to align internal business values and environmental goals with external perceptions of the company, which can be accomplished by explicitly embedding environmental risks into daily processes.

Addressing Environmental Business Risks

Traditional approaches of addressing environmental business risks is comparable to the manner in which corporation must tackle financial risks. Before undertaking a project, the company should determine all possible risks associated with operations at the specific site and the probability of each adverse event occurring. Using a cost-benefit analysis, the company can then estimate the total social burden of an event occurring.

The Resource Curse Theory

The Resource Curse theory was originally coined by Richard Auty (1993). Auty studied economics and geography, and he investigated the reasons why some resource-rich countries underperform and remain undeveloped in spite of the abundance of natural resources in the country as in the case of Nigeria. In other words, Auty defined the term natural resource curse as the perverse effects of a country's natural resource wealth on the country's economic, social, or political well-being (see Rose, 2014 Cited in Mehrdad, 2017: 2). Azarhoushang and Rukavina (2014), and Mellissa (2017), in their respective studies of the resource curse theory, lumped the term with the Dutch Disease, an idiom used in association with a 1960 crisis in Netherlands after the discovery of natural gas in the North Sea region of the country. They saw the phrase as the appropriate word to describe what happens when an event, like a commodity-boom, makes a country's currency more expensive and its other goods less competitive. Akpotor (2016) stated that the Dutch Disease or Resource Curse theory is used to examine the negative effects that rich natural resources bring upon the economic growth of a resource rich country. To him, it is paradoxical for countries with the abundance of non-renewable natural resources to experience stagnant economic growth and contraction often associated with conflicts or crises of marginalization of the host community. For Duruji and Dibia (2017), Resource curse also known as the Paradox of Plenty describes the failure of many natural resource-rich nations to benefit fully from the wealth of their rich natural endowment following the inability of their governments to respond favourably and effectively to public welfares and needs. In a more elaborate manner, Azarhoushang and Rukavina (2014) argued that rich natural resources such as oil deposits and a significant other which are located in abundance in some countries have become a trap or a curse rather than being a blessing to the countries.

The Man Environment Relationship Theory

In the year 1997, Holland put up this notion. The notion was born out of the fundamental need to provide a focal point for the interaction between man and his surroundings so that every action he took might contribute to the sustainability of both his surroundings and the components that inhabit them. This was done in order to resolve the complex relationship between the environment and human nature, as proposed by the environmental philosophy theory college of thought. This concept originated from research conducted in the year 1909 by a researcher named Parsons, who found that human behavior was influenced by his immediate environment both psychologically and through the interactions that men had with it. According to Holland (1997), people naturally gravitate toward places where they can see a glimmer of hope and find the basic necessities of life, which can ensure their hope for survival. As a result, living in such an environment ceases to be a drag because it is clear that relationships can be formed there. More specifically, the surroundings' possibilities and propensity to increase their capacity for productivity.

METHODOLOGY

The descriptive and qualitative research survey design was adopted for the study. Five research questions were raised to guide the study. To ensure the face and content validity of the instrument (questionnaire), the questionnaire together with the objectives of the study was submitted to my supervisor who read through, vet, scrutinized, and made comment(s) before approval for distribution. This was done to establish that the instrument is appropriate for measuring the variables contained in the study. The data for the study were collected using a five-point likert scale questionnaire containing a total of 25-items and utilized as a major instrument for the study. In all, three hundred and sixty (360) respondents made up the sample for the study. Arithmetic mean and standard deviation were the major statistical tools used for the data analysis.

Result and Discussion

Research Question 1: What are the risks of oil spills and other environmental hazards on the study areas?

Table 4.1: Mean responses on risks of oil spills and other environmental hazards on the study areas

S/No	Questions	SA	A	D	SD	\bar{X}	SD	Remark
1	Oil spills cause by oil exploration often result in fire outbreak	120	220	15	5	3.57	.49	SA
2	It causes destruction of crops and farmland	150	205	5	0	3.59	.50	A
3	It causes pollution of water bodies and dead of marine lives	160	200	0	0	3.51	.50	SA
4	It causes the destruction of mangroves and forest trees	145	210	4	1	3.47	.49	A
5	It causes and increases the cases of health threatening diseases such as cancer among the people	130	200	20	10	3.46	.50	SA
Grand Mean						3.52	0.50	SA

Criterion mean = 2.50. Guide: 0 - 1.49 = strongly disagree (SD); 1.50 - 2.49 = Disagree (D); 2.50 – 3.49 = Agree (A); 3.50 – 4.00 = strongly agree (SA)

Source: Researcher's computation from survey data, 2023.

The result in Table 4.1 revealed that fire outbreak, destruction of crops and farmland, pollution of water bodies and dead of marine lives, destruction of mangroves and forest trees and increase in the cases of life threatening illnesses such as cancer are risks of oil spill and constitute other environmental hazard in the study area ($\bar{X} = 3.52 \pm 0.50$). The analysis revealed that respondents strongly agree that destruction of crops and farmland is a risk associated with oil exploration in the study areas ($\bar{X} = 3.59 \pm 0.50$) and that fire outbreak is risk associated with oil exploration in the study areas ($\bar{X} = 3.57 \pm 0.49$). Also, the result of the analysis shows that respondents strongly agree that pollution of water bodies and dead of marine lives is risk associated with oil exploration in the study areas ($\bar{X} = 3.51 \pm 0.50$).

Furthermore, the respondents agree that the destruction of mangrove and forest trees ($\bar{X} = 3.47 \pm 0.49$) and the increase in the cases of health and life threatening illnesses such as cancer ($\bar{X} = 3.46 \pm 0.50$) are risks and environmental hazard associated with oil exploration in the study areas. Thus, it can be concluded that Fire outbreak, destruction of crops and farmland, pollution of water bodies and marine lives, destruction of mangroves and increase in the cases of health threatening are the risks and environmental hazards associated with oil exploration in the study areas.

Research Question 2: What are the economic, social and cultural impacts of oil exploration on the livelihood of people in the study areas?

Table 4.2: Mean and standard deviation on the economic, social and cultural impacts of oil exploration on the livelihood of people in the study areas

Publication of the European Centre for Research Training and Development -UK

S/No	Questions	SA	A	D	SD	\bar{X}	SD	Remark
6	Oil exploration result in loss of economic livelihood of the people	170	190	0	0	3.68	.49	SA
7	Oil exploration leads to impoverishment of the people	145	195	15	5	3.58	.50	SA
8	Oil exploration result in loss of the natural habitat of the people	150	200	7	3	3.50	.50	SA
9	Oil exploration could cause the displacement of people from their Homes	140	205	10	5	3.52	.49	SA
10	Oil exploration could cause the loss of cultural diversity of the people	160	200	0	0	3.55	.49	SA
Grand Mean						3.57	0.49	SA

Criterion mean = 2.50. Guide: 0 - 1.49 = strongly disagree (SD); 1.50 - 2.49 = Disagree (D); 2.50 – 3.49 = Agree (A); 3.50 – 4.00 = strongly agree (SA)

Source: Researcher's computation from survey data, 2023.

The result in table 4.2 revealed that loss of economic livelihood of the people, impoverishment of the people, loss of cultural diversity of the people, displacement of people from their homes and loss of the natural habitat of the people are the economic, social, and cultural impacts of oil exploration on the livelihood of people in the study areas ($\bar{X} = 3.57 \pm 0.49$). The analysis also revealed that the respondents strongly agree that disaster and pollution emanating from oil exploration result in the loss of economic livelihood of the people ($\bar{X} = 3.68 \pm 0.49$), disaster and pollution emanating from oil exploration impoverishment of the people ($\bar{X} = 3.58 \pm 0.50$), disaster and pollution as a result of oil exploration loss of cultural diversity of the people ($\bar{X} = 3.55 \pm 0.49$), disaster and pollution emanating from oil exploration result in the cause the displacement of people from their homes ($\bar{X} = 3.52 \pm 0.49$). Furthermore, the respondents strongly agree that Disaster and pollution emanating from oil exploration result in loss of the natural habitat of the people ($\bar{X} = 3.50 \pm 0.49$). Thus, it is concluded that loss of economic livelihood of the people, impoverishment of the people, loss of cultural diversity of the people, displacement of people from their homes and loss of the natural habitat of the people are the economic, social, and cultural impacts of oil exploration on the livelihood of people in the study areas.

DISCUSSION OF FINDINGS

The finding of the study reveals that fire outbreak, destruction of crops and farmland, pollution of water bodies and marine lives, destruction of mangroves and increase in the cases of health threatening are the risks and environmental hazards associated with oil exploration in the study areas. This finding is in agreement with the work of Omodanisi et al (2014) when they assert that faulty and exposed pipes and inadequate security or poor monitoring of the pipeline were some of the disaster emergencies and risk drivers associated with oil and gas operation in Nigeria. The findings is also in tandem with the work of Macdonal, Lockhart and, Gilman (2007) when they posit that flaring, venting, insufficient cementing or sealing of good bores, lack of maintenance of production facilities, inadequate processed water, and solid waste management scheme, bad handling of crude oil

and natural gas contributing to spills and leakage, and non-compliance with legislation are emergency drivers and risk factors associated with oil exploration and production activities.

The finding of the study also reveals that loss of economic livelihood of the people, impoverishment of the people, loss of cultural diversity of the people, displacement of people from their homes and loss of the natural habitat of the people are the economic, social and cultural impacts of oil exploration on the livelihood of people in the study areas. This finding collaborates with the work of Adewuyi and Olowu (2012) when they posit that oil-related pollution poses significant threats to human and ecological well-being. This finding is also in agreement with the finding of Adewuyi and Olowu (2012) when they observed that oil-related pollution poses significant threats to human and ecological well-being. Their study found that the concentration of contaminants in and around the NNPC Apata product depot was higher than the WHO and EU allowable limits.

Summary of Findings

The findings of the study are highlighted below.

- i. Fire outbreak, destruction of crops and farmland, pollution of water bodies and marine lives, destruction of mangroves and increase in the cases of health threatening are the risks and environmental hazards associated with oil exploration in the study areas.
- ii. Loss of economic livelihood of the people, impoverishment of the people, loss of cultural diversity of the people, displacement of people from their homes and loss of the natural habitat of the people are the economic, social and cultural impacts of oil exploration on the livelihood of people in the study areas.

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