



## Review of Related Risks in Nigerian Oil and Gas Industry

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### ABSTRACT

The exploration and production of natural gas and crude oil is known as upstream while downstream involve the refining, marketing, and distributing the oil and gas products. Both downstream and upstream activities pose a huge safety risk to employees and the people surrounding the sites or involved in the activities. It is suggested that a research would be conducted in order to assess, analyze and manage the risk factors. Modern technology, which is the use of sophisticated statistical softwares and Artificial Intelligence, is suggested to be used by the Nigerian oil and gas companies to solve a lot of challenges with regard to managing safety risks in both downstream and upstream sectors.

### Introduction

Oil and gas industry is a crucial sector for economic growth in Nigeria and as such has contributed to poverty reduction and national development. The industry has encountered numerous incidents related to extensive environmental harm, safety resulting in loss of life and significant financial losses [1]. The industry becomes hazardous due to the nature of its activities and sometimes this leads to occupational health and safety challenges [2]. Nigeria's oil industry has recorded a loss of about 412 lives between 2018 and 2022 [3]. [4] Reported that hydrocarbon releases attributed to 40% of hazardous prevalence in the oil gas industry in China.

A situation involving exposure to danger is referred to as a risk. The fundamental part of the oil and gas good management practice is the ability to effectively and efficiently manage risk involved; hence there is need for determination, evaluation and analysis of these risks as well as to give recommendations that will provide a safe working environment both for employees and the surrounding communities of the oil and gas industry.

### Risks Involved in Upstream Activities

Oil was discovered in Nigeria in 1956 at Oloibiri. It is the Nigeria's primary commodity for export. Nigeria is the Africa's largest exporter of the commodity. Some of the giants companies that carry out oil exploration in Nigeria are Mobil Producing Nigeria, Chevron Nigeria, Total Upstream Nigeria, among others. In the process of exploration by these companies, their employees and the surrounding communities used to suffer from one type of hazards or the other [5]. [6] Opined that despite the laws set by government to impact on the provision of occupational health and safety for the oil and gas industry, communities/workers are still in danger of various risks involved. The pathogenic toxins, viruses, fungi, micro-organisms, spores, and bio-active substances are form of biological hazards, organic substances that pose a threat to the health of the people [7]. The high level of workplace hazards in the oil and gas industry generally represents a concern for the health of women in this sector, depending on how well these risks are managed [7]. Pregnant women encounter additional risks if expose to hazardous substances including biological agents that can affect the fetus and lead to congenital malfunctioning or higher mortality rates [8]. Occupational hazards are dangers to human health and wellbeing [9].

In both 2014 and 2015, Africa was the region with the highest number of deaths according to reports of International Association of Oil and Gas Producers [7]. The death rate from the oil and gas extraction industry is 2.5 times and 7 times greater than construction industry and general industry respectively [2].

The primary occupational hazards associated with offshore exploration and production operations comprise personal injury, stress from travelling long distances over water and illnesses from exposure to climatic and geographical elements. Psychological problems may result from the physical isolation of exploratory sites and their remoteness from base camps, and the extended work periods required on offshore drilling platforms [7]. [5] Reveals how offshore oil rigs activities have caused serious accidents leading to severe consequences to the life and health of employees, pollution of the environment, direct and indirect economic loses. They added that there is a clear need for proper data collection and reporting. According to [10], oil and gas industry's financial plan, profitability, quality and execution can be influenced by effective risk management, in this regard managing risk is an essential part of the decision making process. [10] Affirmed that there has not been any recent study to ascertain and evaluate the health risk of occupational health hazards of the Nigerian refinery and petrochemical workers. Likewise [11] suggested that determination of the risk factors of health hazards exposure of individuals should be a follow up to his research.

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## Risks Involved in Downstream Activities

The conversion of crude oil into natural gas liquids, gasoline, diesel, and a different of other energy sources is referred to as a downstream. Downstream sector is responsible for producing these products; gasoline, liquefied natural gas, lubricants, heating oil, synthetic rubber, fertilizers, pesticides and plastics [12]. [13] Affirmed that the downstream operations (both regulation and commercial) in Nigeria which include petroleum product transportation and distribution are mainly participated by Nigerian government.

As a result of absence of inland water transportation and total collapse of rail infrastructure, truck and pipeline systems are the leading channel of petroleum products transportation and distribution. Like many pipeline system around the globe, in Nigeria, transmission pipelines carrying liquid petroleum products are not on secure industrial sites but are routed across the land. Consequently, there is ever-present potential for third parties to interfere with the integrity of these pipelines. In addition, the combination of pipeline route and third-party interference implies that communities surrounding the pipelines are subject to significant risk from pipeline failure [14].

Safety and risk management research in downstream context has often been neglected and, till date, no satisfactory generally accepted risk management framework has been developed for measuring, assessing, interpreting and mitigating safety and environmental risks from accidents in downstream operations of the Nigerian petroleum industry. As such, when accidents occur within downstream operations, they lead to major economic losses in addition to serious safety and environmental consequences [14]. [15] Emphasized the importance of regulatory adherence and safety management practices as they play significant role in safety compliance, enhancing safety outcomes and reducing occupational accidents and injuries in the oil and gas industry. [1] Stress that managing oil spill risks, infrastructural inadequacies, valve and seal failures, and security concerns are the critical issues which are crucial for enhancing the safety performance in the oil and gas industry.

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## Risks Assessment Using Data Analytic and Artificial Intelligent (AI)

In order to have an enhanced efficiency and accuracy in risk management processes, the oil and gas industry is required to adopt data analytic, predictive modeling, artificial intelligence and scenario analysis as they play essential role in proactive decision making. Data Analytic helps in risk identification and management by analyzing data from diverse sources, both internal and external. Artificial Intelligence is increasingly crucial in risk assessment, enabling efficient identification, assessment and prioritization of risks [16]. Organizations can conduct thorough and transparent risk assessments by following industry standards, regulatory compliance and implementing robust risk management systems. [17] also affirms that fire and explosion risk assessment, if integrated into consequence modeling offers enabling informed decision making, substantial benefits, compliance regulations, regular inspection, targeted risk mitigation, effective and continuous safety protocol improvement.

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## Conclusion

Health and safety are meaningful and vital commitments that each industry must consider. Oil and gas industry is the most hazardous sector with regards to the health, safety and security of workers as well as the surrounding communities. Thus, for the organization to develop and prosper very well, it is imperative that risk factors are identified, analyze and successfully managed. In nowadays, data analytic and AI play a vital role in risk assessment, hence I strongly recommend the use of data analytic using appropriate models and sophisticated statistical tools as well as Artificial Intelligent in future researches for effective risk management.

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