

**INTEGRATING ENVIRONMENTAL AND
HEALTH AND SAFETY MANAGEMENT
SYSTEM IN THE OIL AND GAS SECTORS: A
CASE STUDY OF NIGERIA**

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MANAGEMENT SYSTEM IN THE OIL AND GAS SECTORS: A
CASE STUDY OF NIGERIA**

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DECLARATION

I confirm that this research work has not been approved in substance for any degree and is not being submitted concurrently for any other degree other than the Doctor of Philosophy (Ph.D.) being studied at the University of Wolverhampton's Faculty of Science and Engineering. I further certify that, unless when otherwise indicated by sources, this work is the result of my findings and that I have not plagiarised others' work.

Date 28...02...2022

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ABSTRACT

Oil and gas industries around the world are often linked to poor environmental management. As a result, they raise concerns about potential negative environmental, health and safety impacts. Oil spills are considered to have caused a wide range of environmental damage. About 7 to 700 tonnes per year, approximately 100 billion cubic metres (BCM) of associated gas flaring, and five million deaths are attributed to oil pollution (contributing to approximately 9% of all deaths worldwide). The extent of this pollution is particularly significant and damaging in developing countries like Nigeria.

This study aims to investigate the integration of environmental, health and safety management systems in the oil and gas sectors. Focusing on Nigeria, this research evaluates and provides solutions to the rising number of oil and gas industry related environmental pollution.

The study analyses the causes of environmental pollution and the relationship between the environmental, health, and safety management systems in the oil and gas sectors in Nigeria.

A mixed-methodologies approach that combined both quantitative and qualitative methods with embedded units of analysis was explored. Semi structured interviews, questionnaires and observation approach were used for data collection from multiple participants. To analyse the study findings, SPSS and Nvivo data analysis programs were used.

The study found that using an integrated environmental, health, and safety management system to reduce pollution in the oil and gas industry could be a reliable option to mitigate the current oil and gas related concerns in Nigeria. Based on the findings of the study, a strategic framework for integrating and sustaining Oil and Gas environmental, health, and safety management system was designed.

This study demonstrates that the integrating environmental, health and safety management system could minimise adverse impacts of Oil and Gas industry including environmental pollution in Nigeria and other developing countries facing similar challenges, and make this key industry more sustainable.

Keywords Management. Management system, Environmental pollution, health, and Safety. Nigeria; Oil and Gas.

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LIST OF ABBREVIATIONS

Abuja Environmental Protection Board	AEPB
Addax Petroleum	AP
Advisory Committee for Safety in Nuclear Installations	ACSNI
Billion Cubic Meters	BCM
Bureau of Labour Statistics	BLS
Bureau of Ocean Energy Management Regulation Enforcement	BOEMRE
Department of Petroleum Resources	DPR
Emergency Management Agency	NEMA
Enterprise Risk Management	ERM
Environment Research Funders' Forum	ERFF
Environmental Data Management System	EDMS
Environmental Health Officers Registration Council of Nigeria	EHORCN
Environmental Impact Assessment Law	EIA
Environmental Management Information System	EMIS
Environmental Management System	EMS
Environmental Management, Health and Safety	EM and H&S
Environmental Protection Agency	EPA
Environmental, Health and Safety	EH&S
European Environment Agency	EMAS
European Union	EU
Federal Energy Regulatory Committee	FERC
Federal Energy Regulatory Committee	FERC
Federal Environmental Protection Agency	FEPA
Federal Ministry of Environment	FME
Federal Ministry of Water Resources	FMWR
Gross Domestic Product	GDP

Gross Domestic Product	GDP
Independent Scientific Assessment	ISA
Integrating Environmental Management	IEM
Integrating Environmental Management System	IEMS
Integrating Environmental, Health and Safety Management Systems	IEH&S
International Covenant on Civil and Political Rights	ICCPR
International Covenant on Environment, Social and Cultural Rights	ICESC
International Labour Organization	ILO
International Organization for Standardization	ISO
International Petroleum Industry on Environmental Conservation Association	IPIECA
Lagos State Government Ministry of the Environment	LSGME
Leadership in Energy and Environmental Design	LEED
Liquefied Petroleum Gas	LPG
Local Content Act	LCA
Local Government Area	LGA
Local Government Area	LGA
Ministry of Mines and Energy	MME
National Academy of Engineering	NAE
National Advisory Committee	NAC
National Biosafety Management Agency	NBMA
National Council of Occupational health and safety	NCC
National Energy Policy	NEP
National Environmental Policy Guidelines and Standards	NEPGS
National Environmental Standards and Regulations Enforcement Agency	NESREA
National Health Insurance Scheme	NHIS
National Oil Spill Detection and Response Agency	NOSDRA
National Policy on the Environment	NPE
National Primary Health Care Development Agency	NPHCDA
National Research Council	NRC

Nigeria Hydrological Services Agency	NIHSA
Nigeria's Environmental management	NEM
Nigeria's Health Act	NHA
Nigerian Environmental Impact Assessment	NEIA
Nigerian National Oil Corporation	NNOC
Nigerian National Petroleum Corporation	NNPC
Nigerian Nuclear Regulatory Authority	NNRA
Nigerian Social Insurance Trust Fund Management Board	NSITFMB
Nuclear Safety and Radiation Protection Legislation	NSRPL
Occupational Safety and Health	OSH
Occupational Safety and Health Administration	OSHA
Oil and Gas	O&G
Oil Spill Contingency Plan	OSCP
Organisation for Economic Co-operation and Development	OECD
Organisation of Petroleum Exporting Countries	OPEC
Petroleum Technology Development Fund	PTDF
Physical, Mental and Emotional Well-being	PMEW
Polycyclic Aromatic Hydrocarbons	PAHs
Primary Healthcare	PHC
Private, Social and Community Healthcare	PSCH
Research Institute of Nigeria	FRIN
Responsible Canadian Energy	RCE
Shell Petroleum Development Company of Nigeria	SPDC
State Ministries of Environment	SME
Statistical Package for the Social Sciences	SPSS
United Kingdom	UK
United Nations Environment Programme	UNEP
United Nations	UN
Universal Declaration of Human Rights	UDHR

University of West of England	UWE
Volatile Organic Compound	VOCs
Workplace Safety and Health Institute	WSH
World Health Organization	WHO

Ph. D JOURNEY

The journey to a Ph.D. degree has stretched, equipped, and expanded my intellectual capabilities on how to conduct independent research. The three years invested in the programme have been very intense in terms of academic discovery and have positively affected my entire life. This journey has been like a roller coaster there have been challenging times, trying times and of course the good times which has led me to a better understanding of research process and academic writing. Above all, a crucial part of this journey was the fact that I was privileged to have an experienced and supportive supervisory team, which guided me throughout the period of my studies (Thank you sirs). I have learnt so much during the trying times and good times, even in non-academic related issues, but most importantly, this journey has taught me how to endure, focus and believe in myself. Lastly, the road wasn't easy but it was worth going through.

1.0 CHAPTER ONE INTRODUCTION

1.1 Introduction

This chapter provides a summary of the thesis, with discussions focusing on the research background, scope, research questions to be answered, as well as the aim and objectives of the thesis. The research methodology, research assumptions and limitations are discussed briefly, after which the chapter concludes with an analysis of its contribution to knowledge, the relevance of the research findings and a summary of the chapters.

1.2 Background of the study

Crude oil is a naturally occurring resource originating from certain rock formations in the dirt or earth (Overholt, 2016). It is a dark and sticky liquid, usually classified as hydrocarbon, containing multiple carbon and hydrogen, with or without non-metallic elements, e.g., sulphur and oxygen. It is highly flammable and can be burned to create energy, along with natural gas spin-offs from crude oil to make fuel (Rasmussen, 2013).

This natural resource is of unlimited use; to extract maximum value from crude oil it goes through a refinement process to produce gasoline, best known in some countries as petrol or petroleum products (Hough, 2017). There are other products that can be obtained from a barrel of crude oil when refined. These include liquefied petroleum gas (LPG), fuel oil, naphtha, gas, oil and kerosene. Other useful products are found in the process of manufacturing or refining crude oil, according to Maizar (2004). Over 4,000 different petrochemical products can be found in crude oil, although only a few of these are considered basic products. However, the sector has recorded high mortality rate for employees and ecological pollution over the decades, making it one of the most dangerous industries in the world (Nwankwo et al 2022).

According to Charles Britton (2022), across the world, around 25 deaths per 100,000 workers and over 100 million marine animal's lives get lost annually from activities of the industry (World Ocean Network 2022). while 81 suffered fatal injuries in 2017 and 94 in 2018, accounting for

22.24%. This means that air pollution from burning fossil fuels such as coal and diesel was responsible for more than 8 million deaths in 2018 (Pixabay user marcinjozwiak 2021). Oil and gas pollution has become a major cause of accidents, particularly in developing countries. Evidence shows that pollution could result in asthma, cancer and heart disease, which may lead to premature death. A large number of illnesses or ecological loss may advance from temporary to permanent disability as a result of oil spills (CSG 2017).

Besides the impact on human health and safety, pollution also leads to loss of productivity in agriculture and fishery, as well as additional project costs such as medical expenses (Charles Britton 2022). Additional expenses include workers compensation, litigation, insurance and rehabilitation programmes. This has continued to pose a great threat to a sustainable environment and the economy of Nigeria (Kate Hairsine, 2021). In addition, stakeholders, workers and local communities have less trust in the industry. Although statistics (Ite, ET I 2016, Ojijiagwo, et al 2017, Ite, 2018, and Odera, et al 2018) show a trend of improvement in reducing environmental pollution, there are still serious health and safety problems to be addressed.

Preventing environmental pollution in the Oil and Gas sector has become a significant matter that needs an innovative approach. Previous initiatives have not considered the potential impact of an integrated management system for environmental, health and safety (EH&S) management system in the Nigerian Oil and Gas sector. Furthermore, the current literature does not give a wholistic view of how integrating framework techniques could be used to promote EH&S in the country. Therefore, this research project is being undertaken to answer the fundamental research questions contained in 1.5.1 with the aim and objective contained in 1.4 and 1.5 of chapter one.

1.3 Scope of the research/ rationale and justification

According to the WHO, environmental pollution is increasing around the world, with oil and gas contributing more than 40%, (Jillian and Jeff 2021 and Jonathan 2020), particularly in developing countries like Nigeria. Researchers from the University of Hull and Hull York Medical School

found microplastics in the deepest section of the human lung due to inhalation (Hull York medical school 2022). There were 4,919 oil spills in Nigeria between 2015 and 2021, roughly 400,000 barrels of oil spill per day (Agency Report, 2021). The Nigerian O&G sector has the highest oil spill in the world (i.e highest environmental polluting country) second being Mexico with 5,000 to 10,000 barrels of oil spill per day (Agency Report, 2021).

Studies show environmental pollution reduces quality of life and increases health and safety ClientEarth, (2021) and Hull York medical school (2022). It also aggravates breathing conditions and increases health risks leading to untimely death. Example, the three globally deadliest health problems caused by Oil and Gas air pollution such as strokes, cancer or chronic respiratory disease (Olaifa, 2018 and Peterson, 2019).

Another reason for the integration of oil and gas management in Nigeria is because Nigeria is affected by the poor quality of health and safety management. According to Akindare, (2020), approximately 77% of health care spend in Nigeria are out-of-pocket. This means that 23% of health and safety is delivered by the government, so ordinary Nigerians have extremely limited access to quality health care, particularly the host community (Abubakar, et al 2022). Evidence by Welcome (2011) signifies that most of the citizens living in rural areas (of the O&G host communities) are devoid of good health and safety (Raimi, et al 2019). They suffer several infectious disease outbreaks and mass chemical poisoning from Oil spill and Gas flaring (Sako, 2017, Ruth and Kelechukwu, 2022). Evidence by Nriagu et al (2016) and Elum (2016) call for daily needs and adequate sustainable health management, because what is ideally obtainable currently is ranked as 143rd of 163 independent nations around the world (Mukhtar 2021). Therefore, the choice of Nigeria for this research is vital. This research therefore sees the oil spill and the quest for its management as a catalyst for the improvement of environmental, health, and safety (EH&S).

1.4 Aim

The research aim is to develop a framework for minimising environmental pollution in the Nigerian Oil and Gas sector.

1.5 Objectives

1. Identify the previous and existing roles of Oil and Gas and the relationship between environmental, health and safety in the Oil and Gas sector
2. Examine the current and the preceding issues of Environmental, Health and Safety
3. Develop a sustainable framework that integrates environmental and health and safety management systems for managing environmental pollution
4. Design a framework that incorporates both environmental and health and safety management systems for managing environmental pollution in the Oil and Gas sector

1.5.1 Research questions

The aim of this research constitutes the research question, which are answered in accordance with the research objectives.

- What is the background to O&G and environmental pollution in Nigeria?
- What is the impact of O&G pollution with respect to EH&S in the country?
- How can O&G environmental pollution be minimised in Nigeria?
- Can the EH&S management system be integrated?
- What is the cost of integrating EH&S management systems in Nigeria's O&G industry?

1.6 The Research Limitations

- A few relationships identified in the literature review were based on logical analysis.
- The study is limited to the Nigerian Oil and Gas sectors.
- Only management practitioners of EH&S in O&G sectors were considered as samples for the study, hence no other departments were included in the study.
- Practicing management system was used as a unit of analysis.

- Due to the undesirable effects associated with O&G environmental pollution, which are discussed in detail in chapter 2 and 3 of the study, it is imperative to evaluate and determine their impacts on local communities.

1.7 Research Methodology

The value of management practises in fostering fair environmental health and safety has been a source of heated dispute in Nigeria's oil and gas sectors for decades. While some scholars and practitioners perceive it as a production system that exposes ecology to poor health and safety, others see it as a way to promote environmental safety. The majority of studies offer techniques for promoting environmental, health and safety. Nevertheless, there is little or no empirical data to support these claims. The research used a mixed method approach to investigate the relationship between environmental, health, and safety problems and management systems, based on experiences and understandings from the oil and gas industries. The study took a pragmatic approach, combining qualitative and quantitative research methods.

In this study, ethical approval was sought for and obtained from the University of Wolverhampton's School of Technology Ethics Committee for the primary data collection phase of the research. For the qualitative study, a phenomenological strategy was adopted, which meant that the experience, opinion and descriptions of environmental problems were used to study the phenomenon and develop patterns relating to the relationship between management systems and the environmental, health and safety problems in the Oil and gas sector.

This was preceded by a thorough assessment of the literature to determine the origins of the relationship. The literature review was conducted utilising electronic databases, national and international journal searches, bibliographies of relevant articles, citation searches, and inter-library lending services for relevant materials, textbooks, news, and published Ph.D.

The goal was to establish the present body of knowledge on potential areas of Oil and Gas environmental pollution caused by health and safety problems, and interactions between

management systems and health and safety in the form of integrated environmental, health, and safety management systems. Relevant information gathered through the literature search on Oil and Gas management systems and environmental, health and safety problems, and their interrelationships was analysed, via development of preliminary study.

In order to confirm, buttress and analyse the outcome of the literature study, a preliminary survey was designed comprising a questionnaire and an interview. The questionnaire was given out to 131 Oil and Gas practitioners. There were 5 invitations for interviews, and sixty-four (64) with three (3) interviews were granted upon completion of return survey questionnaires based on the proposed method (Mixed method approach). This was utilised to create a management tree; the tree depicts how an integrated Oil and Gas management system could be used to promote environmental health and safety.

An exploratory study was conducted based on the results of the literature review and the semi-structured (preliminary survey gap) analysis in order to fully construct the conceptual framework. A total of 66 management teams were surveyed, with 5 interviews conducted to help build and confirm the links and concepts given in the framework. The findings were used to refine the framework after the qualitative data was analysed using a thematic content analysis approach. Quantitative analysis was also utilised to test the conceptual framework of the many components. Descriptive statistics, inferential statistics, inter-rater agreement, and statistical significance tests were used to analyse the quantitative data. The descriptive and inferential statistical analyses were done with SPSS, while the other agreement and statistical significance tests were done with NVivo.

An integrated framework was built based on the findings of the literature review, preliminary survey and research survey to guide how Oil and Gas management approaches may be applied to promote integrated environmental, health, and safety in the Nigerian oil sectors. The validity of the framework was determined using a survey of ten (10) oil and gas professionals.

Finally, conclusions were drawn to indicate that the research made an original contribution to the body of knowledge, and the highlighted issues were summarised to illustrate how the goals and objectives of the research were met.

CHAPTER 2.0: REVIEW OF PREVIOUS AND CURRENT ROLES OF OIL AND GAS PRODUCTION AND ITS SIGNIFICANCE

2.1 Introduction

The first chapter presented an overview of the world's O&G history. The primary goal of the study is to determine the previous and current roles of O&G production, in order to identify and document the causes of mishaps and investigate how they connect to EH&S degradation in the O&G industry. As a result, this chapter begins with a review of O&G production and its significance around the world and in the global economy. In addition, the chapter considers the United Nations and O&G organisations view, followed by history of oil-producing countries in neighbouring countries and internationally. The chapter also considers the discovery of oil in Nigeria, the natural environment, natural disasters and pollution. The importance of management is also discussed, as well as a management case study and the impact of management on workers. Finally, the chapter identifies possible linkages/relationships between Nigeria's oil production as a developing country and those of developed countries.

2.2 History of crude oil and natural gas (O&G) production

Crude oil has existed before new technologies. Fritzie (2009) revealed that 40,000 years ago, asphalt was used in the construction of towers of Babylon walls, and there were oil spots in Zacynthus, Lnian Island, close to Babylon. A great quantity of oil was found in the banks of the river Issus of Ardericca (Fritzie, 2009). As confirmed by the Holy Bible, Genesis Chapter 11 verse 3 and 4 (especially 3), 'They said to each other, "Come, let's make bricks and bake them thoroughly". They used brick instead of stone, and tar for mortar. Then they said, "Come, let us build ourselves a city, with a tower that reaches to the heavens, so that we may make a name for ourselves; otherwise we will be scattered over the face of the whole earth". The corroboration of such building existed in the Darius Palace in Susa and the Ziggurats of Ur (Anonymous 1, 2015).

According to Sabitova and Shavaleyeva (2015), oil was exploited in Roman Moldavia, Dacia, in 1769 by Dimitrie Cantemir, named Picula in Romanian languages. Likewise, oil was named 'burning water'

in Japan and ‘石油 Shíyóu, literally rock oil’ in China. The first oil well in China was drilled in 347 AD; the hole was dug with bits attached to bamboo poles with a depth of 800 feet, which is approximately 240 m (Rahman, 2004). In the ninth century, tar was used in paving Baghdad Street, and kerosene was used in lighting upper rooms of society houses (Fritize, 2009; Anonymous 1, 2015). Between the 10th and 11th centuries, the production of chemicals through Al Ambig used kerosene lamps. Likewise, oil was distilled by the Persian and Arab militaries to produce flammable war materials (Frederick-Jacobus, 2005).

Oil production was popular and exploited by Islamic people in Spain, until the 12th century when Sir Walter Raleigh made extraction available in Western Europe and the Americas (Adati, 2012). North American oil springs appeared in Pennsylvania in 1753. Before this time, Greek teacher Eirini d'Eyrins and Russian-born Swiss physician discovered asphaltum at Val-de-Travers in 1710-1711 (Neuchâtel) and established a bitumen mine in de la Presta from 1719 to 1986 (David, 2014). The first oil well and refinery by Empress Elizabeth of Russia was built in Ukhta by Fiodor Priadunov in 1745 (Oil Now, 2017).

Oil's modern history began in the 18th century, with the first well being drilled in Baku in 1846. (Bibi-Heybat settlement). Oil exploration was conducted with percussion tools having a depth of 21 m (Mir-yusif, 2012). In the same year, Abraham Pineo Gesner's discovered the kerosene refining process for coal in Nova Scotia (Fritize, 2009). Evidence reveals a natural petroleum seepage in 1847 by James Young, suitable for lighting lamps and lubricating machinery. In 1850, Canadian geologist Abraham Pineo Gesner discovered oil shale, liquid fuel from coal and refined bitumen, creating a gas light company and lighting the streets and cities of Halifax in Canada (Fritzie, 2009; Mir-yusif, 2012). The company expanded in 1854 to New York and Long Island in the United States, where North American kerosene gas light was created.

Meldrum & Co the world's first commercial oil company refinery and oil works began in West Lothian in 1856 by Edward William Binney and Young Meldrum named E, Meldrum & Co at Glasgow and E. W. (Dundee, 1875). Binney & Co. was located in Bathgate, using local shale,

bituminous coal and torbanite extracted to manufacture lubricating oil and naphtha solid paraffin for lighting (Dundee, 1875). Few years after, Edwin Drake drilled a 69-foot oil well, with an estimated 25 barrels per day in Creek, near Pennsylvania and Titusville in the United States (Annex, 2017). Crude oil was discovered in Warren, Pennsylvania, by David Beaty in 1875, leading to the opening of the Bradford oilfield refinery, which produced 77% of the world oil supply in the 1880s (Granitz, and Klein, 1996).

Between 1881 and 1950, significant oilfields were discovered across the globe. Examples are Peru in 1863; Zorritos District, Dutch East Indies, in 1885; Sumatra, Persia, in 1908; Masjed Soleiman, Venezuela, in 1914 and Maracaibo Basin, Alberta, Canada, in 1947. This also includes Oil Rocks Neft Dashlari in 1949 at the Caspian Sea, off Azerbaijan (Kalyuzhnova, 2008). However, coal exploration and/or extraction remained paramount up till 1950s before it was replaced by oil spinoffs. In 1956, oil was discovered at Oloibiri in Bayelsa State, which is in the Niger Delta of Nigeria (Gighi et al., 2012).

Nigeria has 2.58% of the total world population, estimated at 213 million, according to the United Nations Worldometer data as of 31 December 2021 (Simona Varrella 2021). It is, situated on the west coast of Africa with black Africans and, lies on the latitudes of 3° to 14° on the east of the Greenwich Meridian and 4° north of the equator. It has an area of 923,768.64 billion m² (Toyin and Mathew, 2012). Its currency is Naira & kobo and has a three-tier political structure: federal, state and local government. Nigeria shares boundaries with the Republics of Benin, Niger, the Gulf of Guinea in the southeast of Cameroon and Chad in the north.

Nigeria's major industrial complexes are steel, located in Ajoakuta, Osogbo, Aladja, Katsina and Jos; fertiliser in Kaduna, Kano, Onne Port Harcourt and Minna; aluminium smelting in the main seaport located at Ikot Abasi and O&G refineries at Oloibiri and Ubata (Osondu, 2017). Nigerian crude oil was discovered by Royal Dutch Shell (RDS) (formerly known as Shell British) Petroleum. The majority of oil production in Nigeria takes place in the Niger Delta, with four state-held refineries. The first and second are located in Port Harcourt, the third in Kaduna and the last one

in Warri, capable of producing 438,750 bbl/d (Digha et al., 2017). In 1958, Nigeria's first oilfield came on stream with the production of 5,100 barrels per day (bpd) (Allan and Chilenye, 2014). However, in 1960, the Niger Delta exploration rights offshore and onshore were extended to other foreign companies, including the EA oilfield located in Warri, southeast of Nigeria, inside shallow waters in 1965.

In 1971, Nigeria joined the Organisation of Petroleum Exporting Countries (OPEC). The Nigerian National Oil Company was established in 1977; before this, operation of the Nigerian Bitumen and British Colonial Petroleum have been in existence since 1908 at Okitipupa. Addax Petroleum (AP) had a certified exploration license to obtain oil from Nigeria, followed by Mobil Oil Corporation in 1955 (Anthony, 2012). Nigeria's first oil company, Shell, commissioned crude oil from Bonny Terminal in 1961; Nigeria also accepted the operation of Texaco overseas in the same year (Anonymous 1, 2015). A gas field by Phillips Oil Company in the then Bendel State in 1965 was supported by Agip oil production at Ebocha with 12,000 bpd (Ibama and Eyenghe, 2015). In addition, between 1966 and 1967, Phillips developed two oil drills at Osari and Gilli-Gilli in the then Bendel State.

Between 1968 and 1971, Mobil Producing Nigeria Limited commissioned and started production from four wells at the Idoho Field and Qua Iboe Terminal, and Gulf's Terminal at Escravos was commissioned as well as Agip production (Enaruna, 2013; Anonymous 1, 2015). At the same time, the department of petroleum resources inspectorate (PRI) endorsed and commissioned Shell's Forcados terminal (Vassiliou, 2018).

Nigeria's federal government took 35% of shares in oil companies in 1973, which was increased by the second Participation Agreement to 55% in 1974. In 1979, the Nigerian National Oil Corporation (NNOC) was restructured into the Nigerian National Petroleum Corporation (NNPC) under Decree 33, and third participation increased the federal government's equity to 60% and later to 80% with Shell's 20% (Genova, and Falola, 2003 and Vassiliou, 2018).

In 1984, Shell changed its name to Shell Petroleum Development Company of Nigeria (SPDC), and in the 1984–1986 Agreement consolidated and signed a memorandum of understanding which established a joint venture with NNPC. The fifth agreement by the federal government through NNPC in 1989 showed Agip 5%, Elf 5%, Shell 30% and NNPC 60%; in 1993, the equity was Agip 5%, Elf 10%, Shell 30% and NNPC 55%. Between 2000 and 2020, several agreements were signed (Kingston and Iragunima, 2020).

2.3 Oil and gas in the world economy

O&G is wealth (Kingston and Iragunima, 2020). The production of O&G has a direct and indirect impact on countries and their domestic economies. According to Johnson (2017), O&G is not just wealth for the industry or producers but also wealth for the entire world and everyone across the state. It provides more than half of the world's energy. O&G is the power or engine of the world economy; its absence would have entire countries grinding to a halt, according to the OPEC (Maizar, 2014).

Tsvetana (2018) described O&G as the world's leading commercial energy for many decades. The consensus is that its primary function will be maintained well beyond the 21st century. Likewise, Irakli (2015) considers O&G as the backbone of the world energy, which will surely remain for a thousand years. Despite the growth in alternative energy sources, the demand for O&G was 20% higher than yearly production. Anthony (2012) disputed the assumptions of most researchers about the failure of O&G in the world energy market. He noted that most countries are either directly or indirectly affected by low production or influenced by market rates.

2.3.1 The world's Oil and Gas economic growth

O&G enhances the world's economic growth and energy needs by 60% to 70%; this also brings about 4% to 50% increase in industrial production (Maizar, 2018). Its uniqueness and accessibility mean that thousands of tools and machines run daily with O&G, and hundreds of modern technologies are made using the same natural resources. Low costs, ease of transport and

versatility of refined products have made them some of the most important raw materials, (Hans-wilhelm, 2016). In addition, O&G contributes about 65% of the world's energy supply. Bob (2017) stated that advances in technology have become advantageous to the O&G field by increasing safer, cleaner, easily accessible and transportable operations in the industries.

According to Irakil (2015), all country and state economies are subject to the flow of O&G prices; whenever they increase, it automatically affects the prices of other products. Beyond this, they also restrict and predict the movement of people. O&G has been in existence for over 50,000 years; yet, it has always met energy needs, even during and after World War II (Rahman, 2004). The lowest energy consumption in the world today is from European countries at 30%–40%, and the most energy consumption has been from the Middle East at 60%–70% according to statistics (John, 2017). In the developing world, Asian countries, China, and India will remain the key sources of oil demand increase (Heli and Laura, 2017). The total world O&G consumed per year is 39 billion barrels, nearly 25% of which is from the United States (John, 2017), see Table 1 for more details. It specifically highlights the top 15 O&G producing countries, while Table 2 shows the top 15 O&G reserve countries from 2016 to 2017.

Table 2 1 Top 15 O&G production countries in the world (source: Mohammad, 2017)

NO	COUNTRY	OIL PRODUCTION BPD 2016
01	Russia	10,551,497
02	Saudi Arabia (OPEC)	10,460,710
03	United States	8,875,817
04	Iraq (OPEC)	4,451,516
05	Iran (OPEC)	3,990,956
06	China	3,980,650
07	Canada	3,662,694
08	United Arab Emirates (OPEC)	3,106,077
09	Kuwait (OPEC)	2,923,825
10	Brazil	2,515,459
11	Venezuela (OPEC)	2,276,967
12	Mexico	2,186,877
13	Nigeria (OPEC)	1,999,885
14	Angola (OPEC)	1,769,615
15	Norway	1,647,975

Table 2 2 Top 15 O&G reserve countries in the world (source: Mohammad, 2017)

Proven reserves (millions of barrels)		U.S. EIA (start of 2017) [1]		OPEC (end of 2015) [2]		BP (end of 2015) [3]		Other	
NO	Country	Rank	Reserves	Rank	Reserves	Rank	Reserves	Date	Reserves
01	Venezuela	1	300,878	1	300,878	1	300,900		
02	Saudi Arabia	2	266,455	2	266,455	2	266,600		
03	Canada	3	169,709	26	4,118[4]	3	172,200	end 2014[5]	171,000
04	Iran	4	158,400	3	158,400	4	157,800		
05	Iraq	5	142,503	4	142,503	5	143,100		
06	Kuwait	6	101,500	5	101,500	7	101,500		
07	UAE	7	97,800	6	97,800	8	97,800		
08	Russia	8	80,000	7	80,000	6	102,400		
09	Libya	9	48,363	8	48,363	10	48,400		
10	United States	10	39,230	10	36,685	9	55,000	ENI, end of 2015[6]	43,629
11	Nigeria	11	37,062	9	37,062	11	37,100		
12	Kazakhstan	12	30,000	11	30,000	12	30,000		
13	China	13	25,620	13	25,132	14	18,500		
14	Qatar	14	25,244	12	25,244	13	25,244		
15	Brazil	15	12,999	14	16,184	15	13,000	ENI, end of 2015[6]	16,848

2.4 World energy GDP

Figure 1 shows the prediction of world energy GDP growth and energy consumption by region (OECD continues to have the largest share of world oil demand followed by China, India, non-

OECD Asia, Africa and others). Likewise, Figure 1 reveals the statistical future reference for population growth by region, GDP growth by factor and GDP growth by region.

Growth in GDP and primary energy consumption by region

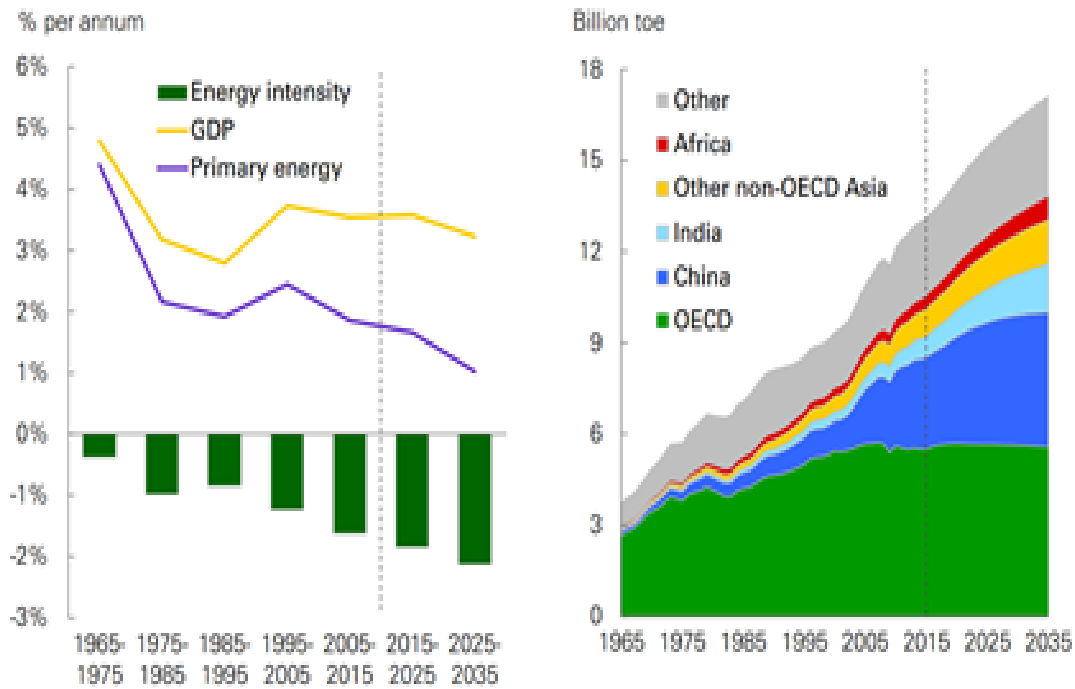


Figure 2.1 GDP and energy consumption by region (Annex, 2017).

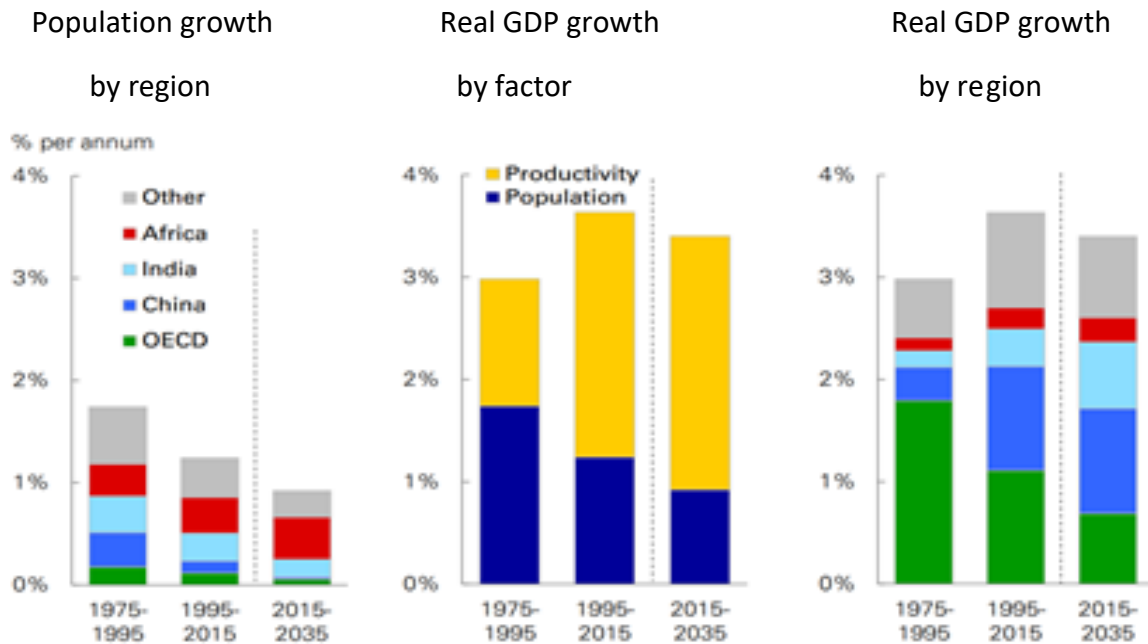
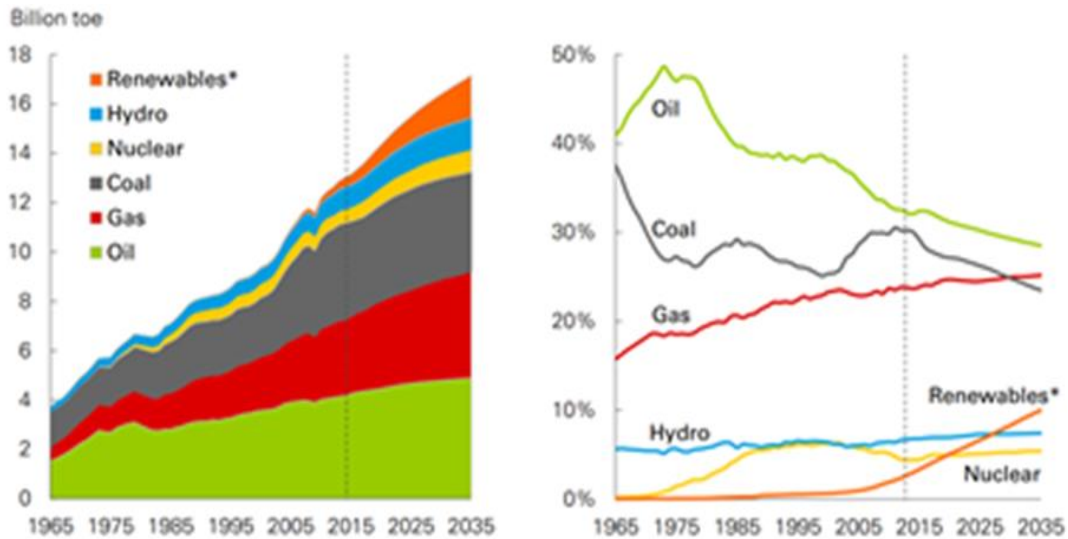


Figure 2 Future reference of population growth by region, GDP growth by factor and GDP growth by region (Annex, 2017)

2.4.1 Future reference to meet global Oil and Gas needed

A total of 115 million bpd is needed to meet global O&G needs by 2025; by 2030, the figure rises to 118 million bpd, an average growth of 1.7% annually (Annex, 2017; Hans-Wilhelm, 2017). Mir-yusif (2012) argued that to secure the world economy, oil and natural gas need to grow rapidly. Figure 2.4.4 shows the rate of growth (Mir-yusif, 2012).

Evidence suggests a possibility of increased natural gas demand in the years to come due to the rapid growth and accessibility of liquefied natural gas across the globe (Bob, 2017). Heli and Laura (2017), believe there is a possibility that oil demand will be slightly reduced in future as technology improves and focus moves to autonomous driving, electric vehicles and car charging. However, Hans-wilhelm (2017) believes that despite energy alternatives and the sustainable and renewable initiatives, none have been able to contribute or supply significant world energy requirements; they are either simply unreliable, difficult or expensive.



Primary energy consumption by fuel Potential shares of primary energy
 Figure 2 3 Gas in energy transition gaining rapid improvements (source: Annex, 2017)

2.4.2 Oil and gas demand

Oil demand is growing (OPEC); it will continue to be the world's most important source of energy beyond the 2022s (Mohammad, 2017). Oil would remain the world's biggest source of energy; as shown in Figure 2.4 (Cook, M., 2021).

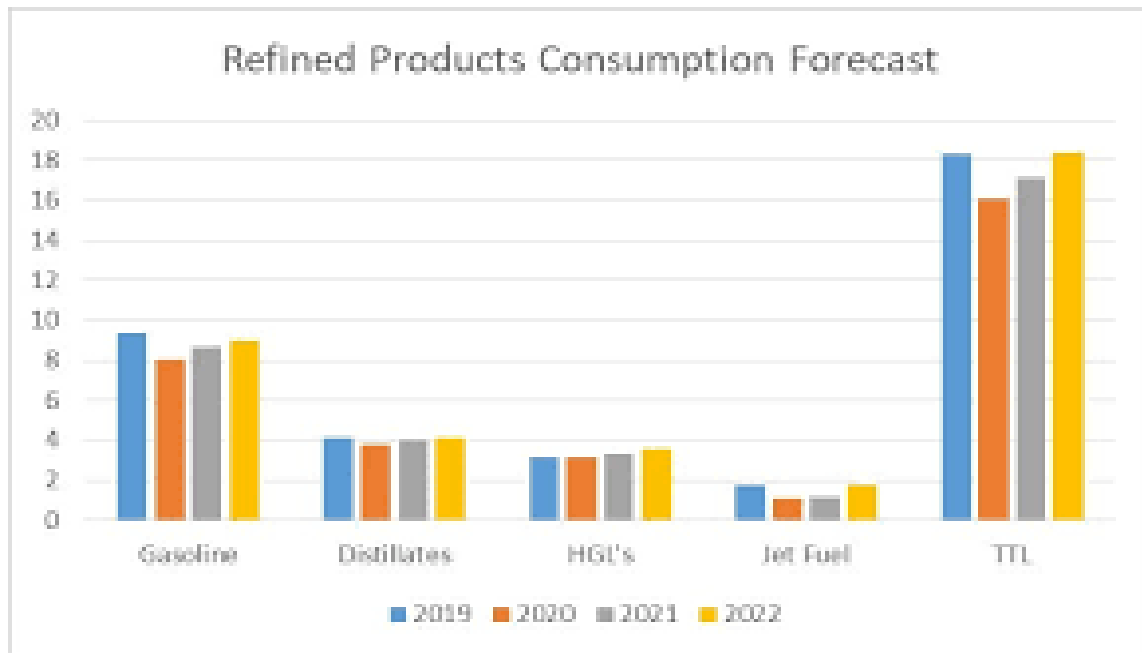
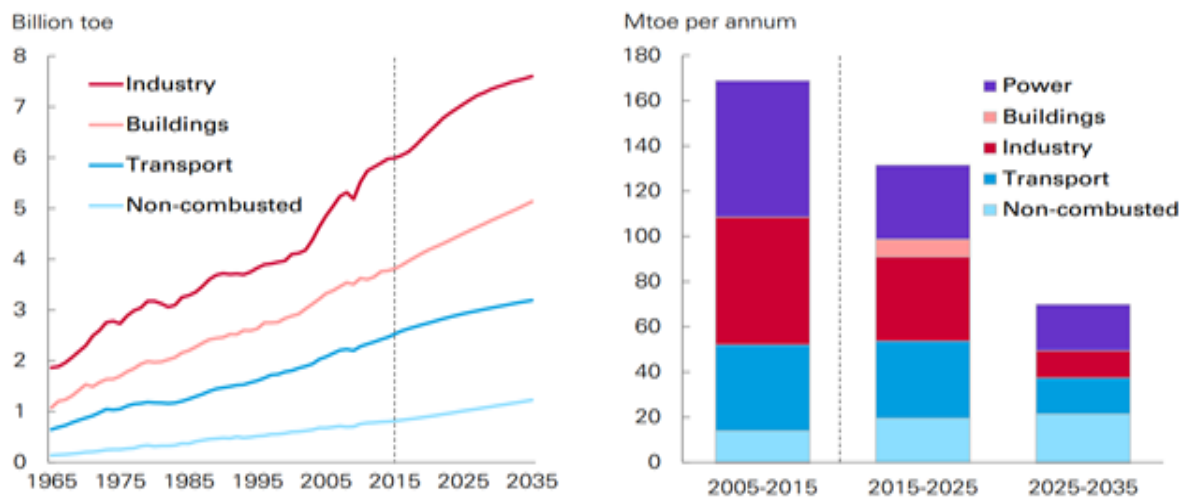


Figure 2 4 O&G demand growing stronger till 2020 (Cook, M., 2021)

2.5 Importance of O&G in the world

There is much evidence on the importance of O&G to the world at large. John (2017) described it as our day-to-day life, what we do, what we touch, where we stay and the infrastructure we see. Evidence shows that 40% of energy is consumed by industry, 30% by building, 22% by transport and other sectors, 8% in 10 years (John, 2017). Figure 2.5.6 below displays the importance of O&G in total energy consumption and fossil fuel demand in each sector.



(a) Total energy consumption by final sector

(b) Fossil fuel demand growth by sector

Figure 2.5 Importance of O&G in total energy consumption (Annex, 2017)

2.5.1 Importance of hydrocarbon in human lives

According to Allan and Chilenye, (2014) failure to properly secure energy supplies would cause nations to collapse because of its impact on the human condition and human productivity (Allan and Chilenye, 2014). In addition, oil accounts for one-third of humanity's primary energy supply, up to 94% if natural gas is included. O&G powers 99% of all transportation, and nothing can be moved faster than 25 mph without oil (Audun, 2010). Rahman (2004) states that the operation of modern militaries is abortive without O&G, which is also significantly useful in every human activity such as agriculture. UKOOG (2015) and Agbonifo (2016), Table 5 below highlights the important day-to-day uses of hydrocarbons.

Table 2 3 Importance of hydrocarbons

Importance	Uses							
Health	disposable syringes		coatings for pills		binding agent for creams			
School	crayons	ink and cartridges		coverings on books		glue	rulers	binders
Leisure	bicycle handlebar grips		CDs	tyres	house and vehicles heating		crash helmet	videos
Leisure	football boots	cassette tapes	windsurfers	camera film	artists' paint		roller blades	shin pads
Office	phones and faxes		chairs	computer hardware		printing ink		pens
Cooking	cling film	non-stick pans		storage containers				
Homes	paint	contact lenses		dry-cleaning fluid		fabrics	clothing	nail polish
	shampoo	washing up and laundry		deodorants				
Shopping	credit cards	plastic milk bottles		egg cartons		shopping bags		
Building	pipes	asphalt	petrol	diesel	roofing tiles		insulating material	
Garden	fertilisers		pesticides		garden furniture			

2.5.2 Likely effect of hydrocarbons

Chris et al (2013) and Irakli (2015) highlighted the negative externalities of O&G production in our environment. For example, environmental degradation affects between 50%–90% of human

life. It is inimical to environmental regulation including noise pollution, climate change and impacts cultural and ecological resources (UKOOG, 2015).

2.6 The United Nations (UN) and O&G production

The United Nation (UN) has taken an interest in O&G development over the years. The fundamental principles applied is to integrate the development strategy to promote environmental well-being without severely undermining sustainability (Agbonifo, 2016). Over the decades, economic growth, employment and the natural environment have been driven through O&G in public- and private-sector investments. Although these induce environmental pollution and carbon emissions, biodiversity and loss of ecosystem services, they also enhance energy and resource efficiency. The strategies for Oil and Gas sector have been implemented through advanced eco-tourism, climate change policy and a framework for developing occupational health and safety at the workplace (UKOOG, 2015; Agbonifo, 2016).

UN policy encompasses national and international O&G companies, pipeline companies, exploration companies, oil service companies, joint ventures and other contractors, including business actors, whether onshore or offshore. The policy was divided into two parts: human rights in the O&G sector and respect for the environment and environmental practice (Dupuy, and Viñuales, 2018). However, the policy covers human rights for workers and respect for internationally recognised human rights, including rights for individuals, groups or anybody in a position of vulnerability (such as local communities, children, women and indigenous peoples).

The guide applies to owners of activities and their business relationships, including third parties in O&G companies. It also includes companies that are one or more steps removed from the value chain and ones with direct relationships (Emetumah, 2016). The policy explores commitment, promotes respect for the environment, as well as health and safety and O&G host communities both internal and external, local and international. Continuous respect is also required for culture, staff and business partners, which triggers a range of actions that require commitment in practice (Idemudia, 2018). It encourages the Assimilation of appropriate approaches and languages for

culturally relevant advice. It is significant for O&G companies to consider how EH&S can be integrated and how workers and other stakeholders, particularly local or host communities, should access information, for example, via spoken, written or visual means; and with or without the use of technology (Idemudia, 2018).

2.6.1 Nigeria's O&G production and United Nations directive

Nigeria's O&G production companies failed in national and international policy according to the UN through Mike Cowing, the head of the environmental team. Human rights, development, environmental rights and the centre for environment policy have been capsized in Nigeria's O&G system. In line with the report, a three-year investigation by the United Nations Environment Programme (UNEP) disclosed 9 million barrels of oil spilt in host communities over the past half-century, nearly twice that of the Gulf of Mexico at 4.9 million barrels during the Deepwater Horizon disaster in 2010. This contaminated lands, air and water including underground water (in Nisiooken Ogale) from which people were drinking contaminated wells with benzene, which could cause health issue such as cancer 900 times above World Health Organization (WHO) guidelines (Onu, 2019).

The Independent Scientific Assessment (ISA) and UNEP described the existence of environmental pollution to be continuous of over 50 years of production in the country. Penetrating deeper and further than many may have supposed, most areas appear unaffected at the surface but are severely contaminated underground (UNEP, 2017). The restoration of those host communities could prove the most long-term oil clean-up exercise and the most wide-ranging in the world (UNEP, 2017). Thus, a comprehensive study on EH&S has been called for to protect human health and reduce the risks that affect potential environmental or host communities safety without delay.

2.7 Oil and Gas at the global level

The O&G companies' responsibility has become well-known and active in recent years in understanding human rights and addressing the issues linked to their operations. According to Welford, (2016), every human is entitled to rights without discrimination; however, the basic aim in O&G standards is to secure EH&S dignity and equality for people. The International Labour Organisation (ILO) pointed out the negative impact of O&G on EH&S and the local communities around their operation. Thus, they set out fundamental principles and rights at work, which embrace the EH&S management system, for example, rights to life, to favourable conditions in each environment, e.g., land, water and air and freedom of expression. The International Covenant on Environment, Social and Cultural Rights (ICESC) and the International Covenant on Civil and Political Rights (ICCPR) with the Universal Declaration of Human Rights (UDHR) address the freedom of host communities from environmental pollution, forced labour and child labour. They provide clarity on potentially marginalised individuals' or groups' human rights. They also acknowledged that not enough attention to human rights in O&G can lead to potential scarcity, high risk to health and safety and high costs of living within the environment.

The International Petroleum Industry on Environmental Conservation Association (IPIECA) underlines the importance of the development of tools and support for O&G good practice with regard to respect for environmental human rights in each country. Several large companies, governments and civil society groups have come together to launch multi-international stakeholder initiatives aimed to prevent environmental and negative human rights impacts and minimise pollution in O&G sectors for the security of the environment. However, evidence shows many O&G companies in various countries playing important roles in supporting environmental development via the provision of energy and generation of significant revenues which reduce poverty (Sadaghiani, et al 2015).

2.7.1 Oil and Gas Production in The United States

In the United States, O&G production began from the 1820s to the 1850s (Mark, 2016). In 2015, the production was 767.3 billion cubic meters of natural gas and 567.2 million metric tonnes of crude oil. Similarly, more than 300,000 bpd were produced in 2017. The United States has the world's fifth largest natural gas reserves and ninth largest oil reserves (Erahman et al., 2016). They also consume 27.5 trillion cubic feet of natural gas and 851.6 million oil barrels per year, with 12.4 million barrels of oil daily including natural gas.

The United States depends on the strength and health of the O&G industry. Although the industry has grown for a period of time with more investments in drilling and pipelines, the country is now poised to be a key exporter of O&G. The independent U.S. economy today counts on the production, exporting and deals in oil and natural gas across the world (Sarica and Tyner, 2016). Thus, the industry supports 5.6% of total U.S. employment every year, 10.3 million jobs in 2015, excluding any capital investment impacts. Despite the lower price of oil in 2014, the industry increased the GDP by \$1.3 trillion, accounting for 7.6% of the total national growth (Bob, 2017).

Evidence from the U.S. Bureau of Labour Statistics (BLS) confirmed the average wage paid in 2016 was \$174.832 yearly, excluding retail station jobs. Also, \$67 billion went to the economy in the same year (Dudley, 2018). The outlook of the U.S. economy has improved in two major ways: exporting rather than importing and constructing an energy market that brings money into the country rather than out of the country. Therefore, the United States has become profitable with lower energy and gasoline costs for Americans without increasing the costs of oil and natural gas. Lower gas and utility bills across the country mean inexpensive goods, shipping and transportation. Also, less spending on utilities and gasoline increases businesses both local and national. Thus, the health of the American economy has always been directly associated with the O&G industry (Sieminski et al., 2018; Mark, 2016).

2.7.2 Oil and Gas Production in Saudi Arabia

Saudi Arabia acknowledges the importance of O&G in economic growth after eight years. The collapse of O&G prices from 2014 to 2015 enlightened Saudi Arabia to value O&G in the country's

economy. According to McFarland, (2020) the Saudi economy was firing on all cylinders back in the days when oil was at \$100 and above, unaware that the Saudi Arabia–Aramco crown jewel could be on the IPO block in a few years. Over the years, the Saudi economy and activities have strongly depended on O&G with strong support from the federal government (Aramco). Statistically, Saudi is the largest economy in the Arab world and the largest exporter of petroleum between the world’s first and second largest proven petroleum reserves every year (ZeroHedge, 2017).

The energy superpower with the fifth largest proven natural gas reserves has one-quarter of the world’s gas at 260 billion barrels (41 km³) according to Saudi government records (Bahrain, 2016). It is also known as having the third highest natural resources in 2016 with a value of \$34.4 trillion. However, the O&G sector accounts for 90% of export earnings, 87% of Saudi budget revenues and 42% of GDP. In 2014, the O&G prices crumbled, and the economy remained stagnant. Thus, the Saudi government enhanced private sector growth, especially in O&G sectors, to increase the GDP by 40% from the private sector. Likewise, increased employment opportunities enabled the government to post budget surpluses and boost spending on infrastructure development, job training and education and salaries. The government increased insight plans to launch six economic cities through O&G income (e.g., King Abdullah Economic City to be accomplished by 2020) expected to support the economy by \$150 billion yearly (ZeroHedge, 2017; Bahrain, 2016).

2.7.3 Oil and Gas Production in Russia

The Russian government declared a dual increase in GDP along with the growth of O&G (Simola and Solanko, 2017). Russia was blessed with an abundance of O&G with other natural resources, and the economy was rated as the sixth largest in the world and twelfth largest in terms of market exchange rates (Sabitova and Shavaleyeva, 2015). Russia has over 30% of the world's natural resources, with a total value of \$75 trillion according to World Bank estimates (Sabitova and Shavaleyeva, 2015). However, 52% of federal budget revenues, 16% of GDP and over 70% of total exports are accounted for by the O&G sector. It is the largest exporter of natural gas, has the world's largest proven natural gas reserves and the second largest exporter of petroleum (Heli and Laura, 2017). Average monthly wages were between \$450 and \$500.

The Russian economy experienced a recession a few years back because of falling oil prices. The statistic breakdown revealed that the Russian economy and the federal government's budget were highly dependent on O&G revenues (Sabitova and Shavaleyeva, 2018). The unstable worldwide economic situation or unpredictable O&G prices increased the budget risks of Russia from 2015 to 2016. However, evidence from Simola and Solanko (2017) proved the economy has begun to progress with a 0.3% GDP growth in the first quarter of 2017; progress continued with an increase of 1.5% before the last quarter of 2017, officially taking the country out of the recession. More is expected before the end of 2018 (Simola and Solanko, 2017).

2.7.4 Oil and Gas Production in Brazil

Despite the current meltdown of O&G all over the globe, the Brazilian O&G sector is fairly mature, independent and boasting O&G participation in several ways (Smith, 2018). O&G production rises by 4% year over year in Brazil, natural gas reaches 103.8 million m³ per day and 2.5 million oil bpd is produced, therefore increasing GDP by 13%. Interestingly, Brazil's industrial sectors and electrical power demanded 80.26 mm³/day, imported 28.33 million m³ oil pd and 3.81 mm³ of gas pd from Bolivia and cargoes to meet the yearly target in the past (Temer, 2018). This inspired the Brazilian government to appreciate the importance of the O&G industry in the economy and

implement the needed reforms. New policies and regulations arose to attract national and foreign investors.

The government formed a comity group to study the best ways of finding and exploiting O&G in the country and ways to attract foreign investors (Biscardini et al., 2017). In 2016, the answer to the government notion was manifested by the discovery of oil in 'Santos basins and ultra-deep waters of the pre-salt layer of the Campos' according to Brazil's Ministry of Mines and Energy (MME) (Guterres and Kituyi, 2017). Notably, the government tagged O&G sectors as the destined industry sectors for Cameroonians to improve market overview and trade data. The discovery gradually improved the number of employees in the country, had a positive impact on the Brazilian economy by increasing its GDP and reduced the unemployment rate from 9.9% to 6.2%, with 80,000 direct jobs and 320,000 indirect jobs in 2016, and in 2017, the direct jobs increased to 101,000 (Temer, 2018).

2.7.5 Oil and Gas Production in Nigeria

Over the past 50 years, Nigeria has been an abundant natural resource country, in particular the O&G sectors. The Nigerian economy is deeply dependent on these resources (O&G); the sector accounts for over 83% of government revenues and 97% of export earnings (Toyin and Mathew, 2012). In addition, 75% of the total economy bears witness to the massive progress of O&G activities. However, the O&G boom in Nigeria has led to the neglect of other economic resource sectors such as manufacturing and agriculture (Osondu, 2017). O&G has made various contributions to the Nigerian economy, playing a vibrant role.

Nigeria was known as the largest of Africa's oil producers, the 30th largest economy in the globe in terms of nominal GDP and 23rd largest in power parity purchasing (Gighi et al., 2012). Also, it is the largest economy in Africa, winning the largest re-emergent manufacturing sector in 2013 by producing a large percentage of goods and services for the West African subcontinent. It is ranked 10th in proven oil reserves at an estimated 35 billion barrels and natural gas of over 100 trillion fti (2,800 kmi) (Gbadebo, 2007).

The role of Nigeria's O&G in GDP increased steadily over the years. In 1965, the statistics accounted for 3.43% of GDP growth, increasing to 19.37% in 1975, 38.87% in 2005 and growing by 1.92% at the fourth quarter of 2017 (Eboh, 2017). However, 0.83% to -1.58% was recorded between 2015 and 2016, which strongly led Nigeria to a recession (luxury does not come without a price). Given that the oil section is an active sector in the Nigerian economy, the country's sector has grown impressively both in production and exportation. Christopher et al. (2017) stated that huge revenues from O&G present net wealth and provide an opportunity to improve expenditure and investment. As argued by Agbonifo (2016), the huge revenues (O&G) complicated macroeconomic management and also made the Nigerian economy highly oil-dependent, which is risky for any developing country.

The industry has contributed tremendously to local expenditure on goods and services, employment opportunities, government revenues, Nigeria's GDP, foreign exchange reserves and energy supply (Anonymous 2, 2018). According to Brown and Tari (2015), one of the main contributions to the Nigerian economy via O&G was the creation of employment opportunities. In the same vein, the Federal Civil Service Commission announced a working population between ages 15 and 64 in O&G of 110.3 million in Q2 2017 and 111.1 million in Q3 in the same year (Anonymous 1, 2015). Nigeria's labour force population rose from 83.9 million in Q2 to 85.1 million in Q3 2017. Primarily, 98% of the Nigerian economy depends on O&G for their livelihood (Anthony, 2017).

In view of all these positive achievements in the oil and natural gas sector around the globe, quite a number of factors still militates against its success drive across the world, mostly in Nigeria, topmost of which is the issue of integrating environmental management, health and safety (EM and H&S). The direct consequence goes to environments and environmental pollution, such as degradation of land and vegetation, water pollution and air and noise pollution (Schneider et al., 2013). According to Dibia and Onwuchekwa (2015), most Nigerians are facing industries with

environmental problems, health issues, safety problems, environments with hazardous chemicals and unsafe work environments via the environmental management of the O&G industry.

2.8 The Important of Natural environments

Natural environments can simply be referred to as the environment. This is a common term used to cover all-natural living and non-living things. Also, complete ecological units (microorganisms, rocks, vegetation, soil, atmosphere, and natural phenomena) function as natural systems within their boundaries and nature without massive civilised human intervention. In contrast, Boele et al. (2001) accepted natural environments as the survival of economic and human activity reliant on the specific type of weather, climate and natural resources. The aim of natural environments is to focus on environmental efforts, recovery of ecosystems and safeguard biodiversity and cultural and/or natural environments from dangerous substances as well as promote effective energy use, sustainable use of natural resources, good human health and patterns of consumption (Okhumode, 2017). Temer (2018) argued that the natural environment's aim is to comply directly or indirectly with all national and international natural environment legislation, integrate natural environment management into usual activities and communicate, embed and share best practices across communities, employees and employers and contractors and partners.

Surely, the natural environment contributes remarkably to people's H&S via the quality of water we drink, air we breathe, food we eat and some other natural resource use. In addition, it enhances recreational opportunities and national economic health.

2.8.1 Disaster arising from polluted environments

The natural environment might be greatly reformed or altered into a disaster or polluted human environment, threatened by human activities such as environmental pollutants, industrial processes, transportation, O&G disasters or waste management practices, including pathogenic organisms that can potentially harm people's H&S via a series of exposure. The Environment Research Funders' Forum (ERFF) recognised that integrating environmental, health and safety management systems (IEH&S) particularly in Nigeria's O&G is one of its precedence areas for joint work and research investment (Pamela et al., 2015).

According to Allan and Chilenye (2014), the environment can be polluted or affected by hydraulic fracturing. For example, rock fracturing requires certain amounts of natural water mixed with hazardous chemicals to extract oil from the rock strata. Water use during oil production is dangerous to environments. The hydraulic fracturing wastewater comprises dissolved chemicals and other contaminants that endlessly require treatment before reuse or disposal (Toyin and Mathew, 2012). Thus, improper handling or lack of good management of such wastewater may result in leaks or spills of fracturing fluids (David, 2014). However, the challenges, complexity and amount of money required for treating such wastewater lead most companies to dispose of such water by injection into deep wells, surface water or water aquifers (Adekunle, 2014). Nevertheless, such toxic wastewater in the environment could cause environmental disasters to EH&S such as earthquakes, losses of farms, fish, quality water and natural resources and death. Examples of such disasters are shown in Figures 2.6 and 2.7 below.



Figure 2.6 A leaked or injection of O&G wastewater into the river in Niger Delta (source: Nnimmo, 2016)



Figure 2.7 Leaks and spills of fracturing fluids in Bodo, Ogoniland Nigeria (source: Mohammed, 2012)

Nigerians' reviews have highlighted rapid industrialisation, urbanisation, increase in population growth and particularly O&G disaster as major challenges facing the environment and the EH&S system (Dibia and Onwuchekwa, 2015). According to research, environmental disasters and

pollution originate directly or indirectly from human activities, which affect the welfare of the natural H&S of every nation. As supported by Akinleye (2017), the existence of human control natural and physical environment is surrounded and affected by human activities, and human life is affected by polluted environments. Akujuru (2014) argued that environmental challenges in Nigeria originated from a lack of integrating environmental management (IEM). He recognised the high volume of environmental litter in Nigeria mostly in O&G sectors compared to other human activities.

The Department of Petroleum Resources (DPR) in 2015 revealed damage to EH&S, human life and property, with over 400,000 bpd of oil spills in Nigeria for decades. Negligible oil spills of 400,000 bpd to over half a million barrels in one single incident is shown in Figure 2.8 below (Ladan, 2016). However, Sieminski et al. (2018) noted the high volume of O&G environmental disaster through five main points: land acquired by facilities over the life of the O&G field, the number or size of wells, land disturbed by drilling activities, location with respect to natural resources and environmental management system (EMS). Examples are distance to cities, local community, surface water, wildlife use and natural resources.



Figure 2.8 Damage to human life and property and environment in Niger Delta Nigeria (source: Nnimmo, 2016)

2.9 Management goals

Association among leadership, planners and forecasters in the execution of skills aims to achieve specific goals or the art of getting things done correctly within an organised group (Adewole, 2014). Management is teamwork to find the most effective way of achieving business goals while sustaining the satisfaction of workers as a priority. In other words, Asamu and Arisukwu (2015) defined management as the administration of an organisation, either a government body, business or non-profit organisation. However, the role of successful management is full of activities and coordinates the attempt of workers to attain the goals of an organisation. The spirit of achievable management is the integration of EH&S and other natural resources to achieve the desired purposes.

According to Okafor et al. (2016), the success of management is determined by the range in which organisational goals are achieved because upstanding management is the backbone of successful economies and nations. Management is essential for human health and necessary to promote safety in environmental challenges. Hiraoka (2017) noted that the influence of a world management system on the environment and environmental disasters is a breakthrough in the world's EH&S and economic growth. Thus, the absence of management, the WHO and economic growth is unlikely to continue.

2.9.1 Campus Case Study of Effective Management

The UN engaged the Enterprise Risk Management (ERM) team to review the current UN headquarters campus design for renovation in New York City. The ERM was to evaluate the development of energy efficiency and environment/EH&S performance and determine the potential status against Leadership in Energy and Environmental Design (LEED) standards. In addition, the UN management team requested a potential blue-sky design showing cost-effectiveness for stakeholders and being EH&S friendly (United Nations, 2018).

In 2014, the WHO defined management as an integral, unignorable part of the universal economy, spanning nearly every industry (WHO, 2014). However, Adewole (2014) noted how management skills improve health services, medical devices and other areas of the H&S sector that have been enhanced via management developments in technology and sensors, including monitoring of diseases via small and powerful microchips, transferring of data through cloud connection and a higher standard of human health via a large number of drugs being developed.

According to Aliyu et al. (2014), managements means getting things done to attain life's objectives, and organisational management is defined as getting things right for other people to achieve its objective. However, Johansen described four types of managerial styles and their functions within the organisation: autocratic or authoritarian, democratic or participative, paternalistic and free-rein or laissez-faire (Johansen, 2006). According to him, free-rein management avoids responsibility and power and gives workers freedom to complete tasks with no direction. It also allows the group to work out its own problems and establish its own goals. Paternalistic management, defined as paternal (paternalism means 'Papa knows best') or fatherly management, is the type of management that allows the relationship between workers and their leadership. Likewise, it protects and guides workers as members of a family by providing subordinates with fringe benefits and good working conditions to assure that workers will work hard out of gratitude.

Democratic management decentralises authority, labelled as exemplary and persuasive rather than fear-based and forced management, and moderates and suggests ideas. It is willing to share work and support employees by encouraging participation in decision-making and delegating tasks for specific workers (de'Angelis et al., 2015). Authoritarian management takes control of authority, assumes full responsibility and centralises power with personal decision-making. Such management assigns tasks, gives orders without consulting or allowing ideas or opinions of subordinates and believes that authority alone can decide what is right in a given situation without workers influencing decisions.

On the concept of Environmental Health & Safety, the notion and attitude of the above four managements govern the environmental aspect. Capps and Harkey (2012) defined management as the alliance of output to input in relation to the environmental transformation process, as productivity is an index and ratio of output over input according to Asamu and Arisukwu (2015). Likewise, productivity can be reformed as a measure of ideas and resources managed and utilised for achieving a set of results. Thus, management is connected to the availability and use of resources, e.g., workers, meaning that productivity is reduced where organisation resources (workers) are not properly managed.

Evidence revealed that the average Nigerian organisation is authoritarian or autocratic in the production of the EH&S management system. The word 'management' in Nigeria's system is less considerate of workers, workers' ideas or EH&S in their managerial skills and rather cares for more input without good output (Taiwo, 2010). Meanwhile, management, according to Hanifen (2015), refers to the output per unit of factor input over a given period. Also, it is the ratio between the input of resources consumed and the output of wealth produced in the process of production. As argued by Kokkinidis (2015), on many occasions, workers in an organisation are less considered in EH&S management because of negative attitudes towards work. However, for Smallwood (2012) and Passas (2017), management style influences workers' attitude and productivity levels, and management identity affects workers' cooperation, decisions, performance and thus firm output.

2.9.2 A case study of a company on EH&S management issue

On 13 January 2014, a case of mismanagement and a lack of EH&S management was brought forward to Court ND in California. The case was between Gbarabe (a fisherman who resided in the Niger Delta, Nigeria) and Chevron Corporation (the main contractor). It was handled by Judge Samuel Conti with case Dkt. No. 30 at 10-11 and Dkt. No. 25 at 17-18.

A gas drilling explosion occurred on the North Apoi Field, five miles from the coast of southern Nigeria's Niger Delta region by the KS Endeavor drilling rig (the subcontractor for Chevron

Corporation). The explosion was alleged to be due to pump failure on the rig where 65,000 people were directly affected by health problems, losses of livelihood and environmental disasters involving water, land and food supplies within the community. The complainant also identified other community members who also suffered skin rashes and boils from the same health issues caused by the explosion. Thus, a petition arose out of the defendants due to negligence, wilful misconduct and depraved management skills. Hence, the court concluded that all areas that have been subjected to various degrees of damage and significant environmental impacts due to lack of management should be recompensed. Also, the court concluded that the petitioner failed to present the case accordingly but granted the defendant's motions in limine (N.D. Cal., Mar. 13, 2017).

The ability to share knowledge throughout organisations depends on how the management system is designed to enable subordinates' ideas to be utilised as if they were an asset. Bratton and Gold (2017) stated that management systems not only affect workers competence, cost-effectiveness and commitment but also determine long-term consequences for worker and environmental well-being. There is some evidence specifying that management designs may have effects on EMS and H&S, the environment and workers' mental health, physical health and longevity of life itself (Qing-gui et al., 2012). According to Kim et al. (2016), management designed to suit employees' free flow of ideas is measured as a better medium of motivating workforces towards higher production. As maintained by Hanifen (2015), encouraging management ensures the well-being of workers, which motivates employees to perform their various roles with all vigour, which may lead to higher productivity. However, dozens of Nigerian organisations have attempted to solve their EMS and H&S problems excluding O&G via the application of participative and paternalistic (authoritarian, see 3.3.1 and 3.3.2 for more details) innovative management techniques.

Dibia and Onwuchekwa (2015) studied conflicts of management surrounding Nigerian O&G production and reviewed the dynamics of environmental struggles in Nigerian O&G (mostly in

O&G host communities). Nigeria, highly environmentally free for decades, has diverse animal and plant species, including exotic birds and unique flowers, but not at the moment. Emuedo (2015) showed the violence between the host community's youths in Choba Rivers State and ODI Bayelsa State with O&G management, claiming over 100 lives and properties due to incompetent management and/or corrupt environmental management. For four decades, according to Tarabinah (2015), Nigerian oil-bearing communities have been left desolate in environmental degradation on the one hand and uninhabitable and poor due to neglect and hazards arising from O&G production on the other hand.

Transportation via the ecosystem became difficult (shown in Figure 9); thus, a statistics described it as graveyard for the high mortality rate experienced (Omeje, 2017). The frustration of long periods of neglect due to environmental pollution by the management of multinational O&G companies, the federal government, political parties of the communities and state/federal environmental agencies pushed the host societies to the wall. Thus, they took the law into their hands by taking up arms against O&G management and its political allies, establishing local refineries to earn a living (see Figures 2. 9 and 2.10 below); these were people who have fished and farmed for centuries. Unavoidably, evidence showed violence led to calls for a reassessment of O&G in Nigeria, particularly the need for an EMS and H&S management regime Tarabinah (2015 and Dibia and Onwuchekwa (2015).



Figure 2 9 Transportation via ecosystem: boatmen carry people through polluted water in Nigeria's Ogoniland region (source: Tarabinah 2015)



Figure 2 10 Arms against O&G management (source: Chika Ebuzor, 2016)



Figure 2 11 Local refineries (Balogun, T.F., 2015)

2.9.3 Management Influence

Management can increase the pressure on employees' mind to go far and ignore the rules. Onoh (2017) showed that a teamster told the writer that management instructed four-man teams to become three-man teams with extra work all around, engaging truckers to overload their rigs with some working past the legal limit in driving hours to earn more money. In addition, the crane operator fell asleep and lost control. According to Taiwo (2010), organisations that will succeed, survive and successfully grow will understand that their business will be more effective when their management head is not planted where the sun does not shine, as managing the O&G sector is like a hill marathon, not a race; thus, it is hard to see the goal when the view is obstructed.

2.10 Contextualising Nigeria and Other Countries in Oil and Gas EH&S Management

The upwards integration within developed countries has employed stakeholder engagement plan and embraced community development and consultation of stakeholder's concerns in the O&G sector (Dudley, 2018) and (Offshore Energy, 2022). It disclosed royalties, taxes and profit payments made to governments in support of sustainable development of local communities, the opposite of which is the case in Nigeria. Russians climbed to fifth on the environmental protection rankings while Nigeria was cited as having the world's most polluted cities among the seven worst countries on the human capital index (according to the World Bank) and the 11th worst place to be born a baby. Likewise, research showed Nigeria as having the second worst electricity supply and world's third worst city to live (Babalwa, 2018). Meanwhile, in 2020, Brazil ranked second in the G20 for fossil-free energy generation, with over 80% of electricity generated from renewable sources, mostly hydroelectricity (Muyi and Pete 2021).

Following the review outcome, regardless, Nigeria is the biggest and richest economy in Africa, among the top 15 oil-producing countries across the globe. Evidence has found Nigeria as 40th out of 50 countries in Africa in occupational H&S. However, study announced Nigeria 14th among the 18th worst H&S systems in the world, where 16,000 babies die per year due to poor managerial skill, oil spills and environmental degradation including 20% of the world's gas flares (Abubakar et al 2018). Evidence (Onwujekwe et al 2020) also asserted that Nigerian O&G and H&S management operated below international recognised standards to prevent or control chaos of hydrocarbons in environmental and H&S disorder.

O&G hazardous waste disposal problems are extensively growing in host communities. Evidence highlighted Nigeria as the fourth most corrupt country in the world, if not number one. In support, Abubakar et al 2018 noted the effects of politicians on Nigeria's environment, H&S and O&G (mostly appointing themselves as petroleum ministers) as the main setback. Similarly, (Olonisakin et al 2017) contends that highly placed persons and people in government implement laws that also prevent the course of justice by shielding criminals using political power.

Meanwhile, in developed countries, a political MP was jailed over lying to police in preventing the course of justice on a car speeding ticket. Pakistan's prime minister was found guilty of corruption and sentenced to 10 years in prison. Likewise, South Korea's former president was jailed for corruption, and Guatemala's former vice president was jailed for more than 15 years on corruption charges linked to the clean-up of a contaminated lake. These are rich people and highly placed politicians in the world.

2.11 Summary

This chapter examines the history of crude oil and natural gas (O&G) production. It also examines the first oil wells of every country and the effects they have had on the ecological system. A large amount of O&G is squandered annually - examples of which include, burning fossil and greenhouse gases (Christophers, 2019). Burning fossil and greenhouse gasses releases large amounts of carbon dioxide, sending heat into the atmosphere and causing global warming (ClientEarth, 2022).

This waste demonstrates great potential to alter the environment and cause climate change (Ref). Although developed countries such as the United States and Canada have put effective measures in place to combat O&G pollution, many developing countries such as Nigeria and Brazil still lack the necessary management skills to reduce hydrocarbon pollution. The irony is that Nigeria is the country with the greatest pollution as more than half of Nigeria's population is at risk of complete or partial environmental destruction, which is not going to improve anytime soon (Nwankwo et al 2022).

The importance of hydrocarbons to environmental, health and safety were also discussed, followed by the likely effects and standard of Oil and Gas production in five developed and developing countries, the United States, Saudi Arabia, Russia, Brazil and Nigeria. Using existing Nigeria's O&G management system as a basis, natural environments and disasters that may result from the early stages of oil production have also been highlighted.

3.0 CHAPTER THREE: ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

3.1 Introduction

The first chapter provided historical context, while the second chapter identified prior and current O&G duties. This chapter examines the literature on current and previous issues of environmental, H&S management on O&G pollution, which is the second objective of the research. The chapter is divided into three main sections, each with its own set of subheadings. It begins with an overview of the environment and environmental management system (EMS) Souza, and (Alves, 2018), followed by subheadings on Nigeria's EMS aims, Nigeria's environmental management (NEM) roles and environmental impact. The role of the Nigerian government and its failures, as well as health and the National Institute for Occupational Safety are further reviewed under another heading. The heading also includes analyses of Nigeria's health concerns related to oil production, Nigeria's health status and the link between Nigeria and international health management. The chapter considers the importance of being healthy, as well as physical, mental, emotional and health and the environment. Finally, the chapter discusses safety and adherence to safety management, safety environment, H&S, safety and O&G production, Nigeria's safety stage and the importance of safety. In addition, it discusses a safety tool in a case study on safety in O&G, international health and the Nigerian economy.

3.2 Environmental Management System (EMS)

EMS is a state of managing an environmental program in an organised, planned, comprehensive and/or documented manner (Oliveira et al. 2016). It encompasses planning, organisational structure, policy implementation and policy maintenance for environmental protection. Souza, and Alves, (2018) state that environmental management systems (EMS) are a set of practices and processes that enable an organisation to increase its operating efficiency and reduce its environmental impact. It is a method to implement an organised program of recurrent improvement in environmental performance (Lannelongue et al., 2015) or a database and system which integrates monitoring and summarising processes and procedures for training personnel

and reporting environmental performance and information to internal and external stakeholders (UN, 2018).

According to Zeng et al. (2017), Environmental Management System (EMS) focused on providing the highest value to the customer and reinforces the need to align processes into integrated systems of procedure. However, the primary customer is the environment at the local and global levels, while the secondary customer includes government agencies, owners of organisations or shareholders, customers and employees. Sayre (2014) and Souza, and Alves, (2018) state that EMS is based on the creation of environmental buy-in from employees and management, managing an organisation's environmental affairs in a systematic way and assigning responsibility and accountability. It also encourages suppliers and contractors to establish their own EMS and sets a framework for training to attain desired and objective performance.

EMS is a process or tool (Herva et al., 2014) designed to empower environmental performance and data, minimise waste, control pollution, set goals and report hazards to top management. It also helps in auditing and reviewing environmental future, opportunities and objectives to meet the desired results (Oliveira et al., 2016). Likewise, it provides consistency and order, and addresses organisation environmental concerns via ongoing evaluations of practices, allocation of resources, procedures and assignment of responsibility and processes. Welford (2016) noted that EMS is the overall organisation's management structure, addressing immediate and long-term environmental impact. The best way to determine legislative requirements is to better understand the impact of a product or service, as well as priorities, significance and objectives.

3.3 Establishment of Nigeria's Environmental Management

The standard that EMS is based on is the International Organization for Standardization (ISO). Alternatives include the Environmental Data Management System (EDMS) and the Environmental Management Information System (EMIS) (Sayre, 2014). As mentioned earlier, EMS tracks the environmental pollution of all organisations to implement solutions. ISO was

formed on 23 February 1947 in London and the European Environment Agency (EMAS) in 2004 (Stergiou et al., 2018).

According to Sam et al. (2015) and Ite et al. (2016), Nigeria took a giant leap in 1987 to become an environmentally conscious nation, following the dumping of poisonous waste in Koko Village in Delta State in 1987–1988. Before these incident, there were no legislations and institutions to address environmental issues in Nigeria. Consequent upon the toxic waste in Koko Village was the establishment of the Federal Environmental Protection Agency (FEPA) by decree 42 on 30 December 1988, through Decree 58 of 1988 which was amended by 59 in 1999 (Omubo-Pepple et al 2010). According to Bello et al. (2015), FEPA was charged with overseeing all environmental protection in Nigeria until 1999. The Federal Ministry of Environment (FME) was formed by FEPA and other relevant departments in other ministries to enforce laws and regulations on environmental matters. The National Environmental Standards and Regulations Enforcement Agency (NESREA) was also established on 31 July 2007, to maintain environmental standards.

According to Tirima et al. (2015), several state and federal agencies deal with environmental problems and/or pollution in Nigeria. These include the Forestry Research Institute of Nigeria (FRIN), the National Biosafety Management Agency (NBMA), the National Emergency Management Agency (NEMA), FEPA, the Environmental Health Officers Registration Council of Nigeria (EHORCN), the Nigeria Hydrological Services Agency (NIHSA), the Federal Ministry of Environment (FMOE), the State Ministries of Environment (SME), the Abuja Environmental Protection Board (AEPB), the Lagos State Government Ministry of the Environment (LSGME) and the Delta State Environmental Protection Agency. According to Ite, (2018) the Nigerian O&G environmental control is exercised under the umbrella of Clean Nigeria Associates through which O&G companies tackle environmental pollution. Membership includes the National Oil Spill Detection and Response Agency (NOSDRA), the Department of Petroleum Resources (DPR), the Nigerian Nuclear Regulatory Authority (NNRA), the Federal Ministry of Water Resources (FMWR) and FME (Ite et al., 2016).

3.3.1 Nigeria's Environmental Management System Aims

Nigeria's EMS aims under decrees 58 of 1988 and 59 of 1999 can be summarised as protecting Nigerians and Nigeria's environment. It Enforces general principles, and environmental conventions, including enforcing environmental laws, guidelines, regulations and standards to which Nigeria is a signatory (Daramola and Olowoporoku, 2016) and impacts assessment in various sectors .the Nigerian Environmental Impact Assessment act (2004) established NOSDRA in 2006 to put machineries in place to implement and coordinate the National Oil Spill Contingency Plan (OSCP) and to ensure effective, timely, safe and appropriate response to disastrous and major O&G pollution in Nigeria (Nwauzi, and Fab-Eme., 2019). In the same vein, the Harmful Waste Act section H1 LFN 2004 prohibits the discharge of harmful waste on land or territorial waters; depositing untreated raw human waste into public gorges, drains or any land and discharging any form of spent oil, grease and trade waste from manufacturing to production into a watercourse, road verge, public drain or surface and underground water (Ogbonda and Ji, 2017. And Abilogun, 2019).

3.3.2 The Roles of Nigeria's Environmental Management (EM)

According to Federal Environmental Protection Agency (FEPA), Nigeria's EM has demonstrated actions required (between 1988 and 2018) to manage waste from inception to final disposal. Nigerians have benefited from managing waste via characterisation, improved technology and partnering with other accredited agencies in waste collection, transportation, disposal and treatment together with regulation and monitoring (Idemudia, 2017). Likewise, weekly and monthly cleaning is set up by EM to prevent and regulate environmental degradation in the country. Oroworukwo, (2019) alleged the system as indigenous knowledge in EM sectors. Nigerian EM agencies, especially FEPA, FME and NESREA also reached the following milestones in the conservation of natural resources and environmental protection: development of the National Policy on the Environment (NPE) 2013, establishment of the National Advisory Committee (NAC) 2013, review of the National Environmental Policy Guidelines and Standards (NEPGS) 2007, establishment of the National Council on Environment (NCE) may 2013,

enactment of the Environmental Impact Assessment Law (EIA) 1992 and establishment of the National Energy Policy (NEP) in 2013 and the Nuclear Safety and Radiation Protection Legislation (NSRPL) in 2006 (Ambituuni et al., 2014). In addition, a \$1 billion clean-up of heavy oil pollution in Ogoni land, Niger Delta was set up by Shell, four years after UN produced a report on Nigeria which advised the government and the oil industry to act urgently.

Daramola and Olowoporoku (2016) argue that the major challenges to Nigeria's environmental problems are deforestation associated with soil erosion, acid deposition, desertification, global warming, ozone layer depletion via oil spillage and oil pollution. According to Sam et al. (2015), the fact that EMS is unavoidable also means the treatment method is inevitable to avoid epidemics. Therefore, every sensitive government is expected to lay hold of EMS firmly, as negligence could be disastrous and damaging. NESREA called for the integration of EMS and scientific systems of development with workers, stakeholders and indigenous people (Adati, 2012).

Onoh (2017) states that there are laws regulating waste disposal or management in the country, but they are disobeyed by lawmakers, security officers, politicians and those connected to senior government officials in the country. Thus, limited success has been recorded by Nigerian EMS, which also struggles and cannot account for waste generated at all times. Consequently, it becomes irrelevant and a disservice to the entire society. Souza, and Alves, (2018) argues that the EMS has remained a great challenge in Nigeria despite several efforts by private, state and federal environmental agencies; environmental pollution has remained a threat to healthy living. Likewise, Adewole (2014) revealed ineffective enforcement of EM laws, conflicts in environmental management, inadequate enforcement facilities and corruption within EM and governmental agencies in the country as major problems.

3.4 Environmental Management and Oil and Gas Production

According to Emuedo (2015) and Daramola and Olowoporoku (2016), oil pollution and oil spillage is the main cause of environmental degradation in Nigeria. O&G have become essential

high-value commodities and fundamental sectors to the Nigerian economy, encompassing industry and industrial process and output. Ogwu-Friday (2014) noted that the environment and O&G are two positive bodies important to the national well-being, which entail day-to-day business activities. They coexist in a marine environment that is delicate to exploitation and contamination. Interestingly, several scholars agree, supporting the value of O&G production, exploration and the environment.

According to Fritzie (2009), the first stage of acquiring hydrocarbon through fracturing rock is exploring the geographical location of the drill. Thus, environmental pollution is determined by the possibility of balancing the first stage, because a single well exploration occupies between 4,000 and 15,000 m² bpd. Mir-yusif (2012) stated that exploration of wells is divided into two phases, first on land and second in rivers or oceans; the type of pad used in the construction of each depends on location, soil conditions and seasonal constraints.

According to the European Union (EU) (2016), a single fracturing rock drill produces mud and fluid, which is cycled from the depth of the drill pipe back to the equipment surface and into the air. The mud and fluid are advantageous to the exploratory process, balancing the underground hydrostatic pressure, cooling the bit and flushing out rock cuttings. However, they are dangerous to the environment and environmental health. Brown and Tari (2015) state that well exploration would destroy all vegetation and impact wildlife. Furthermore, non-native (unwanted) invasive vegetation may thrive as a result of vehicular traffic. Exploration may affect the quality of water, decrease the pressure of well flow and provide a path for surface toxins to come in contact with groundwater or subsurface water and commingle via dust pollution (Smith, 2017).

Timothy-Weston (2015), drilling and flaring of gas generate the highest noise pollution, resulting in continuous noise/air pollution which can last anything from 0–24 hours per day for over 4 to 8 weeks or more depending on the depth of the drill formation. The primary sources include the drilling and development phases, blasting activities, as well as production and equipment, e.g., diesel engines, bulldozers, 24-hour generators and others create much noise pollution. Noise

from blasting could be occasional but last for longer hours, and frequent heavy vehicle movement via drilling and development could generate continuous noise. EPA (2017) measured O&G drilling noise pollution as 115 dBA from the origin to above and 55 dBA at a distance of 549 meters (1,800 feet) to 1,067 meters (3,500 feet) from the land or well. CSG (2017) and Timothy-Weston (2015) found that cumulative noise levels from drilling, blasting and heavy vehicles could exceed those of any environmental protection agency guidelines. In addition, a successful exploratory well ends up becoming production wells, which could continue to generate environmental pollution resulting from production, transportation loading and offloading phases.

Emission generated during the drilling and development production stages include flare stacks, carbon monoxide, sand from blasting, vehicle emissions, nitrogen oxides and diesel emissions from generators and large construction equipment (Dudley, 2018) as well as dust from many sources: excavating, clearing, trenching, grading, dumping and moving soil by truck and other activities such as mixing concrete and orders.

3.4. 1 Oil and Gas Production and Land Use in Nigeria

Audun (2012) noted land-use reduction in O&G sectors as a major part of reducing O&G environmental impact. Though hydraulic fracturing requires more land, (Okpako 2014), organised drilling and production of hydraulic fracturing call for acres of lands, including staff temporary lodges, drilling rigs, pump trucks, drill pipe storage, pits or tanks for water and waste storage, data vans, trailer equipment and impermanent offices. According to Brown and Eyenghe (2015), the size of a well site, the location including drill pad or number or type of wells determine the factors of land degradation. The U.S. Pinedale field, located at the southwest Wyoming is the sixth largest O&G field in the United States, with a core development area of 70 square miles in southwest Wyoming and 70 to 100 miles north of Rock Springs. It can produce 4 million barrels and 436 billion cubic feet of natural gas daily (Knight and Costello, 2017).

According to Zabbey et al. (2017), the total land footprint of the largest oil production in Nigeria at a portion of Oloibiri in the Niger Delta is six to eight acres; this includes production, land taken

up by water impoundments for hydraulic fracturing, waste storage, access roads and other equipment. Ante and Ante (2018) identify the need to integrate environmental management system (IEMS) into O&G land use, particularly in Nigeria during drilling and production stages (see Figure 3.0 for details). According to Anonymous 1 (2015), even in an area without specific cultural importance, the ongoing drilling and production of O&G in Nigeria destroy precious scenic sites particularly the host community's lands and environment. Anonymous 6 (2015) stated that leaks and faulty infrastructure of oil and natural gas are major contributors significantly to land pollution and environmental destruction in the area.



Figure 3.1 The impact of O&G on land (Obida, et al 2018).

According to Caineng et al. (2016), the impact of faulty facilities or infrastructure could modify the character of the natural landscape from rural to a more industrialised setting. Existing land use could be affected (as shown in Figure 3.1 above) by intrusions such as O&G spills, dust, hazardous chemicals and vehicle traffic. Farmers and ranchers would also be affected by the loss of croplands and/or available grazing. Similarly, Emoyan et al. (2008) argue that the introduction of noxious and invasive plants could possibly increase livestock collisions and loss of long-term timber in forested areas. Changes in landscape resulting from expansion of access roads could affect hunters; thus, illegal hunting activities could increase and be promoted. According to Lois-Epstein (2013) and Allan and Chilenye (2014), the overall land-use impact could range from 20% to 90%, depending on the density of wells, compatibility of the O&G field and other ancillary facilities put in place. However, the impact on land used is likely to continue, lasting throughout the life of the land. The United Nations Environment Program (UNEP) declared a 30-year remedy for O&G environmental degradation in Ogoniland (Obida, et al 2018). According to Timothy et al. (2017), devastating O&G spills cause long-term environmental impacts and chronic health effects including the potential risk of cancer.

3.4.2 Water Resources (Surface Water and Groundwater) and Oil and Gas Production

Safe water is healthy in homes, industries, schools, farms and businesses. It nourishes entire ecosystems and provides important habitats for animals and native plants. Water is a vital natural resource supporting the environment and environmental health to ensure natural systems thrive and survive for the benefit of all. According to Ginders et al. (2016), the quality of natural water is used to target specific outcomes, such as recreational agriculture, animals, fishing, tourism, industry and environmental health. It provides the right amount/quality of water at the right time for breeding, feeding and growing. Water releases carbon that energises the environment and the food web, supporting environmental health around the river to provide for human needs. Water is required for human use (Nwabinel, 2012).

Torres et al. (2016) reveals concerns around substantial water consumption associated with O&G development and production. The process requires large volumes of water, which affects aquatics and alters stream flows and ecosystems. In addition, the fluids used in fissure rock formations contain numerous chemicals that have deleterious impacts on the environment, (e.g., air and water quality) downstream and in local communities. The EPA (2016) outlined the crucial aspect of assessing freshwater via frequently removing excessive amounts of surface or groundwater by drilling and well development. O&G wells require between 3 and 7 million gallons of water during the development phase, regardless of type. The development creates additional impermeable surfaces that prevent the infiltration of water into the soil. Quality and quantity of water or water resources available for human consumption, and aquatic ecosystems would be reduced or adversely harmed during the development and production stages.

Pierre et al. (2018) revealed the limited impacts on water and water resources of wind energy development. This is unlike O&G, which conserves the present and potential impacts on water quality regardless of size, due to the large volume of water used during the drilling process. Depletion of stream flows would occur wherever surface waters are used to meet O&G drilling and development needs (Shengfei et al., 2016). Similarly, water could be drained from nearby aquifers and can be contaminated with drilling fluids via trucks, human activities and other materials (acids, crankcase oils, diesel oil, alkalis and acidic stimulation fluids) brought to the water surface (Rogers et al., 2015).

Despite widespread concern about the environmental impact of O&G, little is known about IEMS and H&S impact on water, water resources and aquatic biota in Nigeria. Evidence has exposed the effect and consequence on the environment and economy, which calls for more attention and focus from Nigeria. The UN statistical report came up with a sum of \$1 billion for the clean-up of water, air and land pollution due to O&G in Nigeria (Allison et al 2018). Recently, water and water source depletion attracted the attention of the Nigeria'n government and environmentalists to the growing downstream sector of the O&G industry in Nigeria (O&G refineries and

petrochemical production centres). This resulted in an examination of the effect of activities in the sector on water, water source and the host communities. Adelman-McCarthy et al. (2015) noted that calcium, chloride, sodium, potassium, magnesium, lead, arsenic, antimony, barium, sulphur and zinc are the main hazards in O&G downstream sectors. Likewise, Anthony et al. (2014) highlighted the causes as improper drilling activities or unsuitable subsurface formations and lack of good cement casing which could influence water and water source. According to Alawattagama et al. (2015), wrong aquifers by non-potable formation increases tension and therefore contact between contaminant surface and groundwater and would distress or dewater water sources, ponds, rivers, streams, open pits and lagoons.

Edwards et al. (2016) state that the use of dust suppressants, herbicides (e.g., magnesium chloride) and contaminant spills increases sediment loading and salinity levels. Soil compacted via new access roads and well pads generate extra runoff into water flow, which increases runoff and channels higher peak storm flows into streams. Therefore, an increased runoff would also increase turbidity during storm events and more efficient sediment delivery. Ginders et al. (2016) found that greater runoff subsidises degradation of riparian areas by impeding the natural processing of pollutants; meanwhile, increased sediment load would decrease the volume of groundwater flow to natural resources and human communities. As the impermeable surface increases, the richness and abundance of native species would reduce, and invasive species increase, particularly in O&G host communities.

3.4.3 Statistics and the Frequent Question in Nigeria Oil and Gas

To what extent does O&G impact water, water resources, water quality and the environment in Nigeria?

Onwuazombe (2017) answered the question by exposing daily hydrocarbon spill (shown in Figure 3.1) through multiple routes to water, land and the environment, including frequent pervasive O&G pollution from refining operations. A UN report cited Nigerian O&G host communities that have been found to be highly contaminated from 50 years of O&G extraction (UNEP, 2017). The soil was soaked with hydrocarbons to depths of five meters and groundwater

was highly contaminated with hazards (Faturoti et al., 2018). Scientists found a nine-centimetre layer of refined O&G floating on the river (as shown in Figure 3.2) and on the groundwater that served the communities. Avaneesh (2015) showed the spill had been ignored for the last six years. Thus, Pichtel (2016) suggested a possible 98% damage to the environment and environmental system via O&G production.



Figure 3 2 O&G impacts on water, water resources, water quality and the environment Edwards et al. (2016)

According to King Emere Godwin, Bebe Okpabi of Ogale and four other tribal leaders, O&G producing companies have created severe health hazards in their communities through water pollution, which violated their development rights and threatened their lives (Effiong, and Ekop and Adonteng-Kissi 2021). Dandyson Nwawala, another community leader, told reporters; every week, a minimum of five people die via respiratory diseases and cancer (Ani et al., 2015). Evidence from the United States and Nigeria revealed cruelty, gross negligence, inhuman or degrading treatment and violations of international treaties and obligations by Nigerian O&G production companies. Meanwhile, Edwards et al. (2016) stated that O&G companies knew or

should have known that hydrocarbons hold chemicals which are harmful to human health, ecosystems and the environment.

February 14, celebrated as Lover's Day across the globe, turned out to be a tragic day in parts of the O&G host communities in Nigeria (Brown and Tari, 2015). Residents were helpless as refined hydrocarbon seeped into the stream and underground water, the only source of drinking water for the community. One of the production companies announced an oil spill from their 1.2-metre (48-inch) export line under 4.5 metres of water. Meanwhile, lovers dressed in a touch of red demonstrated while their water, was coated with hydrocarbon, rose. All existing sources of water were distressed by the O&G spill as shown in Figure 3.3. The UN research team confirmed the evidence and located another area where drinking water was seriously contaminated with cancer-causing benzene 900 times above WHO guidelines (example is shown in Figure 3.3 above) (Effiong, and Ekop).



Figure 3 3 Hydrocarbon seeping into the stream and underground water.

One of the women in the community told the minister for the environment that nobody appeared to care whether they existed or not or if they were humans; they had no roads, electricity and

water. She added that they had no jobs, all their potential is zero with the federal government and O&G companies having left them with an unclean environment. Their children were in hospitals receiving treatment from the effects of the O&G spill (Rui et al., 2018). Unfortunately, the victims received no compensation. The O&G company officials denied being aware of any illnesses arising from the spill. Victims also noted that O&G companies avoided taking any concrete steps to provide safe drinking water, protect their environment or support the people of the host communities in medical treatment and assessment. Obida et al. (2017) points out that inadequate federal and state government regulation in Nigeria causes hydrocarbon disasters. Increased difficulties in implementing IEMS and H&S are also identified.

3.4.4 Oil and Gas Production and Transportation Globally

According to King and Jacobson (2017), transportation means the movement of people and goods within environments. It is one of the fundamental needs of life just like agriculture, water, shelter and air. Kates (2018) defines transportation as the process of being transported or the action of transporting something and/or someone or any object used to move an item from one location to another. Transportation is essential; it enables trade and advances development and civilisations. Thus, it is defined as the movement of people and goods to meet the basic needs of society that require access and mobility. In today's system, there are different modes of transportation, which include road, air, rail, sea and pipeline. Factors determine the choice of each specific mode of transportation such as distance, movement type, cost and availability of suitable alternatives.

Common products transported through a pipeline differ, and include oil, gas, water, sewage, cement and other petroleum products. According to Smith and Murphy (2016), there are various methods of transporting O&G products from one production site to the refinery and from the distribution centre to the final consumer. Transportation of O&G from the production site to the terminal could be via tankers, pipelines, railway tankers, barges and tank trucks. Thus, transportation of O&G impacts the environment including the movement of hydrocarbons from production fields to storage areas and retailers. According to Kladnitski and Kenwright (2016),

O&G transportation consists of infrastructure such as; access roads, waterways, railways, canals and pipelines, airway terminals for example bus stations, airports, refuelling depots, warehouses, trucking terminals and seaports, which always call for improvements in construction and reconstruction at appropriate times.

According to Rutter et al. (2016), U.S. O&G is transported by two primary modes: pipelines and tankers. Pipelines are the means by which most O&G moves to a part of the route, while tankers travel interregional routes. Once crude oil has been refined and separated into O&G, pipelines transport the hydrocarbons to another carrier or straight to a refinery. Final products travel from the refinery to the market via tankers, railroad tankers, trucks and pipelines. Smith and Murphy (2016) identified tankers and pipelines as two major means of transporting O&G in the EU. Tankers and pipelines are the most economical ways of transporting hydrocarbons or finished products (O&G) either within the geographical boundary of a country or over long distances.

Nigeria operates over 43,000 mi (68,000 kilometres) of pipelines and flowlines, 87 flow stations, 12 natural gas plants and more than 1,000 O&G producing wells. On many occasions, the transportation of O&G from terminals to the refineries down to the distribution centres goes through the pipeline. From the distribution centres, finished products are distributed via tankers and pipelines to retailers. However, as evidenced by the UN report on the long-term environmental impact of Nigeria's O&G transportation, transportation has led to acute health risks and widespread environmental damage in a country that requires IEMS and E&H management (UNEP, 2011).

3.5 The Effect of Oil and Gas Production on Transportation in Nigeria

Nigeria's Federal Road Safety Corps (FRSC) (shown in Figure 3.4) notes that the country lost 7.157 billion Naira in the first half of 2018, excluding damages to the environment, loss of life, injuries and cost of treatment. Mr Boboye Oyeyemi disclosed the loss was due to 116 petroleum tankers involved in road traffic accidents (Udotong et al., 2017). Onwuka and Dike (2015) noted the dangers posed by O&G pipelines: spills, fires and other disastrous incidents. Data highlights

the significant pipeline and/or transportation accidents in Nigeria between 1998 and 2017 as devastating incidents. These have resulted in 1,949 deaths, 4,576 injuries and over 30.5 billion Naira in financial damages.



Figure 3 4 Effect of O&G transportation (Udotong et al., 2017)

Andeobu et al. (2015) states that common O&G accidents or explosions in Nigeria are due to bad management of the oil system, which disregards road and vehicle safety. Ninety-five people died when an O&G tanker burst into flames at Okogbe in Port Harcourt. According to police spokesperson Ben Ugwuegbulam, the tanker was loaded with unleaded fuel and overturned because of fuel overload. Another accident was recorded in Festac gate at Amuwo Odofin, Lagos State, which left more than 25 vehicles and 47 motorcycles completely burnt although no lives were lost. According to Faturoti et al. (2018), more than 50 people were set ablaze in June 2018 in Lagos State after an O&G truck (shown in Figure 3.5) spilt its contents on a busy motorway during rush hour. The report showed 15 people dead and 50 vehicles burned including five state buses.



Figure 3 5 Unleaded fuel and overturned (Faturoti et al. 2018)

FEPA and NESREA revealed the effect of fire and smoke on the environment. O&G contains hazardous chemicals, and there is always a record of fatalities in fire and smoke, but not everyone considers the health and environmental implications of fire and smoke inhalation. A small amount of fire or smoke inhaled could result in the loss of many lives, especially in O&G. Chuks-Ezike, (2018) defined the environmental impact of fire as the systematic identification and assessment of future stressors (hazards) on proposed and existing projects, natural resources, systems and their contents, occurring from unwanted or adverse fire events in terms of the physical–chemical, cultural, biological and socioeconomic components of the environment.

According to Boin, (2020) fire can lead to the most devastating crises if left unattended. It poses much threat to health and the planet; it is easy to think of its immediate impact, but the secondary effects can be more devastating. When vehicles, particularly O&G tankers, go up in flames, there are always additional consequences to consider, not only the vehicle that carried hazardous chemicals or flammable goods but also the tanker fuel and engine oils, which could put the immediate environment at risk. However, frequent; there is a difference between fire quenching and environmental disasters which can occur when smoke escapes into the air and fuels or

chemicals threaten to leak into nearby water sources. Fires and smoke are harmful events with tangible costs to environments and human lives; these include diet and air and environmental pollution via fire plumes and their subsequent diffusion. Deposition of particulates and other toxins or hazardous materials could distress air, water and soil.

Cipolla et al. (2018) found that carbon monoxide, along with many other toxins, cause a great deal of damage to the throat and lungs, and toxic or reduced oxygen to the brain can lead to unconsciousness. Unlimited exposure to fire or smoke results in damage to the respiratory system (Knopp, 2015). Boboye Oyeyemi of the Nigeria FRSC, called for immediate IEMS and H&S within the O&G sectors because there is so much collusion between tanker drivers, owners and the O&G sector. He noted conspiracy between the downstream production unit, Oil and Gas merchant and truck owner, the tanker always goes beyond their limit of hydrocarbons and are filled to the brim.

3.5.1 Pipeline Transportation of Oil and Gas Products globally

Pipelines are a safer alternative to tanker trucks, freight trains and air transport. Statistical evidence compared road tank, truck and pipeline transportation. Environmental analysts found that transportation via pipelines results in fewer incidents, personal injuries, greenhouse gas emissions and barrels released. Vuchic's (2017) study on the environmental impact of U.S. transportation confirmed that the pipeline mode of transport was the safest. He posited that O&G transportation via pipeline had an annual accident rate of 1.47 per billion tonnes compared to 2.08 incidents per billion tonnes of rail and 19.95 incidents per billion tonnes of tanker transportation. According to Cheng (2017), 2,175,000 miles (3,500,000 km) of pipeline in 120 countries of the world deliver hundreds of billions of tonnes of liquid petroleum and trillions of cubic feet of natural gas each year. Vuchic (2017) acknowledged the pipeline as the most extensive mode of transportation of O&G and liquids in the world.

Aung (2017) states that transporting O&G via pipeline is considered cheaper and safer than other modes of transportation. Human error, pipeline failures, natural disasters and failing infrastructure could cause pipelines to become a major source of accidents.

As noted earlier, O&G is a health hazard according to Tasker et al. (2018), it contains more than 1,000 hazardous chemicals, most of which are dangerous to human health, such as benzene. Poor management and/or sabotage of transported O&G pipelines could pose a high health risk and an environmental hazard if the fluids spill or leak into the soil. Aung found that the release of such potentially toxic chemicals infiltrate the soil, surface or underground water and expose communities to viruses. Vairo et al. (2017) states that O&G disasters have caused a great deal of damage to people, particularly host communities. Their farms, lands, water and crops are also being polluted as a result of hydrocarbon transportation and leaks via damaged pipelines. Local chief Ndudirim Amadi said that O&G pipeline explosions kill 250 people a day in his village and causes illness and starvation within the communities as a result of soil, water and air pollution (see Figure 3.6) (Osugwu, and Olaifa, 2018). He encouraged the Nigerian government to introduce a high standard of IEMS and H&S in the country.



Figure 3 6 Effect of pipeline spills (Osuagwu, and Olaifa, 2018)

There are no clear federal/state guidelines for chemical exposure during oil spills and no long-/present-term studies to show how much damage these chemicals can cause to human health. To better understand the extent of this damage, City Lab mapped out a few significant pipeline accidents between 1996 and 2016 based on data compiled by Richard Stover, an environmental advocate and former research astronomer at the University of California, Santa Cruz. According to Stover, accidental hydrocarbon has claimed 548 lives, injured 2,576, and caused over \$8.5 billion in financial damages (Peck, 2016) and (Peterson, 2019).

3.5.2 Air Quality and Oil Gas Production

Productivity is good for the economy, human health and environment of a country, but polluted air places the public and the environment at risk.



Figure 3 7 Polluted air (Osuagwu, and Olaifa, 2018)

Air quality has been defined by Ragothaman and Anderson (2017). as how dirty the air we breathe, or how clean the air in the absence of contaminants such as dust, turbines, smog, smoke, fire, flaring and purging gases including vehicle traffic and other gaseous substances. Udotong et al. (2017) revealed the three main pollutants that pose a threat to humanity as air, water and soil pollution. Pichtel (2016) exposed over 1,000 components in O&G that are harmful to the atmosphere and environment because they intensify global warming and trap heat. Furthermore, 22% of all greenhouse gas emissions, including methane, have been traced to O&G extraction (Ekwurzel, et al 2017). Thus, the environment and environmental health can be exposed to O&G pollution.

According to Akinleye (2017), the glare of the Nigerian O&G boom is more visible from space. As shown in Figure 3.7, high-definition photos of the earth at night showed O&G companies burning or flaring O&G. Much of this polluting light is produced by flaring, burning off or separating natural gas from oil. However, Ambituuni and Amezaga (2014) note that particularly in Nigeria, most O&G companies deliberately discharge such emissions into the atmosphere. Emissions include nitrogen oxides, sulphur dioxide, ozone, volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs), including particulates, ethylbenzene, methane, hydrogen sulphide, toluene, benzene and carbon monoxide. Thompson et al. (2017) reveal the primary sources of EH&S emission in the country are O&G companies, particularly, those involved in the production and separation of O&G phases, pipeline spills, pumping and operations, production well and operational vehicle traffic. Ganesan (2017) states that methane is a key greenhouse gas and compound with hydrogen sulphide and carbon dioxide, and possible leaks could lead to air pollution.



Figure 3 8 Environmental pollution (Ganesan 2017)

Mason et al. (2015) conducted a study on O&G host communities and people's lives in major cities. The study found that 56% lost cognitive functions in addition to suffering from respiratory

illnesses or other chronic conditions due to EH&S pollution. The study revealed that high amounts of air pollution leads to significant loss of lives. Wolch et al. (2014) argues that air pollution affects our physical environment and increases our mental illness risk; as it increases outside, it increases inside via the air we breathe in. Other studies by Stoddart and Evans (2017) and McCance and Huether (2018) linked EH&S disasters to low birth weight, premature birth, dementia and mental illness of children.

According to Durkalec et al. (2015), intensifying carbon dioxide levels is the main driver of climate change; however, change in the climate is a hazard not just to nature and environmental health but also to human thinking. At higher levels, weak air or environmental pollution increases tension, thus leading people to develop fewer ideas. Additionally, it reduces their ability to take in new information, formulate complex thoughts or change their minds. The U.S. EPA announced that emissions of mercury from O&G companies cause symptoms including emotional insomnia and instability, reduced cognitive function and increased memory loss and an epidemic of dementia (Mojammal et al., 2018).

3.5.3 Climate Change in Hydrocarbon Pollution Content

Climate change is one of the biggest environmental problems facing humanity and occurs not only in developing countries but all over the world. Stoll-Kleemann and Schmidt (2017) exposed the factors that influence the climate in most developing countries, particularly Nigeria, and around the world from O&G production. They include but are not limited to oil spills, pipeline leaks, gas flaying and fires due to O&G truck accidents. According to Okon (2017), it is to be expected in the future that climate change will seriously trap many developing countries including Nigeria and affect the national economy, if care is not taken. Ogwu et al. (2015) states that the consequences of climate change could be displeasing and cause disasters such as drought, erosion, hurricanes or floods. Changes in precipitation levels could affect the quality of water and agriculture, as harvest will decrease. The soil would also be contaminated as a result of which mass migration, conflict and civil unrest may occur (Peterson,2019). Lack of food, good water and

integration of EH&S would fuel anger and militancy. The problem may even become more serious if countries refuse to take significant action (i.e., proper IEH&S management). The situation seems quite depressing and thus calls for active measures to properly integrate EH&S management

3.5.4 Environmental Vandalism or Sabotage

It seems imperative to note each time environmental pollution is mentioned in Nigeria, the O&G industry readily comes to mind. As mentioned previously, human actions mostly affect the environment; likewise, the environment also affects people. Ninety per cent of Nigeria's budget comes from O&G; thus, an overwhelming proportion of environmental challenges can be expected (Kate 2021).

Petroleum Production and Distribution Act (1990) (Anti-Sabotage) noted vandalization and sabotage as anybody who does or supports, counsels, incites or procures another person to do anything to obstruct or prevent production, procurement and distribution of O&G via pipelines, vehicles or any public highway in any part of Nigeria (Kassim, 2020). According to Kabir (2016), vandalism or sabotage is the unauthorised or illegal act of puncturing or destruction of O&G pipelines, so as to siphon or to disrupt the O&G supply or to redefine products for the motive of appropriating them for sale on the black market or personal use or any other outlet. Johnson-eze (2018), defines vandalism as the deliberate act of destroying public and private properties within the civic domain.

Njoku (2016) adds that O&G vandalism or sabotage killed numerous people in host regions, destroyed vegetation, salt marshes and mangrove swamps and inhibited the growth of plants. Onwuka and Dike (2015) note that the process of local refinery and pipeline robbery creates a range of physical health challenges, such as fires with thick smoke billowing into the atmosphere, polluting creeks, air, land and rivers across the country. Over the past decades, thousands of lives have been claimed through conflicts of sabotage and vandalism (Okwechime, 2018). Numerous lives were also lost due to fire disasters associated with O&G pipeline vandalism.

Evidence further suggests threats to life, property and the environment in host communities and across the country (see Figure 3.9 for details).



Figure 3 9 Disasters associated with O&G pipeline sabotage and vandalism (Okwechime, 2018)

According to Ibeh and Nnakaihe (2016), Nigeria lost N174.57 billion (\$413,477,022.85) in several years in the upkeep of sabotaged and vandalised pipelines. Nigeria also lost \$10.9 billion in three years due to O&G pipeline theft (Brown, and Tari, 2015). From 2015 to 2021, according to Mohammad Abubakar, Nigeria recorded 4,919 oil spills, lost 4.5 trillion barrels of oil to theft in four years, 106 to operational maintenance and 3,628 sabotage and 70 yet to be determined Minister of Environment (Agency 2021). Statistics point to Nigeria as the worst country in the world for oil spills, losing about 400,000 barrels a day (Vanguard, 2021).

Igbinovia (2014) states that O&G theft can be traced to the general perception of frustration, as host communities feel deprived of the benefits of their natural environment and the huge revenue sourced from the region. O&G companies allege that pipeline bucklers are the main causes of

spills and environmental degradation in the region. However, Majolagbe et al. (2017) suggest that outdated laws, corruption and personal interest in Nigeria O&G management are the major factors influencing environmental pollution. These are followed by a lack of IEMS and H&S as well as vandalism and sabotage, which are induced by unemployment and poverty, particularly in host communities.

3.6 Role of Nigerian Government and Failure to Manage O&G Environmental Pollution Impact

The persistency of EH&S and natural resource degradation in Nigeria through O&G has attracted the attention of scholars. In attempting to protect the natural environment, H&S management further researches the implementation of EH&S integration in the country. It becomes interesting when likened to the governing laws and the extensive O&G EH&S impact, together with their significant disasters. According to Ibama and Eyenghe (2015), Nigeria is not only home to oil wealth (where a positive percentage of its revenue comes from the sale of O&G products) it is also the giant of Africa. Nigeria is one of the largest producers of O&G in Africa and a known figure globally among oil-producing countries. Sections 17(2) and (d)(2) of the 1999 constitution of the Federal Republic of Nigeria includes provision for the exploitation of human or natural resources in any form whatsoever for reasons that should be good for Nigerians, the local community and the natural environment (Adeniran, 2020 and Idemudia, 2017).

With reference to the O&G industry (Ijaiya et al., 2018), the first regulation covering mineral oils (Safety Act) was passed into law in 1963. This was followed by the Federal Environmental Protection Agency (EPA) act in 1988 (amended in 1999) as a result of the toxic waste dump in Koko, Delta State. In 1990 and 2004, several Acts were passed, such as the Oil in Navigable Waters Act, the Oil Pipelines Act, the Associated Gas Reinjection Act, the Petroleum Act and the Environmental Impact Assessment Act (1990 LFN 2004) to protect environmental, health and safety (Akpomuvie, and Orhioghene, 2011). The Nigeria Act 2004, section 20, provides each state to safeguard and improve the environment of Nigeria, e.g., land, water, air, forest and wildlife.

It seems surprising to see a lot of environmental damage in the country; this must have been due to the abuse of law and the environment. Ibama and Eyenghe (2015) reveal that pollution and disaster have O&G multinationals operating in Nigeria despite purported government enforcement and existing regulations on the O&G sector. Onwuka and Dike (2015) note the inefficiencies of regulators which they attribute to poor environmental database, duplication and inadequacy of logistics and overlaps in regulator functions. However, the obligations of the ruling governments in Nigeria were to protect the environment and avoid threatening people's health, practices and policies that could violate the integrity (laws and environment) of Nigerians (Amechi, 2015). However, section 2 of the Nigerian Environmental Impact Assessment (NEIA) and section 5(e) FEPA Act provide for cooperation between the Nigerian federal/state government and the EPA in ensuring the conservation of natural resources and environmental protection (Ingelson, and Nwapi, 2014). Section 5(e) also prohibits authorised activities and projects in the public or private sector without investigating and considering the impact on the environment. Furthermore, Act 21(d) mandates state/ and local governments to ensure activities undertaken within their territories do not damage the environment (Ikhuosho-Asikhia, 2018).

Scholars argued that pollution has been orchestrated by O&G multinationals in Nigeria. Olokesusi, (1998) however reports that the Nigerian government used laws and worked closely with environmental agencies and H&S sectors to control pollution. Ukpong and Obok (2018) reveal that strong pollution due to O&G comes with health risks such as skin problems, asthma, bronchitis and breathing problems federal and state governments in Nigeria failed to regulate O&G environmental pollution in the country.

Ojukwu, (2020) wondered about whether the intention of the Environmental Act is real; this is further buttressed by the fact that the government holds the largest share in O&G companies. Nigerian law provides that all natural resources are owned by the federal government. Therefore, any extraction without federal government approval is deemed illegal. Olonisakin, et Al (2017) recognise that the legislative arm of government has good intentions towards a natural resources

policy and against O&G pollution in Nigeria. Furthermore, a judge confirmed that conducts of Nigerian O&G and the government were in clear breach of the obligations to protect, respect and fulfil the right of EH&S and the right to a healthy environment under the African Charter (Chuks-Ezike, 2018).

Okpanachi (2011) reviewed the 2007 proposal and introduction of the national O&G policy, which was intended to harmonise existing petroleum laws, encourage IEMS and H&S and comprehensively restructure the entire O&G sector and sustainable development in Nigeria. Evidence showed the policies are still being reviewed and are yet to be issued. However, the 2007 proposal lack the sanctioning, enforcement strength to ensure compliance and clarity of communication and exact intentions. Notably, the inability of the law to check gas flaring has been observed by Okpanachi, (2011) the evidence exposed the Nigerian government's failure to make any moves to resolve the deficiency associated with the O&G Pollution Act, which remains the statutory instrument for gas flaring in the country.

According to Nigerian law, the statutory penalty for O&G flaring remains the sum of N10.00, \$0.028 and £0.021 (the official exchange rate as of 08/11/2018) for every cubic foot of flare (Chuks-Ezike, 2018). However, the legislation gave O&G sanctioning power to the petroleum minister; however, a politician with no background, previous skill or knowledge in O&G could be appointed petrol minister (Wigwe, 2000). This could result in arbitrary permission for O&G pollution by a sitting petroleum minister for monetary gains. This might have contributed to the inability of the environmental agency to succeed in O&G degradation. According to Chuks-Ezike, (2018), It is thus not surprising that the Nigerian government granted applications permit for O&G pollution where the applicant paid some prescribed fee by the minister.

3.6.1 Case Study

The Nigerian government was alleged to have colluded with O&G companies to cause environmental degradation and health problems for host communities. The case was between SERAC and the Nigerian government with case number ACHPR/COMM/A044/1, African

Commission on Human and People's Rights. A non-governmental organisation alleged that the Nigerian government had failed to regulate the operations of O&G companies on matters of the environment and environmental damage. The plaintiff noted that the O&G consortium disposed of contaminated and toxic waste in the waterways of host community's, in violation of international environmental standards. The complainant further alleged neglect of properties and failure to maintain O&G facilities by the consortium. It accused the Nigerian government and O&G companies of failing to produce basic environmental impact training relating to the hazardous effects of O&G production in host communities and even preventing environmental organisations from conducting assessments, which resulted in several O&G spills (Chuks-Ezike, 2018).

The court found that the Nigerian state is not only obliged to provide environmental information but to protect and resettle victims with compensation. The Nigerian government was Also found to have an obligation to provide adequate comprehensive clean-up of the polluted area. However, the violation was committed by the former government. Indeed, the case described above exemplifies inadequate Nigerian environmental legislation (Chuks-Ezike, 2018).

3.7 Health and the National Institute for Occupational Safety

Over time, the meaning of health has evolved; health was defined as a state of regular function of humans that could be disrupted from time to time (Paoli, et al 2019). Health is also defined as the ability to deal with physical, psychological, biological and social stress, including performing community and personally valued roles and family work (Ambituuni et al 2014). The World Health Organization describe health as a condition of complete bodily, social, and mental well-being, rather than simply the absence of sickness or disability (Scully, 2004. and Pizzi and Richards, 2017). However, Medvedev, and Landhuis, 2018 defined health as the ability to manage and adapt to physical, mental and social well-being challenges through lifestyle. Other writers (Jetten, et al 2017) including the WHO referred to the word 'health' as a state of complete physical and emotional well-being.

Medical News Today (Annisa, 2020) defined 'health' as a resource for living a full life (a state of physical, social and mental well-being), which encompasses the ability to recover from all illnesses and other problems (Adam, 2020). (Pizzi, and Richards, 2017) listed the factors that enhance good health, including the natural environment, a healthful diet, genetics, exercise, relationships, screening for diseases, education and coping strategies that can boost a person's health. Medvedev and Landhuis, 2018) noted physical and mental health as the common modes of health that are normally discussed; emotional health can also be linked to mental and physical well-being.

3.7.1 Importance of Being Healthy

Delle Fave et al. (2018) and Lades et al. (2020) linked the three modes of health, physical, mental and emotional well-being (PME) to the importance of being healthy. Healthy customs are celebrated as any behaviour that benefits a person's PME health. These habits require a change in mindset, which is hard to develop, but it makes a person feel good and enhances overall well-being. Good nutrition is important for PME health; in the one's same way, the environment can help reduce risk of chronic disease (such as cancer and heart disease) and promote and maintain overall health.

3.7.2 Importance Physical Health

Physical health can be defined as the most visible dimension of health that shows overall well-being, including social, spiritual, intellectual, emotional and environmental health. It is the standard and evidence of a healthy life, which maintains a balanced and overall wellbeing that receives necessary treatment. According to Medvedev and Landhuis, (2018) and Paoli,et al (2019), physical health involves pursuing a healthful lifestyle by decreasing the risk of environmental disease, injury or health issues including environmental hazards in the workplace, for example, water, air and on land, practising safe sex, good hygiene and avoiding the use of alcohol, tobacco and illegal drugs.

Being deprived of physical health, according to (Kisely, S., et al 2018) can lead to risks in developing mental health problems, and neglected mental health issues can affect physical appearance, and the two (physical and mental) can lead to or increase the risk of emotional health conditions. Evidence highlighted that a polluted environment, e.g., pollution from O&G operation, industry, smoking etc., including drug taking, alcohol and sexual behaviour, unfortunate H&S and social issues are factors that influence physical well-being.

3.7.3 EH&S Mental Health

Galderisi, et al (2015) and Tasker et al., (2018) quote the WHO which describes Mental health as a condition of well-being in which a person may reach his or her full potential, cope with everyday challenges, work professionally and fruitfully, and contribute to society. Although it is difficult to define mental health, in many cases it depends on diagnosis and perception. Some signs and types of mental illness are now becoming visible and obvious. According to Thomas et al. (2017), mental health affects how people act, feel and think. It encompasses psychological, social and emotional well-being and determines how stress is handled, choices are made and how people relate to others. Delle Fave, (2018) observes that mental health is not only the absence of anxiety, depression and order-disorder but depends on the ability to feel safe and secure, enjoy life, achieve potential and recover in an unpolluted environment.

3.7.4 EH&S Emotional Health

Emotional health can be determined as a constructive state of well-being which empowers individuals to meet the demands of everyday life and function in society. People who are emotionally healthy are in control of their feelings, thoughts, and behaviours. They are also capable of coping with life's challenges. People who are emotionally healthy still feel sadness, stress and anger, but they know how to manage and control their negative feelings.

3.7.5 Influence of Environment on Health and Safety

According to Lades et al. (2020) and Tasker et al. (2018), the environment is regularly cited as a central factor influencing the health status of individuals; this includes characteristics of the social, natural and built environment. Factors such as natural land, clean water, air, adequate housing, safe communities and good roads contribute to good health, particularly of infants and children. Environmental pollution caused by contaminated air and water kills 50,000 people a year in the UK (Fouquet, and Pearson, 1998). With multiple victims across the world (Maltby, 2013), environmental pollution is the deadliest of all the noxious pollutions, killing 6.5 million people a year. However, researchers link health hazards to water supply and other pollution, including land and air, which has led to the deaths of 1.8 million people from diseases such as stroke, lung cancer, heart disease and chronic obstructive pulmonary disease across the world.

Philip Landrigan, a professor from the Icahn School of Medicine in New York City, investigated health, pollution and the environment (Davies, R., 2018). Evidence from the research noted that pervasive pollution is much more than an environmental challenge; it is an enhanced threat with many effects on human health and well-being. The research produced the first global inventory of environmental pollution above the legal limits of international and UN law monitored by lab-based tests. In addition, evidence revealed that outdoor air or environmental pollution caused an estimated 3 million deaths worldwide in 2015 (Cohen et al 2017). Most of these occur in low- and middle-income communities in each country.

In 2017, WHO statistics revealed a high mortality rate of 25.7 out of every 100,000 people due to environmental pollution in Great Britain; In Argentina, the number was 24.6, 23.5 in Mexico, 15.8 in Brazil and 12.1 in the United States (Gallardo, E.S et al 2020). The Statistics called for reducing the number of deaths globally from environmental pollution by examining IEMS and H&S.

3.7.6 Health and Oil Gas Production

A total of 1,300 different toxic chemicals may be emitted from O&G into the environment. Two significant reviews by Werner et al. (2015) and Balise et al. (2016) studied the strength of evidence concerning the health impacts of unconventional natural gas. A systematic review of O&G extraction processes and human reproduction concluded that an estimated 63% of environmental emissions cause human illness resulting from O&G exploration and production. Exposure to chemicals used in the O&G industry may lead to lung cancer and skin diseases; Noise-induced hearing loss can occur in those who are exposed to dangerous noise levels (Hong et al 2013). Death could also occur due to the amount and duration of chemical exposure.

The WHO found that 10% to 69% of illnesses around the world were linked to O&G emissions, spiritual or physical assault and mental and physical illness due to O&G chemicals, oil spills and tanker explosions (Montero-Montoya et al 2018). Ramirez et al. (2017) grouped O&G symptoms into three: traumatic symptoms (pain); respiratory problems and irritations (eye, skin, etc.) and neurological effects (headaches, dizziness, etc.). Other studies (Bamberger, et al 2012, Balogun, 2015) have uncovered irreparable harm to humans from exposure to hydrocarbon emission, and the effects can enhance cancer risk, damage the liver and decrease immunity.

Recent reviews by Robert E. Oswald on the impact of hydrocarbon pollution on human and animal health noted that killing 17 cows in an hour is a method for allowing the release of fracturing fluids into the water adjacent to the cow pasture (Bamberger, et al 2012). Hundreds of barrels of hydraulic fracturing fluids leak through defective valve tanks onto the land, leading to the infection of 46 goats. Long-term residents around the top crude oil producer in Texas, Karnes County, are worried about the O&G boom subsidising children's school fees and facilitating highways, and charities, even with effects such as dizziness, migraines and shortness of breath. The community organiser (Priscilla Villa) unveiled a series of changes to health in the community after years of O&G production (Balogun, 2015).

To shed more light on human health risks and O&G production, a conference was held in Colorado in 2017 titled the Epidemiologic and Public Health Considerations of Shale O&G Production (Haynes, et al 2017). The conference included Dr Roxana Witter, Assistant Research Professor at the Colorado School of Public Health; Dr Jerome Paulson, Director of the Mid-Atlantic Centre for Children's Health and the Environment and Dr Vikas Kapil, the Chief Medical Officer of the National Centre for Environmental Health. It was a gathering of environmental health experts from around the world who debated the accessible data on health and the necessity for more information and scientific investigation regarding human health impacts of O&G. Dr Witter presented a paper on the effects on air quality of the refusal of cooperation by the O&G industry. Dr Kapil highlighted the deficiency in handling the O&G toxicology of fracking chemicals (Haynes et al 2017). Doctors at the conference suggested establishing an independent organisation funded by O&G sectors, who have the money to conduct scientific and medical research on impact on health and O&G operation. This would complement the work of that conference, which was primarily concerned with implications of hydrocarbon on public health and interpreting data (Thomas et al., 2017).

3.7.7 Challenges of Oil Production on the Health of Nigerians

The health hazards caused by O&G production are covert and may take effect slowly. Nigeria refused a major burden host (Manzoor, and Sharma, 2019). The impact on health and safety, particularly on workers and host communities is widely reported across the country. An average of 245,000 barrels of crude oil is spilt in the Niger Delta host communities every year. Other damage results from mechanical failure which accounts for 17.04%, third-party activity (20.74%) and unknown causes (31.85%) (Iheriohanma, 2016). The spills contaminated the ambient air with carcinogens such as benzo and polycyclic aromatic hydrocarbon. Surface water and groundwater including naturally occurring radioactive materials and crops were also contaminated with hydrocarbons and trace metals that were further bioaccumulated in some food crops (Abubakar et al 2018).

More of the population in O&G host communities became ill, died, and were injured via industrial accidents as a result of where they were born or worked (Taiwo, 2010 and Philip, 2016). Health is at risk when pollution and temperature shock, dust, wind, freezing rain, fog, ice, snow and violent storms result in difficulties in health and living conditions. According to Onoh, (2017) O&G spills could lead to a 60% reduction in physical health and household food security. They are capable of lowering to 36% the ascorbic acid content of vegetables and to 40% the crude protein content of cassava. Additionally, they could increase the prevalence of childhood malnutrition by 24%.

Health effects typically associated with exposure to hydrocarbons include drowsiness, headaches, dizziness and nausea (Omeje, 2017). Sensitisation and dermatitis from repeated skin contact with drilling fluids and exposure to O&G mists also come with inflammation and irritation of the respiratory system. Most diseases do not kill immediately, but they can cause years of suffering and pain for those affected and their family members. For example, cancer is a result of the aromatic compounds in O&G mists. Okpako, (2014) asserts that animal studies, show that contact with Nigerian crude oil and natural gas chemicals could be hepatotoxic and hemotoxic and could cause cancer and infertility.

3.8 Nigeria's Health Status

According to WHO standards, Nigeria has a low standard of nurses/doctors-to-population ratio of 700 per 1,000 for nurses and 2.5 per 1,000 for doctors (Saddiq, et al and Federal Republic of Nigeria HRH Strategic Plan 2008-2012). Among the challenges facing Nigeria's healthcare sector is the lack of trained manpower, including doctors, nurses and allied healthcare professionals. There are less than 150,000 (Sylvester 2020) practising nurses and, as of 2016, Nigeria record 24.6 thousand register doctors for a population of 213 million people, which represents a doctor-patient ratio of 1:5000. On average, the WHO recommends 1 doctor per 19 patients a day and 1 pharmacist per 200 (Taylor et al 2018), To meet the WHO recommendations, Nigeria needs

283,308 additional doctors. Presently, Nigerian doctors attend to an average of 100–150 patients or more in a day because of these skewed ratios.

Nigeria does have the clinical expertise required but working conditions and the lack of opportunities have led to continuing brain drain in the country. The problem is further complicated by the scarcity of specialist' equipment; Nigeria has a shortage of neurosurgeons, nephrologists, cardiologists, oncologists, orthopaedic surgeons among others, due to poor pay and lack of government support. Akunne et al. (2019) notes that 4,000 NHS doctors and more than 25,000 doctors in the United States are from Nigeria, affecting lives positively. Due to the absence of quality health care, Nigerians look to other countries in the Middle East, India, Zimbabwe, the UK, South Africa and the United States to meet their health needs. In 2006, 47% of Nigerians visited India for medical treatment, amounting to N41.6 billion in expenditure (Makinde et al 2014 and Wapmuk,et al 2016).

Healthcare in Nigeria is financed via several sources: health insurance, donor funding and social and community sources including out-of-pocket payments (OOPs, i.e., private clinics). Donor agencies such as UNICEF, USAID and WHO have played an active role in financing Nigeria's healthcare. Some reports suggest that O&G supports 27 health facilities, and 3 newly built ones, over 880 government-employed community health staff, but these are invisible and insignificant.

Nigeria's 2018 to 2019 health budget was estimated to be around N8.6 trillion with a total expenditure of N528.14 billion, which represents 4% and 4.75% of the total budget; This figure is less than the 12.6% allocation in Germany, 19% in the United States and 10.0 in United Kingdom (Adebisi et al 2020). The average infant mortality rate remains high at 87.3 per 1,000 live births, and life expectancy in Nigeria is 48.5 years in a country of over 195 million people. The population still lives on \$2 per day. Thus, the UN and UNICEF advise the federal government of Nigeria to increase to 15% its total annual budget allocation to the health sector.

Private, Social and Community Healthcare (PSCH) remained the dominant mode of funding for Nigeria's healthcare, constituting about 95.9% of total healthcare spends. This is one of the

highest in the world today (Opeloyeru, and Agbatogun,2020). In 2005, the National Health Insurance Scheme (NHIS) was introduced in Nigeria to guarantee access to healthcare for Nigerians; since its inauguration, less than 5% of the working population of Nigeria have been enrolled.

3.8.1 Oil and Gas and the Nigeria's Economic Future

Nigeria has never been ranked among the top 20 manufacturing countries in the world. One reason for this is its near total reliance on oil and gas. According to Oroworukwo, (2019), O&G accounts for more than 65 percent of the economy, and countries rely on raw material exports to make decisions. Nigeria spent \$10 billion on refined petroleum, \$641 million on frozen non-fillet fish, \$1.6 billion on wheat, \$393 million on rubber tyres, and \$384 million on raw sugar, according to Elemo, et al (2017). Nigeria and others spent \$14 billion importing pharmaceutical products, because medical equipment and devices were never indigenously manufactured (made in Nigeria), they were largely imported at astronomical prices. Meanwhile, developed countries empower the manufacturing company.

Evidence points to further recessionary trends for Nigeria if the present unsustainable O&G slumps again in the future. In the second quarter of 2015, the economic growth rate fell to 2.35% from 3.96%; likewise, a shrinkage of 1.73% from 3.2% was seen in the first quarter of 2016. O&G environmental pollution hurt the country's economic development, triggering damages equivalent to 1.3% of gross domestic product (GDP) in host communities. According to Oppong (2020), diseases from air, water and land pollution accounted for an estimated 1.7% of healthcare spending in high-income countries such as the United States and the UK and 7% in middle-income countries such as India, South Africa etc.

The Nigerian economy grew by 1.5% in the second quarter of 2018 which was the weakest growth rate since the third quarter of 2017 (Abubakar et al 2020). However, the O&G sector shrank by 4.0% year-on-year, compared to the expansion of 14.8% in the prior period (Chuks-Ezike, 2018). Evidence points to production of 1.87 million barrels of crude oil per day a year

2015, down to 1.84 mbpd in 2016 (Faturoti et al 2018). The oil sector accounted for 9.0% of the GDP in 2018 and 8.6% in 2019. Now the O&G sector increased by 2.0% after an expansion of 0.8% in the last quarter of 2019.

The O&G industry creates thousands of direct and indirect jobs in Nigeria, in engineering, communications, safety, law, regulation and environmental management among others (Albert et al 2018). In addition, hundreds of jobs are created by subsidiary businesses such as vehicle leasing, hotels, restaurants and retail outlets, whose success is controlled by industry activity in and around their communities. Although people work in the industry because they are well trained and/or compensated, they believe in what the industry provides for their country, and they see a real future for themselves. Nigeria's oil and natural gas industry is the backbone of the federal, state and local governments in terms of economy and annual royalties. It can fund construction workers and highways, classroom teachers, nurses and hospital beds.

3.8.2 Nigeria's Health Management

According to Edwards, (2017), as a significant element of national security, public health management not only functions in the provision of timely and adequate medical care, but controls, monitors and tracks disease outbreaks. The Nigerian healthcare management system is poorly developed, and no passable and functional observation systems are currently working or expected to be working in years to come. Meanwhile, Act 2014 (NHA, 2014), Nigeria's national health law, is to deliver legal framework for healthcare management, federal and state medical centres, and universities teaching hospital, while the state local hospitals and primary healthcare centres account as the state government's responsibility (Adati, 2012).

According to Obida et al (2017) the Nigerian government's failure renders Nigeria's Health Act (NHA) ineffective. The failure of the government to implement prevailing laws and policies as a major problem of the Nigerian health sector. (Adekunle, 2014) analysed the conference of 130 health professionals, which included medical doctors, dentists, laboratory scientists, pharmacists, nurses and other health-related professionals, finding that 52.6% exhibited poor knowledge of

the NHA Act 2014, and only 47.4% had a good perception of the NHA (Abubakar, et al 2018). Thus, Nigeria's socio-demographic and health indices have deteriorated due to a series of government laws, policies and conventions, approved but not properly implemented. Nigerian healthcare is the third most corrupt branch of the country's sectors. Unfortunately, corruption is the main problem facing Nigeria's healthcare.

3.9 International Health and Environmental Standards

The United States is among the top 10 Oil and Gas producers in the world, with an estimated 5 million bpd from 2005 to 2010 increasing to 10 million bpd within eight years. Yearly, the sector supports approximately 9.8 million jobs or 7.7 percent of total employment (Brown et al 2019). O&G resources in the United States are generally privately owned, unlike Nigeria where natural resources are owned by the federal government. In the US, states developed specific policies to promote environment H&S, including infrastructure. While encouraging recovery of indigenous O&G from within the state, opposite in Nigeria, where the federal government controlled O&G. However, there is collaboration between the state and the U.S. federal government through regulation agencies. The act of 1975 under the U.S. Conservation and Energy Policy banned the export of hydrocarbons (O&G) produced from the United States; On the other hand, Nigeria exports 78% of its crude oil.

The majority of O&G produced within the United States is transported via pipeline, though some quantities are transported by rail and tanker trucks. There is a different regulatory body with jurisdiction for interstate pipelines, the Federal Energy Regulatory Committee (FERC) (Coleman, 2020). However, US federal and State governments work together to determine whether the pipeline unnecessary or redundant and to guarantee that pipeline construction will not pose environmental and undue health risks during and after operation and construction. This is unlike Nigeria where the pipeline pollutes the environment without federal or state government action. There is no effective law or active state of federal agency regulating O&G environmental risks, including H&S risks during hydrocarbon transportation (Omeje, 2017).

3.9.1 Following WHO Standards for Healthcare and Health Infrastructure

According to Darabont et al (2018) health standards can be defined as tools designed for the achievement of the highest quality of healthcare possible within the resources available. In line with the definition, there was a known need to declare or define a set of Minimum Standards in healthcare and health infrastructure, provision of essential drugs, commodities for primary health institutions and human & financial resources in Nigeria. Eboreime et al (2019) noted the Minimum Healthcare Standards were set as a temporary measure and it was expected that a more robust system would be achievable in a few years.

WHO health standards highlight the different modes of primary healthcare (PHC) service delivery outlets at neighbourhood community levels, settlement, political world communities, villages, all the way up to the apex local government area (LGA) facilities. The specifications include infrastructure, medical equipment and furniture, nomenclature, personnel, hours of operation, expected services and other support items. The WHO standards of work requires at least 2.5 medical staff (nurses, midwives, and physicians) per 1,000 people to provide adequate healthcare (Mkonyi, et al 2021). However, Okpako, (2014) points out that long-term neglect by government and systemic weaknesses in healthcare management have made it impossible to achieve goals within the short term. Hence, IEMS and H&S were declared as a set of minimum standards especially in healthcare and/or health infrastructure, provision of essential drugs, commodities for primary health institutions and human and financial resources in Nigeria.

The requirement for standard setting in health services has become widely recognised and adopted in recent times. According to the WHO, the motive of setting health ethics as a tool in health services management is to inspire the highest quality achievement of healthcare (WHO 2014). Standards offer degrees of excellence, monitoring, supervision, regulation and comparison; they are to be pursued in a given exercise. Standards facilitate instant recognition with regard to services provided at different levels.

3.10 Safety in Oil and Gas Sectors

According to Silla et al. (2017), safety is about relative freedom from danger and risk, or taking steps to avoid or reduce the threat of harm and injury, including loss while driving, playing sports, working, doing chores, for personnel and/or property whether caused accidentally or deliberately. Safety is the means or process by which human, tools and properties physically prevent, delay or protect against internal or external dangers, loss, defects and other actions that hinder, destroy or threaten an organisation or rob it of its intended purpose (Rezaee et al., 2020). Although it seems expensive and could be extremely difficult, safety is relative, lessens and eliminates risk. A safe state or situation is where risks, threats, injuries or property damages are low and manageable.

3.10.1 Safety and Management in Oil and Gas sectors

According to Silla et al. (2017), safety management in organisations is demonstrated by effective and competent H&S committees, which inspire and mandate the formulation of safety management and appoint experienced safety and self-regulatory persons capable of addressing safety issues. In 1970, the U.S. Congress and the Department of Labour established the Occupational Safety and Health Administration (OSHA), (Act 1970) to ensure possible safety management and enhance healthful working conditions within the organisation and the environment. In 1974, the existence and functions of safety management were commissioned and executed directly by the OSHA (Act 1974) (Novakovich, 2021).

Novakovich, (2021). noted that the primary purpose of safety management is to establish the public safety and welfare of people at work, including conducting new research and proposing standards and regulations, providing information with advice and encouraging organisations to realise that safety is relative. Provan et al (2020) highlights the primary purpose of safety management as ensuring safety issues are planned, assessed, organised, controlled, monitored, recorded, audited and reviewed by management in a systematic and holistic way. Provan et al (2020) and Akinleye, (2017) noted the necessity of these activities in cases of disasters such as the

Clapham rail disaster (Hidden, 1989), the Piper Alpha disaster (Cullen, 1991) and the Nigerian O&G explosion 2008 and 2009. Akinleye, (2017) stresses the value of H&S as a priority for the O&G industry. However, safety management, occupational hygiene exposures or safety regulations are often not accurately assessed to determine the true risk to workers. The active support of organisations in most developed countries and effective participation of regulatory authorities thereby enhance the protection of safety management and welfare of the workers.

Safety management is the condition of a steady state of an environment or organisation doing what it is supposed to do to function when complying with specific rule definitions of what is expected and acceptable. (Hollnagel, (2018) asserted four meanings of the safety management plan as: the highest degree of maintaining and promoting the physical, mental and social well-being of workers; defence to workers and employer from risks resulting from factors unfavourable to health; adaptation of the occupational environment to place and maintain the physiological and psychological capabilities of workers; and preventing health-related problems triggered by working conditions.

The focus on a positive safety management culture particularly for O&G sectors has led the Advisory Committee for Safety in Nuclear Installations (ACSNI), to actively pursue safety management practices for O&G companies worldwide (Masys, 2018.). ACSNI have described O&G sectors or employee safety based on the protection of workers from the dangers of industrial accidents. The National Council of Occupational health and safety (NCC) recognised workplace hazards as anything that can cause physical and mental injury in the workplace (Emetumah, 2016). However, the NCC differentiates health hazards from safety management hazards; health hazards are defined as acute or chronic illnesses, while safety hazards are immediate, direct/indirect or traumatic injuries such as crushed hand, eye damage, severed finger and broken nose, and including hidden safety hazards, such as falling objects, blind spots, unguarded machinery, unbalanced walking surface, outlets and wires, tripping hazards, holes in the ceiling and damaged plugs (Ilbahar et al 2018). Hence, according to ACSNI and NCC, safety management

policies may encompass activities directed at either totally reducing or completely removing any hazardous conditions causing bodily injuries. Taken more generally, safety management means a condition of being safe from all that causes hurt, injuries or loss.

3.10.2 Safety Environment in Oil and Gas sectors

2014 joint research four governmental agencies (National Academy of Engineering, National Research Council (NAE and NRC), the Bureau of Ocean Energy Management Regulation Enforcement (BOEMRE) and the U.S. Coast Guard (ND)), underlined that compliance with government laws and regulations alone is inadequate to create and maintain a safe environment, particularly in the O&G sector. Despite the policies and improvements in the government's safe environmental management acts, ecological, health and safety continues to suffer from environmental pollution (Oyebode, 2018).

The quality of employers and the standard of the organisation's safety management enhances the comfort of the workforce with respect to the physical environment. Mostly, the environment influences the level of safety, motivation and innovation (Theophilus, et al 2017), especially in the O&G setting, which could impact the level of collaboration and absenteeism and how long to stay in the job. OSHA does make it compulsory for employers to deliver a workplace free from recognised hazards and the likelihood of death, physical or mental harm to employees (Theophilus, et al 2017).

Initiative in health, safety, and the environmental freedom by the UN and the WHO in 2015 to 2016 conferences, address, monitor and induce the key environmental social and safety for workers and the public to perform efficiently and effectively (De Marco et al 2019). However, the need for a safe environment cannot be overemphasised; it creates healthy outcomes for people via reduced costs and improved performance of health and social well-being. The seminars were for both public and private companies around the globe, multi-stakeholders involved in research or have a flaring policy in place or a convincing environmental, safety, social and health track record.

3.10.3 The Health and Safety World Standard

The idea of Health and Safety has been discussed and explained above, with reference to different researchers and authors in different dimensions. However, (da Silva (2019) in his own understanding, defined H&S as the procedures and regulations to prevent injury and accidents in our environments. H&S is a state of mandating the removal and reduction of environmental hazards by the replacement of materials, which could help minimise the effects of hazards. Authors and researchers define it as a set of rules (laws) planned to protect people from injury or illness caused by their work (Hollnagel, 2018).

H&S is a process, belief and ideology, although some scholars document it in terms of the mechanism and system of retaining human resource from illness. da Silva (2019) understood it as the act of protecting workers from H&S hazards, which sets out duties for the rights of workers in workplaces and establishes procedures or strategies for dealing with workplace hazards. It also provides the enforcement of law where compliance has not been attained voluntarily.

H&S laws and duties apply to all employers, businesses and self-employed persons; they are to them and members of the public from workplace and environmental threats (Downie and Gosling, 2019). It requires employers to ensure the H&S of each employee and other workers who may be affected; the guiding principle for the operator, contractor and owner of a project or installation is the responsibility towards every person working on the installation. The act states that the main concern for controlling risks (H&S) lies with those who create the operations.

3.10.4 Safety in Oil and Gas Production

According to Alkhaldi, (2018), O&G work-related diseases across the globe are growing alarmingly. The O&G industry is likely to be as one of the most hazardous industrial sectors in the future. El Bouti (2017) rated it as number one because of flammable chemicals, powerful equipment and procedures which are under high pressure and can lead to hazardous and/or noxious incidents. Alkhaldi, (2018) noted the numerous environmental risks associated with the

safety of workers in the O&G industry, such as flammable gases (including hydrogen and well gases) and vapours which can be released from trucks, wells, surface or production equipment such as tanks and shale shakers. Other risks include fire and explosions due to ignition of flammable gases or vapours. Adebisi et al. (2020) state that ignition sources can also include static, open flames, lightning, electrical energy sources, cigarettes, welding and cutting tools, frictional heat and hot surfaces.

According to Horseman et al (2018) and Munirah, et al (2019), high-pressure lines and equipment expose workers to hazards resulting from internal erosion such as leaks or line bursts from compressed gases or high-pressure lines. Ergonomic hazards result from repeatedly lifting heavy items, pushing and pulling heavy loads, bending and working in awkward body postures including reaching overhead, which might expose O&G workers to ergonomics-related injuries and risks. There are also risks around confined spaces caused by the frequent entry of workers to petroleum storage tanks, reserve pits, mud pits and other excavated areas, including sand storage and containers which have associated safety hazards in confined space. Risk includes ignition of flammable gases and vapours. Falls have been recorded by workers in O&G drilling and other elevated equipment located high above the ground.

Munirah, et al (2019) point to the risks of explosions and fires due to the ignition of flammable gases and vapours. Munirah, et al (2019) also point out that three out of every five on-site fatalities in the O&G industry are caused by struck-by/caught-in/caught-between hazards. Workers are exposed to such hazards in multiple ways, from falling or moving equipment or vehicles. Vehicle collisions are another leading cause of O&G extraction worker fatalities. (Mohammadnazar, and Samimi, (2019) revealed that 4 of every 10 workers died in O&G as a result of highway vehicle incidents. Machine hazards occur because workers may be visible to a wide diversity of rotating wellhead equipment, including pumps, compressors, conveyors, top drives, belt wheels, catheads, hoist blocks and draw works, which might cause injury if they are struck by or caught between unguarded machines. Electrical and other hazardous energy, poorly

installed or managed electrical power sources pose a risk to the health and safety of workers and the environment.

Muazu (2019) and Kemunto, (2019) highlights the inadequacies manifested in poor safety management, unsuitable such as: designed workstation furniture, excessive noise area, inappropriate lighting system, absence of personal protective equipment and insufficient safety measures in fire emergencies. Good management systems of developed countries have been successful in mitigating H&S risks and reducing the number of incidents in most companies. O&G sectors in these countries continuously improve H&S and environmental protection of workers, as demonstrated by monitoring performance. Mohammadnazar, and Samimi, (2019) reveal that most common and vital H&S incidents occur within the O&G sector. Thus, three of five researchers focus on the H&S in the O&G environment or workforce of developed countries.

3.10.5 The State of Nigeria's Safety

Many sources have assessed Nigeria as a level 3 travel country, with crime, terrorism, piracy, one-man judgement by traffic officials and routine bribes for police officers affecting safety (Isukul et al 2019). Scooters, motorcycles and vehicle drivers typically disregard traffic laws; traffic lights/ and road safety signs are often non-existent and regularly ignored where they exist.

Ugwuoke et al. (2017) point out the absence of reliable statistics on safety hazards, traffic, industry, health and other fatalities, due to the lack of centralised (IEMS and H&S) reporting. However, occupational accident information is not standardised worldwide, especially in developing countries particularly Nigeria. Evidence reveal unreliable information on occupational accidents due to deficiencies in proper notification and recording systems.

A 10-year study on occupational accidents reported the 2019 world day for health and safety in Nigeria, the Minister of Labour and Employment Chris Ngige, stated 2.78 million workers die from occupational related diseases and accidents annually (Anonymous1 2019). The International Labour Organization (ILO) estimated 374 million suffer from non-fatal occupational accident

annually worldwide; the report showed accidents and work-related illnesses are 1 more higher than the 2.2.78 million estimated in previous year (Probst et al 2019). However, the true figures are not obtained from Nigerian factories because of lack of data.

Due to the unemployment rate and work processes in Nigeria, workers in industrial and manufacturing companies, including the O&G sector are exposed daily to various occupational hazards like vibration, dust, noise, extreme-temperature gases, radiation and other highly reactive chemicals, including ozone, carbon, carbon monoxide, nitrogen oxide, dioxide, sulphuric acid. This has led to gross deficit of health and sudden death of some workers. High risk of physical hazards is also prevalent in the workplace. These include heat, radiation, stress, cold and repetitive motion, which causes blood disorder, cancer, burns, deafness and hypothermia (heat stroke).

Workplace and environmental hazards in the majority of Nigerian industries were due to bad workplace safety tool layout, design and planning. (Adebisi et al 2020), adds corruption, inappropriate enforcement mechanisms, chronic unemployment and bad and outdated legislation including a lack of effective industrial enforcement (David). O&G in Nigeria could be compared with H&S systems in developed and developing countries; appropriate laws, regulations and enforcement will be demonstrated by both lawmakers and the public (Izuogu, 2019).

3.10.6 The Importance of Safety in Oil and Gas sector

According to ILO, 151 work-related accidents occur every 15 seconds. Injuries and deaths take a particularly heavy toll in most developing countries, where a large portion of the population is engaged in hazardous activities like construction, agriculture, fishing and industries (ILO 2016). An estimated 651,279 hazardous substances, 2.4 million work-related diseases and 380,500 fatal occupational accidents are recorded by WHO annually, according to the Workplace Safety and Health Institute (WSH) in Singapore, ILO and the Finland Ministry of Health and Social Affairs (Bennett et al 2018).

The most serious risk is that of hydrogen sulphide (H₂S) which accounts for 70% to 80% of casualties and methane (CH₄), which accounts for 20%. The U.S. OSHA reported that O&G fatality rate is seven times greater in the past 10 years than the rate for all industries in the United States (Mokdad et al 2018). The Progress Report for Responsible Canadian Energy (RCE) formed by the Canadian Association of Petroleum Producers recorded eight greater fatalities despite the overall decline in injury frequency.

3.10.7 Safety Tools for Oil and gas management system

According to Saunders, et al (2019), Safety tools can be defined as safety communication signs or symbols. Safety signs, symbols or tools are significant safety communicating means that help to indicate hazards present or in a workplace or any environment. According to Saunders, et al (2019), feeling safe at work ranks as a crucial factor in job satisfaction. Using standard H&S signs overcomes language barriers and improves understanding.

Hazard is the potential of a substance, process or activity to cause harm (Chen, et al 2018). To reduce or eliminate this risk, organisations will incorporate safety tools into their policy. This guarantees safe work execution under a climate capable of enhancing emotional, physical and mental conditions. (Chen, et al (2018) note safety tools as indicators that help workers to be aware of various hazards present in the workplace. Likewise, they alert workers to keep safe by giving required information and safety instructions. They are helpful in reducing accidents in the workplace especially in the O&G sectors, construction sites and heavy industrial companies, though they are also important in office-based environments.

Safety tools (Figure 3.10 below) prevent injury and ensure staff and visitors are well aware of the possible hazards ahead in certain situations at work and the environment. The purpose of having safety signages in the workplace is to identify and warn workers who may be exposed to hazards. Safety signs can assist in the communication of important instructions, reinforce safety messages and provide instruction for emergency situations.

HAZARD AWARENESS CHART

HAZARD CLASSIFICATIONS



HAZARD INDEX

- 4 - SEVERE HAZARD
- 3 - SERIOUS HAZARD
- 2 - MODERATE HAZARD
- 1 - SLIGHT HAZARD
- 0 - MINIMAL HAZARD



Carcinogen

Health Hazard



Flammables

Flame



Hazardous to ozone layer

Exclamation Mark



Skin corrosion/burns

Corrosion



Explosives

Exploding Bomb



Gases under pressure

Gas Cylinder



Acute toxicity (fatal or toxic)

Skull and Crossbones



Oxidisers

Flame Over Circle



Aquatic toxicity

Environment

Figure 3 10 Safety tools




































	MEANING	SHAPE & COLOUR	SYMBOLS are put inside the safety shape. These are used in all EEC Countries		
PROHIBITION	You must not. Do not do. Stop.	 RED means STOP	 No admittance	 No smoking	 No dirty clothes
MANDATORY	You must do. Carry out the action given by the sign.	 BLUE means OBEY	 Keep clear	 Head protection must be worn	 Wear gloves
WARNING	Caution. Risk of danger. Hazard ahead.	 YELLOW means risk of DANGER	 Danger high voltage	 Danger mind your head	 Danger fork lifts in operation
SAFE CONDITION	The safe way. Where to go in an emergency	 GREEN means GO	 First aid station	 Emergency phone	 Emergency exit
MULTI-PURPOSE SIGNS To be used when the hazard requires more than one of the 4 types to convey the safety message.	 Acetylene	 Wear masks	 Warning Flammable liquid	 Protective garments must be worn	
SUPPLEMENTARY TEXT If the safety sign needs additional information it may be added in words.	 Fire alarm call point	 DANGER Highly flammable	 Protective gloves must be worn	 Electrical gloves	
FIRE EQUIPMENT SIGNS For indicating the location of fire fighting equipment and how they should be used.	 Fire alarm call point	 Fire hose reel	 Fire extinguisher	 Fire phone	
WORKS TRAFFIC SIGNS Are the same design as public road signs.	     				
	DANGER IDENTIFICATION MARKING 				

Figure 3 11 Safety tools and safety sign



Figure 3 12 Safety tools and safety sign



Figure 3 13 safety instruments

Safety signs guarantees a safe working environment and workplace. Up-to-date workplace safety tools or signs are adequately enforced and compiled by the employee, employer, governmental

agency and working environment to eliminate safety hazards. (Ref) highlighted getting the most out of H&S signs by keeping safety messages fresh and choosing the correct ones for each work location. Each work area needs different workplace safety signs to avoid sign blindness.

3.10.8 Case Study of the Importance of Safety in Oil and Gas sector

In 2005, the Buncefield Oil Storage explosion registered 2.4 on the Richter scale 125 miles away. It took five days and 1,000 firefighters from across the UK to put out the blaze. This was the largest oil storage explosion seen in peacetime Britain. Lack of overflow safety tools which result to overflow of one of the storage tanks caused the explosion, which resulted in the spilling of nearly 300 tonnes of gasoline.

After the explosion left 45 people injured, 60 children aged 5 to 14 were offered counselling through their schools, 2,000 people were evacuated, and several families lived in temporary accommodation for months. The blast affected 92 businesses employing 9,500 people, and 923 temporary and casual jobs were lost, 410 people were made redundant and 18,580 and 32,500 sqm of local businesses stores were destroyed while others relocated, and some businesses folded. Although Jacqui Campbell from Dacorum Borough Council said no life was lost, many people lost the lives they had before the incident happened.

The O&G industry is potentially one of the most hazardous industry sectors across the nation, with a combination of the most powerful equipment and flammable chemicals including processes that are under high pressure, which can lead to hazardous and even deadly incidents. Thus, the ILO and the WHO challenged the sector to facilitate safety and effectively respond to potential menace and serious incidents.

3. 11 International Health, Safety and the Environment (HSE)

In collaboration with U.S. state/federal agencies, OSHA mandates the regulation of health, safety and environment (HS&E) recordkeeping and reporting requirements to gather HS&E hazards and promote governing safeguards in the United States (Carie, and Protection, 2015). Various state and federal O&G exploration, production and pipeline/transportation monitoring bodies have also launched specific procedures for HS&E, such as safety measures, environmental enforcement and FERC-prescribed health for O&G and pipeline regulations relating to drilling and production platform.

The Environmental Protection Agency has stepped up its enforcement actions under the Clean Air Act 1963, by establishing regulatory jurisdiction over O&G processing, treatment and transportation facilities. It has aggregated multiple facilities together to establish regulatory thresholds.

What are the regulations on the disposal of waste products resulting from oil or gas extraction or processing? The typical waste products generated from oil or gas extraction and processing include flowback fluid from high-volume hydraulic fracturing, produced water (generally hypersaline) and drill cuttings. Flowback fluid from high-volume hydraulic fracturing is routinely recycled for reuse in future operations. Produced water is most commonly disposed into Underground Injection Control Class IID wells permitted and regulated by the Environmental Protection Agency. Solid waste, in the form of drill cutting precipitates from recycled flowback fluid and is, where allowed, land-farmed or disposed of into permitted landfills. The existence of low levels of naturally occurring radioactive materials in shale formations may require drill cuttings to be disposed into Environmental Protection Agency-permitted hazardous waste landfills. The International Department of the Interior instructed limiting the flaring and venting of gas in the environment, public or Native American lands to the Bureau of Land Management. The three-year trail commenced in January 2016 to 2018, and the total reduction was 12,600 thousand cubic feet (Mcf)/month/well within those years. Regarding human rights and

governance criteria, all workers have a right to work in places where risks to their H&S are properly controlled. H&S is about stopping employees from getting hurt or ill through work. The employer is responsible for H&S, but employees must play their part.

3.11.1 Management system and occupational Safety

The ILO estimates that 2.3 million women and men around the world succumb to work-related accidents or diseases every year; this corresponds to over 6,000 deaths every day (Pega,et al 2021). There are an estimated 340 million occupational accidents and 160 million victims of work-related illnesses annually across the globe (Pega,et al 2021) . The ILO updates these estimates at intervals, and these indicate an increase in accidents and ill health.

Noncommunicable diseases were responsible for 81 percent of deaths. Chronic obstructive pulmonary disease (450,000 fatalities), stroke (400,000 deaths), and ischemic heart disease were the leading causes of mortality (350,000 deaths). Occupational injuries were responsible for 19% of deaths (360,000 deaths). Long working hours and workplace exposure to air pollution, asthmagens (occupational asthma), carcinogens, ergonomic risk factors, and noise are among the 19 occupational risk variables examined in the study. Long working hours were the leading cause of death, accounting for about 750,000 deaths. 450,000 people died as a result of workplace air pollution (particulate matter, gases, and fumes) (Pega,et al 2021).

Due to the nature and frequency of occupational injuries and diseases prevalent among workers in the informal sector and small and medium enterprises, Rafei (2004) and Varianou-Mikellidou, et al (2019) advocates governmental and regulatory bodies pay increased attention to matters of occupational H&S. He notes that the absence of legislative, administrative and technological provisions for the sector accounts for the volume of casualties recorded from year to year. In addition, an ILO-sponsored study conducted by Comaru and Werna (2013) examined H&S-related issues in informal sector enterprises and recommended safe practices that can enhance the health status of urban workers in the informal sector. They argue that this sector forms an important part of human capital formation and development.

The International Labour, Safety, Health and Welfare Bill of 2012 empowers the National Council for Occupational Safety and Health (OSH) to enforce and implement measures in the workplace, promote the protection of lives and properties, promote OSH awareness, carry out inspection of workplaces and monitor compliance with all regulations or other OSH measures stipulated in the bill. The estimated cases of fatal occupational accidents in Nigeria are over 11,000 compared with 5,850 cases that were actually reported. However, gross underreporting of occupational accidents and diseases, including fatal accidents, gives a false picture of the scope of the problem. The Nigerian Social Insurance Trust Fund Management Board (NSITFMB) implements the Employee's Compensation Act of 2011, which makes provision for compensation for any deaths, injuries, diseases or disabilities due to employment. The Factories Act (1990) enables the Inspectorate Department of the Federal Ministry of Labour and Productivity to enforce the minimum standard requirements of the Factories Act of 1990 in Nigeria.

Table 3.1 highlights the problems facing Oil and gas EH&S management systems as observed from literature., 11 major gaps in EH&S knowledge in the Oil and Gas sector were identified, as shown in table 3. These were used as points of focus for the preliminary study.

Table 4 Literature review and preliminary survey gaps

NO	LITERATURE REVIEW GAP
1	EH&S Mismanagement Problems
2	Lack of Appropriate Supervision
3	Corruption within O&G EH&S Management
4	Duplication of O&G Logistics
5	Violation of Human Rights
6	Insufficient of EH&S Data
7	Human Error
8	Lack of Government Support to Oil and Gas EH&S Sectors
9	Unsuitable Management
10	Outdated O&G Laws
11	Lack of Incentives to EH&S Management

3.12 Summary

Despite its global importance, the O&G industry has remained one of the most dangerous sectors, due to the high record of disease, death and health issues associated with pollution. Despite attempts to tackle this problem through the formulation of management acts, poor EH&S records remain unacceptably high. According to the review, several major gaps were discovered, including inadequate management and government performance, as well as other fundamental factors as stated in the table 3.1, which represents a high social and economic burden on EH&S. Several studies have stated that inequities and a lack of data produce excessive stress and have a negative impact on the country's EH&S. The study designs a preliminary survey question (see Chapter 5 for details) to confirm empirical data and achieve a systematic inquiry and the notion of this literature review point.

4.0 CHAPTER FOUR RESEARCH METHODOLOGY

4.1 Introduction

Having reviewed the literature relevant to the research in the previous chapters. This chapter will illustrate the philosophical concepts that underpin the research and how it should achieve its goals. As a result, the methodology of inquiry for the research is discussed here. It begins with the research philosophy and alternative approaches to knowledge claims, followed by the research strategy and selection of the most appropriate method for doing the research. The chapter also discusses the choice of research methods, the mixed-research method, sampling, data collection. It then moves on to discuss the methods utilised to obtain the necessary data, as well as how the data was obtained and analysed to develop the framework.

4.2 Research Philosophy

Scholars view research philosophy as 'a group of beliefs that influence or dictate what should be studied, how the research is done, and how results or outcome are interpreted' (Ackerman et al 2021). Saunders, Kivunja, et al (2017) referred to philosophy as individual thinking and belief concerning knowledge and how it is created and developed. Research philosophy is considered by Smidt, et al (2017) and Ackerman et al (2021) as the basic belief system that guides an investigation, and the electron lens through which a researcher looks at the world. It also supports the researcher to recognise the research design that will work for the study. In 2012, Saunders et al. interchanged philosophy with paradigm and defined paradigm as a set of shared theories or ways of thinking about some trait of the world (Saunders et al 2012). Likewise, it represents the way which social phenomena can be analysed to gain a scientific understanding. However, in the discipline inquiry context, the paradigm question seeks to address the general philosophical principle realm within which a research should be undertaken (Smidt, et al 2017). In the early 20s, Pham, (2018) noted that research philosophy focuses on three levels of enquiry:

- 1) Ontology – What is the nature of reality?
- 2) Epistemology – What can be studied?
- 3) Interpretivism and positivism

4.2.1 Ontology

Ontology is the philosophy of understanding the reality of existence. It advocates the basic beliefs that people have about the way the world operates (Crotty, 2012; Saunders et al., 2015). It is the study of being, which is concerned with what exists in the universe and from which humans can gain information. It helps researchers in determining the certain presence of things about what they are researching. Realist and idealist ontologies were defined by Bryman (2018). The realist claims that reality exists independently of human thinking and values, while the idealist believes that reality is founded on individual constructs and thoughts and reasoning (Crotty, 2008; Saunders et al., 2012). The thoughts and behaviour of individuals in the construction of social phenomena is highlighted by idealist ontology. Meanwhile, the realist school of thought contends that causal mechanisms are separate, stable variables that interact under certain circumstances, resulting in impact (Pham, 2018). According to Rashid, et al (2019) realism encourages case studies aimed at uncovering evidence of causal processes that explain outcomes.

Ontology helps in this research to establish different categories of certainty: (Sedell, 2021) existence of an oil and gas EH&S management system and its nature, identify truth claims, determine who decides legitimacy, deal with different and conflicting ideas of reality, and place information into order to better understand those things (example case study) (Colorafi, and Evans, 2016 and Vincent, et al 2018). Based on this, the quantitative study was chosen as the best approach for testing the different components of the sustainable framework. Hence, the first stage of the research adopted constructionism as its ontological stance (Baethge et al 2019).

4.2.2 Epistemological Underpinning

The epistemological approach focuses on the researcher's understanding of knowledge, as well as how knowledge is learned or how we learn (Pham, 2018). It is the philosophy of understanding that is rooted in a researcher's theoretical perspective and methodology (Rashid, et al 2019). Epistemology is a branch of philosophy that studies the essence of knowledge and seeks to answer the following questions:

- 1) How do we know we know what we are talking about?
- 2) What is the connection between the knower and the thing that is known?
- 3) What do we mean when we say 'knowledge'?

Interpretivism, positivism and critical realism are the three epistemological positions defined by Heeks, et al (2019). Each of these positions is discussed in detail in the sections that follow.

4.2.3 Interpretivism and Positivism

The interpretivist view holds that 'the social world of business and management is too dynamic to lend itself to theorising by concrete 'rules in a way physical sciences do, (Saunders et al 2007 and Saunders et al. 2012). According to the interpretivist viewpoint, there is no single truth; rather, reality is determined by an individual's perception of social events based on their life experiences (Crotty, 2012). Interpretivists claim that something cannot exist without the presence of the person who experiences it (Bryman, and Bell, 2007). This means that the person can only have their own explanation, effectively dismissing what can be accepted as true and the possibility of determining causality.

Positivism on the other hand, claims that experience is distinct from the researcher who studies it, implying that the researcher and phenomena being examined are separate entities (Saunders et al., 2015). The positivist position is mostly associated with quantitative data collection and analysis approaches, which necessitate a highly organised methodology to promote study

replication (Saunders et al., 2012). According to Crotty (2012), positivists assume that when research is conducted using an analytical method and a neutral mechanism, a single truth can be discovered. As a result, when a researcher uses the cause-and-effect theory to quantify relationships between variables to establish a single truth, reality is discovered (Heeks, et al 2019). The weakness in this approach was highlighted by Pham, (2018) who said, 'The most critical problem is that constant conjunction of elements or variables is not a causal explanation or indeed any kind of explanation'. It is just a world-theoretical argument that does not address the question 'Why?' (Heeks, et al 2019).

These philosophies help in achieving the research aim and objectives by determining the individual's perception and experience of the oil and gas management system. Its strength is the research culture, like the physical world (EH&S), and social trends, such as the relationship between the O&G management structure and the stakeholders based on a set of general laws.

Individuals and their real-life experiences are seen as core components of study by positivists, who consider them as autonomous and non-reflective subjects. This overlooks any ability to 'reflect on problem situations and act on them in an interdependent manner' (Ackerman et al 2021). Rashid et al (2019) adds that people are surrounded by socially constructed realities that are impossible to quantify using statistical instruments and structural equations. Saunders et al., (2012) went on to say that because of the interactions that exist between the researcher and the phenomenon under study, the natural-science approach cannot be used for social research. Furthermore, the positivist position isolates the researcher from the environment they study in social research. However, the researcher will engage in real-world life to some degree, in order to comprehend and articulate its emergent properties and characteristics.

Table 4 1. The main characteristics of both epistemological positions

Positivism	Interpretivism
The observer must be independent	The observer is part of the research process
One truth exists	Many truths and realities exists
Beliefs must be objective	Beliefs that different people have different needs, experiences and perception
Requires large sample selected randomly	Requires small number of cases selected for particular reasons
Generalization through statistical probability	Generalization through theoretical abstraction
Quantitative research method	Qualitative research method
Illustrates causality	Helps to deeply understand a situation

4.3 Research Strategy

A research strategy outlines the course and operation of the research as well as context and structure for data collection and analysis (Creswell, 2009; Bryman, 2007). The philosophical positions that serve as the foundation for the study relate to research strategies. Therefore, the research strategy chosen represents decisions about the importance given to various aspects of the research process. As a result, the three research paradigms mentioned above relate to the two in one Pragmatics key research techniques used in any study. Thus, qualitative, quantitative and mixed methods are related to interpretivist, positivist and theories are among the strategies. According to Rashid et al (2019), The use of any of the above design techniques, is based on the

research questions raised, the level of influence a researcher has over the research events and the degree of emphasis on contemporary as opposed to historical events.

4.4 Qualitative Research Approach

This research approach is based on interpretivist philosophical assumptions (Creswell, 2007, 2009; Heeks, et al 2019) and has been in existence for over five decades as an alternative to conventional quantitative research methods (Guba, 1990; and Bryman, 2008). The techniques are primarily used in social and scientific research. It is deductive in terms of literature and hypotheses and shares the philosophical base of the positivist paradigm's (Bryman, 2008 and Creswell, 2009).

According to Clarke and Dawson, (1999) 'Naturalistic', 'constructionist', 'interpretivist', 'post-positivist' and 'holistic-inductive' are some of the terms used to characterise the approach. It includes grounded theory, ethnography, case studies, narrative and phenomenology (Wolcott, 1994; Denzin and Lincoln, 2005; Creswell, 2009). In contrast to proponents of quantitative science or positivism, this ontological stance argues that there is no single empirical truth out there in the universe (Creswell, 2009). Truth is created by characters or actors in the research and is subjective (Biggam, 2015). Qualitative study, according to Creswell (2009), entails investigating a phenomenon to comprehend a social or human problem while employing evolving versatile questions and procedures to elicit data from participants in their natural environment. Furthermore, according to Creswell (2009), a qualitative approach allows the researcher to analyse and appreciate the meaning of individuals or groups assigned to a specific phenomenon.

The qualitative analysis model means that the researcher gets close to the subject matter under investigation, based on the ontological role of social constructivism (Denzin, and Lincoln, (Eds.) (2005 and Vincent, et al 2018). There are many truths or realities; individuals and groups may create their own, based on their socioeconomic, political and cultural context or experience. The qualitative (interpretivism) research method was used to incorporate the human experience, document and report all the different versions of the truth or facts, rather than determine which

one is closest to reality. It saves money and allows flexibility in reformulation of the researcher's priori knowledge and understandings during the research process (Heeks, et al 2019).

The researcher's job is not to figure out which version is closest to the facts, but to accurately record and report all of them (Clarke and Dawson, 1999 and Sedell, 2021). It is worth noting that the epistemological perspective of proponents of qualitative research methods is based on the idea that natural and social phenomena are fundamentally different. As a result, the approach used to study natural phenomena might not be appropriate for social phenomena. Qualitative research favours an inductive approach to research, which allow data collected to explore ideas and explain the results (Clarke and Dawson, 1999; Creswell, 2007, 2009 and Azungah, 2018).

The qualitative research approach was chosen for this analysis as a means of achieving the research goal. The motivation was to address the problem of environmental degradation and the importance of incorporating EH&S concerns. The qualitative research approach can embrace ambiguity and subjectivity, allowing the researcher to gain perspectives and discover the significance of a specific experience, condition, cultural aspect, or historical event through interviews, observations and perceptions of the phenomenon (Creswell, (2009).

The ability to acquire impressions and narratives of thoughts, emotions and perceptions in a smooth, accessible and organised way, typically in close contact, is a major benefit of the qualitative approach (Heeks, et al 2019). Rashid et al (2019), and other proponents of qualitative analysis, assert that there is no risk in getting close to the individuals or objects under review for the primary purpose of studying and considering their perspective. The fundamental distinction between physical and social sciences, is that the techniques used in the physical sciences are always appropriate for studying phenomena in the social sciences (Creswell, 2009). The qualitative methodology helped the research in interacting with top O&G executives and determining the truth.

4.5 Quantitative Research Approach

This approach has its origins in positivist knowledge statements, which are supported by empiricist tradition (Guba, 1990; Clarke and Dawson, 1999; and Creswell, 2009). It was classified as a scientific, traditional and orthodox research methodology until the last five decades (Guba, 1990; 2000; Clarke and Dawson, 1999). This approach examines social or individual issues by putting scientific theories to the test, principally through the collection and analysis of observational evidence to see whether a predictive generalisation of a hypothesis is right (Bryman, 2004; Creswell, 2003, 2009; and Heeks, et al 2019).

The purpose of study is to increase verifiable knowledge by enabling explanation and prediction. It includes the comprehension of scientific truth, which is construed as the only accurate knowledge that can enhance the human condition (Bryman, and Bell, 2007). Avoiding all kinds of bias and subjectiveness in investigation is difficult and necessitates a separation of the inquirer from the subject matter of inquiry (Clarke and Dawson, 1999; Creswell, 2003, 2009). Clarke and Dawson (1999) conclude that information is conjectural and anti-foundational, implying that scientific proof is always incomplete and fallible.

The quantitative analysis approach is more effective at evaluating objective hypotheses by looking at correlations between groups of variables. This idea is founded on realist ontology, which proposes that there is a single objective fact in the universe, which is absolute truth driven by universal rules that are incapable of human experience. It also enables the researcher to gather a vast volume of information in a limited amount of time. It is therefore less costly than conducting laboratory experiments.

4.6 Mixed-Research Method

Multi-methodology, popularly known as mixed methods, has gained popularity among many social science researchers, based on the philosophical position of pragmatism. The notion is comparatively recent and is a combination of the quantitative and qualitative approaches. It is connected to several philosophical considerations, such as concurrent (which has been adopted

in this study), sequential and transformational (Creswell, 2003, 2009; Heeks et al 2019). The existence of the philosophical approach of pragmatism disallows the existence of a single objective reality.

The concept behind this notion outlines the strengths and the weaknesses of each method and uses the flexibility of each to complement the other and combine their strengths to provide significant positive outcomes. Consequently, the problem at hand and its solutions are more paramount for researchers using this approach. This is because the three most common questions (what, why and how) are always examined and used to solve any problem in a mixed-method approach. However, it directs researchers towards amalgamation (strategies, data collection techniques). It also puts more emphasis on social problems and ensures potential solutions (Creswell, 2003, 2009; Creswell, 2003, 2009; Heeks et al 2019).

Table 4 2 describes the differences between qualitative and quantitative methods.

Qualitative Research Method	Quantitative Research Method
More subjective	More objective
Inductive: generated theories	Deductive: testing proposed theories
Less generalisable	More generalisable
Text-based	Number-based
Small sample – interview, direct data collection	Representative sample
No statistical test	Statistical test is employed
Methods include in-depth interviews, focus group and reviews for types or themes	Method includes surveys, structured observations and interviews, reviews of documents or records for numeric information

4.7 Research Method

The researchers' experience or training determines the method, data collection and analysis of every research approach. However, the quantitative and qualitative methods have been criticised by several researchers, pinpointing the deficit and the merit of each method (Naoum, 2008)

including how these approaches can be used collaboratively due to opposing principles (Heeks, 2019). A qualitative approach method could be used if the research requires interviews, observations and writing in a literary way (Creswell, 2009). Likewise, a quantitative approach could be adopted where the researcher is good at using computer statistical software or if a research work requires a statistical tool, for example, questionnaire and “Statistical Package for the Social Sciences” (SPSS) (Naoum, 2008). A researcher can also adopt a quantitative approach using questionnaire survey and support it with an interview (qualitative), using a mathematical (NVivo and SPSS) method for analysis (Creswell, 2009). No research approach is better than the other; all have their own benefits and shortcomings.

4.8 Choice of Research Methods

The importance of research work, or put in another way, the achievement of the aims and objectives of every research is embedded in the research method. Following the discussion of various research approaches in the above section, it is appropriate to illustrate how the research method for this study was selected. With respect to published best practices, it is recommended that the selection of a specific research methodology must be supported by a clear foundation for its adoption. Various reasons are frequently considered during the selection of any research approach, (Naoum, 2013 and Bryman, A. 2008). The main reasons include aims and objectives, the nature of the research problem, the availability of resources, the personal experience of the researcher, adequate time, literature gaps, financial resources and the direction of the research.

A mixed-method research approach was chosen for the study, which means a pragmatic philosophical stance that merges both qualitative and quantitative methods. The rationale behind the selection of the approach was to examine objective and subjective views, to combine the strengths of both methods to compensate for the weaknesses of each. The mixed method was considered suitable and appropriate to achieve the research aim and objectives, supporting a wider understanding of the research problem. The mixed method was used to improve the quality of the research study

and contribute towards the development of better integration of the EH&S management system (Pham, et al 2018).

The researchers' experience or training in using data collection and analysis methods determine the type of approach to adopt. However, the nature of the research problem determines the method to be adopted in the research (Baethge et al 2019). For instance, qualitative approach is the most appropriate when a solution to a problem involves exploring a concept and identifying the variables to examine or understand a phenomenon. On the other hand, quantitative method is considered as the best approach where the problem is about testing a theory by establishing the magnitude of a causal relationship using identified variables (Sugimoto et al 2017). the mixed method approach is adopted where neither the quantitative nor qualitative approach can be used alone (Colorafi, and Evans, 2016 and Vincent, et al 2018).

1. There is a need to obtain views or perceptions and information on the management of the existing environmental system and what type of H&S programmes or measures are employed, how and to what extent they are employed.
2. It is obvious that the research will require a lot of time to collect and analyse survey data because the data from participants will make the outcome more reliable.
3. The time limit attached to a PhD research program is considered.
4. At the conclusion of the study, it is necessary to generalise the findings.

The aim of this research is to generalise the findings regardless of any circumstance, to prevent the prevalence of accidents in EH&S in O&G, particularly in Nigeria. Figure 4.0 outline the research process.

This study seeks to establish the integration between O&G EH&S management systems, with emphasis on reducing O&G environmental pollution in Nigeria. To some extent, literature has established the cause and relationship, though this is based on little or no empirical evidence (Pichtel 2016 and Ekwurzel, et al 2017). This suggests that the identified relationships may not

actually exist or be exhaustively researched, Hence, there is need for exploration to fully ascertain the relationships.

- **Given the foregoing**, the mixed method research approach is comparatively more suitable to addressing the research problem in terms of:
- **Widening findings:** The quantitative method helps in widening the findings while the qualitative method deepens it
- **Exploration and Generalisation:** While the qualitative approach was used to explore and broadly identify the relationships, the quantitative research method was used to confirm the relationships, test the framework and generalise (infer) the findings.
- **Improved confidence and accuracy:** The literature review and qualitative findings were further verified using the quantitative method to improve confidence in the accuracy of the findings.
- **A more complete picture:** The combination of quantitative and qualitative results allowed for a more comprehensive picture of the relationship (Baethge et al 2019).
- **Validity:** the quantitative and qualitative methods were used to test the different components of the framework.
- **Compensating the strengths and weaknesses of each:** For instance, the qualitative approach gave an in-depth understanding but did not cover a large sample. The quantitative approach covered a large sample across a wider geographical area within a much shorter period, but did not provide information as deep as the qualitative approach (Sugimoto et al 2017). Therefore, the mixed method approach was adopted for this study.

INTEGRATING ENVIRONMENTAL MANAGEMENT AND HEALTH AND SAFETY IN THE OIL AND GAS INDUSTRY: A CASE STUDY OF NIGERIA

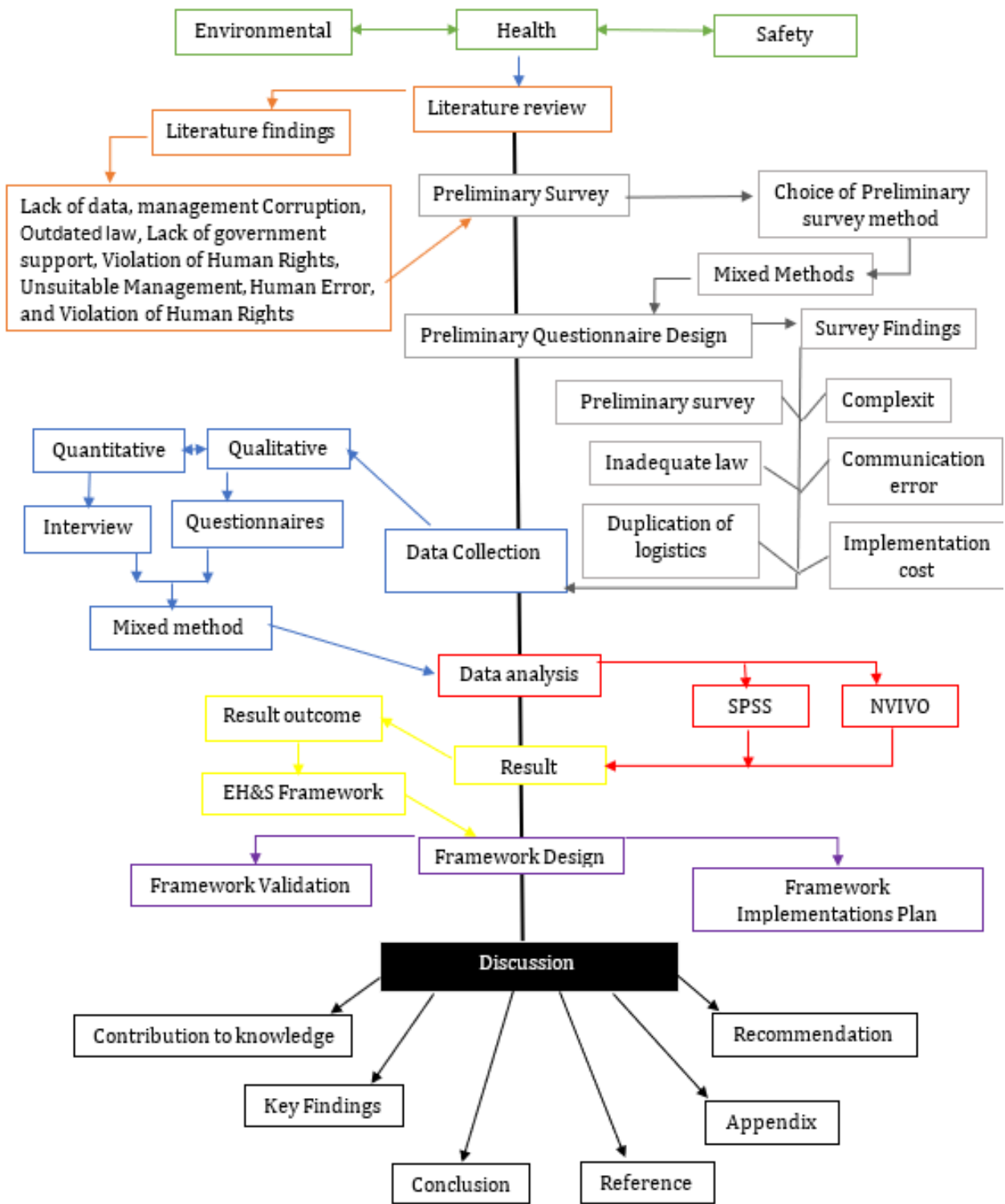


Figure 4 1 Research Flowchart

4.9 Data Collection

Two basic approaches were used in this study, but there were three distinct ways of data collection. The review of literature on the integration of the O&G management system and EH&S was the first, supported by two to three case studies, see 2.9.1 and 2.9.2. (A case Study of effective campus management and case study of a company on EH&S management). Second, the study conducted a questionnaire survey with management teams from three companies (EH&S) that had relevant experiences and knowledge of the problems around the integration of EH&S management in O&G. The study also collected raw data through interviews with participants from the three companies.

In stronger terms, three sources of data collection methods were applied in the research study, and they include the literature review, pilot study survey and the main research survey. The main research survey included observations from the pilot study and the design of the questionnaire and interviews, followed by documentation and observation. According to Pham, (2018.), the nature of the research is worth noting as opposed to the specific data collection methods for a given research, and every expectation of the research depends on the successful usage of data collected.

4.9.1 Literature Review

The literature review in this research was utilised to provide an academic understanding before the empirical study. This was in line with the identification of the significant issues and concepts, as well as the opportunity to provide an effective review of existing gaps and studies related to the research problem. In this regard, the literature review was identified as a steppingstone to an future and existing relevant gap in the area of study. It provides a proper focus for the research and helps tackle and achieve some of the research objectives.

4.9.2 Review of Previous Research

The research systematically reviewed the previous literature on O&G EH&S, including the problems facing host communities. The review helped the study to recognise the various hazards that are associated with O&G environmental problems such as economic, water, land, air, animal, and infrastructure issues, including H&S impacts. (Okafor, et al 2016, Ojjiagwo, et al 2017) The O&G industries of developed and non-developed countries were also reviewed with regard to existing O&G degradation and integration of EH&S management systems in those countries, including their permissions, policies, restrictions, monitoring, enforcement and penalties. (Harrison, 2018, Hembra, and Phil-Eze, 2021).

4.9.3 Case Study

Review of existing literature provided the researcher the opportunity to investigate deeper into Nigeria, the case study of the research topic. The review helped to understand the issues surrounding the integration of EH&S in the country and identify a series of gaps associated with the O&G management system. A review of literature was also carried out on the impact of O&G, digging, blasting, fire and pipeline sabotage. It highlighted the current effect on temperature and pressure, which affects the efficiency of EH&S.

4.9.4 Problems Associated with EH&S in Oil and Gas

Based on the literature review of this research, 11 major gaps to EH&S knowledge in Oil and Gas sector were identified which were used as points of focus for the preliminary study. The aim was to provide solutions by enquiring further with questionnaires and interviews. The identified gaps in Oil and Gas environmental, health and safety management system included: management problem, lack of management supervision, insufficient data, human error, lack of government support, unsuitable management, outdated law, lack effective communication, lack of incentive, violation of human rights and corruption.

4.9.5 Literature Source

The 'literature' is a collection of all relevant written sources, it includes both theoretical and empirical works, both providing scope and depth to a literature review (Galvan, et al 2017). Data for this literature review was obtained from relevant sources, including scientific journals such as the International Journal of Emerging Trends in Eaidns engineering Development, the Journal of Natural Gas Science and Engineering, and Energy Journal, as well as textbooks and WIRE from the University of Wolverhampton. Other sources include trusted organisational and private websites, such as Local, national and international News sites, and other relevant material from university libraries, which guides authors in their writing. The most reliable sources of information has gone through a peer-review process (Sugiofmoto et al 2017 and Baethge, et al 2019). Literature is considered the premier source of research and way of identifying:

The research focus, how information is created and how it evolves over time

The perspectives of the topic and the impact of the information cycle on the reliability of information

4.9.6 Questionnaire Design

The first step in the questionnaire design was identifying from the literature review, a list of issues relating to the aims and objectives of the research. Converse, (2017.) noted that design of a proper questionnaire plays a big role in achieving a good response rate. However, Bhatnagar, et al (2017) argues that it is sometimes difficult to get quality response from Nigerian management personnel, particularly in the O&G sector. This be worse, as the present situation of the country is becoming alarming. The questionnaire and interviews were designed conducted with O&G EH&S management practitioners only. After this, an initial version of the preliminary question was developed, consisting of 7 sections (see Appendix H title preliminary survey question). Based on findings from the preliminary survey, the main survey questionnaire was refined into 4 sections: Introduction, Profile of respondents, Instructions, Questions and vote of thanks, to make the issues more explicit.

The research survey was designed to investigate incidents without compromising the research aim and objectives and the key techniques of safety management. The question enabled investigation of the root causes of O&G environmental pollution, the effect on ecosystems and the health and safety of stakeholders and host communities within the management system of O&G. It gleans information on how oil spill incidents occur, as well as ways of avoiding them. By so doing, it serves to determine whether environmental pollution occurred as a result of wrong management of a proper intention, or adequate management of wrong intention. Furthermore, the survey suggests the possible means of reducing O&G environmental pollution through developing a framework for integrating EH&S management systems.

4.9.7 Sampling Technique Adopted

The research is centred on developing a framework for reduction of Oil and Gas environmental pollution to promote EH&S in Nigeria. For this inquiry, the best approach is to adopt a purposive non-probability sampling technique (Amir, and Ralph, 2018). The question was therefore open only to oil and gas management practitioners, particularly those in the EH&S sector. As total number of oil companies contributing to oil spill and environmental pollution is unknown, The researcher is dealing with some unknown factors. However, it is important to note that not all O&G companies contribute to environmental pollution. In this case, a larger questionnaire sample to increase participation was adopted, through a snowball approach. At the end of invitation, the participants were requested to invite fellow management staff within the sector and their email addresses were provided for contact.

4.10 Experience of the Researcher

The researcher experienced personal difficulties during the design and collection of data. Data collection was designed as questionnaires and interviews of respondents within the O&G management system in Nigeria. During the preliminary survey, the questions were designed to be sent via e-mail to the boards of the management teams. For unknown reasons or for lack of trust, the management teams refused to release their e-mails to the researcher. Thus, the

questionnaire was sent to individual e-mails, which widened the survey beyond the necessary time limit. There were also difficulties during the second step of the research survey. The pandemic started after the design of the questions and preparations to travel for fieldwork, shutting down all offices and international flights. Thus, fieldwork was redesigned as an electronic questionnaire via the University of Wolverhampton online survey (formerly BOS), and the interviews were conducted through Microsoft Teams and Skype.

Several questionnaires and interview invitations were sent out, but only one interviewee responded. The interview was accepted and accomplished, but there were no further responses from other invitees. This caused a delay in the survey for over four months. Finally, the questionnaire was cancelled to be redesigned in another form, due to lack of respondents, travel restrictions, less access to Internet or computer system and meagre or ignorant management teams as one of the interviewees put it. Finally, the questionnaire was redesigned as a two-in-one question; every survey question included an interview question, and a space was provided to answer each question. As a result, every quantitative question was accompanied by a qualitative question that must be answered.

It took one year to get my questionnaire filled by those who fit the criteria. This was because of fear of the truth, freedom of speech and ignorance of technology usage. My personal experience as a researcher is that most of the Nigerian O&G management team did not encourage me to achieve my goals. For example, ten oil and gas companies were invited, most are happily agreed to participate in the research findings, while some delay in responding (up to six months before response) and others ignore the invitation. However, some practitioner request for money and seemed to want to take glory before acceptance of the research survey invitation.

4.11 Preliminary Data Collection

In this research, a preliminary survey was adopted using a quantitative and qualitative (mixed method) approach. To address this literature gap, the research introduced a preliminary study to scrutinise or confirm the literature review gaps and. According to Colorafi and Evans (2016) a

preliminary study is an original exploration where data is collected to facilitate the research planning and conduct of the trial. It is also used to identify key features to be addressed in a quality process.

4.11.1 Preliminary Data Collection

A preliminary survey was conducted using a mixed-method approach for designing the questionnaire and interviews. The questionnaire was sent out to key experts and practitioners in the Nigerian O&G sector, based on literature review gaps or outcomes, with assurances of anonymity. 178 survey questionnaires and 5 interview requests were sent out; 64 questionnaires were answered correctly, and 3 interviews were conducted. The questionnaire was designed based on four management systems: environmental, health, safety and the overall O&G management system. However, contributions from external bodies and the impact of technology on each management system were also considered, see chapter five for analysis and discussion (attached question and analysis table E and G for details).

4.11.2 Qualitative Data Collection Methods

According to Pham, et al 2019), in qualitative research, the most commonly used method in collecting and exploring complex or subtle phenomena is an interview. However, there are a few other data collection methods such as observation, surveys and group discussions, including document review and longitudinal studies. Surveys and interviews are part of data collection as appropriate means of collecting in-depth facts and ideas relating to the situation under this study.

The interviewer asks a direct question related to the research from the respondent to collect answers that are vital to the research aims and objectives. In every research work, there are two ways to collect data: interviews that are semi-structured, unstructured, and informal interviews (Saunders Lewis and Thornhill 2012). A semi-structured interview is flexible and allows issues to be discussed and the respondent to cultivate ideas and speak broadly on each question. An informal or unstructured interview disregards any set of questions. Instead, the interview flows

like a natural discussion where open-ended questions are asked based on a particular research topic. In this regard, a semi-structured or structured design was adopted.

4.11.3 Benefits of Qualitative Data Collection

The best advantage is the opportunity for close interaction with the interviewee, allowing for a high level of control of the interview process and a higher chance of obtaining high-quality details. However, there are many other benefits, such as flexibility to reframe the questions, accuracy of answers, chances to seek further issues and obtain more clarification of the details and speed and high response rate.

It is important to remember that the quantitative analysis approach was particularly critical in this study, because it approved and presented recommendations for the implementation and effective completion of the questionnaire surveys. However, it cannot be used solely for the purpose of completing a succinct case study.

In summary, this quantitative research approach is categorised into the following:

1. It ensures an impartial and unbiased appraisal of the case. The researcher is kept separate and independent from the survey.
2. It employs a deductive method of logical reasoning, in which concepts, hypotheses and variables are chosen and retained during the analysis.
3. It also employs mathematical software (SPSS) to perform descriptive and inferential numerical analysis of data to assess the reliability and validity of the findings.

The thesis will be driven by the findings of the literature review. A structure is created (research tree) based on it, and data is gathered and analysed to assess the relevance and generalisability of the framework.

4.12 Qualitative Analysis Results

For the qualitative responses, the participants were asked to elaborate on their reasoning for rating each of the 14 items the way they did. Their responses were uploaded and coded in NVivo 12, a qualitative analysis software. The specific analysis technique that was deployed was the six-step thematic analysis developed by Braun and Clarke (2016). Essentially, these six steps are:

1. Familiarising the data by reading and rereading the complete dataset until the researcher felt comfortable with the data. During this step, the researcher made personal notes about recurring ideas as well as potential themes and subthemes.
2. Generating initial codes based on the data by highlighting a short phrase or sentence that represented a certain idea and giving them code names. Similar ideas were put under the same code. This process was repeated for all 14 items.
3. Determining/identifying themes. Themes represent expressions within the data that belong to the same group.
4. Reviewing themes. In-depth scrutiny of themes to ensure that the theme allocation is optimal.
5. Defining themes. In addition to step 3, the themes are named and defined for use in the final analysis step.
6. Reporting the results. This reporting process is found below.

Following these steps, 10 themes were developed with each having 2–5 subthemes or categories. They are reported in the table below.

4.13 Research Ethical Consideration

The goal of research is undoubtedly to test ideas, make conclusions and add or update information, among other things (Creswell 2007). Thus, researchers must be led by some sort of

ethics when conducting research. Heeks, et al (2019) defined research ethics as the behaviours, structure and process that researchers should exhibit throughout the study process.

As a result, an ethical approval form was requested and submitted to the ethics committee at the University of Wolverhampton as shown in Appendix F, and approvals for category A were obtained. Ethical considerations and permission were given priority while performing this study. Naoum, (2007) pointed out that human participants are considered as collaborators rather than subjects. The whole research was conducted in a way that ensured the confidentiality, respect and integrity of the participants were respected. These were considered throughout the research process from the case review, preliminary survey designs, to the selection of method and data collection, and throughout the implementation and data analysis processes. Maximum dedicated effort by the researcher was in place to maximise the risk or benefit that might emerge from the research.

The participants were told of the purpose and aims of the study, and their agreement to participate was obtained on a voluntary basis. Before performing any field study, critical thoughts on ethical issues were explored. The participants were also assured that their information will be treated with absolute confidentiality and anonymity. Participants, particularly interviewees, were made aware that they could opt out of the process at any moment during the interview if they did not wish to continue (see Appendix H for details).

4.14 Summary

This chapter provided an in-depth explanation of the research approach that was employed to achieve the goals of the study. The use of research strategies and sample procedures has been justified for the selection of the research method and the implementation of each strategy. It is also worth noting that the research strategy for this study was determined by the type of data gathered. The information was collected from respondents across a wide span of the Nigerian O&G sector's EH&S management system via questionnaires and interviews. The study used a mixed-research strategy, which comprises qualitative and quantitative approaches, based on

predetermined aims and objectives. In addition, the qualitative data was analysed with NVivo, whereas the quantitative data was analysed with descriptive statistics. Following the discussion of the technique used, the next chapter presents the analysed data for the study findings.

5.0 CHAPTER FIVE: RESULTS FROM QUALITATIVE AND QUANTITATIVE DATA ANALYSES ON INTEGRATING EH&S MANAGEMENT IN NIGERIAN O&G

5.1 Introduction

The third and fourth objectives of this study are to develop a framework that integrates EH&S systems for managing environmental degradation in the O&G industry, as well as a sustainable framework that integrates EH&S management systems for managing environmental degradation. To achieve this goal, the chapter analysed two separate data, one from a preliminary study and the general research survey to determine the integration of Oil and Gas EH&S management system and concerns connected in Nigeria's Oil and Gas sectors, in agreement with management practitioner to remain unidentified. The findings will be utilised to establish a framework for controlling EH&S degradation and to further develop a sustainable framework for EH&S management in Nigeria's oil industry.

5.2 Survey Responses

In this survey, 178 survey questionnaires and 5 interview requests were sent out; 64 questionnaires were answered correctly, and 3 interviews were conducted. The respondents were classified in section A of the questionnaire (see Appendix). Question 1 in Figure 5.0 designed to ascertain the area of specialisation of the company or companies, while question 2 in Figure 5.1 sought to obtain the area/areas or position of operation. According to Figure 5.0, 34.5% of respondents were in O&G management, 25.6% in H&S management, 21.1% were environmental managers and the remaining 18.8 % were infrastructure engineers and management.

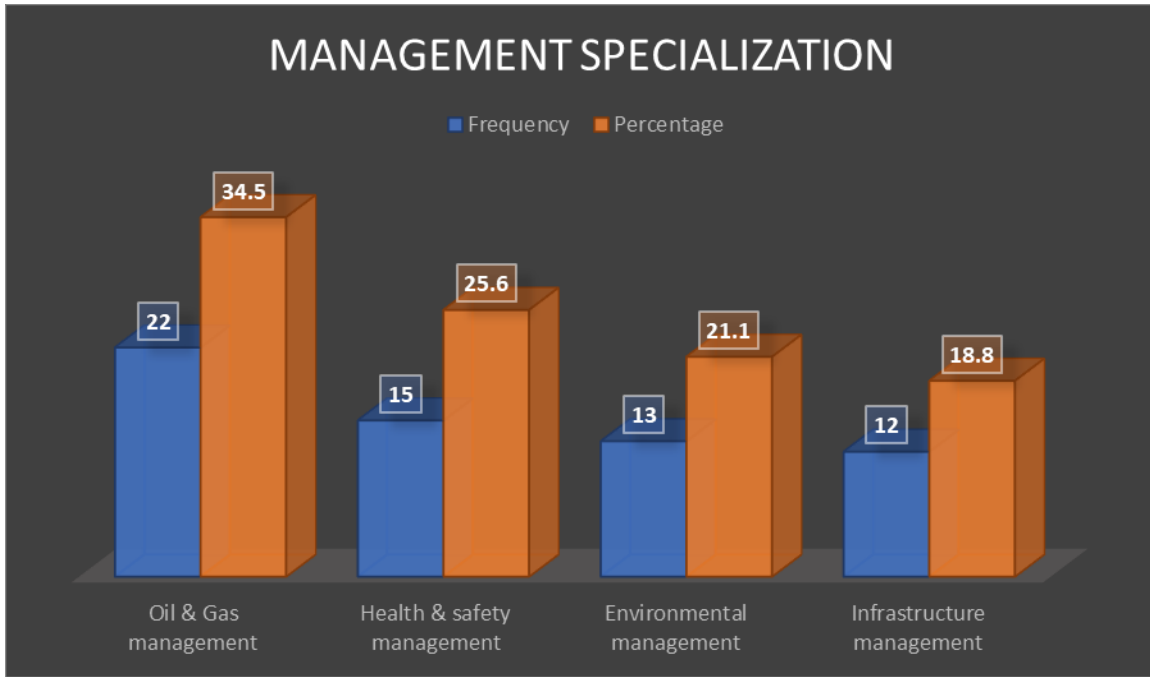


Figure 5 1 Management specialization

Figure 5.1 was analysed to classify the characteristics of the management operation. the results showed that 34% of the respondents were in O&G production and operation, 19% were in health managers and 17% environmental managers, 16% were safety managers and 14% were infrastructure managers, such as architects, civil engineers, quantity surveyors and structural engineers who contractors for O&G EH&S management. This implies that the poll had significant participation from O&G EH&S managers and that their opinions were fairly acquired.

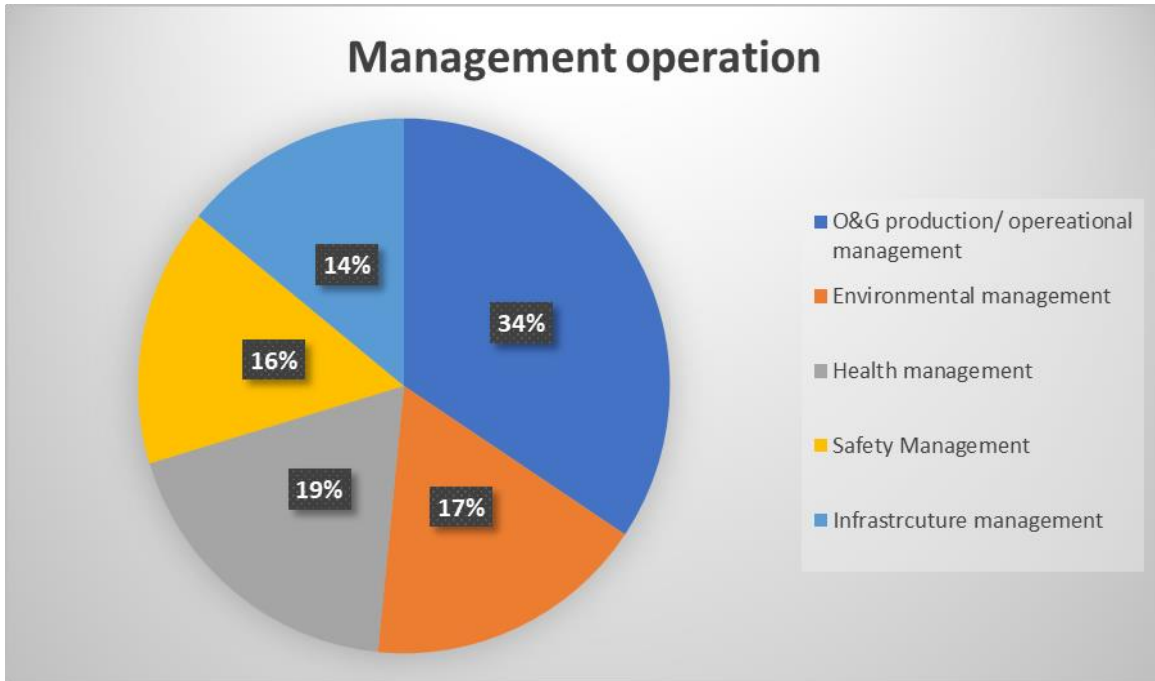


Figure 5 2 Management operation

Figure 5.2 shows that 34% of the respondents had a working experience of 1–5 years, 31% 6–10 years, 16% 11–15 years and 19% 16 years and above. This indicates that over 66% of the respondents involved in the survey had more than five years of work experience and were well-versed in Nigerian O&G problems and their causes

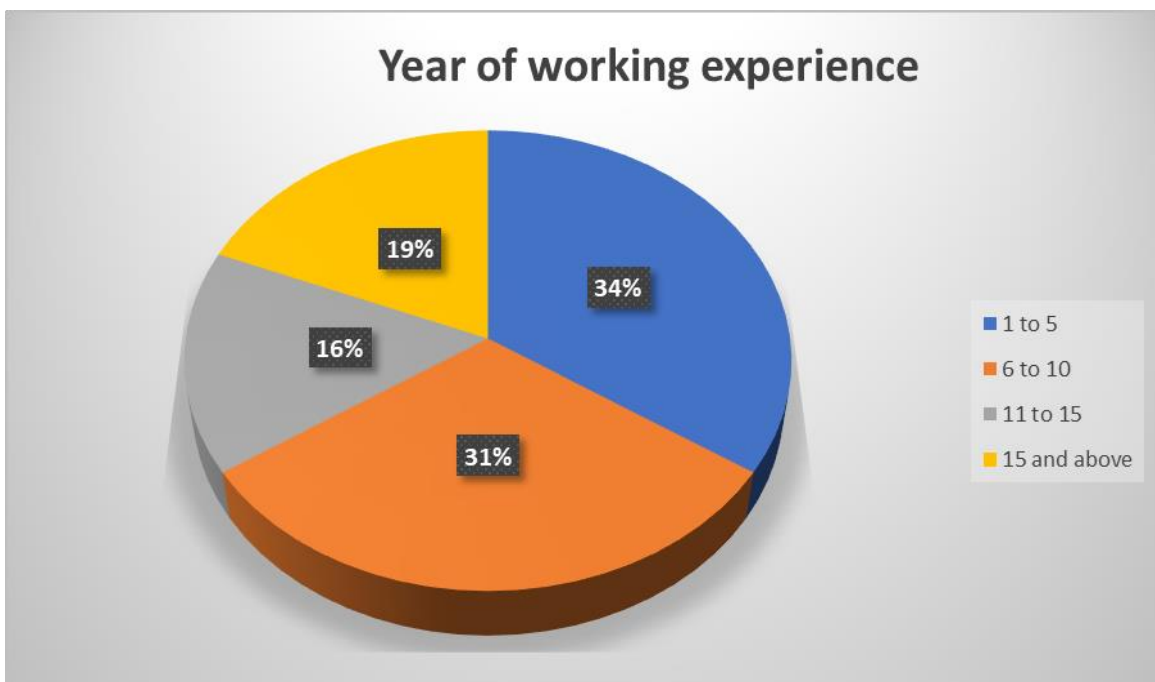


Figure 5 3 Working experience

Question 5 of section A ascertained the sizes of the organisations on whose behalf the respondents responded to the questionnaire (see Appendix). As shown in Figure 5.4, 23 of the 64 respondents have up to 50 employees, 13 have up to 500 employees, 19% have above 500 and only 9 appear to have 1 to 10 employees. This indicates that the questionnaires were mostly answered by large companies with more than 50 workers.

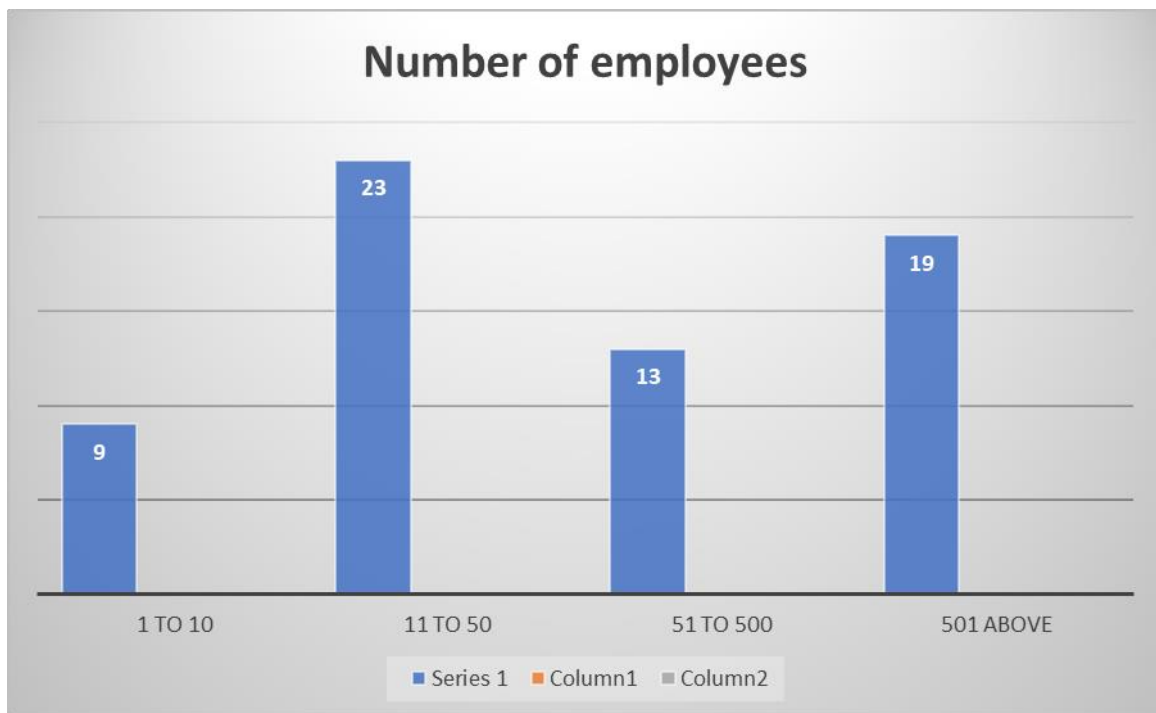


Figure 5 4 Characteristics of employees

Descriptive statistical analysis was conducted for the quantitative portion to summarise the responses to the survey questionnaire. The questionnaire was used to obtain the opinions of the respondents regarding the possibility of integrating the EH&S system in the Nigerian O&G sector. Specifically, frequency and percentage statistics were used to summarise information obtained from the survey responses. The response scales were categorical or ordinal in nature; 1 = Not important (Strongly disagree), 2 = Little importance (Disagree), 3 = Quite Important, (Agree), 4 = Very important. (Strongly agree). According to Taherdoost, (2019) the Likert scale allows better reflection of a respondent's true evaluation and aids assessors to quantify the intensity of responses. It provides more accurate and uncomplicated scale for valuation.

According to Colorafi, et al (2016) statistics can be divided into two broad categories, descriptive and inferential. this study explores the differences between both, the preferable choice and how it impacts the field of data analytics. Descriptive also known as ‘summary statistics can be used to describe both individual quantitative observations and the overall process of obtaining insights from data. It’ describes the characteristics or features of a dataset. It is explanatory and used to measures:

Distribution, (used to show frequency of different data points in this study)

Central tendency (used to measure the typical central values within a dataset) example: the mean, median and mode

Variability, used to Identified variability and how values are distributed such as: Standard deviation, Minimum and maximum values, Range, Kurtosis and Skewness

Inferential statistics focuses on the larger population, based on a representative sample (Kivunja, and Kuyini, 2017). It focuses on making generalizations and predictions rather than stating facts. Results are usually in the form of probability. However, the results rely heavily on the sample data being both accurate and representative of the larger population. Although it is very valuable in some research cases to carry out inferential statistics, it is not always straightforward (Colorafi, et al 2016 and Kivunja, and Kuyini, 2017). Thus, the inferential technique is not suitable for this study.

Table 5 1 Descriptive and Inferential statistics

Descriptive statistics :	Inferential statistics :
Describe the features of populations and/or samples	Use samples to make generalizations about larger populations.
Organize and present data in a purely factual way	Help us to make estimates and predict future outcomes.
Present final results visually, using tables, charts, or graphs	Present final results in the form of probabilities.
Draw conclusions based on known data	Draw conclusions that go beyond the available data.
Use measures like central tendency, distribution, and variance	Use techniques like hypothesis testing, confidence intervals, and regression and correlation analysis.

5.3 Oil and Gas Environmental Management (EM)

Oil and Gas environmental management aspect. It should be noted that majority of the 64 respondents have environmental agencies in O&G ($M = 1.11$; $SD = 0.31$). The summaries of the responses regarding the impact of the failure of the environmental aspect of the Nigerian regulatory body in preventing EH&S degradation in the country. Based on the mean and standard deviation scores, majority of the 64 respondents agreed with the five statements cited below, that is, the top five possible impacts of the failure of the environmental aspect of Nigeria's regulatory body. The criteria were based on the lowest mean scores. Lowest scores indicated higher agreement with the statements. Top five impacts are as follows:

1. Inadequacy of environmental data ($M = 1.78$; $SD = 0.70$)
2. Ineffectiveness of O&G environmental system ($M = 1.88$; $SD = 0.81$)
3. Lack of government support ($M = 1.88$; $SD = 0.86$)
4. Lack of effective environmental law ($M = 1.92$; $SD = 0.78$)
5. Unsuccessful of Pollution sectioning ($M = 1.94$; $SD = 0.71$)

Table 5.2: Frequency and percentage summaries of responses regarding the impact of the failure of the environmental aspect of the Nigerian regulatory body (EH&S)

Table 5 2 Question/Statement

Item	Question/Statement	N	SD	MN	<i>RNK</i>
POEA1	Are there any environmental agency in O&G	64	0.31	1.11	0
POEA2	Ineffectiveness of O&G environmental system	64	0.81	1.88	0.2
POEA3	O&G environmental section induce the degradation	64	0.73	2.14	14
POEA4	Lack of environmental incentives	64	0.79	1.94	0.7
POEA5	Unsuccessful of Pollution sectioning	64	0.71	1.94	0.5
POEA6	Inadequacy of environmental data	64	0.70	1.78	0.1
POEA7	Infrequent environmental resources	64	0.71	1.97	0.9
POEA8	High implementation of environmental cost	64	0.71	2.06	13
POEA9	Duplication and inadequacy of logistics	64	0.67	2.00	11
POEA10	Unsuitable organizational structure	64	0.67	2.00	10
POEA11	Overlaps of environmental regulators function	64	0.70	2.02	12
POEA12	Lack of government support	64	0.86	1.88	0.3
POEA13	Unsuitable environmental lawmakers	64	0.79	1.95	0.9
POEA14	Lack of O&G environmental laws	64	0.94	2.14	15
POEA15	Lack of effective environmental law	64	0.78	1.92	0.4
POEA15	Lack of integration of managements	64	0.71	1.94	0.6



Figure 5.5 Environmental management

O&G Healthcare management aspect. Majority of the 64 respondents were from the healthcare sector in O&G ($M = 1.09$; $SD = 0.29$). Table 4 shows the summaries of the responses regarding the impact of the failure of the healthcare sector aspect of the Nigerian regulatory body in preventing EH&S degradation in the country. Based on the mean and standard deviation scores, majority of the 64 respondents agreed with the five statements cited below, that is, the top five possible impacts of the failure of the healthcare sector aspect of Nigeria's regulatory body. These top five impacts are as follows:

1. Lack of integration with other sectors and government laws ($M = 1.73$; $SD = 0.65$)
2. Inadequacy of health care data ($M = 1.89$; $SD = 0.69$)
3. Lack of government support in O&G health care ($M = 1.95$; $SD = 0.88$)
4. Infrequent health care resources ($M = 1.98$; $SD = 0.72$)
5. Communication Gap ($M = 1.98$; $SD = 0.77$)

Table 5. 3 Responses on the impact of the failure of the healthcare services of the Nigerian regulatory body (EH&S)

Table 5 3 Frequency and percentage summaries of responses

Item	Question/Statement	N	M	SD	<i>RNK</i>
POHS	Are there any Health care sectors in O&G	64	1.09	0.29	0
POHS1	Ineffectiveness of the Healthcare of O&G system	64	2.17	0.85	14
POHS2	The O&G Health section induces the degradation	64	2.31	0.75	16
POHS3	Lack of government support in O&G health care	64	1.95	0.88	0.3
POHS4	Lack of health care incentives	64	2.00	0.76	0.7
POHS5	Unsuccessful health care managerial section	64	2.22	0.77	15
POHS6	Communication Gap	64	1.98	0.77	0.5
POHS7	Inadequacy of health care data	64	1.81	0.69	0.2
POHS8	Infrequent health care resources	64	1.98	0.72	0.4
POHS9	High implementation of health care cost	64	2.03	0.78	0.9
POHS10	Duplication and inadequacy of logistics	64	2.09	0.73	11
POHS11	Lack of managerial laws	64	2.02	0.77	0.8
POHS12	Unsuitable health care laws	64	2.08	0.84	10
POHS13	Unsuitable organizational structure	64	2.16	0.88	12
POSE14	Overlaps of regulators function	64	2.17	0.77	13
POHS15	Lack of effective law in health care sector	64	1.98	0.85	0.6
POHS16	Lack of integration with other sectors and government laws	64	1.73	0.65	0.1

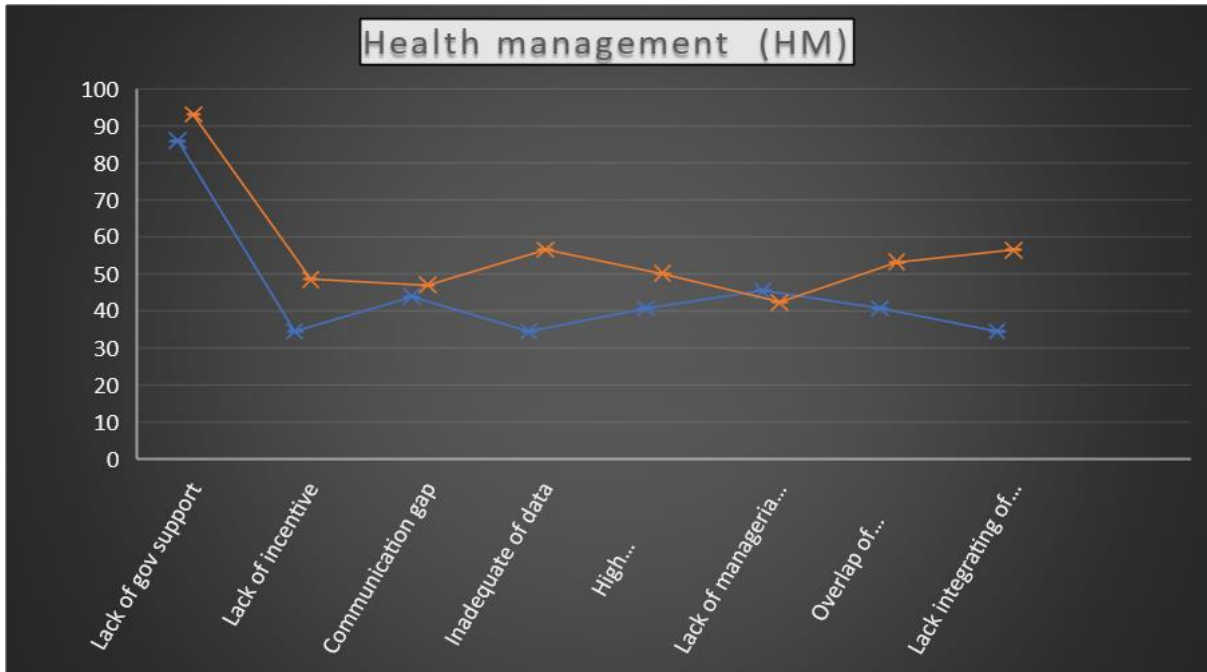


Figure 5.6 Health management

5.4 Management System in Nigerian Oil and Gas Environment

Oil and Gas Safety management system. Majority of the 64 respondents have safety management in O&G ($M = 1.06$; $SD = 0.24$). Table 5 summarises responses regarding impact of failure of the safety management aspect of the Nigerian regulatory body (EH&S) in preventing EH&S degradation in the country. Based on the mean and standard deviation scores, majority of the 64 respondents agreed with the five statements cited below, that is, the top five possible impacts of the failure of the safety management aspect of Nigeria's regulatory body. These top five impacts are as follows:

1. Lack of safety incentives ($M = 1.78$; $SD = 0.77$)
2. Faulty implementation of disaster strategies ($M = 1.81$; $SD = 0.75$)
3. Lack of effective law for safety management ($M = 1.83$; $SD = 0.77$)
4. Infrequent safety resources ($M = 1.86$; $SD = 0.73$)
5. Unsuccessful safety managerial section ($M = 1.86$; $SD = 0.85$)

Table 5.4 Responses on the impact of failure of safety management system of the Nigerian regulatory body (EH&S)

Table 5 4 Frequency and percentage

Item	Question/Statement	N	M	SD	RNK
POSMS	Are there any safety management in Nigeria Oil and Gas	64	1.06	0.24	0
POSMS1	Insufficient of Safety management tools in Nigeria Oil and Gas	64	2.02	0.83	15
POSMS2	The O&G safety management induces the degradation	64	1.88	0.90	0.7
POSMS3	Absent of Safety signs, tools, and managerial structure	64	2.06	0.99	16
POSMS4	Lack of government support in O&G safety management	64	1.89	0.86	0.8
POSMS5	Unsuccessful safety managerial section	64	1.86	0.85	0.5
POSMS6	Inadequacy of safety data	64	1.88	0.72	0.6
POSMS7	Infrequent safety resources	64	1.86	0.73	0.4
POSMS8	High implementation of safety tool	64	1.91	0.77	0.9
POSMS9	Unsuitable safety organizational structure	64	1.91	0.89	11
POSMS10	Duplication and inadequacy of safety logistics	64	1.95	0.81	14
POSMS11	Lack of integration disaster laws	64	1.92	0.70	12
POSMS12	Overlaps of safety regulator's function	64	1.91	0.83	10
POSMS13	Lack of safety incentives	64	1.78	0.77	0.1
POSMS14	Faulty implementation of disaster strategies	64	1.81	0.75	0.2
POSMS15	Unsuitable safety law	64	1.92	0.84	13
POSMS16	Lack of effective law for safety management	64	1.83	0.77	0.3

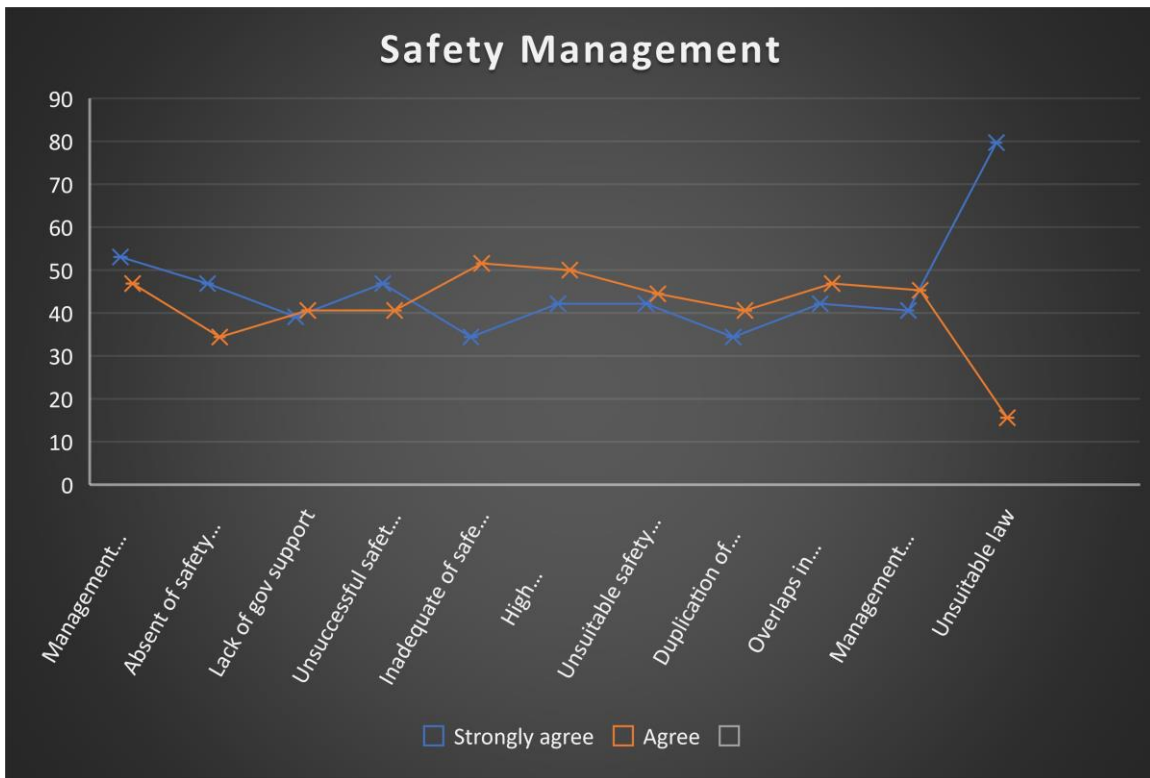


Figure 5.7 Safety management

5.5 Causes of O&G Disasters in the Nigerian O&G Sector

Table 5.4 shows the summaries of the responses regarding the causes of O&G disasters in the Nigerian O&G sector among the 64 respondents. The criteria were based on the highest mean and standard deviation scores. Higher scores indicated higher agreement with the statements. The top five causes of disasters in the Nigerian Oil and Gas sector are as follows:

1. Oil and Gas management corruption (M = 1.38; SD = 0.63)
2. Noncompliance with management instructions (M = 1.39; SD = 0.83)
3. Inefficiencies in governmental regulation (M = 1.53; SD = 0.69)
4. Poor safety management (M = 1.61; SD = 0.66)
5. Sabotages or ethnicity (M = 1.64; SD = 0.68)

Table 5.4 Responses regarding causes of O&G disasters in the Nigerian O&G sector

Table 5 5 Frequency and percentage regarding causes of O&G problem

Item	Question/Statement	N	Mean	SD	RK
NOMS1	Poor human resource management the causes of EH&S disaster in Nigeria O&G	64	1.91	0.81	11
NOMS2	Duplication of environmental logistics	64	2.09	0.66	20
NOMS3	Organizational pressure enhance O&G EH&S degradation	64	2.09	0.73	21
NOMS4	Inappropriate lawmakers or management	64	1.75	0.69	0.6
NOMS5	Inadequate resources	64	1.94	0.81	12
NOMS6	High cost of implementing of EH&S tools	64	1.98	0.75	18
NOMS7	Poor safety management	64	1.61	0.66	0.4
NOMS8	Inadequacy of EH&S logistics	64	1.83	0.61	0.8
NOMS9	Overlaps of EH&S regulators function	64	2.14	0.73	20
NOMS10	Sabotages or ethnicity	64	1.64	0.68	0.5
NOMS11	Noncompliance with management instructions	64	1.39	0.83	0.2
NOMS12	Lack of O&G management Skills	64	2.25	0.76	25
NOMS13	Leadership or management conflict	64	1.95	0.74	16
NOMS14	Misconceptions of EH&S in O&G	64	1.95	0.60	13
NOMS15	Complexity of management system	64	2.17	0.79	24
NOMS16	Lack of EH&S cooperation	64	1.95	0.72	15
NOMS17	Lack of pollution sectioning	64	2.17	0.68	23
NOMS18	Lack of incentives	64	2.06	0.77	19
NOMS19	Lack of government support	64	1.86	0.79	0.9
NOMS20	Lack of integration in EH&S	64	1.89	0.69	10
NOMS21	Oil and Gas management corruption	64	1.38	0.63	0.1
NOMS22	Lack or inefficiency of EH&S data	64	1.75	0.73	0.7
NOMS23	Change to work approach	64	1.95	0.68	14
NOMS24	Difficulty and Overlaps in Regulation	64	2.30	0.81	26
NOMS25	Unsuitable organizational structure	64	2.16	0.78	22
NOMS26	Inadequate resources	64	1.97	0.67	16
NOMS27	Inefficiencies in governmental regulation	64	1.53	0.69	0.3

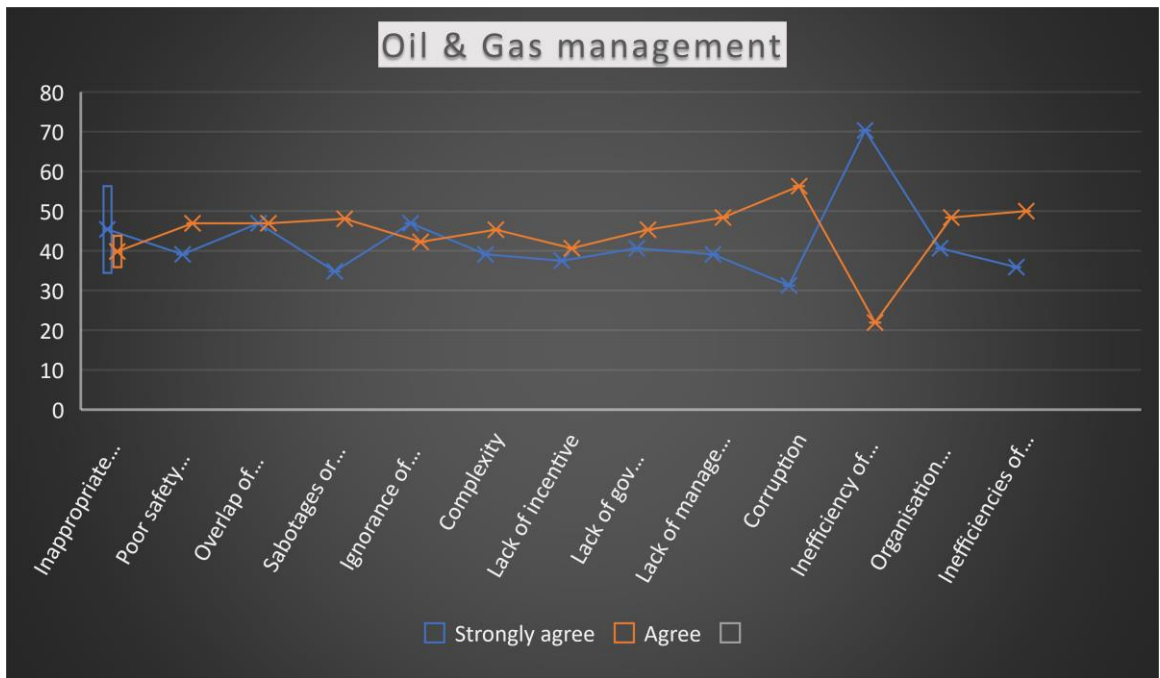


Figure 5.8 Oil and Gas management

Table 5.5 responses regarding the importance of certain factors in driving organisations towards the integration of EH&S. The responses were possible solutions for organisations to integrate modified EH&S management systems. Based on the mean and standard deviation scores, 64 respondents have rated the top five most important factors in driving organisations towards integration of EH&S in the Nigerian O&G sector. Lowest scores indicated higher ratings of importance. These are as follows:

1. Implement EH&S best practice (M = 1.39; SD = 0.55)
2. Update EH&S management practice (M = 1.42; SD = 0.50)
3. Improve government efficiency (M = 1.42; SD = 0.59)
4. Integrate governmental laws (M = 1.45; SD = 0.53)
5. Teamwork within the EH&S management (M = 1.45; SD = 0.56)

Table 5.6 Responses regarding important factors driving organisations towards integration in EH&S

Table 5 6 Frequency and percentage in driving organisations towards integration in EH&S

Item	Question/Statement	N	M	SD	RK
IEHSM1	Review of O&G EH&S law and/or practice	64	1.56	0.61	10
IEHSM2	Update EH&S management practice	64	1.42	0.50	0.2
IEHSM3	Improve efficiency of governmental regulation	64	1.78	0.98	15
IEHSM4	Teamwork within the EH&S management	64	1.45	0.56	0.5
IEHSM5	Eliminate EH&S pollution activities	64	1.84	0.89	16
IEHSM6	Implement EH&S best practice	64	1.39	0.55	0.1
IEHSM7	Implement Government reports quarterly	64	1.52	0.62	0.7
IEHSM8	Process improvement	64	1.53	0.56	0.9
IEHSM9	Improve product and service quality	64	1.52	0.59	0.8
IEHSM10	Improve government efficiency	64	1.42	0.59	0.3
IEHSM11	Integrate governmental laws	64	1.45	0.53	0.4
IEHSM12	Implementation of EH&S integration	64	1.59	0.61	11
IEHSM13	Implement co-operation in EH&S	64	1.64	0.60	12
IEHSM14	Improve competitiveness in EH&S	64	1.75	0.69	13
IEHSM15	Instrument of laws that reduce corruption	64	1.48	0.69	0.6
IEHSM16	Reduce project cost	64	2.00	0.82	17
IEHSM17	Improve EH&S integration above O&G company personal interest	64	1.75	0.82	14

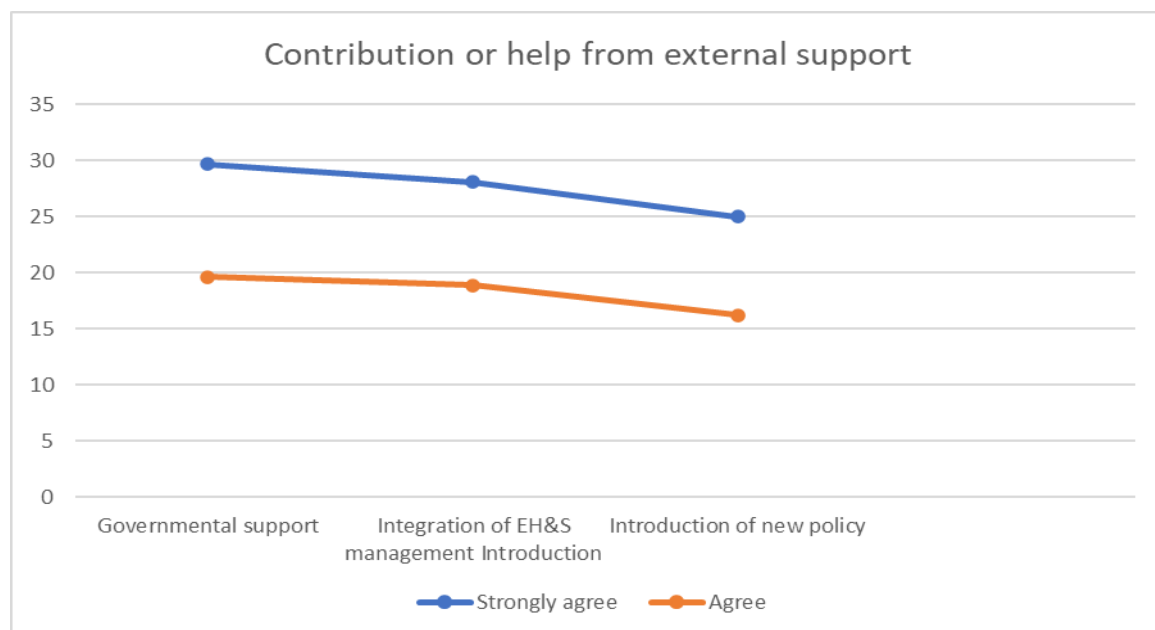


Figure 5 9 External body contribution

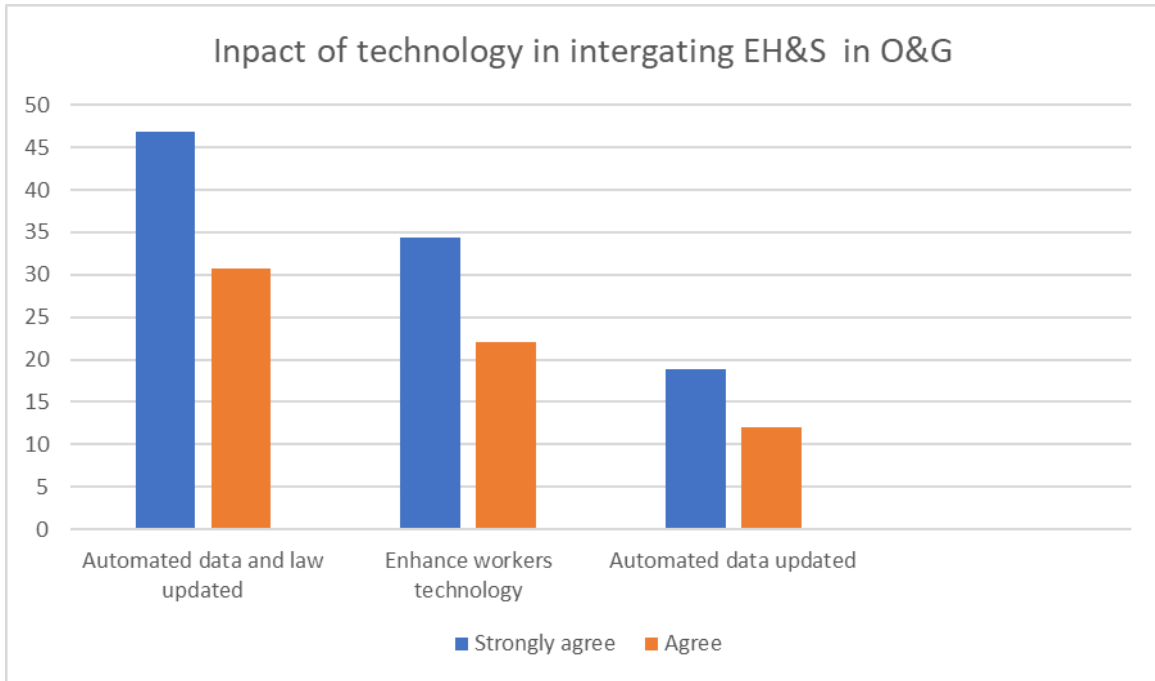


Figure 5 10 Impact of technology on integrating Oil and Gas EH&S management system

5.6 Literature Review and Preliminary Survey Gaps

Table 5.7 below describes and identifies the literature review and the preliminary survey barriers or breaches between the integration of the EH&S management system in Nigeria O&G. The survey results regarding the gaps present a comparison between gaps 1 to 11. The preliminary survey added three to the primary gaps acquired from the literature review.

Table 5 7 Literature review and the preliminary survey barriers

NO	LITERATURE REVIEW GAP	PRELIMINARY SURVEY GAPS
1	Unsustainable Management	EH&S Management
2	Lack of supervision	Organisation structure
3	Corruption within O&G EH&S management	Corruption within O&G EH&S management
4	Duplication of logistics	Inappropriate management Logistics
5	Violation of human rights	Overlaps in EH&S regulation
6	Inadequate Data for EH&S management	Inadequate Data for EH&S management
7	Human error	Complexity of Environmental Managements
8	Lack of government support	Lack of Government Support to Oil and Gas sectors
9	Unsuitable management	Unsustainable management
10	Outdated laws	Inadequate Legislation
11	Lack of Incentives to EH&S Management	Lack of Incentives to EH&S Management
12		Communication Gaps within O&G EH&S management
13		Lack of Integration of Management system
14		High Implementation Cost for EH&S Management

5.7 Quantitative Data Analysis

Descriptive statistical analysis was conducted to summarise the responses of the participants in the survey questionnaire. The questionnaire used for the preliminary survey analysis was designed to obtain the opinions of the respondents regarding the problems facing Nigerian O&G sector and the possibility of integrating the EH&S system in the sector. Specifically, frequency and percentage statistics were used to summarise the data from the survey responses, as the response scales were categorical or ordinal in nature. There was a total of 14 questions rated on a seven-

point response scale. The Likert scale responses ranged from 1 (strongly disagree) to 5 (strongly agree).

5.8 Research Survey and Responses for Integration Oil and Gas EH&S management system

Minimum number of 65 O&G management respondents were targeted as an appropriate sample size with an allowance for 20 errors or inadequately answered surveys. The study considered calculating sample size using standard deviation of 3.5 to ensure sufficiently large number of respondents (Hanna, and Olken, 2018).

65 individuals' + allowance for 20 error or inadequately answered = 85 respondent

Respondent rate (85) X (multiply) by standard deviation (3.4)

$85 \times 3.5 = 289$

290 questionnaires sent out via university of Wolverhampton Online surveys (formerly BOS) on integration of the EH&S management system into the Nigerian O&G sector. 90 participants responded, of this number, only 61 (93.85%) of 65 (100%) expected were properly completed and used for the main survey. 29 of 20 inadequately completed responses expected were received, 6.15 percent higher.

Adomi et al., (2007) and Einola and Alvesson, (2021) note the low adequate and high inadequate response rate may be attributed to four reasons: incompetence or ignorance of the managerial system, overlaps in regulation, corrupt practices and lack of freedom of speech. Though the response rate appeared low, Soetento et al. (2001) advised that for thorough surveys, a response rate of 14.6% is the acceptable standard. When compared to this study, Sutrisna (2002) and Abubakar Bashir (2013) had lower response rates of 8.82% and 17%, respectively.

5.8.1 Profile of Respondents/Organisations

Table 5.7 gives a summary of the sampling approach used in the main survey and the information of the respondents and their organisations. In this survey, a purposive or Judgment Sampling under Non-Probability Sampling method has been adopted. Not every member of the Nigerian O&G sector can be included in the survey question. The total of 61 participant used for the main survey were operations or senior management in the Nigerian O&G companies. 17 (27.9%) work in healthcare safety management, 13 (21.3%) in infrastructure management, 12 (19.7%) in the O&G sector and 5 (8.2%) in environmental agencies. 31; (50.8%) of the 61 respondents have 1–5 years of experience. A significant number of respondents had 6–10 years of experience, (30.8%) (n = 20).

According to Kwizera, (2018) Purposive sampling is a valuable , inexpensive, fast sampling technique, and easy way of obtaining data. It is Adequate for qualitative, quantitative and mixed method research designs. It accomplishes the research aim which is to develop a framework that addresses the incidence of rising environmental problems in the Nigerian O&G sector.

Table 5 8 Respondents of organisations

Frequency and percentage summaries of information regarding respondents of organisations (n = 61)

	n	%
Company Description		
O&G sector/operational staff/senior management staff	12	19.7
Health and safety management	17	27.9
Environmental management	5	8.2
Infrastructure management	13	21.3
Other	15	24.5
Years of Experience in Area of Specialisation		
1–5 years	31	50.8
6–10 years	20	32.8
11–15 years	5	8.2
15 years and above	5	8.2

5.8.2 Operation Staff or Senior Management

Figure 11 summarises the responses of the 61 operations or senior management staff members in the survey questionnaire regarding (1) causes of disasters in the Nigerian O&G sector, (2) possible impact of integrating EH&S management and (3) design of a framework for integrating modified EH&S management systems. It should be noted that higher scale scores indicated higher levels of agreement on the statements. The survey responses are discussed in the succeeding paragraphs.

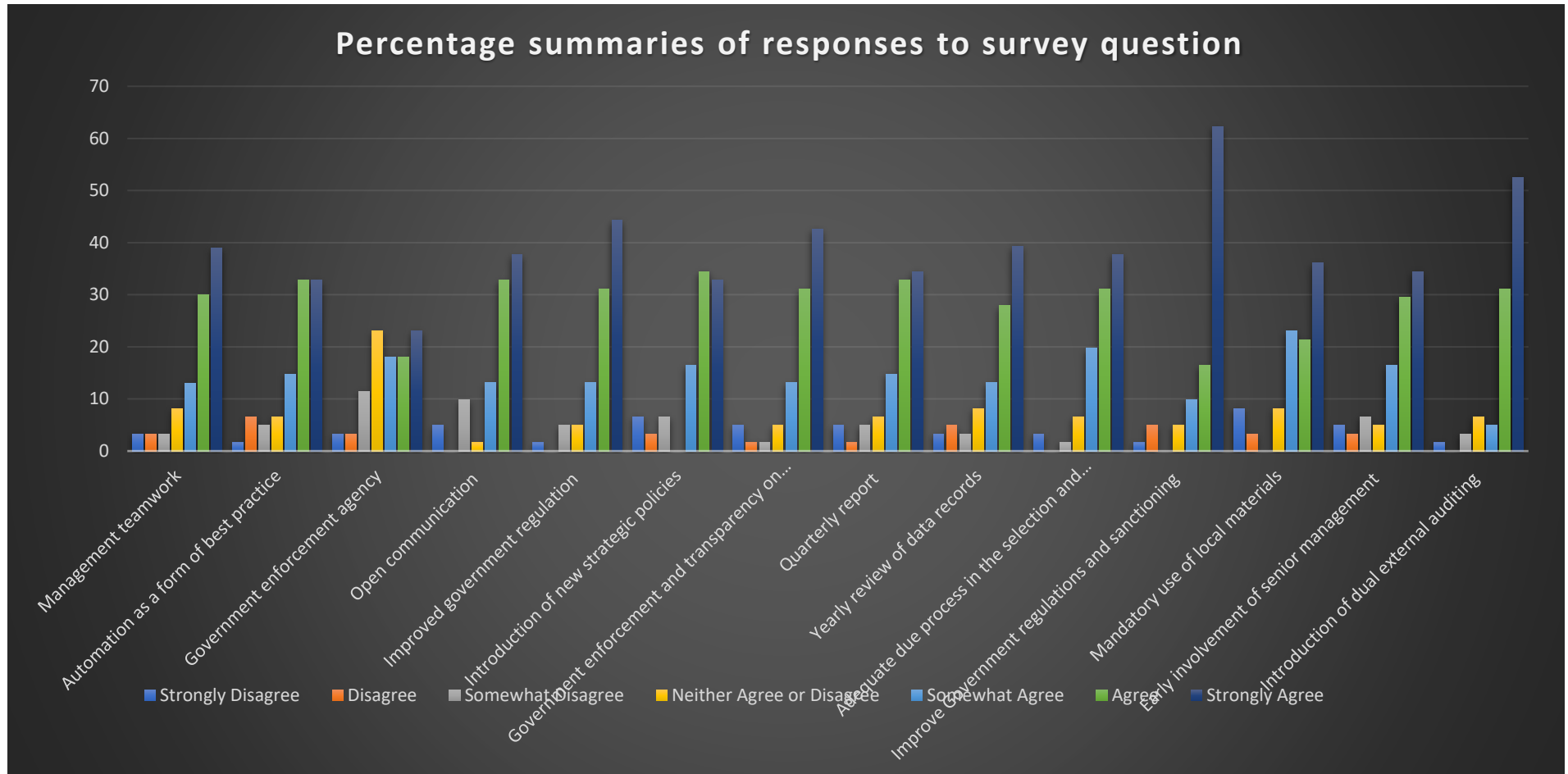


Figure 5 11 percentage summaries of responses to survey questions

5.8.3 Question Summary for Data analysis and contributions

Teamwork can reduce managerial difficulties in the Nigerian Oil and Gas industry. Eighty one percent (50 of the 61 participants) strongly agree with the assertion. Teamwork also reduces Oil and Gas environmental problems and needless confrontations, but enhances the integration of the EH&S management system. According to Carvajal et al (2017) and Leon et al (2017) teamwork made completion of tasks quicker and more efficient. It aids in creation of camaraderie among management as they strive toward a single purpose (Klein et al 2017).

Automation as a form of best practice can improve management performance in the Nigerian Oil and Gas Sector. Forty nine of the sixty one participants (80.4 percent) supported this notion. Automation as a form of best practice, enhances productivity, effective use of materials, and higher product quality. It leads to a shorter labour working week, reduces EH&S stress and enhances safety (Chilaka, and Nwaneke, 2016 and Carvajal, et al 2017).

Automation can increase management performance in the Nigerian Oil and Gas Sector, according to 80.4 percent (49 of the 61 participants). Automation improves productivity, material efficiency and product quality. Its shorter labour work weeks, lower EH&S stress, and increased safety are all benefits (Chilaka, and Nwaneke, 2016 and Carvajal, et al 2017).

Government enforcement agencies enhance management performance in the Nigerian Oil and Gas sector. Thirty six participants working for Oil and Gas management teams (equivalent to 59 of 100 percent) strongly agree with the arguments (Taiwo, 2010, and Taleb, 2017) that Government enforcement agencies enhance management performance by detecting and preventing unexpected and unknown situations or crime.

Open communication enhances management performance in the Nigerian Oil and Gas sector. According to 83.6 percent of management workers working for Oil and Gas companies, (51 of 61 participant) [O]pen communication is an integral part of company success. It eliminates

unnecessary EH&S problems, promotes better performance and increases overall productivity to create strong teams (Tabibzadeh, and Meshkati, 2015 and Ojijiagwoet al 2017).

Improved government regulation will enhance Oil and Gas management in Nigeria. Regulation is necessary for the efficient management of EH&S at all stages in the Oil and Gas sector (Taleb, 2017 and Mohammed-Sani, 2018). It is important for the protection of human rights and the environment. It underpins environmental values and protects rights and safety of citizens to ensure the delivery of good EH&S management, according to 88.5 percent (54 people) of Oil and gas management participants

Introduction of new strategic policies by the government can reduce environmental problems in the Oil and Gas sector. 51 of 61 management participants, representing Oil and Gas company strongly agree, Appropriate rules and processes indicate expertise and equip team members with clear instructions on EH&S. It also outlines daily procedures and processes for all professionals, ensures compliance with laws and regulations, provides decision-making advice and streamlines domestic operations (Zhang and Shi, 2016 and Timothy-Weston,2015).

Eighty-six. Eight percent of management participants working for Oil and Gas EH&S companies support the view that Government enforcement and transparent data management can minimize environmental challenge in Oil and Gas. When the government and management are more open with their employees and stakeholders, the team can see the fruits of their labour. This also gives a tremendous motivation to keep pushing forward. Lakhanpal and Samuel, (2018) noted that transparency improves the overall working environment for managers and their staff. Ultimately, data transparency improves performance, builds trust, stimulates communication, fosters team bonding, empowers activities and inspires creativity within EH&S management systems (Oguagha, 2017).

Eighty two percent of management participants from Oil and gas companies believe Frequently (quarterly) reports to Government enforcement agencies will encourage good practice within the Oil and Gas sector. Quarterly reports support government at all levels in assessing a company's

EH&S practice. One of the numerous laws that must be implemented in the Nigerian O&G management sector is the filing of oil and gas environmental reports that describe the state of EH&S. According to Orazalin and Mahmood, (2018) quarterly environmental financial reporting and performance of EH&S ensures transparency and clarity of EH&S data between the Oil and Gas management sector, government, investors and shareowners (Noah, et al 2020).

Yearly review of data records can enhance operational transparency in the Nigerian Oil and Gas sector. According to 80.3 percent of Oil and gas management practitioner participants, it would be hard to properly monitor a company's health, financial reports, and the condition of EH&S management systems without accurate records. A lack of such vital information can stymie national economy, individual progress and community development (Noah, et al 2020). It is important to maintain effective workplace health and safety records that control hazards before occurrence. An accurate yearly written record describing all key elements of EH&S (Ibida,et al 2019) constitutes a crucial part of care. It also helps to maintain information across teams.

Adequate due process in the selection and inspection of supplier's capabilities in delivering project requirements can reduce unforeseen risks in Oil and Gas projects. Fifty two of 61 participants who are Oil and gas management practitioners describe [ue process as the correct and appropriate manner of doing things in a legal fashion. It is a principle that demands fairness and equality of treatment for d all parties equally without bias in EH&S management systems. It also protects rights and prevents discrimination (Welcome, 2011 and Iqbal, et al 2017). As a result, due process would be the best practise for balancing the effects of obsolete legislation and management of corruption in the Oil and Gas sector.

Improved Government regulations and sanctioning of corruption activities can enhance Oil and Gas operations in Nigeria. 51 of 61 participants working for Oil and Gas EH&S management companies confirm Improvements in government laws and punishment of wrongdoing in Oil and Gas management can reduce environmental pollution, maintain good environmental practices and encourage supervision of financial transaction. It can sustain open communication and treat

unlawful Oil and Gas pollution seriously according to (Anonymous 1 and Lawan. 2010 and Atkinson et al 2018).

Mandatory use of local materials can encourage industrialisation and job opportunities in the Nigerian Oil and Gas sector. According to 50 of 61 participants, it is critical to employ local resources and products. It promotes industrialisation and a sense of belonging, the establishment of work possibilities and emotional bonds between the state, local community and the environment (Chilaka, and Nwaneke, 2016 and Obayagbona,2018).

Fifty-one management participants working for Oil and Gas companies strongly agree Early involvement and support of senior management teams can reduce operational complexity and improve project outcomes in the Nigerian Oil and Gas sector. According to participants, Early involvement of Oil and Gas practitioners evaluates risk, reducing costs associated with accidents and incidents, improving health and safety performance, enhancing public image, staff relations and morale. According to Rui, et al (2018) It lowers insurance premiums, opportunity to deliver fresh EH&S training and information with easier access to finance (Awolusi and Atiku, 2019).

Introduction of dual external auditing and appropriate penalty for corruption victims reduces exploitation activities in the Nigerian Oil and Gas sector. Fifty-two EH&S management participants working for Oil and Gas company stated that the legal requirement for dual external auditing and appropriate penalty encourage sufficient and effective rules and procedures that discover instances of fraud, mistakes and hazard that might harm the reputation of the Oil and Gas companies.

5.8.4 Summary of Quantitative Analysis Results

The analysis showed that the 61 operations or senior management staff members have positive responses regarding (1) the causes of disasters in the Nigerian O&G sector and (2) the lack of integration of EH&S management system's on communities, the economy and the country, including the design of a sustainable framework for EH&S management systems.

Table 5 9 Visualisation of themes, subthemes and categories

Teamwork	Transparency	Automati on	Regulations and Policy	Enforcement
Less mistakes	Open communication	Lack of organisation and precision	Regulations	Enforcement through government agencies
	<i>Transparency</i>		<i>Need for improvement</i>	<i>Power position</i>
	<i>Variety of input</i>		<i>Control mechanism</i>	<i>Accountability</i>
	<i>Feelings of inclusion</i>		<i>Concerns</i>	<i>Concerns</i>
	<i>Concerns</i>			
Variety of input	Data accessibility	Efficiency	Policy	Enforcement through sanctioning
	<i>Management accountability</i>		<i>Positive impact on environment</i>	<i>Decreasing corruption</i>
	<i>Solving environmental problems</i>		<i>Need for renewal</i>	<i>Improving efficiency</i>
	<i>Concerns</i>		<i>Concerns</i>	<i>concerns</i>
Efficiency		Lack of EH&S advancement		
Teamwork feasibility		Concerns		

Reviews	Control and Scrutiny	Leadership training	Protectionism/Localisation of top management sectors	
Control and accountability	Quarterly reporting	Need for experts	Job creation	
	<i>EH&S Management accountability</i>			
	<i>Growth and improvement</i>			
	<i>Concerns</i>			
Tracking mechanism	Selection and inspection	Concerns	National development	
	<i>Good control mechanism</i>			
	<i>Encouraging quality</i>			
	<i>Ability to foresee risk</i>		Reduce environmental pollution	
	<i>Negative views</i>			
Concerns and recommendations	Involvement of external agencies		Concerns	
	<i>Revealing loopholes</i>			
	<i>Checks and balances</i>			

5.9 THEME 1: Teamwork for Oil and Gas EH&S management system

The first group of comments were related to ideas and views about management teamwork in the industry. Four subthemes were developed under this theme: (a) teamwork leads to fewer

mistakes, (b) teamwork invites a variety of inputs, (c) teamwork increases efficiency and (d) concerns about teamwork feasibility. Table 5.10 provides details regarding how frequently these subthemes were mentioned throughout the dataset and what the share of each subtheme was in relation to the theme. Figures 1 and 2 visualise the same data in a pie chart.

Table 5 10 Frequency table of subthemes related to ‘teamwork for Oil and Gas EH&S management system’

Subtheme	Frequency	Share of total (%)
Teamwork leads to fewer mistakes	27	57.4%
Teamwork invites a variety of inputs	7	14.9%
Teamwork increases efficiency	6	12.8%
Concerns about teamwork feasibility	7	14.9%
<i>Total theme mentioning (only valid responses included)</i>	47	100%

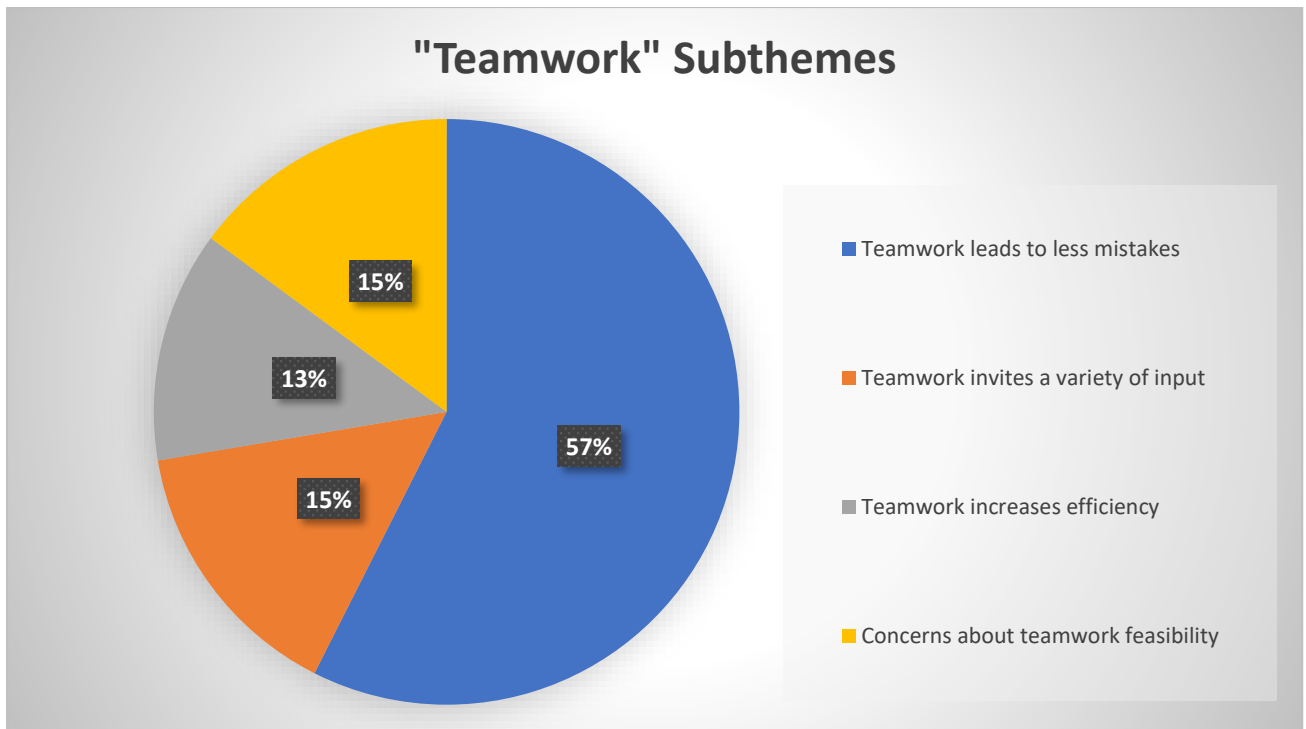


Figure 5 12 Visualising 'teamwork' subthemes and their relative importance

5.9.1 SUBTHEME 1: Teamwork Leads to Fewer Mistakes

A strong majority believed that teamwork would lead to fewer mistakes because 'teamwork enhances individual potential for overall realisation of organisational goals' and 'brings good excellent in what they do together'. Participants acknowledged that different individuals have different skills to bring to the table, and when working together, management can take maximum advantage of these various and valuable skill sets. As one participant explained, 'Collaborative efforts within a team improves success rate to a very high degree'.

Furthermore, some participants reported that teamwork was important because 'management is the brain behind every activity of an organisation'. More specifically, beliefs that 'management teamwork can provide valuable insight and lessons' and can 'help to give in-depth analysis of problems and solutions' contributed significantly to the idea that management teamwork was crucial. Six participants strongly believed that through proper teamwork, problems could indeed be resolved in a timely and fruitful manner. In particular, one participant believed that problems could not only be resolved but also avoided overall, as 'most of the

problems are a result of individual mistakes, and teamwork encourages working together and targeting same or similar goals’.

5.9.3 Subtheme 2: Teamwork Invites a Variety of Inputs.

Seven participants shared their views that management teamwork is fruitful because it encourages various individuals to give their inputs regarding certain topics. As noted above, different individuals have different skills and knowledge, and by working together, individuals are given the opportunity to share them. The advantage of this practice is that different viewpoints will be considered when making decisions. The result is that ‘ideas are discussed and hence managerial errors can be prevented’. In other words, as one participant shared, ‘teamwork always trumps personal decisions’.

5.9.4 Subtheme 3: Teamwork Increases Efficiency.

Considering the above two subthemes, it is not surprising that six participants explicitly stated they believed that teamwork would increase overall efficiency. As one participant noted, ‘Teamwork aids to effectively streamline job roles and responsibilities and promote efficiency of work’. Streamlining of job roles was considered important because ‘this can help reduce workload’ and ‘improve time efficiency’. Furthermore, it was believed that ‘through active collaboration, resource will be effectively deployed’.

In alignment with this idea, another participant noted that ‘teamwork ensures all necessary details in running an administration or production are efficiently attended to, thereby eliminating inefficiency of the management’. In other words, teamwork could guarantee that no aspects or important details are overlooked, ensuring work efficiency and quality.

5.9.5 Subtheme 4: Concerns about Teamwork Feasibility

Regardless of the positive effects that teamwork could produce, eight participants shared some concerns about the feasibility of teamwork. A first concern was related to corruption, with two individuals stating that teamwork would not be fruitful because ‘Nigerian oil and gas sectors are

run by corrupt officials', and the government has thus far not been able to effectively reduce corruption. Three participants added that corruption and nepotism often go hand in hand and that teamwork would not bear fruit because of 'faulty management team selection', which 'has a great effect on outcomes'. According to one participant, '80% government workers are not qualified to be managers'. This is highly problematic because management is only as effective as the level of competence and expertise within it; hence, teamwork alone may not be effective in addressing managerial problems.

5.10 Theme 2: Transparency

A second theme was related to ideas about transparency through (a) open communication and (b) making data accessible and visible. Under each of these subthemes, several sub-subthemes or categories were developed, as highlighted below.

5.10.1 Subtheme 1:

Transparency through open communication

A strong majority of participants believed open communication would strongly benefit the Nigerian O&G sector because it would lead to (a) continuous knowledge-sharing, (b) a variety of inputs and (c) feelings of inclusion. The responses of participants who did not feel open communication would enhance management performance in the industry were categorised under a fourth category named 'concerns about effectiveness of open communication'. Table 5.11 provides details regarding how frequently these categories were mentioned throughout the dataset and what the share of each category was in relation to the subtheme. Figures 13 and 14 visualise the same data in a pie chart.

Table 5 11 Frequency table of categories related to ‘transparency through open communication’

Categories	Frequency	Share of total (%)
Continuous knowledge-sharing	23	51.1%
Variety of inputs	7	15.6%
Feelings of inclusion	6	13.3%
Concerns about effectiveness	9	20.0%
<i>Total subtheme mentioning (only valid responses included)</i>	45	100%

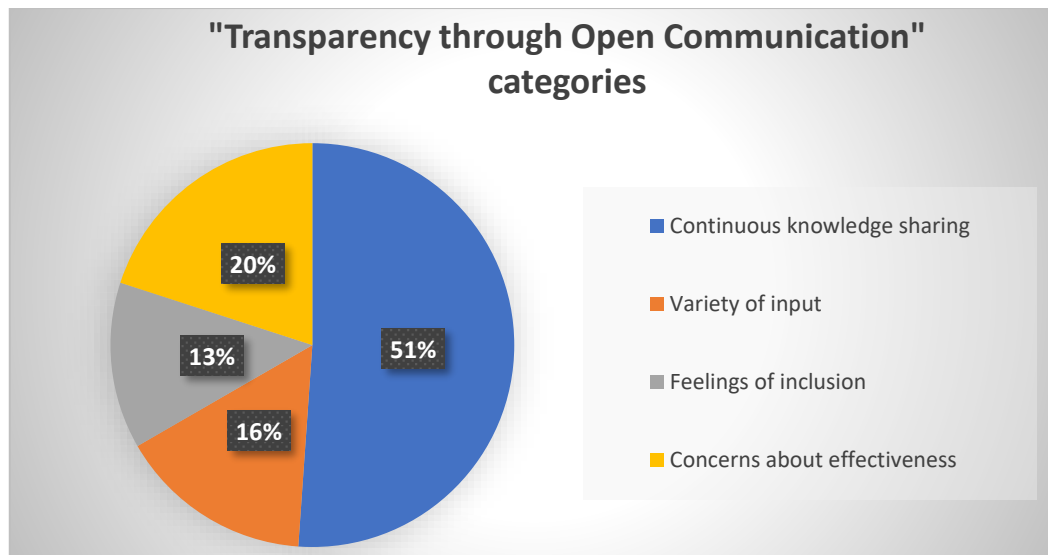


Figure 5 13 Visualising ‘transparency through open communication’ categories and their relative importance

5.10.1.: Category 1: Continuous knowledge-sharing.

Majority of participants linked open communication to continuous knowledge-sharing. More specifically, these participants believed that through open communication, transparency of knowledge would be obtained, and everyone involved would, as a result, be informed about what is going on. In the context of company goals, one participant said that ‘management should communicate their goals as well as those of the company’. This would indeed benefits ‘management performance in the Nigeria oil and gas sector’. Another participant added that open

communication is crucial 'because it keeps every team member relevant and feeds them with latest info'. Elaborating on this idea, another participant explained this to be important 'because everybody will be aware of the challenges or the progress oil and gas is making towards attaining its goals'.

Another participants added that 'open communication gives all stakeholders the ability to know the status of events'. Yet another participant mentioned that 'communication is essential for support across all departments in organisations', suggesting that without open communication, different departments would not be able to support one another due to lack of information. From this perspective, open communication is also clearly beneficial to any organisation.

5.10.2. Category 2: Variety of inputs.

Seven participants valued open communication, as it would encourage individuals with different skill sets to share their inputs. As has been already highlighted in the first theme, participants stated that 'open communication is needed to share knowledge around teams' and 'makes room for vast opinions'. Indeed, as another participant noted 'it paves way for different ideas'. According to another participant, open communication can ensure that 'nobody has monopoly over wisdom'. These statements clearly suggest the value of open communication as a mechanism to collect the inputs of different individuals on a certain issue.

5.10.3: Category 3: Feelings of Inclusion

Besides the direct practical benefits of open communication, such as knowledge-sharing and gathering input from individuals with different skill sets, the participants also mentioned an important social component to open communication. According to six participants, open communication is also important because different team members are made to feel valued and included in decision-making. One participant, for example, stated that '[open communication] gives a sense of inclusion to all stakeholders'. This participant added that in the long run, feeling

included would 'culminate in great performance and achievements'. The reasoning was that 'it encourages everyone to feel confident and supportive', and employees who feel included and valued in their workplace are more likely to be intrinsically motivated to contribute to the company. As one participant explained, '[O]pen communication allows your employees to be more engaged and understand that what they do matters in the success of the business'. Further elaborating on this idea, a participant believed that 'it will enshrine a culture of accountability, which is not prevalent in this industry'.

5.10.4: Category 4: Concerns about effectiveness

Although open communication was considered beneficial for the sake of keeping all team members up-to-date, inviting different members to share their opinions and making employees feel valued and recognised, some participants shared concerns and doubts about the effectiveness of open communication. According to one participant, '[G]overnment regulations have silenced individuals who have the interest at heart'. Another concern was that 'there may not be sincerity from the management team on these conversations'.

The above statements suggest that some power dynamics exist and prevent certain individuals from giving their inputs. Even if such power dynamics are absent, open communication may still be unfruitful, as according to a participant, 'In Nigerian oil and gas sector, no one cares about another's opinion'. This idea was supported by another participant, who argued that 'the problem is not with communication but effective implementations of ideas'.

5.11. Subtheme 2

5.11.1 Transparency through Data Accessibility

A second subtheme was related to the idea that transparency could be enhanced by making Oil and Gas management data accessible and visible to everyone. According to the participants, this could lead to (a) accountability and (b) solutions to environmental problems. Yet some participants shared concerns or did not believe data accessibility would resolve environmental challenges. Their responses were collected under the category 'concerns about data transparency

effectiveness'. Table 5.12 provides details regarding how frequently these categories were mentioned throughout the dataset and what the share of each category was in relation to the subtheme. Figures 14 visualise the same data in a pie chart.

Table 5 12 Frequency table of categories related to 'transparency through data accessibility'

Category	Frequency	Share of total (%)
Accountability	11	35.5%
Solving environmental problems	9	29.0%
Concerns about data transparency effectiveness	11	35.5%
<i>Total subtheme mentioning (only valid responses included)</i>	<i>31</i>	<i>100%</i>

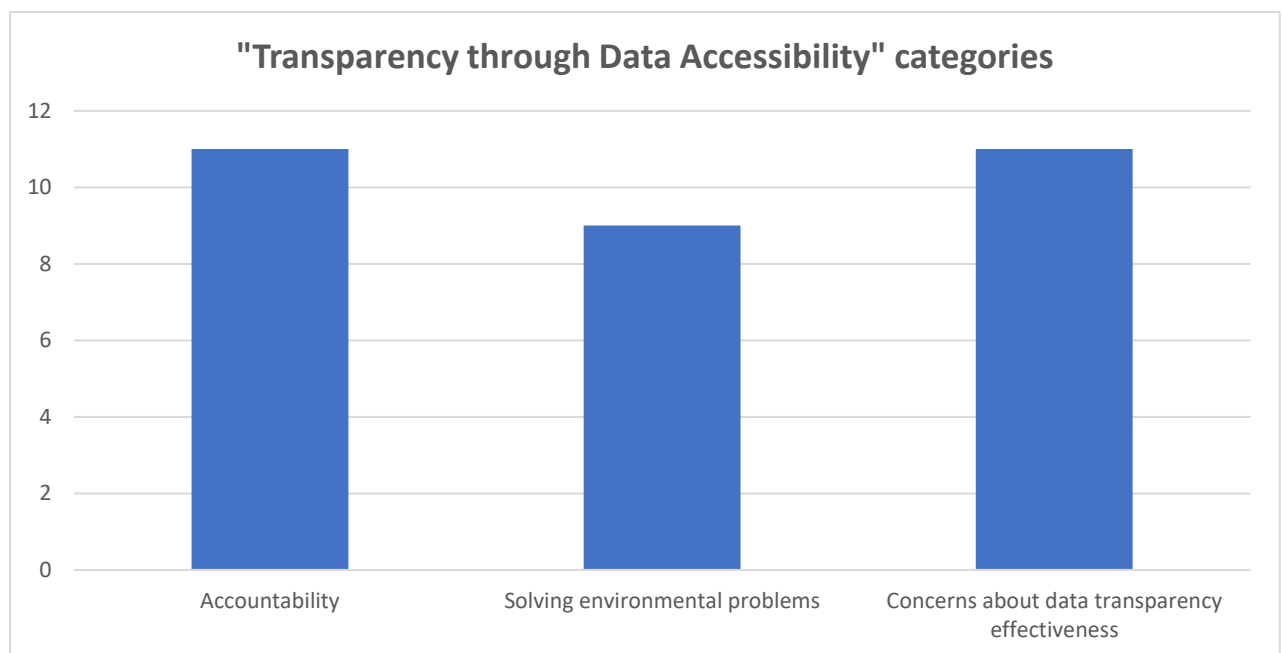


Figure 5 14 Visualising 'transparency through data accessibility' categories and their relative importance.

5.11.1: Category 1: Accountability

Many participants (the Oil and Gas management practitioner) valued the idea of making management data accessible to everyone because 'it will be visible to the common man' and 'show the extent of work done in the sector'. In other words, 'it ensures that everyone is kept abreast of what is going on'. Moreover, a participant believed that data transparency would 'expose the rot within the sector'. As these statements suggested, data transparency was evaluated as an excellent method to hold individuals and organisations accountable for their practices. As two participants explained, this control mechanism would 'reduce corruption and increase accountability' and 'would reduce misappropriation of funds'. Another participant elaborated, '[I]f the oil and gas companies disclose the procedures for managing their waste, the government will be able to monitor if the agreed procedures are being followed or not'. In addition, two participants believed that 'it will also enhance commitment' because 'regulations are not easily disregarded'.

5.11.2: Category 2: Solving Oil and Gas Environmental Problems.

A second group of comments in relation to this subtheme is related to the idea that data transparency in Oil and Gas would lead to better solutions to environmental problems. The reasoning behind this is that, as one participant explained, 'data is the only fact and unbiased form, as this can easily tell the challenges an organisation faces, and then resource can be allocated to tackle these'. Other participants agreed; for example, one said, 'I think government enforcement and transparency on data management could minimise environmental challenge in oil and gas'. Another participant added that 'if there can be data management transparency in Nigeria, oil and gas environmental challenges will be reduced'. Participants stated that on the contrary, if data transparency is absent, 'everything stays in status quo', meaning that current challenges would not be resolved. Hence, data transparency can significantly contribute to the minimisation of environmental problems in the Nigerian O&G industry.

5.11.3: Category: Concerns about Data Transparency

Regardless of the previous two categories, it was noteworthy how 11 participants shared concerns around the effectiveness of data transparency. The most frequently mentioned concern was related to corruption and the lack of sanctions when malpractices are discovered. According to participants, there are 'too many corrupt officials who don't care about the environment'. To address this concern, two participants recommended that 'the government should agree to step aside and allow an appointed body to act'. One participant said that evaluation of management data should be performed by 'a public-private partnership'.

Corruption was not the only concern mentioned; indeed, some participants noted that there is 'inefficiency of the regulators due to inadequacy of logistics, poor environmental database, duplication', suggesting that the current data management practices are weak and poorly executed. To conclude, one participant also explained that policies around O&G 'keep changing as political power changes in Nigeria', which contributes to confusion and the lack of sanctions for malpractice.

5.12: Theme 3: Automation in EH&S management system

A third group of comments was related to the views of participants on automation in the Oil and Gas sector. Most participants had positive views about the adoption of automation in this sector, as they believed automation would lead to (a) better organisation and precision, (b) increased efficiency and (c) overall enhancement. Concerns were categorised under a fourth category, 'concerns about automation'. Table 5.13 provides details regarding how frequently these subthemes were mentioned throughout the dataset and what the share of each subtheme was in relation to the theme. Figures 7 and 8 visualise the same data in the form of charts.

Table 5 13 Frequency table of subthemes related to ‘automation’

Subtheme	Frequency	Share of total (%)
Better organisation and precision	13	31.7%
Increased efficiency	10	24.4%
Overall enhancement	6	14.6%
Concerns about automation	12	29.3%
<i>Total subtheme mentioning (only valid responses included)</i>	<i>41</i>	<i>100%</i>

5.12.1 Automation Subtheme 1: Better organisation and precision.

A first positive association with automation was related to automated processes being more organised and reliable. One participant said in this regard that with automation, ‘it can be assured that processes are scheduled, constant and consistent’. It was stated that ‘automation brings about precision and accuracy coupled with high level of professionalism’. Two other participants added that ‘automation has an organised operation of law and laid-down principles’, and ‘automation reduces human error which in turn increase productivity’. These statements highlighted that automation was clearly seen as more reliable than human labour. This idea was further elaborated by a participant, who believed that ‘automation is the best way to achieve efficient performance with less human error’. Lastly, two participants added that automation ‘promotes accountability and transparency’ and ‘prevents extortion or any other means of corruption’.

5.12.2 Automation Subtheme 2: Increased Efficiency

A second benefit of automation was related to its perceived positive effects on efficiency. Participants believed that automation would increase efficiency, as, according to them, machines can process and execute tasks faster than humans. As one participant noted, '[T]he implementation of automation technologies, techniques and processes improve the efficiency and/or speed of many tasks that were previously performed by humans'. As a result of this increased efficiency, participants believed that in the long run, automation would 'save cost and increase time efficiency'. Other participants highlighted that automation would lead to increased efficiency. Two participants, for example, shared that 'it reduces the time needed for manual approvals', and 'it will improve efficiency in operations with high turnaround'. These statements clearly illustrate that replacing human labour with automation could lead to significant positive outcomes for an organisation.

In addition, one participant noted that automation would also 'reduce stress on employees'. According to the participant, such a reduction in stress level would similarly lead to increased efficiency.

5.12.3 Automation Subtheme 3: Overall Enhancement Oil and Gas sector.

A third positive outcome of automation, as perceived by the participants, was related to the overall enhancement of Oil and Gas sector. Participants who mentioned this theme stated that technology is a part of today's world and should be embraced rather than ignored. Participants shared that 'technology in management is inevitable in today's world' and that 'we need to move with the trend'. These statements suggest that preventing automation would be considered backwards and may even harm an industry. This is because 'it is the direction of world business growth in the new world order', and 'any program or sector where automation is integrated will not only boost their revenue but will also expand their functions'.

5.12.4 Subtheme 4: Concerns about automation

The integration of automation in the Nigerian O&G industry was certainly regarded as potentially beneficial, yet some important concerns were raised. A first concern was related to disinterest in technology. According to one participant, '[A]utomation cannot function properly in Nigerian oil and gas sectors due to the fact that Nigerians care less about new technologies'. Another participant noted that this disinterest may be the result of a lack of knowledge and training on technology and believed that 'knowledge and training will guarantee effectiveness'. However, current training practices were considered of poor quality, and one participant stated that a lack of employees with technical skills forms a real barrier to automation. The participant said, '[I]nadequate supply of necessary techs with updates on database makes automation a big challenge for users'. In line with this idea, one participant noted that 'automation must be fit for purpose and region, or it becomes ineffective'. Evidence (Nagy, and Hajrizi, 2018. Lu, et al 2019) Estimates the significant and efficient automation of activities can enable Oil and Gas to improve performance, by improving EH&S management system quality and speed, contributes to productivity and reducing errors and in some cases attaining outcomes that go beyond human capabilities

Another concern related to the replacement of human labour. One participant expressed in this regard that 'automation is an important part but other aspects like human involvement are key too'. Another participant agreed, sharing that automation would not be beneficial per se, as 'many other factors affect performance too'. These participants implied that by replacing humans with machines, their involvement may decrease, and this may have repercussions for the organisation.

5.13. Theme 4: Regulations and Policy

A fourth theme was developed as a result of comments relating to positive and negative views of (a) regulations and (b) policies. Under each of these subthemes, several sub-subthemes or categories were developed, as highlighted below.

5.13.1 Subtheme 1: Regulations in Nigeria Oil and Gas

In a first subtheme, views, ideas and concerns about the value of O&G regulations in Nigeria were covered. Most participants believed that regulations would be effective because (a) current regulations are outdated, and (b) regulations would serve as an effective control mechanism. Concerns regarding this subtheme were categorised under a third category, 'doubts about regulations effectiveness'. Table 5.14 provides details regarding how frequently these categories were mentioned throughout the dataset and what the share of each category was in relation to the subtheme. Figures 5.16 visualise the same data in a pie chart and a bar chart, respectively.

Table 5 14 Frequency table of categories related to 'regulations'

Category	Frequency	Share of total (%)
Need for updated regulations	18	42.9%
Control mechanism	11	26.2%
Doubts about regulations efficacy	13	31.0%
<i>Total subtheme mentioning (only valid responses included)</i>	<i>42</i>	<i>100%</i>

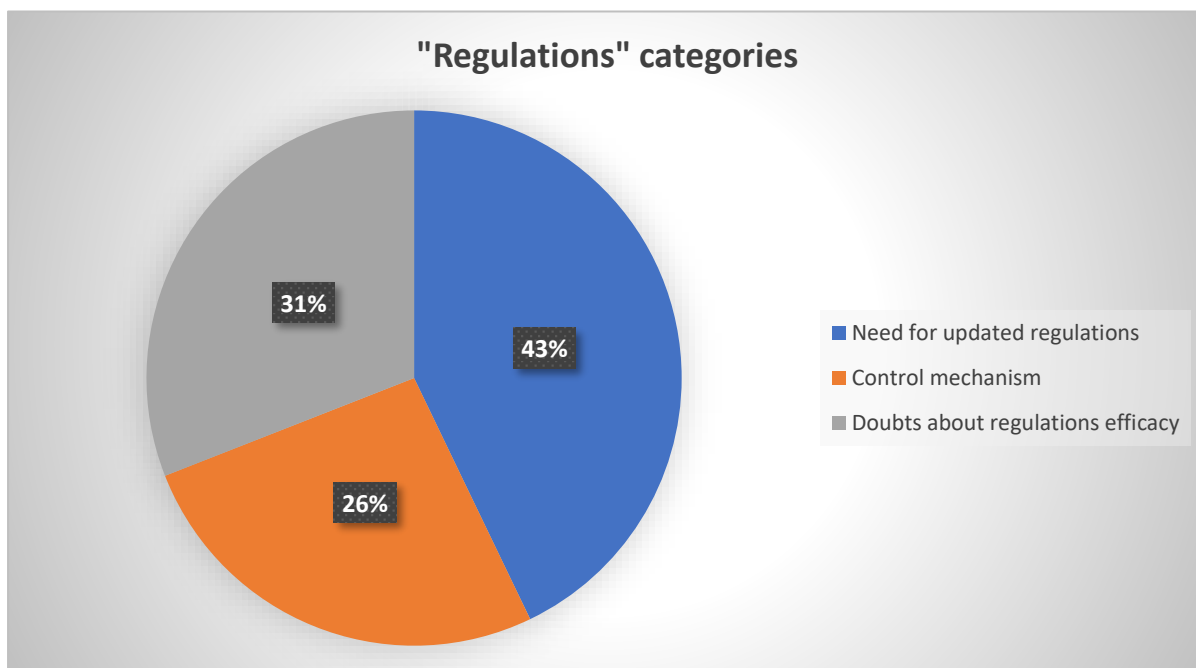


Figure 5 15 Visualising 'regulations' categories and their relative importance

5.13.1. Category 1: Need for updated regulations.

Many participants were of the opinion that current regulations applicable to the O&G industry in Nigeria were outdated and that 'the sector needs improvement'. Participants believed that if regulations are improved, this would automatically lead to sector improvement because, as one participant stated, 'an improved mind is a grow mind, so when there's an improvement in the regulation we tend to improve'. Two other participants added that 'systems need updates all the time', and 'the Nigerian government is currently operating under outdated laws'. As a result of the regulations being 'long overdue for the sector', 'new regulations from government that are enforced are key to enhancing management performance in the oil and gas industry'.

5.13.2: Category 2: Control mechanism for Oil and Gas regulations updated

Besides the need for updated regulations, participants also believed that new regulations could be effective, as they work as control mechanisms. Indeed, as participants noted, 'regulations are important to ensure best practices' and 'will improve management strategies'. This is because regulations 'lead to having a standard', and 'external policy can go a long way in checkmating

health/safety and environmental performance in organisations'. More specifically, participants believed that regulations would be effective because 'government regulations are mostly obeyed so this would work to the advantage of the industry'. Indeed, as another participant explained, 'the government plays a pivotal role in a community and as such their rules cannot be neglected'.

5.13.3: Category 3: Doubts about regulations efficacy

Concerns with regard to the effectiveness of regulations were mostly related to doubts about their implementation. Participants noted that 'it is not as much about regulation but rather about enforcement and implementation'. According to participants, regulations could only be beneficial 'if well implemented' and 'if properly scrutinised'. One participant added that current regulations are in fact well-structured and relevant; however, 'their implementation is poor'. The participant believed that 'with the improved implementation of current regulatory policies and programmes, management performance can be enhanced'.

Another concern was related to the quality of regulations. Some participants stated in this regard that 'if the regulation is not public or masses oriented then there can't be improvement'. Another participant added that 'this will be highly dependent on development and implementation of the right fiscal framework to improve and sustain investments in the sector'.

5.13.4 Subtheme 2: Policy

A second subtheme related to ideas, views and concerns/doubts about the effectiveness and value of policies in the Nigerian O&G sector. A significant category under this subtheme was the shared idea that good policies would have a positive effect on the environment. A second category was related to ideas about the need for updated policies and concerns and doubts, which were collected under the category 'doubts about policy efficacy'. Table 5.15 provides details on how frequently these categories were mentioned throughout the dataset and what the share of each category was in relation to the subtheme. Figures 17 visualise the same data.

Table 5 15 Frequency table of categories related to 'policy'

Category	Frequency	Share of total (%)
Impact on environment	11	29.7%
Need for updated policies	8	21.6%
Doubts about policy efficacy	18	48.6%
<i>Total subtheme mentioning (only valid responses included)</i>	37	100%

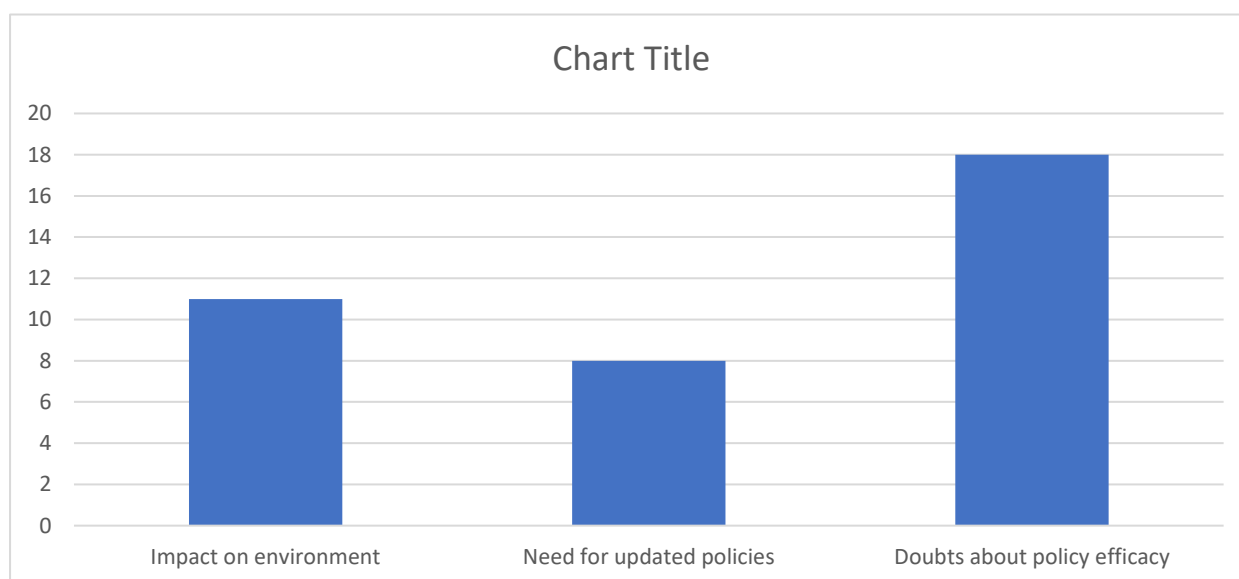


Figure 5 16 Visualising ‘policy’ categories and their relative importance

5.13.5. Category 1: Impact of Oil and Gas Policy on environment

A first group of perceptions in relation to policies was related to potential impact on the environment. Many participants shared positive views and believed that better policies would have the potential of resolving current environmental issues. As one participant said, ‘[N]ew

strategic policies can reduce environmental problems in the oil and gas sectors'. Other participants agreed; for example, one participant noted, '[N]ew strategic policies that address the salient environmental issues in Nigeria will reduce the impact of the oil and gas industry on the environment'. One participant opined that 'if government can introduce recycling policy it will help reduce environmental problems in oil and gas sectors'.

In addition, two participants also noted that 'improved and strategic policies will allow for better management' because 'it will bring in different people to the dialogue table'. The importance of bringing the right people together was highlighted because to make good and effective decisions, the input of different actors needs to be considered (as illustrated in themes 1 and 2). Overall, these statements clearly suggest that strong policies that focus on environmental issues can have significant positive outcomes for the environment.

5.13.6. Category 2: Need for updated policies in Oil and Gas

Similar to regulations, some participants argued that current policies are outdated and need to be updated and improved. Indeed, as a participant shared, '[S]ome methods or strategies our government is currently using are obsolete and therefore call for restructuring'. Another participant said, '[N]ew strategies may be necessary to tackle new challenges and problems in the sector'. Two other participants observed that 'the only thing that is constant in change' and 'new strategic policies are essential'. To conclude, one participant believed that 'toxic waste in the air and soil affect biological essence in our habitat and improved government policies will solve this challenge'. These comments strongly imply that improved policies may positively affect our current environment.

5.13.7: Category 3: Doubts about policy efficacy

Many participants doubted that new policies would be effective, as implementation is the main problem. As one participant said, 'I don't believe it's about the strategies but rather about the implementations'. Another participant fortified this idea and explained that 'there are many

policies already in place, but they are not functioning as they should be', suggesting that implementation is a significant problem. In support of this claim, another participant added that 'policies need to be adhered to in order to be effective'. One participant elaborated, explaining that lack of implementation can be attributed to corruption:

It will not reduce the environmental problems because lots of companies bribe government enforcement agents in the O&G sector. They are after making profits rather than caring about the environment.

Another concern was related to the government's negligence and lack of interest in environmental problems. A participant shared,

I generally do not see how any contribution from the government can efficiently contribute in reducing environmental problems. As the government in years past has paid no attention to these issues till date. Tales of Ogoni clean-up remain a fable.

In alignment with the previous statement, a participant concluded that policies could only be effective 'if the government is ready to serve the nation'. Another participant was less optimistic and believed that 'external agencies are better for this purpose'. This idea will be further elaborated on in theme 7

5.14: Theme 5: Enforcement of regulation in Oil and Gas sector

A fifth theme was related to ideas and views about enforcement mechanisms. Two ideas were explored under this theme: (a) enforcement through government agencies and (b) enforcement through sanctioning. Under each of these subthemes, several sub-subthemes or categories were developed, as highlighted below.

5.14.1: Subtheme 1: Enforcement through government agencies

Comments relating to this theme covered ideas and views about the effectiveness of enforcement through government agencies. In this regard, about half of the participants believed enforcement would be effective because (a) the government holds a powerful position and (b) government enforcement would stimulate accountability. The other participants shared some concerns, which formed a third category. Table 5.16 provides details of how frequently these categories were mentioned throughout the dataset and what the share of each category was in relation to the subtheme. Figures 18 visualise the same data in a pie chart and a bar chart, respectively.

Table 5 16 Frequency table of categories related to 'enforcement through government agencies'

Category	Frequency	Share of total (%)
Power position and ethical responsibility	14	29.2%
Accountability	13	27.1%
Concerns about capabilities of government agencies	21	43.8%
<i>Total subtheme mentioning (only valid responses included)</i>	<i>48</i>	<i>100%</i>

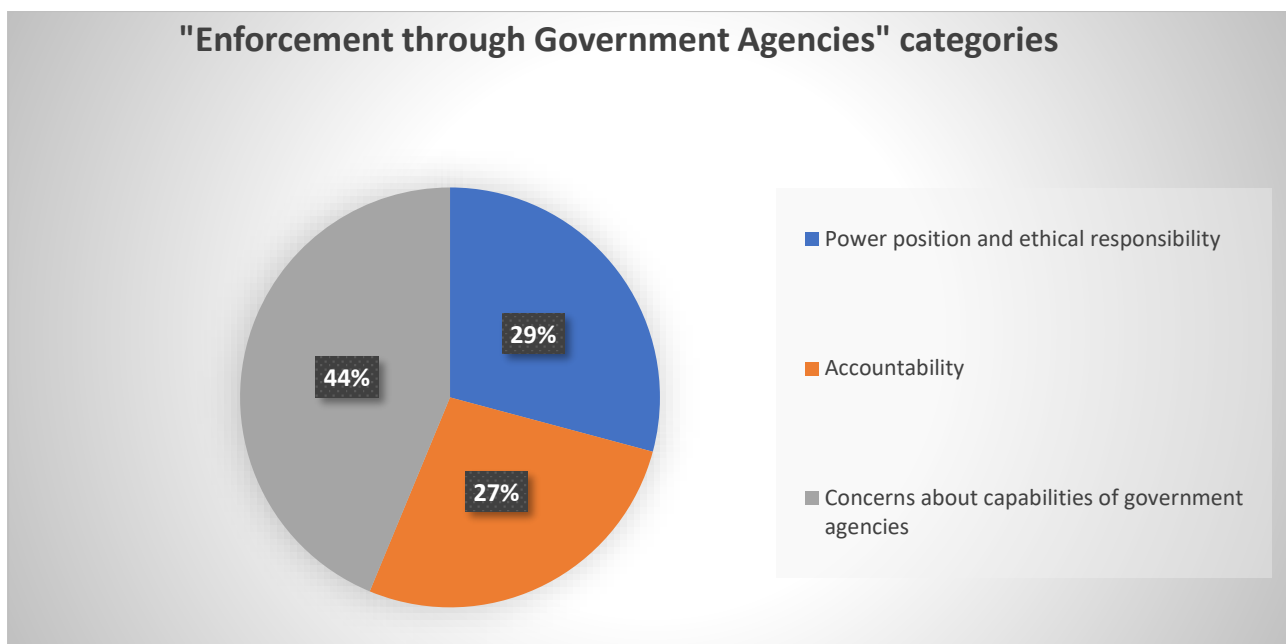


Figure 5 17 Visualising ‘enforcement through government agencies’ categories and their relative importance

5.14.2: Category 1: Power position and ethical responsibility.

Of the participants who opined that enforcement through government agencies would be effective, most argued that the main reason for this was that the government holds a powerful position in society and has the ability to make regulations and policies effective. One participant shared, ‘I think government enforcement agency could enhance management performance in the Nigeria oil and gas sector’. Someone else agreed and added that ‘policy, if implemented and enforced, solves management problems to a large extent’. Another participant agreed and even warned that ‘without the agency it will not work fine’.

In addition to the above, participants mentioned that governments have the ethical responsibility to practice law enforcement. As one participant noted, ‘government agencies are bottlenecks to manage performance in Nigeria’. Two participants agreed that ‘the government should provide everything for the community’, including taking the responsibility to enforce regulations and policies for the benefit of the general population. Supporting this claim, participants mentioned that ‘they are the ones responsible for several policies in oil and gas’ and ‘they are in charge to enforce the agency’.

5.14.3: Category 2: Accountability

Some participants agreed that enforcement through government agencies would be beneficial as, due to their power position, government agencies can execute effective quality controls and hold individuals and organisations accountable for their actions. A participant believed that 'if the agencies are diligent, they can mandate management to obey and comply with standards'. Others agreed, and one participant added, 'there is the need for laws and policies to guide and this would require an agency to follow through'.

Other participants emphasised that with accountability comes punishment, and government agencies were considered important actors in this regard. Their reasoning was that 'they will impose penalties on any culprits found guilty' and therefore have an important role to play in the enforcement of regulations and policies. Another participant agreed and stated that government agencies are crucial actors 'because of the attached penalty to noncompliance'. The potential for being penalised would, according to one participant, have a significant positive impact on compliance, because state agencies are feared by many. The participant explained,

Government policies and their implementation are key to enhance management performance, as the fear of the impact of actions from government does prompt action from management teams of the O&G industry.

All the above imply that because of their powerful position, government agencies can be highly effective in holding individuals and organisations accountable for their actions. Their enforcement can thus be beneficial to society overall.

5.14.4. Category 3: Concerns about capabilities of government agencies

The previous two categories suggest that government agencies can be extremely effective in enforcement. However, most participants were not convinced of this statement and expressed concerns with regard to the effectiveness of government agencies. Most participants shared that 'most of the agencies are not efficient', and many were rather pessimistic about the capabilities of such agencies, as 'not many good results have been seen so far'. Another participant also explained that 'they seem not to be doing their job efficiently because oil pipes are still being vandalised'. A major concern that may explain this is that 'the Nigerian government is not serious about such developments', suggesting that a lack of interest in environmental issues may result in poor government enforcement. In addition, a participant explained that 'those piloting the affairs of the sector lack sufficient ideas on efficient management of the sector'.

An even bigger concern is the ongoing corruption in the country, which many participants evaluated as a serious impediment to enforcement. As one participant explained, government agencies are considered ineffective because 'they are seen to be biased towards locally owned companies'. In addition, a participant noted that 'government enforcement agencies are not properly tasked nor equipped to perform this task effectively' because they deal with 'a system riddled with bribery and corruption'. Supporting this claim, participants explained that 'most agencies are strictly acting on personal interest', and although 'the government enforcement agency has the potential to enhance management performance, widespread corruption is not allowing that at the moment'.

Government bureaucracy appears to be an impediment to efficiency of the sector and this is primarily due to corruption of government officials' (Ikeanyibe, 2018). This idea was supported by yet another participant who explained that 'in the Nigerian context, their efforts have been bedevilled by colossal corruption and irregularities'. More so, a participant said that 'according to present state of Nigeria, government and/or government agencies are the most corrupt part'.

These statements clearly illustrate the scale and implications of corruption that is present in Nigeria.

Participants agreed that government agencies could only effectively enforce regulations and policies ‘if the government officials can abide with the laid-down rules’. However, this appears to be challenging and possibly unrealistic, at least at this stage.

5.14.5: Subtheme 2: Enforcement through sanctioning of Oil and Gas management

A second subtheme was developed based on perceptions of the effectiveness or ineffectiveness of sanctioning as an enforcement mechanism. Most participants were positive and believed that sanctioning would (a) decrease corruption activities and (b) improve efficiency. A few participants shared some concerns, which were covered under a third category called ‘concerns about sanctioning’. Table 5.17 provides details regarding how frequently these categories were mentioned throughout the dataset and what the share of each category was in relation to the subtheme. Figures 5;19 visualise the same data.

Table 5 17 Frequency table of categories related to ‘enforcement through sanctioning’

Category	Frequency	Share of total (%)
Sanctioning decreases corruption	19	48.7%
Sanctioning stimulated efficiency	16	41.0%
Concerns about the effectiveness of sanctioning	4	10.3%
<i>Total subtheme mentioning (only valid responses included)</i>	39	100%

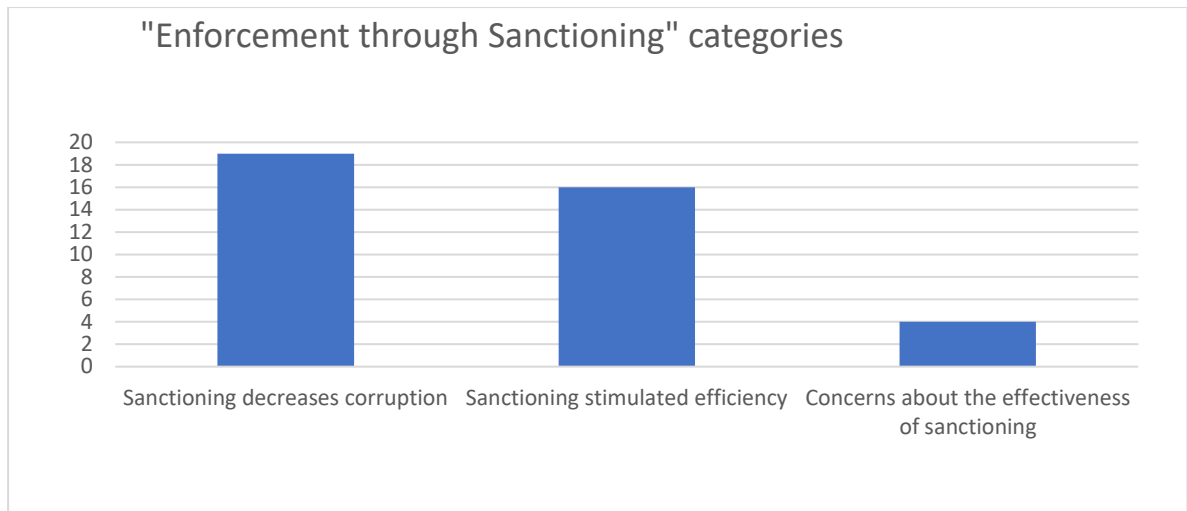


Figure 5 18 Visualising ‘enforcement through sanctioning’ categories and their relative importance

5.14.6 Category 1: Sanctioning decreases corruption

With reference to enforcement through sanctioning, many participants shared positive views and agreed that proper sanctioning would significantly reduce corruption in the Nigerian O&G sector. Participants explained that ‘in the oil and gas industry, corruption has eaten deep into the operational system’ and ‘it has to be dealt with’. Participants shared that ‘corruption has caused severe setbacks in the sector’ and ‘is the biggest problem faced in this industry’. Furthermore, participants stated that ‘corrupt practices lead to multiple and varying impacts of the activities of the oil and gas industry on the environment’, implying a need for effective enforcement strategies, such as sanctioning.

To limit corruption and encourage best practices, the participants said sanctioning should be implemented, as this could ‘deter further corrupt practices’. Another participant believed that sanctioning ‘will make it difficult for people to engage in corrupt activities, knowing the consequences’. Likewise, someone else stated that ‘penalty on corrupt practices will improve oil and gas operation in Nigeria’. To conclude, another participant added that ‘[i]f proper sanctioning is maintained and sustained, corruption in the oil and gas operation will be met away’.

In summary, the above results suggest that proper sanctioning may be a strong solution for corruption. Indeed, as noted earlier, corruption is considered a substantial barrier to the proper implementation of regulations and policies in the O&G industry. With adequate penalties in place, these practices may be mitigated.

5.14.7: Category 2: Sanctioning stimulates efficiency

According to some participants, sanctioning would be beneficial not only for decreasing corruption but also for improving efficiency. Participants who mentioned this category stated that 'more standards will be realised', and 'sanctioning will help a great deal to enhance oil and gas operations, especially when strictly observed'. The idea was that 'if regulations are flouted, commensurate punishment will improve the oil and gas operation in Nigeria'. In other words, 'when people are made to take responsibility for their actions, it reduces the chances of poor practice'.

The reasoning was that because of sanctioning, 'oil companies will act according to the books without any deviation' because they know that if they do not comply with the regulations, 'they will be severely sanctioned by the government'. This was emphasised by another participant, who found that 'discipline enhances and promotes integrity'. Another participant further elaborated, 'Such sanctions can be good examples to others trying to default government policies and rules, when executing projects or doing their daily business. And it will help in minimising unforeseen risks.'

Participants also said that decisions are more likely to be followed through as a result of sanctioning. Thus, 'it will give room for full effectiveness of management decisions'. However, a participant noted that to increase efficiency, a requirement would be that 'the government is consistently reported to'.

5.14.8 Category 3: Concerns about the effectiveness of sanctioning

A few participants expressed some concerns with sanctioning. For example, three participants noted that corruption may inhibit effective sanctioning. A participant elaborated,

Government is the problem, so how can government solve the problem. Government sanctions can be bypassed as long as the right palms are greased, hence I do not see how any government-promoted solution can enhance operation.

Another participant agreed and wondered if ‘this really can be done with the current leadership in the oil and gas sector’. In other words, sanctioning was considered to be only effective ‘if the government is not corrupt’.

5.15. Theme 6: Reviews

Under a sixth theme, perceptions of the effectiveness of yearly reviews were gathered. In relation to this theme, three subthemes were formed: (a) control and accountability, (b) reviews as a tracking mechanism and (c) concerns and recommendations about reviews. Table 18 provides details regarding how frequently these subthemes were mentioned throughout the dataset and what the share of each subtheme was in relation to the theme. Figures 20 visualise the same data in charts.

Table 5 18 Frequency table of subthemes related to ‘yearly reviews’

Subtheme	Frequency	Share of total (%)
Control and accountability	11	35.5%
Reviews as a tracking mechanism	11	35.5%
Concerns and recommendations about reviews	9	29.0%
<i>Total subtheme mentioning (only valid responses included)</i>	<i>31</i>	<i>100%</i>

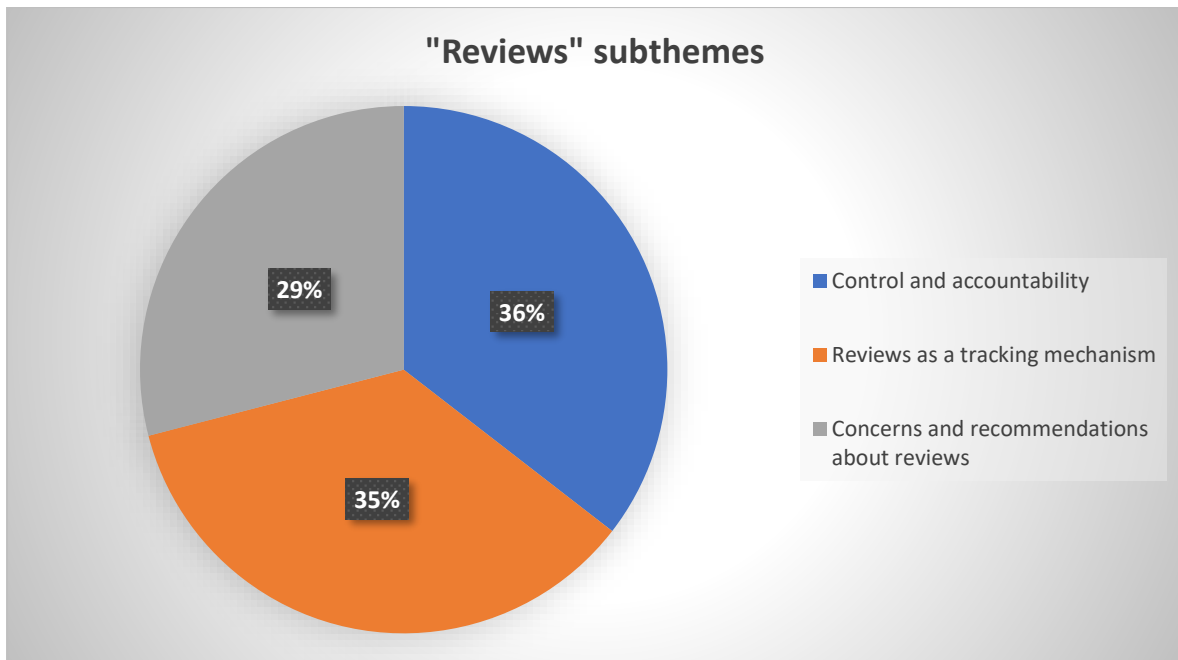


Figure 5 19 Visualising 'reviews' subthemes and their relative importance

5.15.1 Subtheme 1: Control and accountability

Many participants agreed that yearly reviews of data records would be a good way to scrutinise organisations and hold them accountable for their actions. According to participants, yearly reviews of data records would 'ensure transparency' and 'enhance operational transparency in the Nigerian oil and gas sector'. Participants believed that such transparency would enable the government 'to monitor areas where the oil companies are not complying' and 'put adequate measures in place'. Another participant explained that 'with yearly reviews of data records, some organisations that are not duly adhering to government guidelines and rules can be fished out and sanctioned'; hence, this method can be very effective for holding organisations accountable.

One participant noted that such reviews can only be beneficial if they allow to 'quickly know if any fraud-related activities are going on'. In addition, they may also 'make all inclined to be hardworking and up-to-date' and 'reduce ghost workers in the sector'. In summary, these findings suggest that excellent control can be executed through yearly reviews of data. This method may encourage companies and individuals to follow best practices, as they can be held accountable through these reviews.

5.15.2 Subtheme 2: Reviews as a tracking mechanism

Besides control and accountability, participants also mentioned that yearly reviews are an excellent way to keep track of progress and areas for improvement. As one participant stated, 'year review will help to reflect on year-on-year performance'. More specifically, 'reviews are ways of evaluating gains made, while assessing same with strategic milestones that need to be attained'; thus, 'progress can be measured'. Another participant added that 'it helps in retracing reasons for losses and gains'. Moreover, 'it creates opportunity for examination of the process' and 'will allow for areas of improvement'.

5.15.3 Subtheme 3: Concerns and recommendations about reviews.

A few participants mentioned concerns regarding yearly reviews. First, some participants noted that yearly reviews are not frequent enough. The participants stated that 'reviews should be more frequent' and, more specifically, 'should be quarterly'. Their reasoning was that 'yearly review of data doesn't suggest a quick and smart enough correctional medium'.

A second concern was related to corruption as has been mentioned in other subthemes and categories. With specific reference to yearly reviews, some participants were worried that 'data will be manipulated' because 'the level of negligence and corruption in Nigeria is skyrocketed'. Yearly reviews would only be beneficial 'if there will be faithfulness to it'. Lastly, one participant also added that 'when the government is not consistently reported to then there will be no effectiveness'.

5.16. Theme 7: Control and scrutiny in the Oil and Gas sector.

A seventh theme was developed based on ideas and views about the impact of control and scrutiny of organisational practices in the Nigerian O&G industry. Three control and scrutiny practices were covered: (a) control through quarterly reports, (b) scrutiny through selection and inspection and (c) control through external agencies. Under each of these subthemes, a number of sub-subthemes or categories were developed, as highlighted below.

5.16.1 Subtheme 1: Control through quarterly reporting

A first subtheme was based on comments that were related to quarterly reporting as a control mechanism. Categories formed under this subtheme were (a) accountability, (b) growth and improvement and (c) concerns about effectiveness of quarterly reporting. Table 5.19 provides details regarding how frequently these categories were mentioned throughout the dataset and what the share of each category was in relation to the theme. Figures 21 visualise the same data in charts.

Table 5 19 Frequency table of categories related to ‘control through quarterly reporting’

Category	Frequency	Share of total (%)
Quarterly reporting encourages accountability	20	51.3%
Quarterly reporting instils growth and improvement	9	23.1%
Concerns about quarterly reporting effectiveness	10	25.6%
<i>Total subtheme mentioning (only valid responses included)</i>	<i>39</i>	<i>100%</i>



Figure 5 20 Visualising ‘control through quarterly reporting’ categories and their relative importance

5.16.2. Category 1: Quarterly reporting encourages accountability of Oil and Gas management system

Many participants agreed that ‘quarterly report will sure promote transparency’, which they evaluated positively in the Oil and Gas management sectors, as ‘transparency encourages good practice’. Many advantages to quarterly reporting were mentioned, including the identification of

problem areas, personal work quality, noncompliance and best practices. One participant noted that through quarterly reporting, 'leakages will be easily identified'. The advantage of such early identification is that as a result, 'revenue leakages will be minimised'.

With regard to personal work quality, some participants mentioned that through quarterly reporting, companies can keep track of the productivity of their employees' and identify potential areas in which employees need more training. A participant explained, '[T]his will help the management to know who is responsible for errors and who did a good job within the sector'. Participants also mentioned that quarterly reporting 'can help check whether organisations are complying with regulations'. According to participants, 'accountability is essential', and 'this will improve the level of enforcement and compliance'.

Participants also noted that quarterly reporting for Oil and Gas EH&S management could encourage individuals to execute best practices because these reports track all decisions made and hold individuals accountable for their actions. A participant explained that 'frequently reporting to a government enforcement agency will encourage good practice within the oil and gas sector'. Quarterly reporting 'put people and organisations in check', which is crucial for the growth of a company. A participant further elaborated,

This is a culture of accountability, and beyond government enforcement agencies, reports should be publicly accessible by citizenry, as these are public assets in the first place. These ensure there are no underhanded dealings between government and the O&G sector.

5.16.3 Category 2: Quarterly reporting instils growth and improvement

A second category mentioned quarterly reporting as a mechanism that instils organisational growth and improvement. According to participants, 'reporting directs for better decisions', as 'it will help improve the managemzzent, and the government will know where they are lacking'. Another participant observed that 'evaluation is the key to efficient growth', and 'reports need to be made to allow for areas of improvement'. In addition, quarterly reporting will 'give an

organisation time to decide on things’, as they prepare organisations for what is going on and make processes visible before others would even notice them; thus, ‘it will improve their efficiency in their field’.

5.16.4. Category 3: Concerns about effectiveness of quarterly reporting

The main concern about the effectiveness of quarterly reporting was that ‘the enforcement agencies are not functioning for the good of the government but rather personal interest’. Another participant explained that ‘despite the quarterly reports, most government enforcement officials in Nigeria will not bother to assess the issues arising’. These statements implied that quarterly reporting will be useless unless ‘government agencies are not compromised and strictly adhered to’. Unfortunately, as one participant noted, ‘inadequate reporting systems are currently in place in the sector’.

A different concern which was mentioned by only one participant was the frequency of reporting. According to this participant, quarterly reporting is not conducted frequently enough, and instead, this participant said, ‘I think a structured monthly report will help to identify abnormalities or challenges early and intervention can promptly be provided’.

5.16.5. Subtheme 2: Scrutiny Oil and gas sector through selection and inspection

A second subtheme was related to the idea that the adequate selection and inspection of a supplier’s capabilities is necessary for an organisation to be successful. Participants believed that scrutiny of the capability of suppliers would (a) be a good control mechanism, (b) encourage quality and (c) ensure that risks and uncertainties are foreseen. Negative views were collected under a fourth category, ‘negative views’. Table 5.20 provides details regarding how frequently these categories were mentioned throughout the dataset and what the share of each category was in relation to the theme. Figures 21 and 22 visualise the same data.

Table 5 20 Frequency table of categories related to ‘scrutiny through selection and inspection’

Category	Frequency	Share of total (%)
Good control mechanism	13	37.1%
Encouraging good quality	7	20.0%
Foresee risk and certainty	6	17.1%
Negative views	9	25.7%
<i>Total subtheme mentioning (only valid responses included)</i>	35	100%

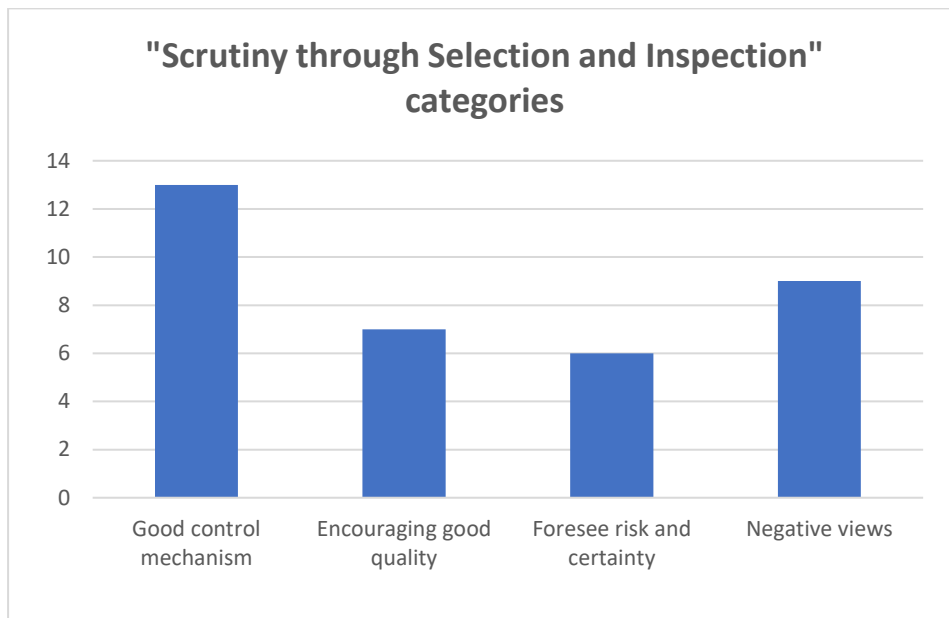


Figure 5 21 Visualising ‘scrutiny through selection and inspection’ categories and their relative importance

5.16.6 Category 1: Good Control Mechanism of Oil and Gas management sector

With reference to the inspection and selection processes of suppliers’ capabilities, many participants said that such processes need to be in place, as they function as control mechanisms. A participant stated that ‘this will definitely deliver a better system and results, curbing nepotism, fascism and tribalism’. Indeed, as was emphasised by several participants, ‘a large amount of

these problems stem from lack of competence, inspired by corrupt practices in the system'. Another participant added that 'suppliers' lack of capacity has caused problems in the past' and believed that 'with a structured process of assessing the suppliers for capabilities, the environment will be better protected'.

Other participants added that it would build trust and reliability in the process and ensure that competent suppliers are engaged. In addition, participants noted that inspection and selection processes would help expose imposers and would also 'make room for tracking of progress of work per bite'. In summary, inspection and selection would encourage accountability, limit negative outcomes and encourage best practices.

5.16.7. Category 2: Encouraging good quality of Oil and gas EH&S management system

A second benefit to the inspection and selection of suppliers capabilities was related to ensuring quality. Some participants believed that such processes can ensure the quality of products and equipment. This is crucial because selecting an incompetent supplier will lead to negative impact on projects. As one participant noted, this process will reduce the chances of obtaining substandard services. Other participants agreed, explain that errors will be eliminated, and it will curb a lot of fake and substandard materials. Two other participants stated that due process encourages right pegs in right holes, promoting professionalism, and 'there will not be room for incompetency'.

5.16.8 Category 3: Enabling to foresee risk and uncertainty

A third advantage to inspection and selection was that this process would enable companies to foresee risk and uncertainty, maximising positive outcomes. The participants who mentioned this category agreed that risk assessment helps in handling uncertainty' and 'inadequate due processes will lead to higher risk. Another participant added that these processes ensure only competent suppliers are selected in execution of projects and the likelihood of unforeseen risk

will be minimised. A participant explained that if the correct supplier is selected, accident can be reduced drastically.

5.16.9 Category 4: Negative views of inspection and selection in Oil and Gas processes

Although inspection and selection processes were considered useful for the sake of (a) having a good control mechanism, (b) ensuring quality and (c) foreseeing risks and uncertainty, some concerns were shared. These concerns were mostly related to ineffective implementation and corrupt activities. Participants noted that such inspection and selection processes would only be beneficial 'if followed properly' and 'when they are effectively implemented.

Some participants were pessimistic about the possibility that these processes would be implemented. They believed that at the moment due process are obviously not being followed. One reason for this observation was that the government abuses power and may try to influence the process to the detriment of society. As one participant noted, 'it won't help because higher authorities will definitely want to influence the selection process. This was considered highly problematic because role should be distributed base on competency. Hence, these implementations could only work 'with an appropriate body in power'.

5.16.10 Subtheme 3: Control Oil and Gas EH&S management system through external agencies

A third subtheme was related to the idea of appointing an external agency to control and scrutinise organisations in their practices. Most participants expressed support for this idea, as according to them it would (a) reveal loopholes and (b) ensure checks and balances are in place. Table 5.21 provides details regarding how frequently these categories were mentioned throughout the dataset and what the share of each category was in relation to the theme. Figures 23 and 24 visualise the same data in charts.

Table 5 21 Frequency table of categories related to 'control through quarterly reporting'

Category	Frequency	Share of total (%)
External agencies can reveal loopholes	16	66.7%
External agencies can ensure that checks and balances are in place	8	33.3%
<i>Total subtheme mentioning (only valid responses included)</i>	24	100%

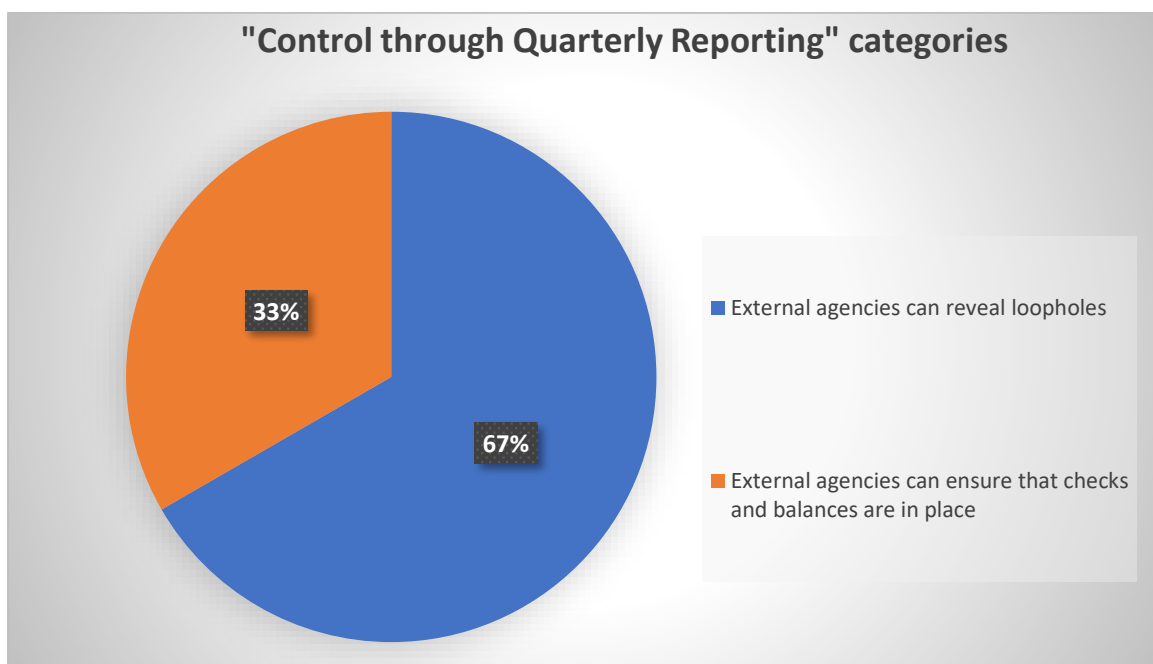


Figure 5 22 Visualising control through quarterly reporting categories and their relative importance

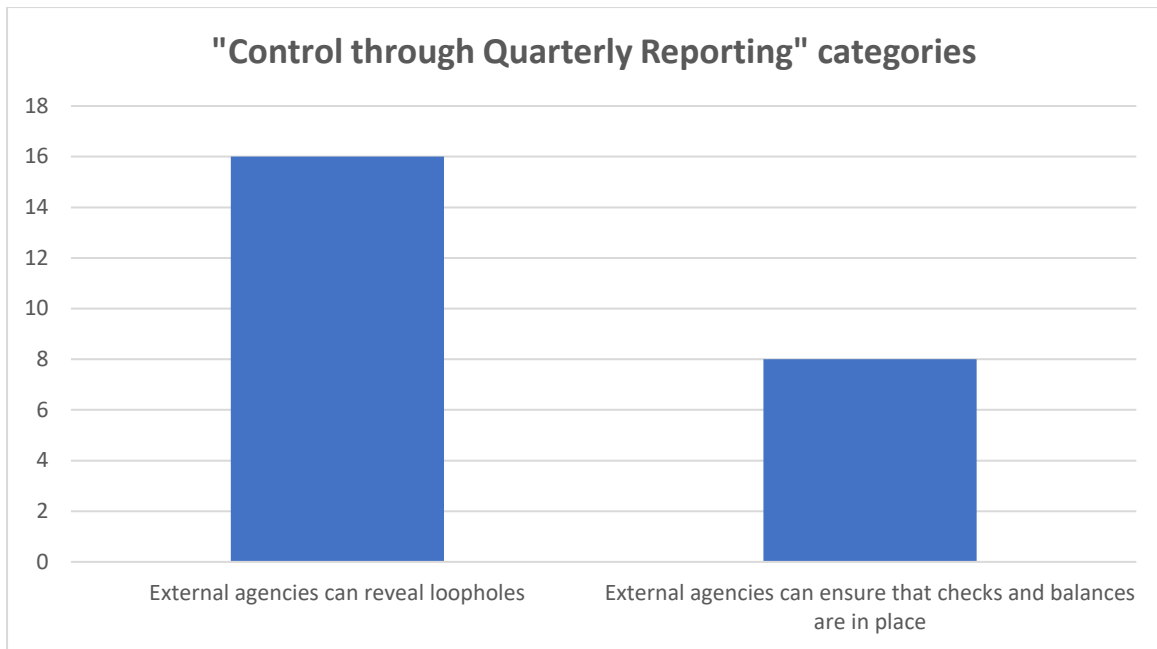


Figure 5 23 Visualising 'control through quarterly reporting' categories and their relative importance

5.16.11 Category 1: External agencies can reveal loopholes.

A first category was related to comments regarding how external agencies were thought of as being more likely to detect loopholes in comparison to government agencies. Participants who mentioned this category agreed that external agencies are more trustworthy and less likely to be influenced by corrupt officers. External agencies were believed to be more transparent and honest than governmental agencies. Hence, their involvement as control mechanisms was highly valued. Participants agreed that the audit will encourage transparency and will create sincerity. Their reasoning was that external auditing reveals loopholes. As This will deter corrupt individual from illicit activities. According to participants, most think they are untouchable, and as a result, culprits will be scared to commit crimes. Another participant shared, [I]t will because it will create fear in the mind of those who are also intending to do same.

5.16.12 Category 2: External agencies can ensure that checks and balances are in place.

A second perceived benefit of external agencies was that because they are external bodies, they can ensure that checks and balances are in place. Participants said that in order to ensure checks and balances, it's vital to allow external auditors. Two other participants agreed and added that 'it will promote checks and balances' because 'it will allow true and fair audit report. A participant elaborated that 'independent auditing, public access to records and appropriate penalties at all levels, will be key to the improved performance and an enhanced industry. The reason was that 'it ensures that local auditing is not easily corrupted.

5.17. Theme 8: Leadership

An eighth theme was developed based on comments relating to whether or not senior management should be involved early on to reduce operational complexity. A strong majority of participants were in favour of the early involvement of senior management because they believed there was a need for their expert opinions. A few participants expressed concerns with this idea; their perceptions were categorised under a second subtheme, 'concerns'. Table 5.22 provides details regarding how frequently these subthemes were mentioned throughout the dataset and what the share of each subtheme was in relation to the theme. Figures 25 visualise the same data in charts.

Table 5 22 Frequency table of subthemes related to leadership

Category	Frequency	Share of total (%)
Need for expert opinions	27	84.4%
Concerns	5	15.6%
<i>Total subtheme mentioning (only valid responses included)</i>	32	100%

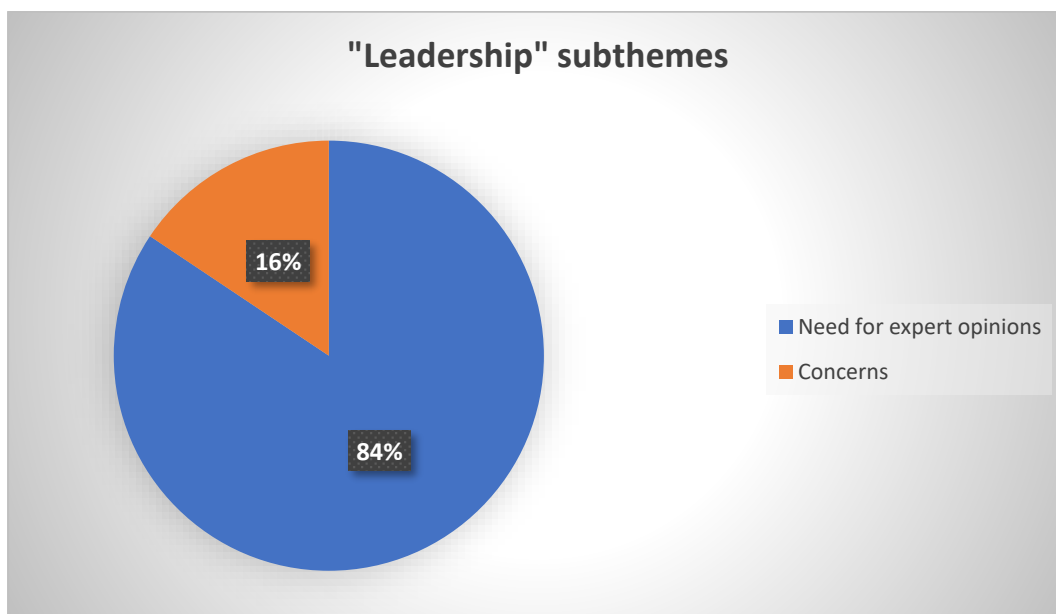


Figure 5 24 Visualising 'leadership' subthemes and their relative importance

5.17.1 Subtheme 1: Need for Expert opinions

Most participants who shared positive views regarding the early involvement of senior management stated that they would appreciate participation, as they may be able to provide good input, guidance and solutions. One participant said that early support from senior management team can reduce complexities and improve project outcomes. Another participant added, [I]f they are allowed to be part, I think it could improve project outcome in the Nigerian oil and gas sector.

Yet another participant stated, [W]hen there is an involvement of senior management team then things will be done rightly'. Other participants added that '[e]arly engagement reduces risks and is preferred because 'management are able to foresee and correct any abnormality if issues are brought to their attention early enough.

Senior managers were regarded as experts in their field and valued for their experience and knowledge. Their early involvement was believed to benefit project outcomes. A participant explained that 'reliance on experienced hands is a positive step in the right direction. Others made similar comments; for example, a participant suggested valuing senior management's input 'because their experience will really help the work. Another participant agreed and similarly appreciated their involvement because of 'their long-term exposure in the field'.

Some participants noted that 'they have all the ideas, and 'they help guide decision-making. In addition, some thought of senior management as supervisors, and one participant stated in this regard that 'supervision is always required for productivity'. Others associated the early involvement of senior managers with better organisation; as two participants stated that 'it will make the process more organised' and 'enable other junior management team to be focused and concentrate on their work. Overall, these statements clearly suggest positive associations that many individuals make with senior management. As a result of these positive perceptions, their early involvement in projects would be appreciated by most.

5.17.2 Subtheme: Subtheme 2: Concerns about early involvement of Oil and Gas senior managers

A few participants were either indifferent or negative about involving senior managers in projects from an early stage. These participants once again mentioned corruption as a significant problem and explained that many senior managers do not necessarily have the right skills or intentions, as they were put in their positions as a result of nepotism. One participant explained that 'only experienced staff would be the best'. Another agreed and further elaborated,

I am indifferent. As earlier mentioned, competence and expertise will be key. What is the point of senior management who have a position based on power and status rather than skill?

Other participants similarly doubted the value of including senior management and referred to their self-interest versus societal interest as a concern. One participant explained, [M]ost senior management team care only about money. According to this participant, such self-interest could inhibit decision-making and thus would not benefit society. Another participant agreed and stated that the involvement of senior managers would only be beneficial 'if they're not doing projects for their selfish interests'. Overall, these concerns illustrate once again the negative impact corruption and nepotism may have on organisational decisions and society.

5.18: Theme 9: Protectionism and localisation

A ninth and last theme provided insights into opinions on the mandatory use of local products in the Nigerian O&G sector. Most participants seemed in favour of this idea, as they believed it would contribute to (a) job creation and (b) national development in general. Yet some important concerns were raised, such as the quality and availability of local products. These concerns were categorised under a third subtheme, 'concerns about localisation. Table 5.23 provides details regarding how frequently these subthemes were mentioned throughout the dataset and what the share of each subtheme was in relation to the theme. Figures 26 visualise the same data.

Table 5 23 Frequency table of subthemes related to protectionism and localisation

Category	Frequency	Share of total (%)
Job creation	18	38.3%
National development	14	29.8%
Concerns about localisation	15	31.9%
<i>Total subtheme mentioning (only valid responses included)</i>	47	100%

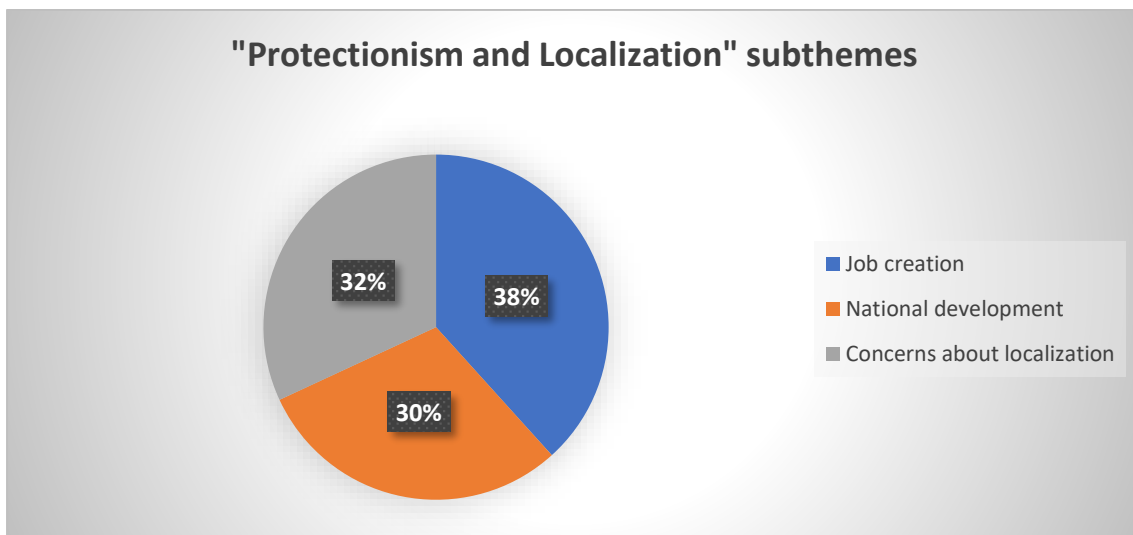


Figure 5 25 Visualising 'protectionism and localisation' subthemes and their relative importance

5.18.1 Subtheme 1: use of local products enhance Job creation

Of those participants who were in favour of the idea to make the use of local products mandatory, most believed this would lead to the creation of jobs. As one participant noted, 'the use of local materials helps create job opportunities because of local production. Another participant shared that 'localisation of skills will be enhanced and this will create job opportunities for Nigerians'. Yet another participant added, [W]hen local materials are sort after, it will open job avenues to the youth'. Someone else explained, [I]f we can be using the local material it will give job to the citizens that are jobless and it will improve the management as well. In addition to job creation,

some participants also believed that ‘masses can actually make use of their diverse intellect to survive financially.

5.18.2 Subtheme 2: National development

Many participants agreed that if the use of local products were to be mandatory, this would result in increased national development. As one participant argued, ‘it will definitely increase our economy output and encourage local investors. The other participants agreed and believed that the use of local materials can encourage industrialisation. Others stated that the promotion of local contents enhances development. They believed that the ‘use of local materials would attract industrial activities of all sorts.

Some participants added that the use of local products would also positively impact the country’s national image, as other countries may change their perceptions of Nigeria. A participant explained, [T]his would discourage industrialised nations to see Nigeria as a dumping ground’. Another participant believed that ‘this would place Nigeria among other manufacturing countries in the world.

5.18.3 Subtheme 3: Concerns about localisation of materials and job creation in Oil and Gas

Although the mandatory use of local products could lead to job creation and overall national development, participants raised some concerns regarding the quality of local products and availability of materials. Regarding quality, some participants raised the question of whether local products would be of the same quality as that of international products. If not, these participants did not seem to be in favour of local products mandatory. A participant explained that ‘standardisation of materials adhering to standard requirements should not be compromised for encouragement of country industrialisation. Another participant explained that ‘as long as the local materials have potentials for improvement in quality and standards, their use should be encouraged. However, another participant noted, ‘[S]tandards must be same or similar to imported goods.

To ensure the quality of local products, participants suggested that care should be taken to ensure quality is not traded'. Indeed, as a participant shared, there is a need to standardise local material and make the market attractive because 'people will naturally buy and use local material when these conditions are met. According to one participant, ensuring the quality of local products may be challenging because there is a knowledge gap in the creation of said materials. Therefore, another participant argued, [S]ystems have to be in place to monitor the process of production.

Another concern was the availability of materials. Participants mentioned that the mandatory use of local products would only make sense if the materials are available in the country. A participant explained, 'Most time this could not work in the H&S sector, because most of the materials or tools used in the sector are not produced in the country. Although using locally made materials is good for the country, what happens if the country lacks the production of needed tools?

Lastly, a participant noted that 'if the material is cheap to import why mandate local material?' In summary, all the above statements suggest that making the use of local materials mandatory must be critically evaluated, and matters such as quality, availability and cost must be considered.

5.19: Summary

This chapter has analysed the data collected from the Nigerian O&G management sector. The results indicated that depletion of environmental pollution is of importance in the sectors. Management applied varying skills across the organisations, in some cases, some executives applied the same tool but in a different way. Despite all the managerial acts to minimise environmental pollution, the study found that there have not been efforts towards integrating the EH&S management system. The analysis identified a large number of deficits across managerial sectors. For example, collaborative planning, which is a popular practice used by successful organisations, has the opposite response among Nigerian O&G firms. However, the participants

have provided various suggestions for how to resolve these difficulties and improve the EH&S management system. Part of this corresponds to research objectives three and four, which are to design a framework for managing and maintaining an integrated EH&S management system to prevent environmental degradation.

According to statistic (Klein et al 2017, Olugu et al 2021) Planning and implementation of integrating EH&S principles keep environmentally safe, protect workers from job-related injuries and illnesses, identify and mitigate environmental hazards. Prevent many negative consequences such as poor-quality outcomes, schedule delays, and cost increases, Likewise, increasing training and communications that clearly convey the company's (Oil and Gas EH&S) goals in order to encourage safe environment and good healthcare.

This study has provided an effective framework for an EH&S management system, as shown in the next chapter of this thesis.

CHAPTER 6.0: DEVELOPMENT OF A FRAMEWORK TO MANAGE THE INTEGRATION OF AN ENVIRONMENTAL AND HEALTH AND SAFETY MANAGEMENT SYSTEM

6.1 Introduction

This chapter presents the responses from the data analyses and discusses the research findings. The questionnaire design and the data analyses were addressed in the previous chapter. The third and last objective of the research, which is to design a sustainable framework and a framework that incorporates an environmental, health and safety management system for environmental pollution in the Oil and Gas sectors was also present in this chapter.

According to the research findings, Oil and Gas management practitioners believe the Oil and Gas management system is built on a defective organisational structure, thus, Figure 6.1 highlights the Environmental, health, and safety problems facing the Nigerian oil and gas sector. The data behind Figure 6.2 demonstrates the problem with colour code, orange problems, proposed solutions with colour black, and the green colour represent EH&S management system. Table 6.1, summarises the viewpoints of participants about each option and includes a list of specific concerns about each idea.

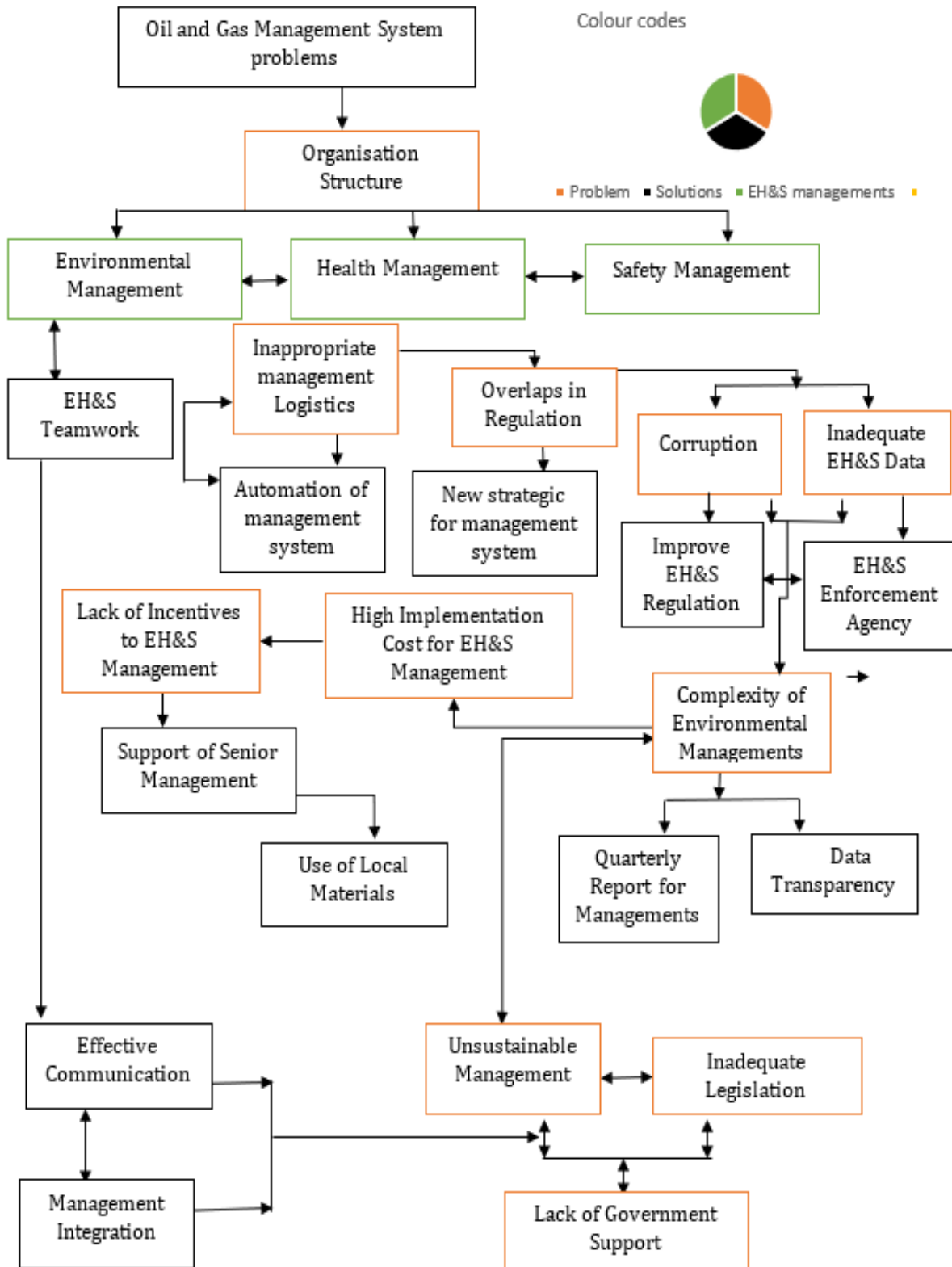


Figure 6 2 Complexities and solutions to Nigeria's oil and gas management

Figure 6 2 Complexities and solutions to Nigeria's oil and gas management

6.2 Concern to Solution – Managing the Nigeria O&G Industry

Table 6.1 presents the potential solutions for mitigating environmental pollution generated by the Oil and Gas sector. It Also highlights the potential concerns that could stymie the effective adoption of an integrated management system in the sector. The table was created using research analysis and input from respondents.

Table 6 1 participant notion and concerns towards integration framework.

Solution	Envisage outcome	Concern
Teamwork	Leads to fewer mistakes, feasibility, increases efficiency	Corruption
Automation	Safety, productivity, higher product quality, effective use of materials	High implementation cost and negligence
Enforcement agencies	Prevent unexpected or unknown situations or crimes	Inefficiency
Communication	Increase productivity, performance, integral success and eliminate problems	Government influence
Improve regulation	Protection of human rights including the integration of EH&S	Has to be public or masses oriented
New strategy	Ensuring compliance with regulations, decision-making, and advice	Personal interest
Data transparency	Stimulates communication, creativity empowers individuals, fosters team bonding	Corruption and lack of sanctions
Quarterly report	Assessing a company's health and provides transparency and clarity to financial data	Inappropriate practitioner
Yearly review of data	Records maintain information across teams and an effective workplace	Data will be manipulated
Due process and inspection	Stimulates communication, creativity empowers individuals, fosters team bonding	Corruption and lack of sanctions
Sanctioning of corruption	Discourages investment, diminishes the rule of law and slows down the economy	Governmental problem
Sanctioning of corruption	Discourages investment, diminishes the rule of law and slows down the economy	Governmental problem
Use of local materials	Promote industrialisation and a sense of belonging, establishment of work possibilities	Quality and availability
Support of senior management	Evaluating risk, reducing costs and improving H&S performance	Lack of right skills or intentions and nepotism
Dual external auditing	Encourages sufficient, effective rules and procedures that discover instances of fraud	Government influences
Appropriate penalty	Promotes openness and improves a company's public image.	Superiority or supremacy

6.3 Design of framework for managing EH&S problems in the Nigerian O&G management system

In order to achieve the objective of developing a framework that will facilitate the solutions to the challenges of oil and gas management in the Nigerian Oil and Gas Sector, before that, the third objective for the research finding was developed, which is to design a sustainable framework for integrating Oil and Gas environmental, health and safety management systems. This framework was created to sustain the design framework for an integrated environmental, health and safety management system (Figure 6.4). The proposed framework (Figure 6.3) also suggests sustainable stakeholder representatives such as federal and state governments, the oil and gas host communities, local management and the Oil and Gas Personnel Forum. It includes the environmental, health and safety emergency rescue team and enforcement agencies for better management of the proposed framework.

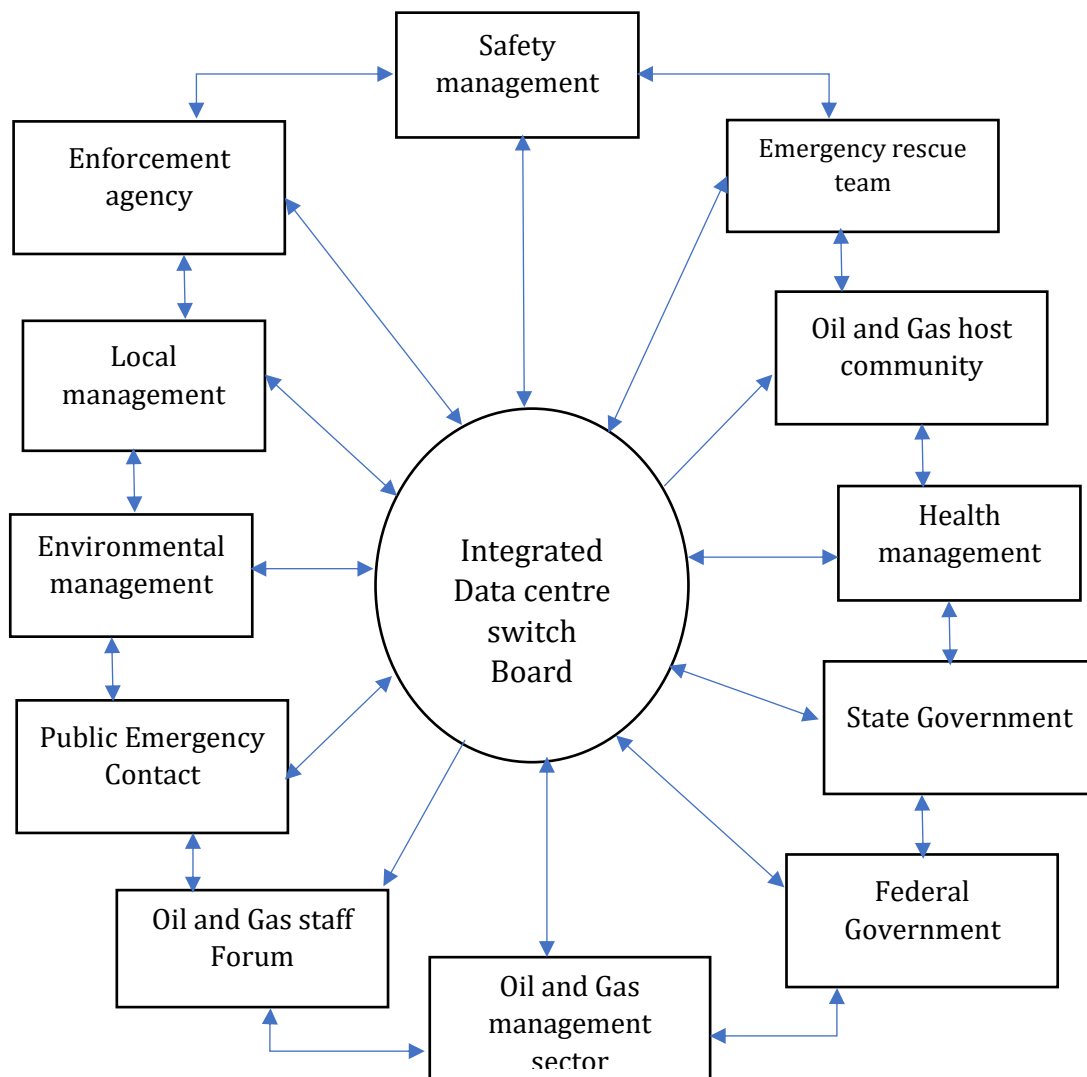


Figure 6 3 The proposed sustainable framework

6.4 Sustainable Framework Implementation Steps

In order to implement this framework, integrate ethical practice and all the elements of Figure 6,4 (the framework for integrating Oil and gas environmental health and safety management system) must be considered. The implementing steps were broken down into five steps, which were labelled L1, L2, L3, L4, and L5. This was assigned as a number so that each could easily identify the other.

- L1, Effective communication, transparency, and teamwork among stakeholders and other relevant departments.

- L2, Data collection, / dissemination centre or switch board such as:
- Receiving, keeping and dissemination of information in utmost working condition via L1.
- L3, Introduction of new strategies, example:
- Sustainable policy for managing the integration of management system
- Selection of Sustainable management task force
- Appointment of sustainable facility managers
- Establishment of sustainable enforcement agency
- Incorporation of sustainable culture within national environmental, health and safety regulatory Act
- L4, Dual auditing, quarterly or yearly report and appropriate penalty for all the appointees in L3 and any L3 that breaches contract, abuses power and ceases to follow the work plan
- L5, Automation to improved safety, improve environmental quality, integrate efficiencies, increased productivity and support transparent record keeping.

6.4. 1 Envisage Framework outcomes

Based on the literature review and research data analysis outcome, the sustainable framework was designed for Nigerian O&G management. The purpose is to reduce daily environmental pollution of O&G, dissemination of accurate information and more sustainable data storage.

The sustainable framework was designed based on the research hypothesis and research data analysis outcome for the use of:

Nigerian O&G management for receiving daily O&G environmental pollution, disseminating accurate information and more sustainable data storage

Nigerian O&G stakeholders: for dissemination of oil spill information and receiving daily O&G update in EH&S.

N.D. Cal., Mar. 13, (2017), Dibia and Onwuchekwa (2015) and Omeje, (2017), confirm poor managerial role, especially relationship with the oil sector management and stakeholders, such as host communities and local management (see chapter 2, 3 and case 2.9.2 for more details). The sustainable framework is based on a model of society that reflects their understanding of what is real and important to measure. The proposed stakeholder arrangement system will produce statistics which will be more timely, responsive, granular and easily adapted to the needs of EH&S. However, in line with directions of Nigeria Environmental Impact Assessment Act (Nsirim-Worlu, 2018) requires management to prepare an environmental impact assessment report to all stakeholders. The framework has several advantages such as:

- Implement self-belonging between the stakeholders and oil management sectors
- Enhance Oil and Gas management work systems
- Jobs creation
- Promotion of safe environmental, health and safety
- Reduce climate change via pollution sanctioning.
- Integration of stakeholders
- Inter-related factors, including EH&S factors like economic, housing, and safety that result in a high quality of life.

The framework also takes into account operations, such as concerns, effects or change of the policies and programs of communities, agency and government that could affect one or several key drivers of the framework by:

- Creating an individual stakeholder direct access to data switch board. i.e., equality and transparency, the arrow showing the input and outcomes distribution across the stakeholders, taking account of contribution and analysis.

- Data record and update, the operational team can make changes to the Statistics, outlines the rationale for this approach and describes its content in systems terms. i.e., sustainable outcomes, assessing how current actions will support high quality of EH&S.

Where there is power failure or mismanagement, the stakeholder has direct links to two or more other stakeholders to relay the information. Over time, the framework will begin to provide evidence that can improve decisions about the particular interventions that are likely to work best for specific individuals.

6.5 The Integrating Oil and Gas EH&S Management System Framework Expectation

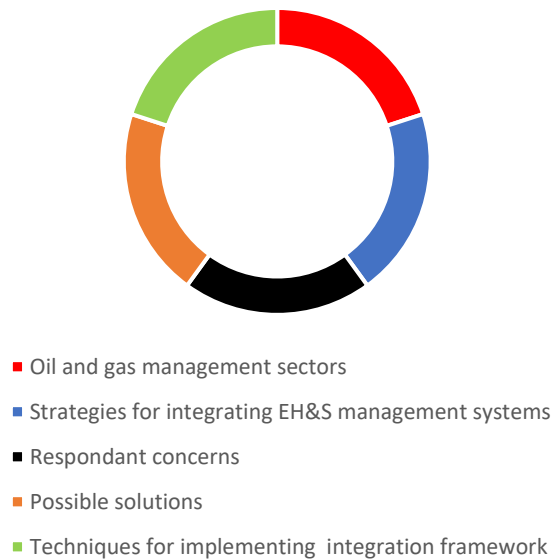
It is proposed that the design of an integrated EH&S management framework for addressing system problems would be necessary to resolve Nigeria's O&G deficit. This will help improve product and service quality, improving safety and reducing project costs. In addition, it should help reduce project duration, deliver a safe environment and increase revenues and profits. In particular, it should increase productivity, competitiveness and efficiency.

In addition, it should eliminate climate change through reduction of air pollution. Burning fossil fuels causes poor air quality and releases air pollutants, greenhouse gases and is closely linked to climate change. Thus, reducing air pollution and quick identification of pollution from the sources will help to address climate change and improve air quality (Blum, 2017 and Eguiluz-Gracia et al 2020). It also reduces waste, while improving the health service to leading edge status. The framework was designed based on the outcome of this study. This framework relies on the questions and outcomes from research data collection and analysis. Evidence from the research findings highlight the solutions embedded within the research responses. The conclusion is that success can be attained only if O&G managerial bodies agree on each problem as shown in figure 6.0 above.

The framework will include a validation and authentication process. The structure is made up of four different colours: red, blue, orange, and black. The red colour represents the oil and gas

management sectors, the blue colour indicates strategies for integrating EH&S management systems, and the black and orange colours represent people's concerns and possible solutions. The dotted line grouped the framework into three, i. e., breach of contract, abuse of power and work ethics. The arrows link the framework, i. e., strategies, concerns, and possible solutions. The green colour highlights the implementation methods for framework strategies, such as good understanding and communication, gradual step-by-step implementation and enlightenment, and simplifying the language term for proposed solution.

Framework colour code



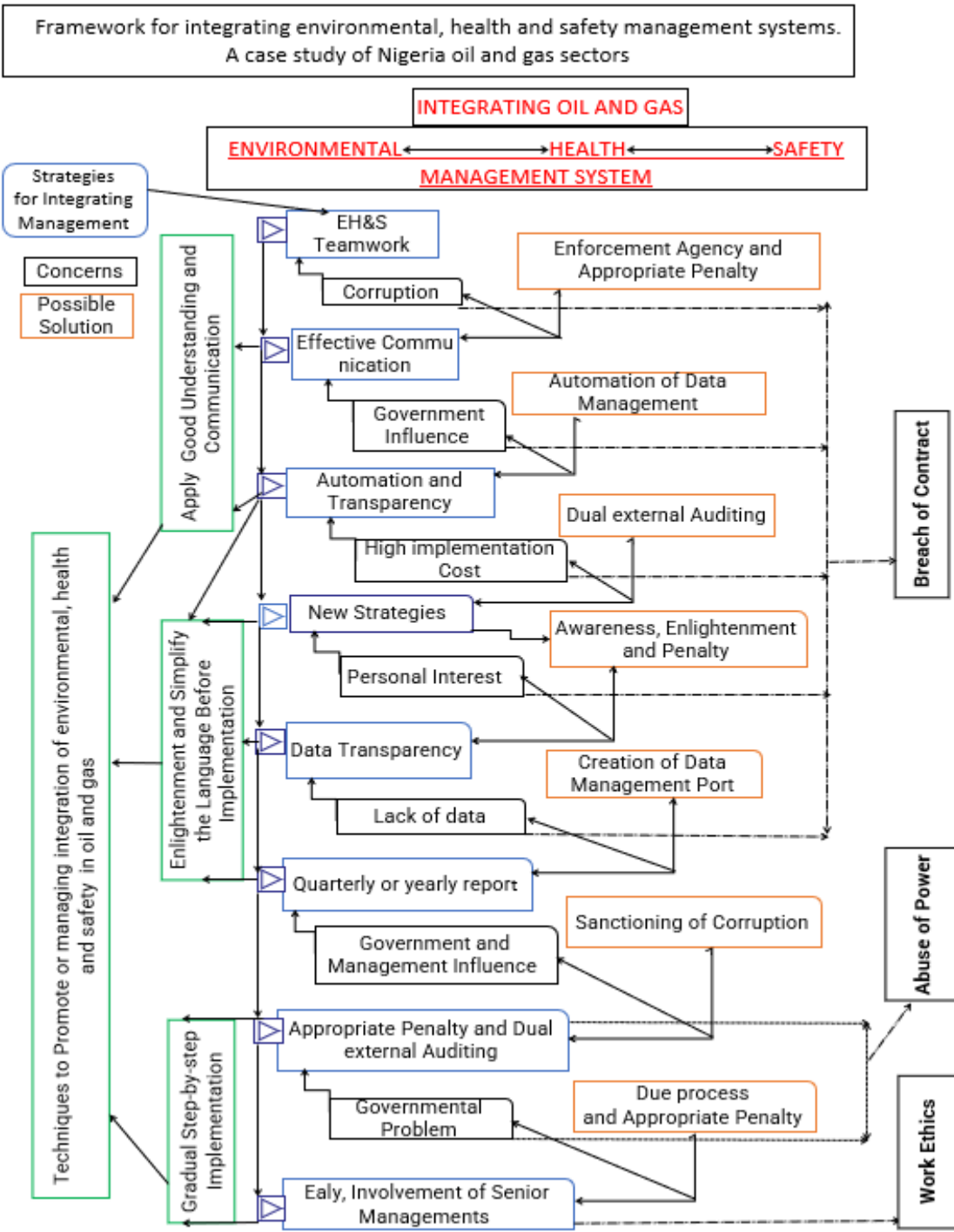


Figure 6 4 Design framework for integrating environmental, health and safety management system.

6.6 Flowchart and framework summary

In this research study, every factor was considered significant. Figure 6.1 highlights the problems or gaps for Oil and Gas environmental, health and safety management systems. The problem was highlighted during the research findings. Figure 6.2 present the incidence and the proposed solutions for the Oil and Gas environmental, health and safety management system. According to Gammeltoft-Hansen et al (2017), all rules, steps and regulations must be taken into consideration to manage and keep research flow and orderliness. Furthermore, commitment and great attention to detail foster harmony and compliance in all areas, leading to stability and research success. Figure 6.3 illustrates the design of a sustainable framework to effectively manage the oil and gas sectors as part of the implementation process. Figure 6.4 shows the framework design for effective environmental health and safety management system. In this framework, the problem, proposed solution and the various concerns that relate to them were highlighted and linked, demonstrating the relation or the flow between.

The concern and the proposed solution of the framework result was finally grouped into three: breach of contract, abuse of power and work ethics, good understanding and communication, gradual step-by-step implementation and enlightenment, and simplifying the language term for proposed solution. The three concerns (breach of contract, abuse of power and work ethics) of the research framework are discussed below; the three proposed solution will be discussed later in the research.

6.7 The research concerns for the framework for managing environmental, health, and safety management system problem.

6.7.1 Breach of contract

According to Draper and Newton, (2017), a contract is an agreement between two entities or individuals, which serves as legal protection for parties involved in a potential business deal, or an employment or contract agreement legally binding between two parties (employee and the employer). A breach of contract happens when one of the contract's terms is broken by one of the

parties (Gilcrest and Carvalho, 2018). For example, Odera et al. (2018) argues that Nigerian Oil and Gas operations embark on environmental degradation with the destruction of aquaculture and pollution of waters, vegetation, and agricultural land during petroleum operations. Meanwhile there is no concern and effective effort by the government or oil management to compensate the local communities where the operations are carried out.

An environmental, health and safety breach of contract is a crime according to the Nigeria Environmental Impact Assessment Act (Nsirim-Worlu, 2018). The Act requires management to prepare an environmental impact assessment report submitted by all project proponents that intend to embark on an activity which could impact the environment. In addition, the Act requires management to set out the activity's plan, including the risks and the corresponding impact to health and safety and the environment. Management is required to set out a mitigation plan for managing every potential impact to the environment.

A breach of the relevant environmental regulations has the following convictions:

- A fine of N100,000 (equivalent to \$243.29 or £180.88 as at November 2021) or five years' imprisonment in the case of an individual; and a fine of N500,000 and N1,000,000 (equivalent to \$1216.46 or £904.38) in the case of a corporation Under the Oil in Navigable Waters Act.
- A penalty of N500,000 to N1,000,000 (equivalent to \$1216.46 or £904.38) for failure to report or clean up the impacted site or complicate the third parties, under the National Oil Spill Detection and Response Agency Act.
- Revoke an authorisation by the minister of petroleum for failure to comply with applicable laws, remediate any environmental damage or fail to pay compensation to affected persons, not excluding any environmental regulations

In addition to applicable federal legislation, the Nigerian courts and some state governments have also enacted environmental laws which awarded special, exemplary penalties on erring operators, general damages and environmental pollution in actions arising from oil and gas.

These lawsuits are brought under the common law principles of the torts of negligence, trespass, nuisance and strict liability.

6.7.2 Abuse of power

A system where government commits an unlawful act, done in an official capacity, where most of the important decisions are taken by selected officials rather than by elected representatives, and which affects the performance of official duties or the safety of environmental health (Atkinson et al 2018).

Abuse of power occurs when a leader manipulates a control area for personal advantage, at the expense of the followers or country, ignoring basic managerial responsibilities. This is a criminal offence under the United Kingdom Equality Act 2010 (Atkinson et al 2018). The offence in essence, can hurt a country or crumble its economy (Ashtiany, 2011).

Misuse of a position of power is a crime according to Nigeria Act under sections 132 (1) and 170 (1) of the 1979 constitution, maintained under sections 188 (1) (applicable to Governors and Deputy governors) and 143 (1) (applicable to the president and vice president) (Lawan, 2010). The President, Vice-President, Governor, or Deputy Governor may be removed from office in accordance provisions of this section.

In December 2018, Nigeria filed a lawsuit against Shell, Eni and former Nigerian Minister of Petroleum Dan Etete over abuse of power amounting to \$1.092bn (Umar, 2019). Nigeria contended alleged bribery, corruption and conspiracy against the country. claiming that potential revenue that belonged to the Nigerian people have been diverged (Lawan. 2010). In another case of abuse of power due to human rights violations. On 12 February 2019, the oil multinational company Shell' faced allegations of misuse of power when Ken Saro-Wiwa and eight other protesters were unlawfully detained and executed by It is however worth pointing out that there is no appropriate penalty, fines or court order in place for abuse of power in the Nigerian code of conduct, due to Governmental personal interest or influence and corruption.

6.7.3 Work Ethics

Ahad et al (2021) reveal lack of work ethics in most countries environmentally polluted by Oil and Gas countries. The problems in these countries include lack of dedication, determination, inadequate legislation and professionalism of management system, particularly in developing countries. Kusumaningrum et al (2019) describe the importance of positive work ethics in the Oil and Gas management systems in developed countries, concluding that it can play a significant role in minimizing Oil and Gas environmental pollution. It also increases external and internal output of employees, which contributes positively to the local and national economy. Ahad et al (2021) noted integrated ethics work plans as a collection of moral principles, applied in developed countries to minimize Oil and Gas environmental pollution. Thus, Table 6.2 and Figure 6.3 below are based on research finding to show the process and importance of work ethics as well as the benefit of integrating environmental, health, and safety management systems in the Nigerian Oil and Gas sector.

Table 6 2 Work Ethic for Oil and Gas management sectors

Dedication	Commitment, early involvement of management and dedication to the work plans, focus on tasks without being distracted, corrupt or abuse of power.
Reliability	Management with a strong work ethic are very reliable, meet their deadlines and offer quality work. A reliable system of manager makes an excellent teammate contribute fairly projects within environmental, health and safety.
Discipline	is an essential part of showing a good management system of work ethic. Highly disciplined of management shows on employees' determination and commitment to the job. They seek opportunities to learn new skills, improve their performance and strive to meet or exceed expectations.
Cooperation	Teamwork is a something a good work ethic management regularly spread to those around them, they show good cooperation and readily integrate with others where needed.
Integrity	Those with a strong work ethic also have outstanding integrity, they are honest, transparent, polite, and fair to others
Responsibility	Managerial responsibility requires a keen sense of demonstrating strong work ethic. Those who are ethical are responsible, accept the blame for errors they've contributed to, hold themselves accountable for their actions and proactively work to fix these issues.
Productivity	outstanding productivity translates a strong work ethic. Productive system of management complete projects early and often has a higher output than their counterparts
Professionalism	A good work ethic management maintain and exhibit their professional and professionalism attitude. Clear communication, inspire in way they dress, and integrate with others, they are focused, organized, and respectful.

6.8 Execution of Framework

Evidence shows the Nigerian Oil and Gas managerial system, particularly the environmental, health and safety management sectors, has a comparable organisational structure (Akinyele, 2011, Oyewunmi, and Olujobi, 2016, Olayisade, and Awolusi, 2021). This shows that at the administrative level, integration and appropriate work ethics are prohibited. As a result, the research framework (Figure 6.4) would be implemented via Integrated ethics work plans, shown

in Figure 6.5 using the following three steps: progressive step-by-step implementation, enlightenment and simplifying the language.

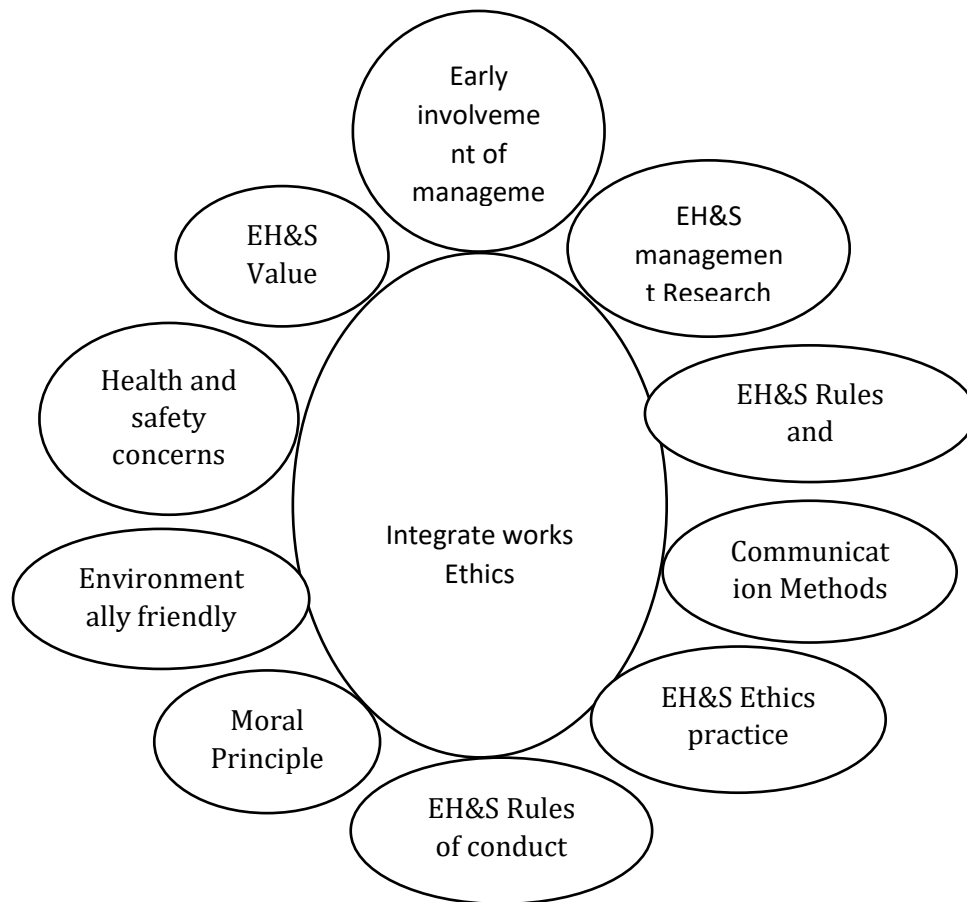


Figure 6 5 Integrated ethics work plans

The framework was created to implement change, although, there are various methods for doing this, depending on the approach and research philosophy used. As a result of this study, there is a need to integrate managements, to foster teamwork and awareness in controlling environmental pollution across the Oil and Gas industry. Early involvement at the management level increases the chances of accurate, ethical work, which simplifies language barriers, enlightening the techniques to evaluate risk, reducing costs associated with accidents in improving environmental, health and safety performance. Appropriate work plan increases knowledge of regulation, fosters data transparency, and creates managerial value. It also sustains competent management system which promotes research to instil confidence, brings environmentally friendly practice and concern for health and safety procedure.

It is believed that after the above-mentioned solutions are implemented, the entire range of benefit will be realised by management. However, the primary motivation for implementing this framework is to improve environmental health and safety in the oil and gas industry via integration of management systems.

6.9 RESEARCH AND RESEARCH FRAMEWORK VALIDATION

Validation of the framework for addressing the Nigerian oil and gas industry's managerial system challenges?

6.9.1 Concept of Validation

One of the outcomes of this research is the evidence from the initial survey, which suggests that integrating management systems could be a good way to address concerns about environmental, health and safety in the Nigerian oil and gas industry. As a result, a framework designed for environmental health and safety management systems is to be validated. According to Wolfe and Smith (2007), validation is a vital aspect of the framework development process, because it indicates confirmation and authorisation. It necessitates the verification of the framework outcomes, as well as a thorough analytical technique that arrives at the study conclusions.

6.9.2 Research Validation

The purpose of this research is to provide measures that can be used to manage the current challenges relating to environmental pollution processes and procedures in the oil and gas sector. This is achieved through the development of a framework to incorporate environmental, health and safety management systems. Therefore, it is necessary to test and determine the validity of the framework before it is widely applied to the Nigerian oil and gas management sector.

6.9.3 Method of validation

During the research process, the quantitative and qualitative approaches used in this study demonstrated the significant agreement between the research findings and published articles. The validation survey, on the other hand, entails the use of subjective research procedures to determine whether study findings are in accord with the reviewed materials. According to Torrance (2012), subjective validation can be accomplished through a process known as respondent validation, which is the utilisation of the perspectives of research participants' and contributions to evaluate the validity of study findings (Barbour and Barbour, 2003, Torrance 2012). This is evidence in other studies such as (Chari, et al 2018, Montalbán-Domingo, et al 2019, Ghodrati, 2018). Thus, this method was used to validate this study findings.

The respondents chosen for subjective validation participated in the first and second phases of the quantitative survey and qualitative study. They also expressed an interest in the research findings and in participating in validating the study. The validation procedure was open to a total of 10 oil and gas management teams. The designed, subjective questionnaire was sent out to ten (10) invitees 5 of whom were internal participated in the formal survey and five external who had not previously participated in the research survey. The survey questionnaires were divided into three (3) portions, with a total of seven questions. The first section introduced the research survey and linked it to the design framework and execution methodologies; the second portion described the specialisation companies, including years of experience. The third section incorporated validating questions with vote of thanks at the end.

All questions had to be answered in order to ensure the validity of the research findings and the applicability of the framework produced for the integrating of the oil and gas environmental, health, and safety management system (see appendix K). However, there was another request title under each question: the reason for your answer, this was to gain the participant concept and contribution. The framework was provided in the form of a flow chart, followed by

implementation map in a style that is more recognisable to the management system (see Figure 6.4).

The first section introduced the research survey, with the survey link to the design framework and execution methodologies (see Figure 6.4); the second portion described the specialisation company or companies, this includes Gas Management M1, Oil Management M2, Health and Safety Management M3, Environmental agency Management M4, and Oil and Gas General Management M5 (see Table 6.5 for more details). The average year of management experience is between 6 to 10, the validating questions are highlighted in the third section tag Q1 to Q5. The years of experience and level of respondents (check Table 6.6 for year of experience) demonstrate they are in a good position to share and add knowledge for the validation of the findings of this research. The table below highlights the department and area of speciality in the Oil and Gas sector of the respondents. Ten management personnel were employed to establish validity, with the number of participants from each department counted and ranked from M1 to M5 as indicated in Table below.

Table 6 3 Management company of specialisation

Management position	Rank	Count
Gas Management	M1	1
Oil Management	M2	1
Health and Safety Management	M3	3
Environmental agency Management	M4	2
Oil and Gas General Management	M5	3
Total		10

6.10 Validation Feedback Findings

The validation feedback of this research indicated that the findings are valid with a recommendation of updating the framework. Table 6.4 below shows the years of experience and the area of management experience of participants.

Table 6 4 Participant Year of experience

Length of experience	Count	Management field
0 - 5	0	0
06 - 10	2	M5, M4
11 - 20	3	M1, M3, M2
21 - 30	3	M4, M5, M5
31 and above	2	M3, M3
Total	10	

In order to demonstrate the structured, well-informed and holistic approach of the proposed framework validating question, the table 6.5 highlights the questions and indicates the level of response for each question from No response to High valid.

Table 6 5 Validating question

Question (Q)	Respondent				
	No response	Not sure	Not Valid	Valid	Highly Valid
Q3, The capability of proposed framework for integration the Nigerian Oil and Gas EH&S management systems	0	0	0	7	3
Q4, How feasible is the proposed framework with regards to Oil and Gas environmental pollution in the Nigeria management system	0	0	0	4	6
Q5, the framework suggests that Health and safe risk via oil and gas environmental pollution can be managed through the proposed framework	0	0	0	7	3

Q6, How through is the framework could be used to address other oil and gas management related issue	0	0	0	8	2
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6.10.1 Validating question 3

The feedback on the proposed framework was that 7 respondents indicated that the findings are valid while 3 indicated high valid with the following statement.

Valid response

M5, Oil and Gas General Management member said, “Absolutely. The framework has been systematically designed; thus, it has elements of managing the Oil and Gas sector”. Buttress by M4 the Environmental agency Management member of staff, “It’s detail plan for every stage of management, spells out roles and responsibilities. Therefore, proposed solution (framework) would help create accountability and transparency in Nigerian Oil and Gas management”.

The framework could be simpler and more understandable in terms of lines and arrow connection. The framework looks acceptable, but it is better to be more specific and clear in each statement. Example teamwork and automation of what? Likewise, each section of the framework should be identified with different colours. Therefore, the framework was restructured to incorporate colours and simpler lines and arrows with colour codes that highlight each section of the colours, see appendix N for the first framework design.

High valid response

According to Gas management company representative M1, “I believe the proposed framework can add great value”. “It can manage the integration of Nigerian Oil and Gas EH&S management systems”, strengthen by M3 the Health and Safety Management personnel.

Since 7 of 10 acknowledged the validity of the findings and 3 others admitted that the proposed framework emphasizes an excellent knowledge (i.e., high validity) and is capable of managing the integration of an environmental, health and safety management system in the Nigerian oil and

gas sector., it is expected that the knowledge from the interaction matrix table in chapter three will be of benefit, reversing the trend of Oil and Gas environmental pollution.

Evidence suggests that issues facing the Nigerian oil and gas management sector stemmed from a lack of a properly integrated management system framework (Akujuru 2014). This is particularly true of environmental, health, and safety management systems. Although there are few effective legislations for controlling environmental, health, and safety management systems in the Nigerian oil and gas industry, such laws are influenced or broken by individuals in positions of authority, such as legislators, security agents, politicians and people with ties to the country's top government leaders, (Akujuru (2014 and Onoh (2017). on the other hand, Daramola and Olowoporoku (2016), claim that the goal of Nigeria's Environmental Management System under Acts 58 and 59 of 1988 and 1992 is to establish an acceptable framework under one umbrella (i.e., integration and teamwork) for protecting environmental, health, and safety management systems of Nigerian without discrimination, to which Nigeria is a signatory.

6.10.2 Validating Question 4

In response to Q4 the feasibility of the proposed framework, with regards to Oil and Gas environmental pollution management in Nigeria, 6 respondents indicated a high valid and 4 indicated valid.

High valid: responses

The visibilities of the research framework "It's highly valid because the proposed framework proffered a reasonable solution", said by M3 the Health and Safety Management staff. According to M5 the Oil and Gas General Management practitioner, "Its only time factor is feasible to achieve without default on its implementation". "It is significantly feasible, because the framework will help manage the process, products and the environmental health and safety, comment from M4 the Environmental agency Management personnel. Meanwhile, Oil management practitioner M2 noted the methods are not new, but the name "integrated environmental, health, and safety management system" distinguishes the framework from others in oil and gas environmental

pollution history. Thus, the framework is visible, and demonstrated how environmental balance could be achieved”.

Valid: responses

The staff members of Gas management and Oil and Gas general management M1 and M5 noted, “adhere the research framework outlines, with accountability and transparency, the outcome would be great”. M3 working for health and safety management company thus, comments “government and private Oil and Gas sector should embrace the framework in order to enhance environmental management in the sectors”.

Respondents believed that the proposed framework is visible, and could be used to manage process and products of environmental health and safety management systems. Thus, promoting and managing the integration of environmental, health and safety system can be through: good communication, gradual step-by-step implementation, enlightenment and understanding and simplifying the language before implementation. However,

The Nigerian Communications Act was passed into law on July 8, 2003, with the goal of establishing a legislative framework for an effective management system. Effective communication is the overall organisational management structure, according to the evidence from (Welford 2016), and is designed to empower management systems, create goals, and report dangers. It also regulates event pollution and information, generates data, reduces impact, and ensure consistency in the presence of management integrations. The integrations management system also aids in the auditing and the review of responsibility, including assignment (Akintokunbo, and Arimie, 2021). The prerequisites of good communication, as well as the gradual step-by-step implementation management process, are a better way of understanding enlightenment and the gradual step-by-step implementation of the management process (Idriss et al and Akintokunbo, and Arimie, 2021).

6.10.3 Validating question 5

Based on suggestion that Health and safety risk via oil and gas environmental pollution can be managed through the proposed framework. the responses were optimistic that this framework is valid. 7 stands valid and 3 stands highly valid.

Valid responses

“I believe the systematic framework of such is capable of achieving good health and safety in Oil and Gas sectors” according to Health and Safety Management personnel M3. Oil and Gas General Management M5 staff agreed and commented “It is achievable as that has been assessed with clear rules and actions for non-compliance in the designed framework, while M4 working for Environmental agency management company also noted the factors like corruption, biased data collection and inadequate legislation suggested and address in the framework as best way of promoting good health and safety in the environment.

High valid responses

The practitioner of health and safety management company M3, confirmed “highly valid of health and safety risk through Oil and Gas environmental pollution can be managed through the proposed framework, the points to manage pollution are clearly pointed out. While the general staff of Oil and Gas management also said, “It is achievable because the framework appears to solve the long-term evils that have characterised the sector”. Buttress by M1 on behalf of Gas Management company “The framework was created to help oil and gas sectors manage and handle environmental, health, and safety challenges.

In agreement to “Corruption, biased data collecting, and other issues as stated in the framework have been the main threats to oil and gas management system, and unless these are entirely eliminated, health and safety in oil and gas environmental degradation cannot be addressed. As a result of this, the relevant part for managing the design framework such as breach of contract, abuse of power and Work ethics can come into play.

Inadequate penalty for unsuitable work ethics and breach of contract led to a conflict between the oil and gas management and the host community, (Dibia and Onwuchekwa (2015). According to Nwauzi, 2016, desperate for justice as a result of abuses of power, Oil spill, and an unethical oil and gas management system, the youths of the host community's decided to take the law into their own hands. Their actions included oil pipeline sabotage, Oil local refineries and kidnaping of oil and gas management professionals and government authorities, see chapter 2 and 3 of the research for more details (Osuagwu, and Olaifa, 2018).

Meanwhile, the aims of the Act of the Nigeria National Policy on Environment is to 'protect the environment and conserve natural resources for sustainable development'. The mission of management and the Nigerian government is to safeguard the environment and conserve natural resources for sustainable development (Abessa,et al 2019). However, the Nigeria environmental Act Cap H1 LFN (2004) prohibits the discharge of untreated and harmful waste on land or territorial waters. Including discharging any form of spent oil, grease, and trade waste from manufacturing to production into a watercourse, road verge, public drain or surface and underground water (Chuks-Ezike, 2018). In addition, the objective of the Nigerian Environmental Impact Assessment Act of (2004) is to implement and coordinate the National Oil Spill Contingency Plan (OSCP). Furthermore, ensure effective wellbeing, safety, and appropriate response to disastrous and any Oil and Gas pollution in Nigeria (Nwauzi, 2016. and Fab-Eme, 2019).

6.10.4 Validating question 6

In order to assess how possible it is to apply the proposed framework, and execution of ethics work plans to address or manage other tasks related to the management tasks in the Nigerian Oil and Gas sector. 8 indicated valid while 2 indicated high valid.

Valid responses

According to M3, the participant from Health and Safety company, "It is obvious that these tasks are interrelated, meaning that there is cohesion among the elements aiding the oil and gas sector's

management. Therefore, the implementation of this framework would help address other related management activities”. M4 who works for environmental agency company commented that “the framework addresses all related challenges; hence, the framework is transferable and should be used to address other related areas”. M1, who works for Gas Management company noted “his believe in research findings and the designed framework, with that the proposed solution should be extended to other Oil and Gas management issue. The practitioner working on behalf of Oil and Gas General management company (M5) describe “the interrelated nature of EH&S management system across Oil and gas sectors as extremely important. However, the framework includes appropriate ethics, work plans and sanctions for non-compliance, thus, EH&S management framework is capable with other management sectors in oil and gas activities”.

High valid responses

M2 and M3, working for Oil management and health and safety management company respectively, confirmed high validity of the framework, “highly valid, because it proposed a style that properly manages environmental challenges in oil and gas sector. They also urged the framework update and recommend the future research to address organisational pressure, involvement of workers, specialist and subcontractors in the oil and gas operational system.

Using this framework to manage other oil and gas related systems could be beneficial, but the organisation using it would need to have a thorough understanding of the organisational structure, purpose of the framework and the experience of implementing Figures 6.2 of the research findings through Figure 6.4.

6.10.5 Validating question 7

In order to demonstrate the structured, well-informed and holistic approach of the proposed framework for managing the integration, environmental, health and safety management system in the Nigerian Oil and Gas sectors. The Table 6.6 below indicates the level of relevancy with the structure of this research.

Table 6 6 Feedback on the relevance of the proposed developed Framework

Question (Q)	Responses				
	No response	Not sure	Not relevant	Relevant	Very relevant
Q7, How relevant, structured, well-informed, and holistic approach did you find this framework	0	0	0	4	6

6.10.6 Very relevant responses

The significance of high relevant of the integrated framework were also commend by M5 working for Oil and Gas general management, said “this appears to be the appropriate framework, as it addresses issues that were not previously addressed such as: government support, transparency, corruption and teamwork. Likewise, “the framework addresses the key aspects of oil and gas management, processes and including health and safety system, according to practitioner for environmental agency management M4.

6.10.7 Relevant responses

Health and Safety management personnel M3 confirmed the importance and strategic impact of the framework towards the Nigerian economy, while M1 and M2 working for Gas management and Oil management company further appreciated the structured, detailed and easier to read of the framework.

6.11 Sustainability Frameworks

This study suggests that environmental pollution caused by Nigeria's oil and gas industry can be controlled through the integration of an environmental, health, and safety management system, which was deemed valid and high valid, relevant, and very relevant by the Nigerian oil and gas management personnel who conducted the study. The respondents made the following comments to support their position on the applicability of the framework.

M1 who works for Gas Management company commented that “I believe the proposed framework can add great value to Oil and Gas sectors”, M2 working for Oil Management noted

“It's highly valid because the proposed framework proffered a reasonable solution”. “The proposed framework is “highly valid, well structured, informed and holistic, however, the points to manage pollution is clearly visible” commented by M3 Health and Safety management practitioner. The environmental agency management expert (M4) noted the framework “details the plan for every stage of management, (M5) “articulated the responsibilities of all the stakeholders, thus, the integrating EH&S management system is achievable because the framework appears to solve the long-term evils that have characterised the sector” according to Oil and Gas general management comment M5.

As a result of this, the research continued to the final step of its goal, which is to establish a sustainable workflow that incorporates integrated management systems for managing environmental, health, and safety frameworks in the Nigerian oil and gas sector. This is evidenced in Abiodun et al, (2016) which emphasised that lackadaisical attitude and lack of sustaining culture has negatively affected the critical development of Nigerian infrastructure development. Poor sustain culture has drawn Nigeria's attainable goals a thousand steps backward (Abiodun, et al (2016) and Bubou, et al (2017). it is imperative that the implementation and maintenance of existing or proposed facilities and framework be given priority.

6.12 Summary

Chapter six identifies the major issue confronting the oil and gas sectors, with the goal of reducing pollution in these industries. The keyways of improved environmental pollution that leads to integrating Oil and Gas environmental health, and safety management system, as particularly identified in this study. Although a few issues were raised, they were all addressed in the same chapter due to the country's past and current environmental predicament. This study produced a framework in the Nigerian setting that served as a foundation for the development of an Oil and Gas environmental management system. The framework demonstrated how environmental contamination from Nigerian oil and gas may be eliminated. This framework method not only reduces environmental, health and safety risks, but it also demonstrates how an integrated Oil

and Gas management system may improve environmental safety. The study has a favourable impact on the Oil and Gas management sector, as evidenced by the trust in accepting the validation test completed. The results revealed that the majority of respondents agree and strongly agree that integrating the management system has a good influence on the environment, health and safety.

7.0 Chapter Seven: RESEARCH CONCLUSION, RECOMMENDATIONS AND SUMMARY FOR INTEGRATING ENVIRONMENTAL, HEALTH AND SAFETY MANAGEMENT SYSTEM FRAMEWORK

7.1 Introduction

Pursuant to objectives 3 and 4 of this research and the evidence from the thesis chapters. Chapter 4 and 5 discussed the research philosophy and the data analysis. Chapter six designed and discussed method of implementation of the integrated framework for utilising of Nigeria O&G management system to promote EH&S practices on ecosystem. This chapter presents the concluding part of the thesis, commencing with the summary of the research objective, method used and the summary of research validation. the research Key findings, practical and academic implications were also discussed in the chapter.

The chapter also incorporates a summary of the research and research contribution to knowledge, and research framework purpose. The research limitations, suggestions for further research, research conclusions and summary were also discussed in this chapter. The chapter also incorporates a summary of the research and research contribution to knowledge, including suggestions for further research and overall conclusions.

7.2 SUMMARY OF THE RESEARCH OBJECTIVES

7.2.1 Background of the Research Findings

Chapter two reviews the history and significance of Oil and Gas in the world economy. The chapter further identifies the top five developed and developing Oil producing countries, followed by the causes of Oil and Gas environmental pollution across the globe.

7.2.2 Research First Objective

To satisfy the first research objective, the chapter presents the importance of oil and gas for humanity, the national and global economy. This is followed by discussions around the annual boosts of world energy growth by 33% to 24%, industrial production by up to 22.1 %, and global

economic growth by 1.7 percent yearly. Evidently, an average of 115 million bpd is needed to cover the world's Oil and Gas needs in the future compared to 99.7 million bpd in 2019. This is expected to have an average of 50%–90% negative effect on human and environmental life through hydrocarbon environmental pollution. The studies examined and state the oil and gas management systems in developed and developing countries as well as the United Nations standard on the oil and gas sectors and management system.

7.2.3 Research Second Objective

To satisfy the second research objective, Chapter three reviewed the literature on the current and previous issues of environmental pollution as applied to Oil and Gas management systems. In so doing, the chapter examines the roles of Nigeria's environmental management, the values of Oil and Gas environmental pollution over ecological system and the roles of Nigeria's environmental management on land, surface water and groundwater, including air quality affected by Oil and Gas pollution. Likewise, the impact of pipeline transportation, sabotage, vandalism, and the role of Nigeria's government was examined. The findings test the present relationships between environmental, health and safety management systems in the Nigerian Oil and Gas sector through the Nigerian Oil and Gas environmental impact assessment, Health and the National Institute for Occupational Safety, and oil and gas safety management department.

The chapter brings together all the essential aspects of environmental pollution and identified 11 ways in which Oil and Gas sectors contribute to environmental pollution. On the basis of the matrix, the chapter developed a preliminary survey to examine how the Oil and Gas management sectors contribute to environmental pollution in Nigeria, considering the required input, the challenges and strategies that could be used to achieve the solution. Additional 3 gaps were identified making a total of 14 gaps. Lack of integration of Oil and Gas management was identified as one of the outcomes of the literature review and the preliminary survey. As a result, the study identified a need to engage integration of management systems to test the validity of the problem and explore other ways in which integration of environmental, health and safety

management systems could be used to promote health and safety in the environment. The most acceptable methodology for conducting the investigation survey was also required.

7.2.4 Research Method used to Study Integration of Environmental and Health and Safety in Oil and Gas Sector

To achieve the research aim, in chapter four, the research detailed how the research was designed, as well as how the research data was collected and analysed to fulfil the research question, aims, and objectives. Using a large sample of the Oil and Gas management practitioners, the quantitative study was chosen as the best approach for testing the different components of the conceptual framework. However, when it came to gathering the necessary data, analysing the results and determining the validity of the findings, the mixed method approach was found to be the most appropriate research approach. It was also used to investigate the relationship in order to better develop the conceptual framework while considering the study limitations and constraints.

7.2.5 Assessing the Research Findings

To satisfy the third research objective, Chapter 5 made an extensive review of previous methodology options. It explores present analysis from preliminary research done with 64 management practitioners in the Nigerian oil and gas sector, which provided a detailed review of the various gaps and possibilities. Similarly, the analysis of the main study survey combines data from 61 oil and gas, environmental, health and safety management systems to determine the causes of environmental pollution in Nigeria and how this management system might reduce its impact.

The chapter also discovered that the environmental, health and safety management systems in the Oil and Gas sector are facing fourteen distinct difficulties. Eleven of these have previously been identified in the literature. Unsustainable organisational structure, a lack of integrated management and high implementation costs are the three new difficulties that were discovered. The study concludes that the design a framework for integrating an environmental, health and

safety management system can be used to address Oil and Gas environmental pollution. However, all the strategies are not specifically focused on addressing particular challenges, thus, further research is needed to clarify which strategy could be used in addressing a particular challenge.

7.2.6 Research Third Objective

To satisfy the third research objective, Chapter six developed a sustainable framework that integrates environmental and health and safety management system for managing environmental pollution. This framework was created to support the framework for an integrated oil and gas environmental, health, and safety management system that was developed previously. The framework concluded by creating a platform for gathering information about oil spills, pipeline leaks, sabotage, gas flaring, and other hydrocarbon pollution. However, data and information should be shared with stakeholders, local communities and the country as a whole. For effective and sustainable execution, the strategies for implementing stages also employ a new law. This new act is a strategy for the Nigerian oil and gas management system to maintain the integration of environmental, health and safety frameworks and achieve environmental, health and safety standard.

7.2.7 Research Fourth Objective

To satisfy the last research objective Chapter 6 presented the outcome of the study; an integrated framework for an environmental, health and safety management system was developed based on findings from the literature review, qualitative and quantitative study (mixed method approach) to guide the Oil and Gas sectors in using the framework to minimise environmental pollution. The framework consists of 3 sections: integrating strategies to manage the challenges, potential concerns, and possible solutions. The integrating strategies is what the organisations put into the system, whereas the potential concerns are the interactions that can occur to corrupt the desired output. In this case, the philosophy of possible solution is the process adopted for appropriate penalties to address potential concerns issue. The output is to promote and improve the integration of environmental, health and safety in the Nigerian Oil and Gas management sector.

In addition, the integrated framework provided two strategies that could be approved in resolving any problem originating from potential concern, such as breach of contract and abuse of power. At the same time, appropriate work ethics plans move to integrating strategies and feasible solutions. The use of this integrated framework has been highlighted as a strategy for the Nigerian oil and gas management system, to reduce pollution and promote acceptable environmental, health and safety standards.

7.2.8 The Research Validation

The findings for the validation procedure were also presented in Chapter 6, to fully satisfy the third research objective and establish the fourth research objective. Subjective methodological techniques were used to validate the overall research findings. In this technique, ten oil and gas management practitioners were employed to validate the process and assess the significance of integrating environmental, health and safety management frameworks in the oil and gas industry. In general, respondents agreed with the conclusions of the study and believed that the framework could be used to address the highlighted environmental challenges.

7.3 Key findings

In this study, the research highlights the key findings as shown in chapter 5 and 6 and summaries in the last chapter. In term of O&G management problem, Inadequacy of EH&S data, lack of government support and lack of integration of Oil and Gas EH&S management system has been noted as key problems. For EH&S, evidence shows Nigeria as the number one oil spill country around the world. The second worst city to live in the world after Damascus, Syria is Lagos state. Nigeria has the Fourth-worst maternal mortality rate and is one of the most dangerous places to give birth in the world, according to Bill Gates in 2018 at National Economic Council (NEC) on Investment in Human Capita.

The proposed framework envisages to implement EH&S best practice, bring about up to date EH&S management, improve government efficiency and eliminate abuse of power. Likewise, it

envisages creation of Jobs, promotion of safe environmental, health and safety and integration of O&G, including stakeholders' management system as shown in 6.4.1 and 7.5.

7.4 The Research Practical Implications for Integrating EH&S

The results from this research present a few practical concerns for integrating an environmental, health and safety management system in the Nigerian oil and gas sector. Some of these implications have been discussed earlier in chapters 5 and 6 of this thesis. Considering the negative effect on implementing integrating management system framework, there is need to ensure the necessary measures are put in place (discussed in chapter 6, research concern for the framework) by federal government and the oil and gas management authorities. Environmental implication does not only affect the companies involved but also has major impact on the health, safety and environment of Nigerians.

The following practical implications can be understood from the results of this research: the first showed that environmental pollution is a major problem in the Nigerian Oil and Gas sector, suggesting an immediate attention to minimise the current excessive oil and gas pollution prevalent in the country. Further implication from study highlights that it will be more expensive and practically non-professional to use a single management system to tackle the environmental pollution in the Nigerian oil and Gas sector.

Consistent with these, the study proposed an integrated and sustainable management system framework to manage and control environmental pollution and improve the integrity of an oil and gas management system. The benefits of the proposed framework and its implementation in the Nigerian Oil and gas sector can be linked to the fact that this form of research has not been carried out in the Nigerian context. Hence, the adoption of the framework presents a valid approach towards dealing with the current challenges of pollution in the Nigerian oil and gas sector.

7.5 Academic Implications

Interestingly, previous research has called for reassessments of O&G environmental pollution to better inform and support EH&S across the globe, particularly the developing countries like Nigeria (Adati, 2012, Ojijiagwo et al 2017 and Adebisi, et al 2020). Academic research has suggested the potential benefits of merging modern academic knowledge about ecological pollution awareness with methods of sanctioning (Ojijiagwo et al 2017, Sajwani, 2017, and Okwechime, 2018). This study has enhanced previous academic research to become a contribution of knowledge on integration EH&S management in the Nigerian O&G sector. However, the study also creates an avenue via recommendations for further research to make further contribution to knowledge.

7.6 Research Objective Over all Summary

Chapter 4 described how the study methodology was developed and data was collected, whereas chapter 5 indicated the research question that was investigated. In Chapters 4 and 5, the most appropriate method is selected through review of the various options, the most suitable approach in collecting the required data and analysing the results was chosen. The mixed method approach was found to be the most appropriate strategy for exploring the relationship and to further develop the necessary framework. This was accomplished putting the research limitations and constraints into consideration. Many research works on oil and gas management, especially in developing countries like Nigeria, have concentrated on a single data collection approach. The method obtained was used to generate the problem and the solution including the views of Oil and Gas management practitioners on each solution step.

The problem and the problem/concern flow chat were developed on the basis of the matrix (see table 6.0 and 6.1), followed by two developed frameworks to show how management systems could be integrated and sustain to promote environmental, health and safety in the Oil and Gas sector. Similarly, the study designed an implemented workflow to guide integration and sustainability of the Oil and Gas management system, in accordance with the Nigerian Act.

The inefficiency of the oil and gas management system is one of the most significant elements influencing pollution levels in the environment. The investigation discovered that the top issues facing Nigerian oil and gas management sector are lack of communication, lack of government support and insufficient data among stakeholders. There are also issues of complexity and sabotage. The challenges facing the Oil and Gas management system were identified, questioned, analysed, tested and validated through all the research chapters.

7.6 RESEARCH CONTRIBUTIONS TO KNOWLEDGE

7.6.1 contributions to knowledge

It can be established that this research contributed the following to the general body of knowledge:

- Presenting mixed method approach for multiple data collection methods as a means of underscoring the efficacy of mixed method research for development of frameworks.
- Using quantitative method to examine causes of environmental pollution in the Nigeria Oil and Gas sector
- Employing qualitative approach to determine the relation and the structure of Oil and Gas management system
- Establishing a steps data collection method such as literature findings, case study analysis, preliminary survey, mixed approach via questionnaire data collection, interviews and subjective methodology for the research validation.
- Discovery suitable techniques that establish a long-term relationship between an Oil and Gas management system and Local community
- Proposed an integration framework for Oil and gas management system in Nigeria, the framework serves as a practical contribution to solving the issue of environmental pollution through:
 - Integration of management system
 - Eliminating abuse of power
 - Abolishing breach of contract

- Implementing work ethics plans
- Providing an alternative means of introducing team work to the national management system.
- Establishing a sustainable workflow that incorporates integrated management systems for managing environmental, health and safety frameworks in the Nigerian oil and gas sector.

7.6.2 The Oil and Gas EH&S Research Framework purpose

The framework serves as a means of solving the issue of environmental pollution and integration of environmental, health and safety management system through:

- Sustaining the integrating framework
- Data collection centre
- Data distribution centre
- Communication library
- Conflict monitoring centre
- Establishment of sustainable enforcement agency
- Engagement of Policy and Practice hub
- Serves as a sustainable means of reduction of environmental impacts associated with health and safety in the Nigerian Oil and Gas sector.

7.6.3 Theoretical Contributions

- The issue of Oil and gas, environmental pollution cannot be overemphasised across the globe; thus, this study established a solid process that facilitates a significant reduction of environmental pollution in the oil and gas sector, particularly in developing countries like Nigeria.
- The outcome of the study demonstrates that the integration of the environmental, health and safety management structure could be used to ameliorate environmental pollution in the Nigerian Oil and Gas sector.

- Evidence from the study established a framework that could be applicable in the reduction of environmental pollution. This provides a strategy for integrating Oil and Gas management system in Nigeria plus a validation system of implementation.
- The study developed a sustainable workflow that incorporates integrated management systems, environmental management, health and safety frameworks in the Nigerian oil and gas sector. This work flow aims to establish a simple framework that if applied can reduce oil and gas pollution in Nigeria.

7.7 The Research Limitations

- A few relationships identified in the literature review were based on logical analysis.
- The study is limited to the Nigerian Oil and Gas sectors.
- Only management practitioners of environmental, health and safety in Oil and Gas sectors were considered as samples for the study, hence no other departments were included in the study.
- Practicing management system was used as a unit of analysis.
- Due to the undesirable effects associated with Oil and Gas environmental pollution, which are discussed in detail in chapter 2 and 3 of the study, it is imperative to evaluate and determine their impacts on local communities.

7.8 Recommendations for Further Research

The relationship between environmental pollution and the oil and gas sector has been the subject of much debate. While findings suggest that the sectors expose environment to hazardous health and safety conditions. Oil and Gas executives argue the sector reduce pollution and its impact on health and safety. As a result of this finding, a framework for integrating environmental, health and safety management systems in the oil and gas sector was developed for reducing the impact of environmental pollution. Based on the study findings, there are more ways to contribute to the reduction of environmental pollution in the Oil and Gas sector, therefore this study suggests:

- The future study can carry out an integrating Oil and Gas, environmental, health and safety management system and communities' management. This could help to determine the severity of the impact of environmental pollution and how it has deprived the local communities.
- Future research should investigate the impact of theft and pipeline sabotage in the Oil and Gas sector.
- The further study should also conduct a thorough financial evaluation for managing environmental pollution using the multiple Oil and Gas management sectors.
- Impact of environmental pollution on national economic and assessment of automation in the Oil and Gas sectors. This could be vital in determining the economics of Oil and Gas sectors.
- Impact of unsustainable law practice and unsuitable practitioners in the Oil and Gas sector is also recommended for further study.
- Regarding the proposed framework for integrated management system, it is suggested that more research be done to identify various sources of environmental pollution. This could aid the updating the current integrating framework, and identification of additional management systems to be integrated.

7.9 THESIS CONCLUSION

- Neglected, uncontrolled and poorly managed oil and gas production in many countries has led to major environmental concerns, including air, water and soil pollution, as well as damaging ecosystem, particularly marine life (Ibama, and Eyenghe, 2015. Ojijiagwo, et al 2017).”However, despite incidents like Deepwater horizon oil spill in 2010 (Corn, 2010) available studies suggest that developed countries, such as Canada, United States and Norway have significantly reduced environmental pollution emanating from the oil and gas sector (Kim et al 2016).
- The Nigerian Oil and Gas sector has over the last decade recorded the highest environmental pollution due to poor management. On the one hand, advocates of the Oil and Gas

pollution suggest that management practice promotes environmental safety. On the other hand, a number of studies argue that sabotage and pipeline burglars expose ecological to poor health and safety. However, both schools of thought lack adequate empirical evidence to support their arguments.

- This study found that integrating environmental, health and safety management system efficiency can be one of the most important factors that could influence Oil and gas pollution in Nigeria. Similarly, the biggest challenges facing the Oil and Gas management system in the Nigerian context includes lack of management integration knowledge, misconception about teamwork and its complexity. The least is unsuitable organisational structure to support management practice. In fact, the study shows that the biggest Oil and Gas corporation in Nigeria still lacks adequate knowledge of management integration and is in need of enlightenment and training towards sustainable management teamwork.
- Based on the thesis findings, a proposed advanced integrated framework was developed to guide operators in the Nigerian Oil and Gas sector in using a sustainable management integration system as a strategy for promoting environmental, health and safety practices in. This highlights that the integration of management system can be adopted by Oil and gas sectors as a way of minimising environmental pollution. Furthermore, integration of a sustainable management system can be incorporated into government environmental, health and safety initiatives for improving health and safety performance and reducing environmental pollution in Nigeria's Oil and Gas sector.

7.10 SUMMARY

This chapter presents the results of this research and summarizes how the goals and objectives of this research have been achieved. The chapter has also presented the conclusions and implications of the research findings generally to Oil and Gas environmental Health and safety (EH&S) management sector in Nigeria and other developed and developing countries with similar problems of integrating EH&S flaring. The chapter has also made a number of recommendations for the oil and gas sectors as well as for reducing hydrocarbon environmental pollution problem generation in Nigeria. This chapter also highlighted the contributions that this research makes to theory and practice. As stated in that chapter.

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APPENDIX A: ETHICAL APPROVAL LETTER

Dear Olayinka

I hope you are well. Thank you for the documents. I have reviewed the Questionnaire form; they meet the ethics requirements (Ethics Category A).

The Pilot Interview and Pilot Study files are fine (Ethics Category A).

Best wishes and thanks

Fullen, Michael A. (Prof)

Badsey, Phylomena

Professional Services - Research Administrator

Faculty of Science and Engineering

Wulfruna Street, Wolverhampton

WV1 1LY [telephone number redacted]

APPENDIX B. A framework for Integrating Sustainable Environmental, Health and Safety Management Systems: a focus on the Nigeria Oil and Gas Sector.

Dr Davo Oloke*, Chike F. Oduoza *, Dr Pouran, Hamid
Postgraduate Research in Built Environment (FT)
Faculty of Science and Engineering.
The University of Wolverhampton,
Wolverhampton, WV1 1LY, United Kingdom
Submitted to Wolverhampton, Conference, 3-5 September 2022,

ABSTRACT

In developing countries, particularly in Nigeria, environmental management often comes with formidable pollution, conflicts, risks and concerns, especially in the oil and gas (O&G) sector. A key feature of these concerns has been identified as the paucity of sustainable frameworks for oil and gas Environmental, Health and Safety (EH&S) Management Systems, which brings risk to EH&S. Inadequate sustainable management has been identified as a significant reason behind environmental pollution concerns in Nigerian O&G producing communities.

This research uses a mixed-method approach to evaluate the development of a sustainable framework for EH&S risk in the Nigerian O&G sector. The paper argues that EH&S is impaired by risk of incidents relating to O&G environmental pollution, the effects of which are amplified by inadequate sustainable EH&S management Systems. The study highlights the steps taken to develop the framework for sustainable EH&S processes in Nigerian O&G management Systems. Thank you Sirs. The viva end with success

Keywords: Environmental pollution, health care, Safety risk, sustainable management system.

APPENDIX C. AN INVITATION FRAMEWORK FOR EFFECTIVE MANAGEMENT IN THE NIGERIA OIL AND GAS ENVIRONMENTAL, HEALTH AND SAFETY SYSTEM

Student: Olayinka Oladayo Odeyemi

ID: 1633950

Suppevise by: Dr Davo Oloke*, Chike F. Oduoza *, Dr Pouran, Hamid

ABSTRACT

The global environment is being endangered daily as a result of Oil and Gas pollution. The risk of illness turns the ecosystems of many countries into death traps, particularly the developing countries such as Nigeria. The absolute management system in the Nigerian Oil and Gas sector has been cited as the cause of environmental pollution in the country. Ineffective management, unsuitable management appointees and even political appointees have resulted in lack of management data and exposed O&G environmental, health and safety to crisis.

This study argues that the components of the overall management structure, comprising the Federal Ministry of Petroleum Resources of Nigeria (PRN), Nigeria National Petroleum Corporation (NNPC) including the department of oil and gas have existed in isolation. A key finding of this paper is the inadequate sustainable integration ethics framework for effective management in the Nigerian O&G sectors. Inadequacy of appropriate management has been identified as a significant reason behind environmental pollution in the Nigeria O&G producing communities.

The study uses a mixed method research approach, to develop a framework for managing environmental degradation and checking the efficacy of the proposed system. It is envisaged that this will enhance the institutional capacity for better environmental performance in the O&G Sector

Keywords Management. Management system, Environmental pollution, health, and Safety.

**APPENDIX D: CONFERENCE PAPER DEVELOPED FROM THE STUDY.
INTEGRATING ENVIRONMENTAL MANAGEMENT, HEALTH AND SAFETY IN OIL AND GAS
INDUSTRY: A CASE STUDY OF NIGERIA.**

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Submitted to 35th Annual ARCOM Conference, 3-5 September 2019,

Insufficient data and management enhance enormous risks in the oil & gas (O&G) sectors across the world. Unsuitable management, a deficit of integrating the workforce also inspires the environmental challenges. Such challenges include gas flare, pipes line leakage, spills, explosions, accidents, human error and others. Evidence further suggests that there is unmeasurable menace in terms of financial, environmental, health and safety (EHS) implications particularly in developing countries such as Nigeria. According to the outcome of a literature -review, failure of the Nigeria government in this regard is the main gap that induces environmental problems in the country. Insufficient attention has also been given to outdated laws, current laws, human rights, corruption, and manufacturing industries over EHS.

Previous research has shown that environmental management systems (EMS) and health and safety (H&S) management systems existing in isolation have only partially addressed the issues. Therefore, it is hereby being recognised that integrating EMS and H&S in O&G industry has a potential to improve the environmental performance strategies and functionality of O&G sector in Nigeria. However, changes to existing structures of the EMS and H&S systems due to comparison with international systems where EMS and H&S systems have been integrated is proposed. The research proposes to use a mixed method approach to develop a framework that will facilitate the development of an integrated EMS and H&S system for managing environmental degradation and validate such in order to check the efficacy of the proposed system. It is thus envisaged that this development will enhance institutional capacity for better environmental performance in the O& G Sector.

Keywords; management, environmental, health and safety, Oil and Gas.

**APPENDIX E: CONFERENCE PAPER DEVELOPED FROM THE STUDY.
REDUCING ENVIRONMENTAL ISSUES IN THE OIL AND GAS INDUSTRY: NIGERIA AS A CASE
STUDY.**

Authors name: Odeyemi Olayinka¹,

Supervisor team: David Oloke and Chike Oduoza

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Submitted to 36th Annual ARCOM Conference, 3-5 September 2020,

Our environment is being endangered by environmental pollution across the globe daily. Currently, high risk of illness, including five million environmental deaths are recorded each year. These attributes to nine percent of the deaths globally. Historic record of oil spills environmental pollution, particularly from 1970 shows a wide range between 7-700 tonnes per year. This is contrary to the united nation (UN) Sustainable Development Goals (SDGS). Literature evidence indicates that Nigeria particularly has been underperforming in this respect. This study thus aims to address the incidence of the rising environmental issues in the Nigerian Oil and Gas industry

Factors such as unsuitable management, insufficient data and the failure of the Nigeria Environmental, health and safety (EH&S) management system, including the Nigerian government appears to be the main gap, Evidence further highlight human error, accidents, pipeline leakage including gas flare and explosions has encourages environmental problems in the country. These are opposing the expectations of the section three/eleven of SDGS, which seek to make human settlements (including the communities and cities) safe, resilient and sustainable.

Historically, research has shown that the EH&S management system have existed in isolation. That is, the issues are only partially addressed. Furthermore, the literature evidence shows that integrating the EH&S management system in O&G industry has a potential to improve the environmental performance strategies and functionality of the O&G managerial sector in Nigeria. However, units, three and eleven (3&11) of SDGS call for appropriate management, good government and sustainable projects across the globe. Thus, this research proposed a mixed-method approach to develop and validate a framework that incorporates both EH&S management system for managing environmental degradation in the O&G industry.

Keywords: environmental, management, oil and gas, health, and safety.

APPENDIX F: CONFERENCE PAPER DEVELOPED FROM THE STUDY.
A Preliminary survey on integration of Environmental, Health and Safety (EH&S) Management Systems, focusing on the Nigeria Oil and Gas Sector

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ABSTRACT

Increasing oil and gas (O&G) environmental pollution activities in the absence of sustainable environmental, health and safety (SEH&S) management system and sufficient data has thrown environmental, health and safety management into crisis. Unsustainable management, and inadequate framework to EH&S induce the challenges, particularly the developing countries. Some of the identified challenges include environmental pollution, pipeline spills on ecological and natural lands. Likewise, there is immeasurable menace to local community, in terms of Health and Safety especially in the Nigeria context.

The proposed paper is a Preliminary survey on the integration of Environment, Health and Safety (EH&S) Management Systems, focusing on the Nigeria Oil and Gas EH&S Sector. The study based on a mixed method research approach. A total of 64 questionnaires and five semi structure interviews concentrating on the EH&S management system in the Nigeria oil and gas. The study argues that the absence of the integration of EH&S have contribute to the risk incidences relating to O&G EH&S challenges in Nigerians. The study further identifies and different ways in which integration of EH&S can improve the Nigeria O&G management system and the country's economy. A multi-dimensional framework advancing the development of an integrated EH&S management system for managing environmental degradation is proposed in this study,

Keywords Environmental degradation, health, and Safety risk, integrating management system.

APPENDIX G: CONFERENCE PAPER DEVELOPED FROM THE STUDY.
A conceptual framework for a Sustainable Environmental, Health and Safety (SEH&S) Management Systems a focus on the Nigeria Oil and Gas Sector.

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ABSTRACT

Environmental management within the oil and gas (O&G) producing countries in developing countries, particularly Africa (Nigeria to be precise) often faces formidable environmental pollution. This generates conflicts, risk, and concerns across, environmental, health and safety management system. A key feature of these concerns has been the paucity of a conceptual framework for sustainable Environmental, Health and Safety (SEH&S) Management Systems, and this imposes risk on local communities. Inadequacy of sustainable management has been identified as a significant reason for the environmental, health, and safety (EH&S) concerns in the Nigeria O&G producing communities.

This paper evaluates the development of a conceptual framework for SEH&S risk in the Nigeria O&G that is part of an on-going study. The research was conducted using a mixed-methods, technique. The paper argues that the EH&S of the host communities is being impaired by risk of incidents relating to O&G environmental pollution, the effects of which are amplified by inadequate of SEH&S management Systems. The study highlights the steps taken to develop the conceptual framework for SEH&S processes in the Nigeria O&G management Systems. Furthermore, the paper highlights all the aspects of future work proposed in the research.

Keywords: sustainable management system, Environmental degradation, and health, and Safety risk.

APPENDIX H: INVITATION TO PARTICIPATE IN THE RESEARCH PRELIMINARY STUDY INTERVIEW

My name is Olayinka, O. Odeyemi (O.O.Odayemi@wlv.ac.uk), and I am a PhD student at the University of Wolverhampton in the United Kingdom working on Integrating Environmental Management and Health and Safety (EH&S) in the Oil and Gas Industry (O&G): A Case Study of Nigeria. Dr. David Oloke (d.a.oloke@wvl.ac.uk) and Prof. Chike Oduoza (c.f.oduoza@wvl.ac.uk) are the principal investigators on this project.

The purpose of the research is to develop a framework that facilitates integrating EH&S best practice in Nigeria O&G sectors. To achieve this aim, I would like to invite you to kindly support and participate in the research, interviews, help my understanding towards the development of an integrated framework.

The purpose of this interview is to gather your input in order to establish a framework for implementing Integrated Environmental, Health and Safety (EH&S) Management processes in Nigeria's oil and gas industry. This, on the other hand, cannot be effectively developed without your involvement.

There are no correct or incorrect replies. If there are any questions that you would rather not answer, you can choose to leave them blank. It should take no more than 15 to 30 minutes to conduct the interview. As a result, the information gathered is totally confidential, will be used solely for academic purposes, and will be destroyed after the research is over.

In no instance would the true identity of any interviewee or organisation be linked to any responses provided and the entire research process would be conducted in accordance with the University of Wolverhampton's ethical and safety guidelines for fieldwork. In return for your participation, any tools, instruments and guidelines on integrating management that will be developed based on the findings will be made available to your firm. I am also willing to comply with any requirements or negotiate any terms that you may deem necessary in accordance with your company's regulations.

If you have any questions or queries, please do not hesitate to contact me. Thank you very much in advance for your valuable time and assistance in this research.

Yours faithfully,

Olayinka. O. Odeyemi

Doctoral Researcher

University of Wolverhampton

Mob: [number redacted]

Email: [e-mail address redacted]

APPENDIX I: INVITATION TO PARTICIPATE IN THE RESEARCH PRELIMINARY STUDY INTERVIEW

Interview Schedule

Section A- Introduction

1. What is your current title within your organisation?
2. How long you have worked in the oil or gas industry?
3. What are the type of the projects your organisation mostly undertakes in O&G?
4. What is the geographic area in which you operate?
5. How much of your role relates to ensuring environmental management?
6. How much of your role relates to H&S management?
7. Does your role include integrating EM&H&S management? if so, can you please explain how?

Section B- Drivers underpinning the need to integrate environmental management and health and safety Practice (IEH&S). (in respect of disaster management)

1. Describe your understanding of the term integrating O&G degradation or disaster management' system?
2. Please describe to what extent you agree, and/or your company has applied integrating O&G disaster within the EH&S management system?
3. Is there any positive need for integrating O&G disaster within EH&S management?
4. Based on your experience, is there any governmental back up (e.g, laws, money, organisation or agency) supporting the management system problem within EH&S in the O&G sector in the Nigeria?
5. If yes. what are these back up? Are they effective?
6. Based on your understanding, what could prevent your organisations from integrating O&G disaster management within the EH&S management system in O&G?

Section C- Impact of integrating environmental management on health and Safety

1. From your experience, describe the impact of lack of integrating EH&S management concepts on health and safety?
2. Please give examples of how lack integration of O&G managerial system has affect ecology, host community's and the country's economy.
3. What are the drivers behind your organisation's decision to apply integration of O&G management system within environmental, health and safety?

Section D- Benefits and Challenges of IEH&S Practice

1. According to reviews, O&G environmental pollution is a big concern in the country, based on your experience, could the recommend integration of environmental, health and safety management system to be a solution to the problem?
2. What could increase the attractiveness or efficiency of integrating EH&S management system within the oil and gas sector?
3. What do you think the negative impacts (Lack of integration, awareness and enforcement agency) could cause to EH&S in your organisation and the country at large if any?
4. What could decrease the integrating of EH&S management system within the oil and gas sector?
5. What undesirable impacts could inefficiency of governmental regulation and lack of integrating best practice could limits within the system?
6. How do you think these challenges can be addressed?

Thanks

1. Do you wish to make any other supportive comments regarding executing of integrating EH&S management?
2. Do you wish to receive a summary of the research findings?
3. Would you be willing to be involved in a subsequent phase of the research?

APPENDIX J: PRELIMINARY SURVEY QUESTIONNAIRE

Section A:- Profile of Respondent/ Organisation

1. Which of the following best describes your company/ companies? Please tick [] all applicable options.

Edit question Question actions

Oil sector Gas sector

Health Care Safety

Environmental agency

Infrastructure management

Other

2. Please describe your area/ areas or position of operation in the company? Please tick [] all applicable options.

Operational Management

Environmental Management

Health care

Safety personnel

Oil or Gas production/ engineering

Infrastructure management

O&G works

3. How many years of experience do you have in your area of specialization? Please tick [] only one box

1-5 years

6-10 years

11- 15 years

15 years and above

4. What types of project does your company mostly engages in O&G or Natural resources? Please tick [] only one box.

Health management

Safety management

Environmental management

Other

5. Please indicate the number of employees in your organisation? Please tick [] only one box.

1-5

6-10

11-50

51-500

501 and above

Section B. Identifying the cause of O&G disaster and previous/ existing roles of EH&S management system in the Nigeria O&G sector, this is with a view of exploring modification opportunities when compared with international systems

1. In line with the above question, is: Poor human resource management the casues of EH&S desaster in Nigeria O&G Edit questionQuestion actions
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
2. Duplication of environmental logistics Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
3. Organisational pressure henhnce O&G EH&S degredation?
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
4. Inappropriate lawmakers or management
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
5. Inadequate resources
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
6. High cost of implementing of EH&S tools
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
7. Poor safety management
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
8. Inadequacy of EH&S logistics
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
9. Overlaps of EH&S regulators function
 - Strongly agree
 - Agree

- Disagree
- Strongly disagree
- 10. Sabotages or ethnicity
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
- 11. Noncompliance with management instructions
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
- 12. Lack of O&G management Skills
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
- 13. Leadership or management conflict
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
- 14. Misconceptions of EH&S in O&G
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
- 15. Complexity
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
- 16. Lack of cooperation Edit question Question actionsStrongly agree
 - Agree
 - Disagree
 - Strongly disagree
- 17. Lack of pollution sectioning
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
- 18. Lack of incentives
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
- 19. Lack of government support

- Strongly agree
- Agree
- Disagree
- Strongly disagree
- 20. Lack of integration in EH&S
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
- 21. Corruption
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
- 22. Lack or inefficiency of data
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
- 23. Change to work approach
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
- 24. Difficulty to understand
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
- 25. Unsuitable organisational structure
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
- 26. Inadequate resources
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
- 27. Inefficiencies in governmental regulation
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree

Section C 1. Examining how the integrating EH&S management system can enhance the performance of O&G disaster in the host community's economy and country at large

1. Are there any environmental agency in O&G
Yes
No

If yes, please answer questions under part ---1c (if No go to the next part). Please rate the extent of your agreement or your disagreement to answer the following questions by ticking [☐]. The rating scale means.

1. Ineffectiveness of O&G environmental system
Strongly agree
Agree
Disagree
Strongly disagree
2. O&G environmental section induce the degradation
Strongly agree
Agree
Disagree
Strongly disagree
3. Lack of environmental incentives
Strongly agree
Agree
Disagree
Strongly disagree
4. Unsuccessful of Pollution sectioning
Agree
Disagree
Strongly disagree
5. Inadequacy of environmental data
Strongly agree
Agree
Disagree
Strongly disagree
6. Infrequent environmental resources
Strongly agree
Agree
Disagree
Strongly disagree
7. High implementation of environmental cost
Strongly agree
Agree
Disagree
Strongly disagree
8. Duplication and inadequacy of logistics
Strongly agree
Agree
Disagree
Strongly disagree
9. Unsuitable organisational structure

- Strongly agree
 Agree
 Disagree
 Strongly disagree
10. Overlaps of environmental regulators function
 Strongly agree
 Agree
 Disagree
 Strongly disagree
11. Lack of government support
 Strongly agree
 Agree
 Disagree
 Strongly disagree
12. Unsuitable environmental lawmakers
 Strongly agree
 Agree
 Disagree
 Strongly disagree
13. Lack of O&G environmental laws
 Strongly agree
 Agree
 Disagree
 Strongly disagree
14. Lack of effective environmental law
 Strongly agree
 Agree
 Disagree
 Strongly disagree
15. Lack of integration of managements (example EH&S management)
 Strongly agree
 Agree
 Disagree
 Strongly disagree
16. Based on your experience, could you please state any supportive environmental laws on O&G disasters that you know

Section C 2. Examining how the integrating EH&S management system can enhance the performance of O&G disaster in the host community's economy and country at large

1. Are there any Health care sectors in O&G
- Yes
- No

If yes, please answer questions under part ---1c2. (if No go to the next part). Please rate the extent of your agreement or your disagreement to answer the following questions by ticking [☐]. The rating scale means.

1. Ineffectiveness of the Healthcare of O&G system

Strongly agree

Agree

Disagree

Strongly disagree

2. The O&G Health section induces the degradation

Strongly agree

Agree

Disagree

Strongly disagree

3. Lack of government support in O&G health care

Strongly agree

Agree

Disagree

Strongly disagree

4. Lack of health care incentives

Strongly agree

Agree

Disagree

Strongly disagree

5. Unsuccessful health care managerial section

Strongly agree

Agree

Disagree

Strongly disagree

6. Communication Gap

Strongly agree

Agree

Disagree

Strongly disagree

7. Inadequacy of health care data
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
8. Infrequent health care resources
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
9. High implementation of health care cost
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
10. Duplication and inadequacy of logistics
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
11. Lack of managerial laws
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
12. Unsuitable health care laws
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
13. Unsuitable organisational structure

Strongly agree

Agree

Disagree

Strongly disagree

14. Overlaps of regulators function

Strongly agree

Agree

Disagree

Strongly disagree

15. Lack of effective law in health care sector

Strongly agree

Agree

Disagree

Strongly disagree

16. Lack of integration with other sectors and government laws

Strongly agree

Agree

Disagree

Strongly disagree

17. Based on your experience, could you please state any supportive health care laws on O&G disasters that you know.

please write you view

Section C 3. Examining how the integrating EH&S management system can enhance the performance of O&G disaster in the host community's economy and country at large

1. Are there any safety management in O&G

Yes

No

If yes, please answer questions under part ---1c3. (if No go to the next part). Please rate the extent of your agreement or your disagreement to answer the following questions by ticking [☐]. The rating scale means.

1. Ineffectiveness of Safety management system of O&G

- Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
2. The O&G safety management induces the degradation
- Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
3. Absent of Safety signs, tools and managerial structure
- Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
4. Lack of government support in O&G safety management
- Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
5. Unsuccessful safety managerial section
- Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
6. Inadequacy of safety data
- Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
7. Infrequent safety resources
- Strongly agree

Agree

Disagree

Strongly disagree

8. High implementation of safety tool

Strongly agree

Agree

Disagree

Strongly disagree

9. Unsuitable safety organisational structure

Strongly agree

Agree

Disagree

Strongly disagree

10. Duplication and inadequacy of safety logistics

Strongly agree

Agree

Disagree

Strongly disagree

11. Lack of integration disaster laws

Strongly agree

Agree

Disagree

Strongly disagree

12. Overlaps of safety regulators function

Strongly agree

Agree

Disagree

Strongly disagree

13. Lack of safety incentives

Strongly agree

Agree

Disagree

Strongly disagree

14. Faulty implementation of disaster strategies

Strongly agree

Agree

Disagree

Strongly disagree

15. Unsuitable safety law

Strongly agree

Agree

Disagree

Strongly disagree

16. Lack of effective law for safety management

Strongly agree

Agree

Disagree

Strongly disagree

17. Based on your experience, could you please state any supportive safety laws on O&G disasters that you know.

Please write your view

Section D Demonstrate the designing of framework for integrating the modified EH&S management systems.

Possible solution. Insufficient attention given to O&G disaster develop by outdated laws, Inadequate, current laws, human rights, corruption and sabotage. Please indicate, using the scale below, how important is each of the factors is driving your organisation to was integration of EH&S:

1 = Little importance, 2 = Some importance, 3 = Quite important, 4 = Important, 5 = Very important.

1. Review of O&G EH&S law and/or practice

Strongly agree

Agree

Disagree

Strongly disagree

2. Update EH&S management practice

Strongly agree

Agree

Disagree

Strongly disagree

3. Improve efficiency of governmental regulation

Strongly agree

Agree

Disagree

Strongly disagree

4. Teamwork within the EH&S management

Strongly agree

Agree

Disagree

Strongly disagree

5. Eliminate EH&S pollution activities

Strongly agree

Agree

Disagree

Strongly disagree

6. Implement EH&S best practice

Strongly agree

Agree

Disagree

Strongly disagree

7. Implement Government reports quarterly

Strongly agree

Agree

Disagree

Strongly disagree

8. Process improvement
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
9. Improve product and service quality
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
10. Improve government efficiency
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
11. Integrate governmental laws
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
12. Implementation of EH&S integration
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
13. Implement co-operation in EH&S
 - Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
14. Improve competitiveness in EH&S

Strongly agree

Agree

Disagree

Strongly disagree

15. Instrument of laws that reduce corruption

Strongly agree

Agree

Disagree

Strongly disagree

16. Reduce project cost

Strongly agree

Agree

Disagree

Strongly disagree

17. Improve EH&S integration above O&G company personal interest

Strongly agree

Agree

Disagree

18. Implementation of external body (example enforcement agency) within the O&G EH&S management

Strongly agree

Agree

Disagree

Strongly disagree

19. Base on your experience, what are the areas you think O&G environmental disaster need help from external sources to help decrease environmental disaster in EH&S? (you can choose more than one answer)

Splits all agencies

Integration of EH&S management

Introduction of new policy within managerial sector

Manage individual management

Governmental support

20. As an employee of this organisation, what form of technology will you suggest to the management, lawmakers and the governmental agencies with respect to integration of EH&S in Nigeria O&G?

Automated data updated

Enhance workers technology

Automated data and law updated

21. This research aim is to provide a validated framework for integrating environmental management and health and safety in oil and gas. It hopes to provide processes and implication towards this. Will this organisation be willing to embrace such an output to support these aims?

Yes No

END OF THE QUESTIONNAIRE- THANK YOU FOR YOUR TIME!

PPENDIX K: INVITATION TO PARTICIPATE IN THE RESEARCH MAIN SURVEY

Dear sir,

I am a research student at the School of Architecture and the Built Environment at the University of Wolverhampton. My research seeks to develop a framework for an integrated environmental management and health and safety system in oil and gas using Nigeria as a case study. I would like to invite you to participate in the research survey. A copy of this will be sent free to all participants. The doctoral research is partially sponsored by the University of Wolverhampton and the petroleum trust development fund (PTDF) and is being undertaken under the supervision of Dr David Oloke and Prof Chike Oduoza.

There are no right or wrong answers. However, if there are any questions that you do not wish to answer, you can choose not to answer them. The information hereby obtained is therefore strictly confidential and shall be for academic purposes only and will be destroyed upon completion of the research.

A copy of the questionnaire is attached. The purpose of the questionnaire is to obtain your opinion on the possibility of integrating environmental management and health and safety (EH&S) system in the Nigeria O&G sector. I will be very grateful if your health and safety manager, project manager, environmental manager, construction manager and infrastructure manager, site supervisor and all other O&G managers/ workers can kindly complete the questionnaires. It is estimated to take approximately 20 to 30 minutes to complete. Data obtained from the questionnaire will be treated with strictest CONFIDENCE and used for academic purposes only.

If you have any questions or queries, please do not hesitate to contact me or the University of Wolverhampton UK. Thank you very much in advance for your valuable time and assistance in this research.

Yours faithfully,

Olayinka. O. Odeyemi

Doctoral Researcher

University of Wolverhampton

Mob: [number redacted] Email: [e-mail address redacted]

APPENDIX L: SURVEYSURVEY INTRODUCTION

This is doctorate research that is being carried out for the purpose of investigating various issue in the Nigerian oil and gas management. The research framework incorporates environmental management, health and safety management systems in the context of environmental degradation in the Nigerian oil and gas sector. The purpose of the questionnaire therefore is to obtain your opinion or views regarding the above frameworks and please answer the questions freely. Participation is purely voluntary and will take about ten to fifteen minutes. Do answer the questions based on your experience, knowledge and views regarding the Nigerian oil and gas sector. You cannot be identified by the information you provided and information about your personal data will not be used for any other purpose other than for academic purpose.

If you have further question, please do not hesitate contact me by Email:

[e-mail address redacted]

Doctoral Researcher

School of Technology

University of Wolverhampton

Wulfruna Street WV1 1LY Mob).

[number redacted]

Olayinka O Odeyemi

Thank you.

APPENDIX M Research Question

Section A :- Profile of Respondents

1. Which of the following best describes the section your organisation belongs to and position of operation in the company?

Oil and Gas Sector / Operational staff / Senior Management staff

Health and Safety / Operational staff / Senior Management staff

Environmental agency / Operational staff / Senior Management staff

Infrastructure management / Operational staff / Senior Management staff

2. How many years of experience do you have in your area of specialization and or professional career?

1-5 years

6-10 years

11- 15 years

15 years and above

SECTION B: Instruction and Questions

The questions below based on fourteen gaps Management, Government Support, Unsustainable management, Inadequate of data, cost of implementation, Organisation structure, Duplication of logistics, Overlaps in regulation, Unsuitable law, Lack of incentive, Integrating of management, Communication gap, Complexity and Corruption) in improving management operational system in Oil and Gas sector. Nigerian as a case study.

Please read each statement carefully. Using the given scale 1 – 7, (1 Strongly Disagree, 2 Disagree, 3 Slightly Disagree, 4 Neither Agree nor disagree, 5 Slightly Agree, 6 Agree, 7 Strongly Agree) mark the number that indicates how much you agree or disagree with each of the statement. Please read each statement below carefully with which you agree or disagree. Keep in mind that there are no right or wrong answers.

1. Management teamwork can subdue managerial problems in the Nigerian Oil and Gas sectors

7 6 5 4 3 2 1

2. Automation as a form of best practice improves management performance in the Nigerian Oil and Gas Sector

7 6 5 4 3 2 1

3. Government enforcement agency enhance management performance in the Nigerian Oil and Gas sector

7 6 5 4 3 2 1

4. Open communication enhances management performance in the Nigerian Oil and Gas sector

7 6 5 4 3 2 1

5. Improved government regulation will enhance the Oil and Gas management in Nigeria

7 6 5 4 3 2 1

6. Introduction of new strategic policies by the government can reduce environmental problems in the Oil and Gas sectors

7 6 5 4 3 2 1

7. Government enforcement and transparency on data management can minimize environmental challenge in Oil and Gas

7 6 5 4 3 2 1

8. Frequently (quarterly) report to Government enforcement agencies will encourage good practice within the Oil and Gas sector

7 6 5 4 3 2 1

9. Yearly review of data records can enhance operational transparency in the Nigerian Oil and Gas sector

10. Adequate due process in the selection and inspection of supplier's capabilities in delivering project requirements can reduce unforeseen risks in Oil and Gas projects

11. Improve Government regulations and sanctioning of corruption activities can enhance Oil and Gas operation in Nigeria

7 6 5 4 3 2 1

12. Mandatory of the use of local materials can encourage industrialisation and the creation of job opportunities in the Nigerian Oil and Gas sector

7 6 5 4 3 2 1

13. Early involvement and support of senior management team can reduce operational complexity as well as improve project outcome in the Nigerian Oil and Gas sector

7 6 5 4 3 2 1

14. Introduction of dual external auditing and appropriate penalty for corruption victims reduces exploitation activities in the Nigerian Oil and Gas sector

7 6 5 4 3 2 1

SECTION APPRECIATION

I would like to thank and appreciate everyone for your outstanding contribution to was this survey.

Thanks

Olayinka Odeyemi [e-mail address redacted]

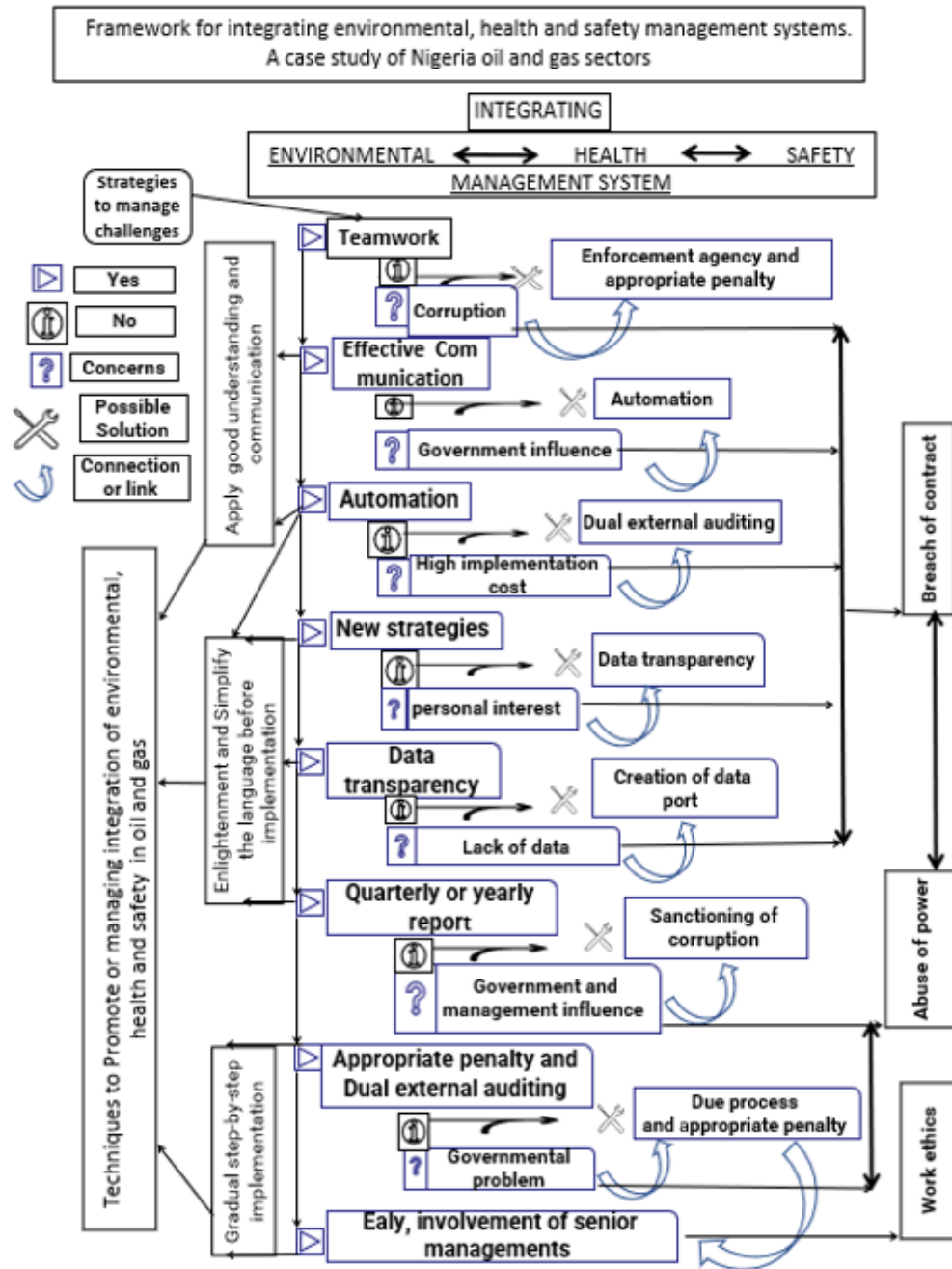
APPENDIX N: THE RESEARCH VALIDATION AND THE RESPONDENT ANALYSIS

Showing 10 of 10 responses

Showing **all** responses

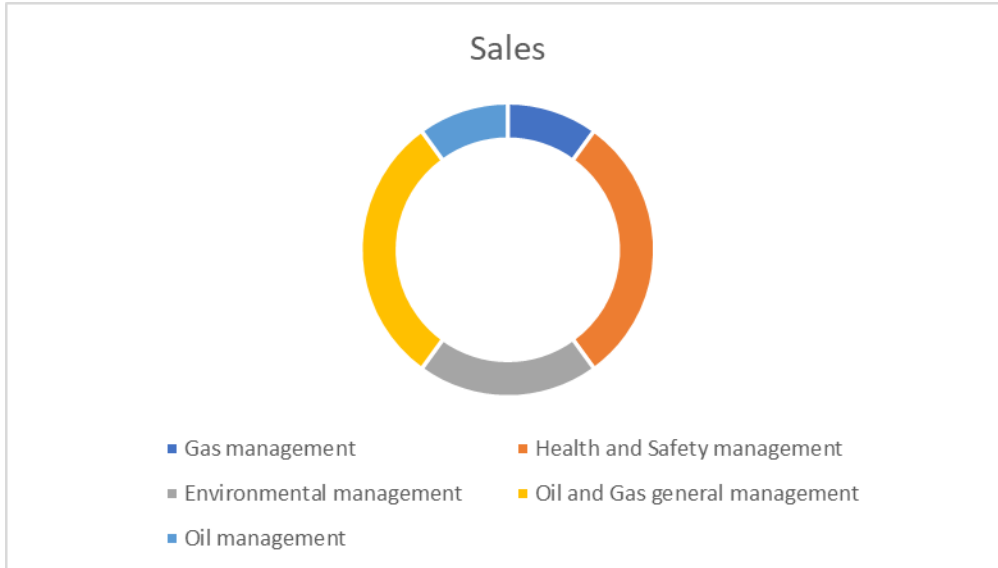
Showing **all** questions

Response rate: 10%

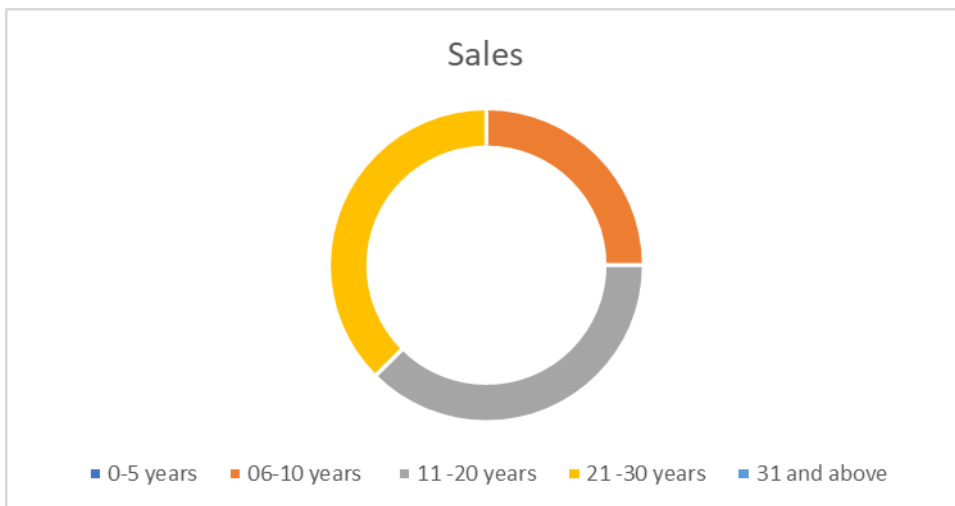


Design framework for integrating environmental, health and safety management system.

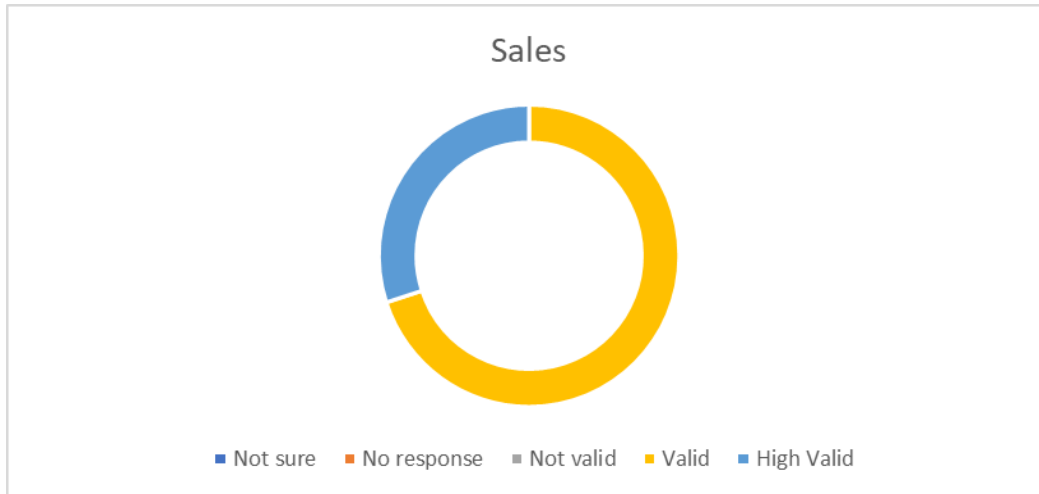
1. Which of the following best describes your position in the organisation you work for?



2. How many years of experience do you have in the oil and gas industry?



3. Can the proposed framework be capable of managing the integration of Nigerian Oil and Gas management systems?



3.1. Reason for your answer

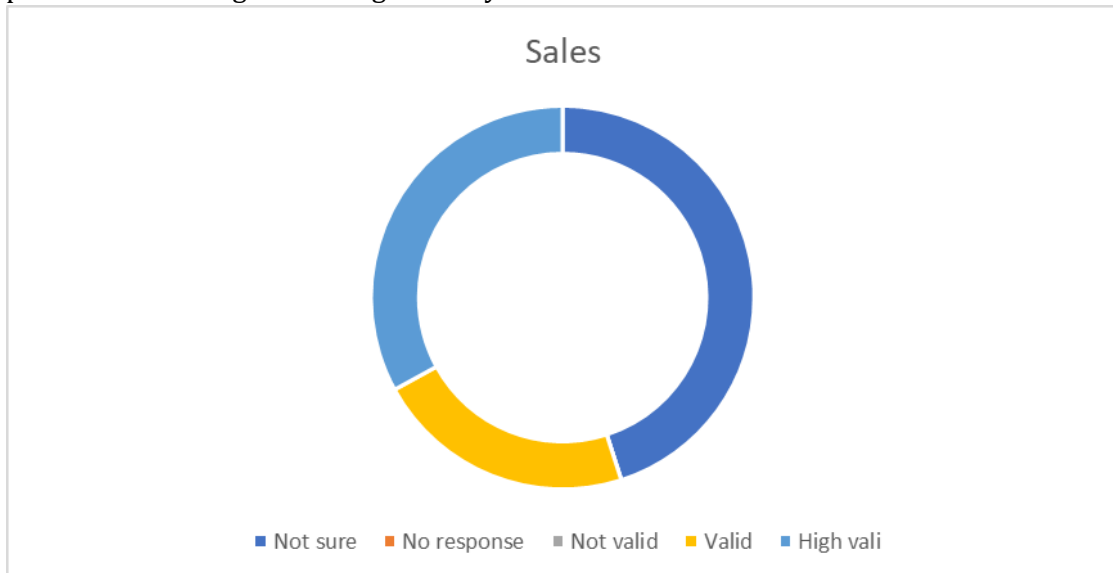
Showing all 10 responses

- Valid because the framework spells out roles and responsibilities 817027-817018-87458854
- The framework has elements to managing the system. 817027-817018-87459583
- It's has a detail plan for every stage of management that favours the 817027-817018-87467378
integration for both industries
- Yes. Oil and Gas processes must be well managed so as to reduce the 817027-817018-87467426
impact of residues and waste from products on the health and safety of the
environment.
- Absolutely. The framework has been systematically designed. 817027-817018-87472291
- Yes. The framework has been specifically designed to suit this cause. 817027-817018-87472219
- The proposed solution would help create accountability and transparency 817027-817018-87478249
in oil and gas management
- In line the research outcomes, I believe the proposed framework can add 817027-817018-87501104
great value

It has been objectively opined in the arguments that the government had not prioritized the management of this sector. Hence this framework again is bringing forth those factors that would manage the integration of Nigerian Oil and Gas management systems.

because the framework insures the key Oil and Gas, management system. Including Government and safety management. Nigeria Oil and Gas, on the other hand, can only overcome climate change through integrating management.

4. How feasible is the proposed framework, with regards to Oil and Gas environmental pollution in the Nigeria management system?



4.1. Reason for your answer

Showing all 10 responses

It's highly valid because the proposed framework proffered a reasonable solution

817027-817018-87458854

Only time factor is necessary to achieve this without being default on its implementation.

817027-817018-87459583

It is significantly feasible, but would require updating with time

817027-817018-87467378

The framework will help manage the process, products and by products and the environmental health and safety. 817027-817018-87467426

It is feasible as that has been put into consideration from the initiation. 817027-817018-87472291

Very much possible because its feasibility has been pilot planned. 817027-817018-87472219

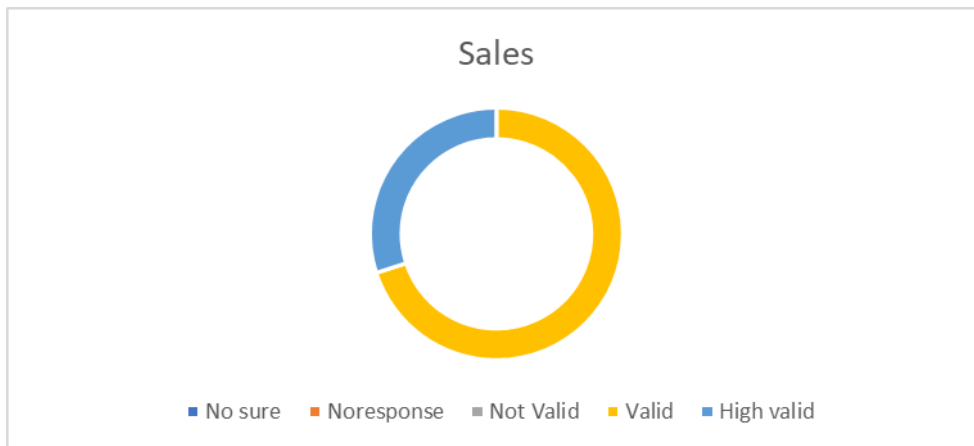
With accountability and transparency, the proposed solution would work perfectly. 817027-817018-87478249

In line with the research outcome 817027-817018-87501104

Both the government and private sector in the business of oil and gas are culpable in the depletion of oil and gas environmental management in Nigeria, though a few private firms had proven that using this framework would achieve much and therefore it is highly feasible that the framework would enhance the management of oil and gas environment. 817027-817018-87600336

These methods are not new, but the name "integrated environmental, health, and safety management system" distinguishes the framework from that of oil and gas pollution. Thus, shows us how we achieve environmental balance. 817027-817018-87675609

- 5. The framework suggests that Health and safe risk via oil and gas environmental pollution can be managed through the proposed framework. Do you think this is achievable?



5.1.Reason for your an

Showing all 10 responses

Highly valid because the points to manage pollution is clearly pointed out. 817027-817018-87458854

It is achievable because the framework appears to solve the long-term evils that have characterised the sector. 817027-817018-87459583

The major aim of the framework is to manage challenges with pollution and other attendant issue in the oil and gas industry 817027-817018-87467378

The framework considers the health and safety of the populace and immediate residents which is very key. Pollution for oil and gas products contaminate the air and threatens the health and safety of the environment 817027-817018-87467426

It is achievable as that has been assessed while designing this framework and that is an important aspect of this framework. 817027-817018-87472291

A systematic framework as such is capable of achieving that. 817027-817018-87472219

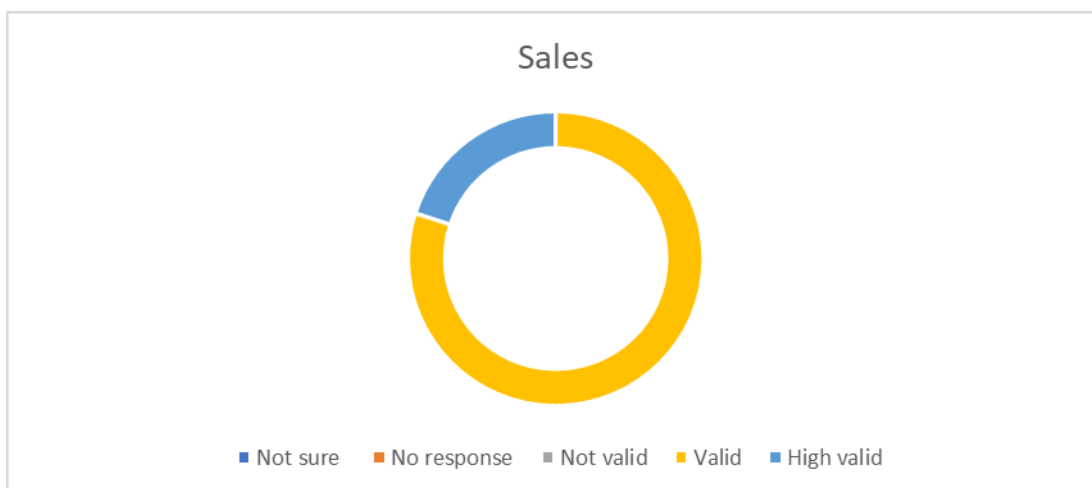
Yes, if there are clear rules and actions for non-compliance by relevant players. 817027-817018-87478249

Good evidence from the research 817027-817018-87501104

To a larger extent, factors like corruption, biased data collection among others have been the sole enemies posing threat to this sector and until these factors are completely eliminated as suggested by this framework, health and safety in oil and gas environmental pollution cannot be managed. 817027-817018-87600336

The framework was created to help oil and gas companies manage and handle environmental, health, and safety challenges. Human attitudes, on the other hand, can be addressed further through managerial collaboration and transparency. Although, in the future, more updates will be required. 817027-817018-87675609

6. Is it possible to apply the proposed framework, and execution of ethics work plans to address or manage other related management tasks in the Nigerian Oil and Gas sector?



6.1. Reason for your answer

Showing all 10 responses

Highly valid because it proposed a management style to manage properly the oil and gas sector. 817027-817018-87458854

Because of the interrelated nature of its indices, this sector with other management sector in oil and gas activities could be enhanced. 817027-817018-87459583

As have been stated in the last question, the framework address all related challenges 817027-817018-87467378

Ideas that work should be transferable. So therefore, this framework is transferable and should be used to address other related areas. 817027-817018-87467426

As long has this proves successful, and the whole process is evaluated, it can be applied to other management tasks in Nigeria. 817027-817018-87472291

The framework has been assessed and further evaluation will be completed to manage other tasks 817027-817018-87472219

It bores down to accountability having clear and workable frame work heavy sanctions for non-compliance 817027-817018-87478249

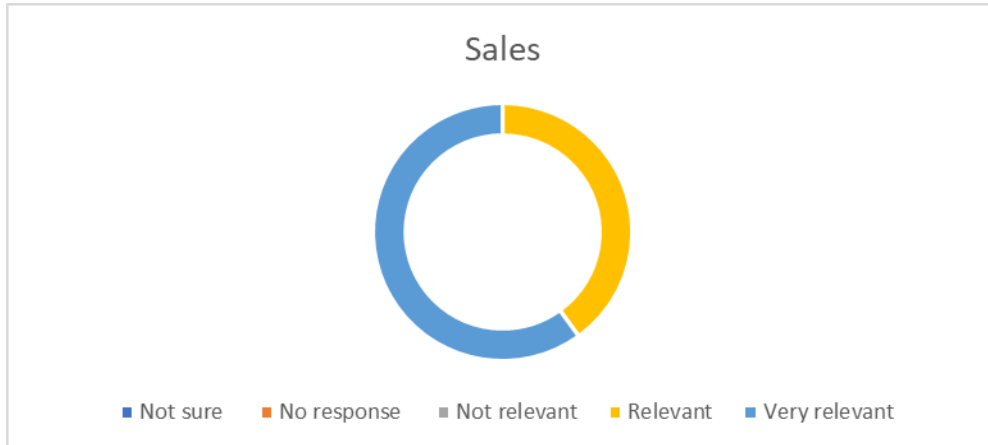
I believe a lot of work went to into the study in terms of data collection and analysis. So with that in mind the proposed solution will be valid to a large extent 817027-817018-87501104

It is obvious that these tasks are interrelated meaning that there is cohesion among the elements aiding the oil and gas sector's management and therefore the implementation of this framework could help address other related management activities. 817027-817018-87600336

But knowledge of teamwork, appropriate ethics work plan and good communication of integrated management process has to be in place. However, Worker's commitment

is necessary to achieve a successful application of the framework. 817027-817018-87675609

7. Does the proposed framework provide a well structured, well-informed, and holistic approach for managing the integration, environmental, health and safety management system in the Nigerian Oil and Gas sectors?



6.1. Reason for your answer

Showing all 10 responses

The approach proposed is well structured, informed and holistic calling out the HSE management arm of the sector 817027-817018-87458854

It appears so as this caters for what have not been addressed previously. 817027-817018-87459583

It's is very well structured and detailed 817027-817018-87467378

This framework addresses the key aspects of oil and gas management, processes and including health and safety 817027-817018-87467426

Yes, because transparency has been put into account. 817027-817018-87472291

It is systematic and transparent. 817027-817018-87472219

The proposed structure has clearly articulated the responsibilities of all the stakeholders. Hence promoting transparency 817027-817018-87478249

Yes 817027-817018-87501104

Because of the importance and strategic impact, this sector is on Nigeria economy, the brain behind this framework had put into consideration much to do approach, structured, holistic, and well-informed proposal, 817027-817018-87600336

it is easier to read and well structure for Oil and Gas management system. 817027-817018-87675609

