OIL AND GAS OPERATIONS IN NIGERIA: THE NEED FOR WELL HEAD SAFETY

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ABSTRACT

As a country, Nigeria is endowed with abundant energy resources, and it has been making appreciable profits from such exports. Oil and gas resources continue to occupy the attention of the petroleum industry, policymakers, and the general public. The legacy of petroleum appears to have a strong footing in politics and security, manifested in the politicization of oil and gas resources, which has an adverse effect on the economy. The economy of Nigeria mainly thrives on a single product. It survives largely by exporting crude oil for economic growth and advancement. The early years of offshore drilling were characterised by extremes of both reward and risk in an environment in which very little legislation and regulation existed. During this period, the industry undertook few safety initiatives. While companies were able to find and produce oil and gas profitably, they also faced a number of hazards that resulted from trying to adapt land-drilling methods offshore, fitting complex drilling and production facilities onto small platforms, using untested designs and procedures, and handling dangerous equipment and flammable materials, all in an adverse marine environment that frequently exposed workers and equipment to high winds and waves as well as corrosive salt water. There are regulations set in motion to curb the menace of well oil safety failure in Nigeria. This article, therefore, assesses the gaps in these regulations in the hydrocarbon industry in Nigeria.

Keywords*:* Oil and Gas, Well Head, Safety and Nigeria

INTRODUCTION

The formative years of offshore drilling were met with extremes of both reward and risk in an environment in which there was very little legislation and regulation.[i] Safety initiatives were undertaken by the industry during this period. Companies could find and produce oil and gas profitably, but they equally faced a number of hazards that resulted from trying to adapt land-drilling methods offshore, fitting complex drilling and production facilities onto small platforms, using untested designs and procedures, and handling dangerous equipment and flammable materials, all in an adverse marine environment that frequently exposed workers and equipment to high winds and waves as well as corrosive salt water.[ii] In addition, high operational costs intensified pressure to surmount these challenges within the shortest possible time.[iii] In recent times, there has been a marked upsurge in the development of offshore oil and gas operations. As a result of increasing energy demand and advancement in technology, drilling activities traversed deep and ultra-deep-water areas.[iv] Presently, about a third of the oil and a quarter of the natural gas consumed in the world emanate from underwater areas. The sudden shift to offshore oil and gas exploration and exploitation appears to be starting now as a result of its revenue derivation potential.[v] Going by forecast, there is a continuing production growth in traditional offshore regions like Western Africa and Gulf of Mexico and appreciable development in new areas such as Eastern Mediterranean and Eastern Africa.[vi]

The more and deeper oil well is drilled indicates increased sustained to the environment, depletion of natural resources, and likely adverse consequences for the human activities depended upon these ecosystems.[vii] Accidents, in recent times, on offshore platforms have demonstrated that the environmental risks of drilling operations, especially offshore, affect all regions of the world and all types of companies. This trans-boundary nature of the effects from these accidents has reinvigorated discussions regarding the suitability of the current international regulatory framework for offshore oil and gas operations.[viii] In this regard, it is evident that there are regulatory gaps, both in terms of safety on offshore drilling activities and liability or compensation in case of accidents.[ix]

Oloibiri Oilfield was discovered on 15 January 1956 by Shell in Nigeria. That discovery was the first oil discovery in commercial quantity coming after 50 years of unfruitful oil exploration by various international oil companies with the consent of the Nigerian Government. Eleven

appraisal wells were vertically drilled to assess the extension of the reservoir to different sections of the field between 26 June 1956 and 28 October 1958.[x]

Oloibiri-1, the discovery well, was completed on 5 June 1956 as a commercial oil production well. Thus, history was made as Oloibiri-1 became first truly commercial oil well in Nigeria. The maturity of oil fields to sustain production over the life span of the field means that there is a significant need to focus on safety related issues of wells - producing and non-producing. The design, construction, operation, maintenance and abandonment of these wells should be done in a manner that protects their safety thereby minimizing their health, safety and environmental risk while ensuring their planned availability throughout their life-cycle. Well safety failure could result in pollution, possible leak and or blowout, the most costly and fatal is oil-well blowout

The article examines the necessity of observing safety in well head operations in the offshore oil and gas industry in Nigeria. It will provide in-depth answers to the functioning of the oil and gas industry and, more importantly, the reason for the regulatory failure.

An examination of the legal and regulatory framework for offshore health, safety, and the environment in the Nigerian oil and gas sector reveals the prevalence of prescriptive regulation. The evolution of offshore health and safety in the United Kingdom shows that prescriptive regulation does not represent the best approach due to its inability to keep up with the changing technology and its encouragement of a compliance culture. This inability was seen following the Piper Alpha disaster in 1988.

The relevance of this article in present times cannot be over-emphasised. It lays the foundation for a critical evaluation of the specific regulatory gaps in the Nigerian oil and gas industry's health, safety, and the environmental risk governance framework. One of the regulatory gaps/differences is the question of the content of the laws that regulate offshore health, safety and the environment. The current legal and regulatory framework for offshore health, safety, and the environment in the Nigerian petroleum industry are inadequate, which points to the need for Nigeria to look towards the review of its laws to ensure they are more effective. Another gap in the Nigerian offshore health, safety and environment is the fact that the Nigerian government seems to be more interested in the petroleum revenues to be received from offshore activities than in the actual regulation of health and safety offshore. An example is the

Petroleum Act[xi] 1969, which declares that the ownership of offshore revenues from petroleum resources is vested in the Federal Government.[xii] The Petroleum (Drilling and Production) Regulations 1969 also contains provisions that deal with royalties to be received from offshore activities[xiii] but only mentions issues of health and safety in passing.[xiv]

THE NIGERIAN OIL AND GAS INDUSTRY: A HISTORICAL PERSPECTIVE

Nigeria is recognised as a country with the most known reserves of petroleum and gas in Sub-Saharan Africa.[xv] With a daily production of between 2.4mbpd to 2.7mbpd, it is the 12th largest oil producer in the world. Nigeria currently has about 150 oil fields and 1,481 oil wells located within the Niger Delta Region. Petroleum has long been an essential aspect of the national economy, accounting for more than half of Gross Domestic Product, about 85% of government revenues, and over 90% of exports.[xvi] Historically, Nigeria had other revenue sources, including agriculture, but this changed with the discovery of oil. This section historically analyses the discovery of oil at a time in Nigeria's economic downturn in agriculture as an argument for the weak health and safety regulatory regime. From the analysis, it will become evident that the maximisation of economic recovery from oil and gas could be a reason for the lack of interest in designing a robust risk regulatory framework.

The estimated recoverable crude oil reserves stand at 34 billion barrels, and it is suggested that this is expected to increase with additional exploration and appraisal drilling.[xvii] So far, about 900 million barrels of crude oil reserves have been identified, but the Nigerian government seeks to achieve a reserve of 40 billion barrels. Regarding its gas reserves, about 159 trillion cubic feet (Tcf) of proven gas reserves have been estimated, placing Nigeria amongst the top 10 countries with natural gas endowments.[xviii] Unfortunately, due to lack of infrastructure, about 40% of the natural gas produced is still flared.

The first traces of oil exploration began in 1908 when the Nigerian Bitumen Corporation, a German entity, began exploratory activities in the Araromi area of Western Nigeria.[xix] There was not very much success, especially with the outbreak of the first world war in 1914. In 1937, oil prospecting resumed when the Shell D'Arcy Petroleum (now Shell Petroleum Development Company (SPDC)) was awarded the exclusive concessionary right to exploit oil throughout

Nigeria. Again, these exploratory activities of Shell were interrupted by the Second World War but resumed in 1947.[xx] With over N30 million invested, which was significant at a time, Shell Nigeria had its first commercial discovery of crude oil in Oloibiri (now Bayelsa State) in 1956. It exported the first consignment of crude from the country in 1958.[xxi] Government revenue exploded from ₦66 million in 1970 to over ₦10 billion in 1980. The oil output has risen from just over 5100 barrels per day to about 2.68 million barrels per day between 1960 and 2012.[xxii] Despite the bombing of oil installations by militia groups in the Niger Delta region, which led to a decline in oil production between 2012 and 2015, oil production is currently about 2.1mbpd. The Nigerian oil industry's development saw other major international and local oil companies playing more prominent roles. These companies include Mobil, Agip, Elf, Texaco, and Chevron.

The dire consequence of this multi-billion dollar industry resulted in extreme rent-seeking behaviour, weak state institutions, anomalous democracy, increased corruption, inadequate human rights protection, and civil conflict.[xxiii] In typical rent-seeking fashion, 85% of oil revenues accrue to 1% of the population; 'perhaps $100 billion of $400 billion in revenues since 1970 have simply gone missing'.[xxiv] In essence, amidst this enormous fortune, it is paradoxical that as of 2010, poverty had risen to nearly 61% in Nigeria, with almost 100 million people living on less than $1 a day.[xxv] This situation, aptly termed the resource curse, has become a common feature of many oil-dependent countries.[xxvi] The resource curse plagued Nigeria, but the situation was also worsened by the safety and environmental consequences of exploratory activities. Environmentally, the level of environmental degradation occasioned by constant, unattended oil spills and deliberate gas flaring has been concerning. This environmental degradation has, in turn, led to poverty and significant social injustice to the people of the Niger Delta region, mainly as they depend on their environment for survival.

The records show that Nigeria has had over 4,000 oil-spill incidents ranging from minor oil spills of a few hundred barrels to over half a million barrels in a single episode.[xxvii] Presently, Nigeria is ranked sixth in the world regarding countries with the highest volume of gas flares.[xxviii] The resultant degradation of the environment has led to a crisis amongst the people living in the host communities, and tension between them and the multinational companies operating in those regions.[xxix] This hostile act has further led to the escalated kidnapping of oil workers and the formation of several militia groups, all in an effort by the indigenous

populations to "enforce" their environmental rights.[xxx] We shall now discuss the current regulatory framework for well drilling and safety in Nigeria to determine its status.

CURRENT REGULATORY APPROACH TO WELL DRILLING AND SAFETY IN NIGERIA

Generally, enforcement and implementation of oil and gas regulations in Nigeria is poor. Certain statutes like the repealed Federal Environmental Protection Agency Act,[xxxi] the Department of Petroleum Resources, Environmental Guidelines and Standards for the Petroleum Industry in Nigeria[xxxii] provide for lower standards to be adopted in the oil industry. The standards recommended by these regulations appear to be lower than the envisaged oil industry standards by the Nigerian Minerals Oil (Safety) Regulations. The oil MNCs appear to comply with the former regulations as opposed to the standard envisaged by the regulations made under the Petroleum Act. The major reason is that MNCs are trying to circumvent the more stringent standards contained in the Nigerian Mineral Oil (Safety) Regulations. This anomaly, therefore, shows the perilous regulatory regime in Nigeria where the powerful MNCs elect the laws they feel like complying with.

The current legal framework regulating offshore exploration and exploitation and safety issues relates to existing laws, rules, regulations and policies which governed the onshore oil industry are now governing well drilling operations by extension.[xxxiii] In furtherance of the duty of making regulations for operations in the offshore sector by the Ministry of Petroleum, the sector has been met with a number of laws and regulations. They include the Petroleum Act of 1969,[xxxiv] the Minerals Oil (Safety) Regulations 1997,[xxxv] and the Oil in Navigable Waters Act 1968.

It does appear that there is no single comprehensive, specific law adequately designed to tackle environmental impacts of pollution resulting from wellhead failure in Nigeria. An examination of Nigerian legal framework on oil and gas generally reveals that they only have provisions relating to the general management of oil pipelines. Even though relevant laws are in place that relate to the general management of oil pipelines, none appear to adequately address the key

causes of pollution resulting from wellhead failure. For instance, while sabotage is addressed in existing laws, none of the laws addresses other causes of pipeline insecurity such as accidental ruptures, well control failure, negligent construction, blow out oil terrorism and illegal bunkering.

In Nigeria, the Office of the Minster of Petroleum Resources is crucial in the regulation of oil and gas operations, including oil well drilling, by virtue of the Petroleum Act. A key feature of the Act is the manner of control the Minister of Petroleum Resources exerts over the sector.[xxxvi] Some of the powers exercisable by the Minister include the power of grant and revocation of licenses and make regulations, *inter alia*.

What primarily drives well head safety regulation in the Nigerian oil and gas industry is the requirement of 'good oilfield practice' and different international standards. However, there is nowhere in the Petroleum Act where 'good oilfield practice' is defined and there is also no description of it with reference to any standards. The provision of the Petroleum Act is only to the effect that where in the opinion of the Minister operations are not carried out in line with good oilfield practice, it is incumbent on the Minister to direct in writing the suspension of such operations.[xxxvii] Also, by section 25 (1) of the 1st Schedule to the Petroleum Act 1969, the Minister is empowered to revoke any Oil Prospecting Licence (OPL) or Oil Mining Lease (OML) if it appears to him that the licensee or lessee is not carrying out operations in line with good oilfield practice. There is nothing to show if this power has been used either in suspension or revocation of licences in the history of the Nigerian oil and gas industry and well drilling operations on the ground of failure to comply with good oilfield practice. A look at the Mineral Oil Safety Regulations (MOSR) 1997 however will give a clearer picture of what good oilfield operations entails.

It is submitted that placing too much reliance on standards will only achieve a prescriptive result notwithstanding the fact that it appears to be flexible. For example, section 6 of the MOSR 1997 only enumerates the various standards which constitute good oilfield practice. The operator in that instance is to merely show the Regulator that it has adhered to any required international standard. Where this is done and other prerequisites have been complied with by the regulator, the government automatically retains risk minimisation for itself where it elects what is appropriate for risk minimisation; the only responsibility on the company is to comply with the regulations.[xxxviii] This appears to be a setback for prescriptive regulation. Supposing

anything was to go wrong, the operator would only need to show that it acted in accordance with the required international standard so as to escape liability.

OIL WELL SAFETY

An Overview

The well accident that occurred in Macondo in 2010 was a sad reminder that operators of oil and gas are occasionally vulnerable to the consequences that come with oil and gas well blowouts.[xxxix] In the wake of the Macondo accident, this reminder has reinvigorated a societal view on well safety in drilling operations alongside aerospace and nuclear industries, which equally have minimal probability and high consequence activities. This is a type of activity where quantifying the frequency of occurrence of incidents and management of uncertainties tied to minimal major accident probabilities are seen as vital by society in embracing an acceptable level of risk.[xl]

Oil and gas well are phased in several lifecycles, starting with drilling, then completion, followed by production and lastly plugging and abandonment. At the well production phase, work-overs and lighter intervention operations is needed to maintain or improve the safety or flow efficiency of the well system. During the lifecycle phases, it is possible to lose control of the high-pressure energy stored in a reservoir. In the course of its history, the oil and gas sector has embraced some simple rules to promote an acceptable risk of well control loss. One of such 'cardinal rules' widely used is to always maintain two qualified and tested well barriers towards a reservoir.[xli] However, maintaining the two well barriers can be a herculean task and experience from many well accidents have brought to the fore that two qualified well barriers were unintentionally not properly maintained by the crew in course of the operation.[xlii]

The well safety record has been supported by years of well blowout data collected by the industry.[xliii] The data shows that serious blowouts are most susceptible to occurrence during drilling and intervention operations in comparison to the other well lifecycle phases. The observations can be explained on the basis that: (i) Well barrier failures occur relatively often[xliv] and (ii) the rigorous and changing nature of such operations could make maintaining the two

qualified well barriers a daunting task.[xlv] A good number of well operations include routine tasks, which includes the bringing in of new or maintenance of current well barriers. However, operations may also include novel and complex sequences of introduction, removal and replacement of individual well barrier elements[xlvi] (WBE), which represents the well barrier building blocks. Additionally, the earth does not consist of homogeneous material. This makes each well construction operation unique and operations are repeatedly faced with new sets of unknowns.[xlvii] The dynamics of well activities is further emphasised in several of the recent accident investigation reports, all of which are critical to the inability of the operator's management of change systems to maintain risk indicators during the operation.[xlviii]

Meticulous planning that includes risk assessments related to critical events such as well barrier failures and blowouts is crucial for the crews' ability to maintain well control throughout various stages of well drilling and work-over operations. The crew must, for instance, be prepared to promptly detect and address well barrier failures that could occur in a timely manner. The risk assessments may be qualitative as well as probabilistic to meet diverse needs. For example, probabilistic risk assessments (PRA) enjoy recognition as vital tools for risk management of low probability and high consequence events.[xlix] The importance of a PRA is to check major accident frequencies associated with an activity whether the modes of operation are normal or abnormal. Thus, a well drilling operation PRA can become an important instrument for risk management in the drilling (and intervention) phase of an oil and gas well.[l] The PRA may be described as a well (drilling) system risk assessment that considers potential loss of two main safety functions of an oil and gas well: (i) the continuous containment of well hydrocarbon fluids.[li] This safety function is typically referred to as 'well integrity' by industry standard definitions.[lii] (ii) The shut in of any well flow upon a demand, for instance, in case of a safety critical situation such as a process leak on-board a drilling rig.[liii]

The brief lifespan and the dynamic 'stress and strength' type nature of hazards, well barriers and other safeguards associated with well drilling operations makes PRA modelling a huge challenge.[liv] More easy drilling technology is also continuously introduced. An example is the technology that enables efficient development of shallow, low pressure and low temperature, unconventional resources such as shale oil and gas.[lv] Another example is the technology developed for harsh deep water environments that contain deep and prolific, high pressure and high temperature, pre-salt reservoirs.[lvi] For example, successful applications of new drilling

technologies recently includes the introduction of wired drill pipe and various type 'closed loop' drilling systems for both fixed dry tree and deep water subsea drilling operations.[lvii]

The phase of production of the well contrasts sharply with well drilling operations. Provided the well is producing, the assumption can be made that operational procedures and well barriers are fixed, or only open to minor changes on dynamic reservoir conditions.[lviii] This situation makes classical bowtie methods based on fault tree- and event tree analysis suitable, and such are also widely described as adopted for PRAs made for risk management during the well production phase.[lix]

Incidences of Well Control Failure in Nigeria

Studies have shown that uncontrolled releases of hydrocarbons have resulted in several major accidents. Experience from accidents in the past is an important source of information to prevent the occurrence of similar tragedies in the future. Attention shall now be shifted to examine some accidents that occurred as a result of well control failure in Nigeria and need to ensure safety.

Funiwa-5 (Texaco) Oil-Well Blow-out

The Texaco (Funiwa-5) oil well blowout, which occurred on 17 January 1980, appears to be Nigeria's worst case of blowout pollution. In that accident, about 400,000 barrels of crude oil was released into the marine environment. The blow out took place during completion operation by the semisubmersible drilling rig, Sedco 135C.[lx] Texaco Overseas Petroleum Company of Nigeria, the operator of a Joint Venture of the Nigerian National Petroleum Corporation, owned the Funiwa-5 oil well.[lxi] Going by the Joint Venture, 60 per cent ownership rests with the NNPC, Chevron Oil Company Nigeria Limited owns 20 per cent and Texaco Overseas Petroleum Company of Nigeria, 20 per cent.[lxii] It is not known what quantity of oil spilled into the marine environment, as there seems to be no consensus on that. However, according to Oil industry sources the quantity of oil spilled was about 200,000 barrels.[lxiii] The Department of Petroleum Resources pegged the figure to be above 400,000 barrels (16.8 million gallon of oil).[lxiv] Notwithstanding the quantity of oil that spilled into the marine environment of the Niger Delta, what is clear is that it impacted adversely on the marine environment.

The blowout may have continued until January 30, 1980 due to the inability of Texaco to respond appropriately to the incident when the oil well was engulfed by fire. As a result, the well bridged and oil stopped flowing. It should be noted that before the outbreak of the fire, there was continuous flow for twelve days and this was followed by massive water pollution. The lukewarm response of Texaco may be as a result of the absence of any serious environmental regime at the time. That notwithstanding, there was an attempt by Red Adair Corporation, an internationally recognized oil well blows out control specialist, to contain the spill. The Corporation was tasked with the duty of capping the over-flowing oil well but owing to the dangerous nature of the blowout, the move to cap the well was unsuccessful.[lxv]

The failure to successfully cap the well forced Texaco to bring to the scene two additional drilling rigs, the Transworld 46 and the Sedneth 1 for purpose of drilling relief well. This did not achieve much as the well had already bridged before the relief drilling could get to the blow out interval.[lxvi] The fact is Sedco 135C was completely destroyed by fire, thus ending efforts geared towards rescuing the well. The capacity to fight oil spills in Nigeria during that period was mainly limited to the application of dispersants. Dispersant used in this case were sprayed from a derrick barge hanging side by side with the North Apoi platform, which was some miles away from the Funiwa- 5 oil well.[lxvii] Sixteen drums were the highest amount of dispersants applied for each day and this helped in reducing the volume of oil which has been cascading towards the shore. Nature may have favoured Texaco because as a result of the high tides and ruggedness of the sea, in addition to 'prompt' cleaning up operation, most of the oil was dispersed.[lxviii]

The impacts of the oil-well blow-out could be felt all over, as it led to environmental pollution, which caused vegetation to dry up and deprivation of plant and animal life. The gravity of the impact was equally noticed five months after the blow out as crude oil was found on beaches and mudflat around the scene of the accident.[lxix] The crude oil percolated in a manner that oily sheen was seen in wells dug by the beach. The Funiwa-5 blowout adversely affected fresh surface water people use. This led to the digging of emergency wells by Texaco. This intervention did not, however, ameliorate the situation as most of the shallow wells suffered abandonment after coming in contact with the spilled oil. The terrain of the blow out did not help rescue attempts by Texaco.[lxx] The inaccessible nature of the swamp area and absence of good roads did not facilitate provision of potable water by water tankers. It is undeniable that

water is vital to life, precious, irreplaceable and cannot be substituted. When there is no potable water that is fit for drinking, the health of the people will be at risk and nearly every aspect of communal life may be endangered.[lxxi]

Ground water pollution from oil spills cannot always be totally cleaned up. It is, therefore, safer and wiser to prevent it from occurring.[lxxii] Some of the obvious consequences of the blow out in the mangrove were the defoliation of some Rhizophera seedlings, death of crabs, as well as the destruction of 836 acre of mangrove.[lxxiii] The importance of mangrove swamps cannot be overemphasized, as it supports commercially important species of fish and shellfish. Mangrove wood can be used in diverse ways by the people. It can serve as firewood, charcoal and for the construction of buildings.[lxxiv] In addition to the adverse impact of the blow out on mangrove, about 180 casualties were recorded and 1,000 people hospitalized.[lxxv] Children of school age were worse hit with illnesses like catarrh, cough, cholera and diarrhoea afflicting them after the consumption of contaminated water.[lxxvi]

The effect of the Funiwa-5 blowout on agriculture can be easily seen from the decline in crop yield in the affected areas. Parts of the affected areas are well known for swamp rice cultivation. During the period of the blow-out, the report was made that thousands of acres of swamp rice farms suffered destruction. The fact remains that crude oil has negative impact on the land, as it renders it barren and also affect soil micro-organisms, which could be destroyed without recovery. The land itself has remained unfertile several years after. After the spill, residents complained of an alteration in the taste of fish. It was particularly observed that there is a taste of kerosene in the fish, which is indicative of the presence of hydrocarbon contamination. The Funiwa-5 blowout negatively affected beaches as oil could be noticed on coated sea sands along the coastline.[lxxvii]

The presence of oil generally limits oxygen, entangle and kill surface organisms and by extension coat the gills of fishes, which invariably lead to asphyxiation and death. All of these were observed after the occurrence of the Funiwa-5 incident. In some instances, however, the consequences may appear less dramatic with only a change in the evenness of species showing their different 'tolerance to levels of pollution'.[lxxviii] The long term impacts of the pollution may not have been computed and documented but the fact that humongous sum of money was paid out for the damages caused by the incident show its extent and magnitude.[lxxix]

KS Endeavor Rig Gas Wellhead Explosion

K.S. Endeavor, run on behalf of Chevron Nigeria Ltd. by drilling contractor FODE Drilling Co., was engulfed by fire on January 16, 2012. The incident took place as the rig was in operation in the Funiwa field off the coast of Nigeria. The jack-up rig was employed as a tool in seeking potential deep-water oil and gas fields in the Lagos area.[lxxx] There was no connection with it to any oil production at the time of the fire. This forced Chevron to shut down operations at its North Apoi platform due to its closeness to the fire. The cause of the fire was likely a build-up of gas pressure from drilling that may have resulted in an explosion. The other theory is that a blowout preventer (BOP) failed to stop gas from leaking into a dangerous area.[lxxxi]

Drilling off the coast of Nigeria resulted in gas build up at the bottom of the well. Blowout preventers usually stop gas pressure from building to an explosive degree, but the blowout preventer in this case appeared to have failed. In consequence, gas was able to shoot up through the drilling pipe, leading to an explosion and igniting a fire that lasted for 46 days.[lxxxii]

What appear to be the most shocking details from the K.S. Endeavor incident is that the crew had a premonition of an explosion three days before the accident. The crew's request to be evacuated was not granted by Chevron and they were ordered to continue with the drilling operations.[lxxxiii] As predicted by the workers, gas pressure continued to build leading to the explosion of the rig, claiming two lives and unsettling 152 other workers.[lxxxiv] As a result of the advance warning, which was rejected, Chevron appeared to be ethically, legally, and financially liable for the explosion.[lxxxv]

This explosion was preventable. Some days before the fateful explosion, the crew discovered pressure readings, indicating that there was an increased risk of explosion.[lxxxvi] Chevron denied receiving any form of evacuation request and even blamed the staff of the rig, who testified severally that they requested evacuation and were apprehensive of an imminent explosion. In the circumstance, if Chevron had the intention to prevent the accident, they would have immediately stopped drilling, examined the problem and evacuate the crew.[lxxxvii]

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Santa Fe Al Baz Blow out

The Santa Fe Al Baz drilling rig, located off the Nigerian coast, suffered a blowout in 1989. Gas escaped from the blowout and ignited, killing crew members as a result of impact of intense heat and flame. Others died as a result of drowning after jumping overboard to escape the raging inferno. The rig eventually sank into the sea.[lxxxviii]

Investigation revealed that the rocks and sand ignited the gas, which produced flames under the cantilever deck. The intensity of the heat extinguished the cantilever and rig package, which descended from the barge, pulling the conductor pipe along.[lxxxix] This seafloor breakage gave room for a crater to develop resulting in stern legs to fall into the crater followed by the main barge. Shell offshore policies state that when the shallow gas sand conditions are presented the well should have been plugged, this was not carried out correctly and many minor errors built up resulting in the blowout that occurred. The rig was salvaged by Stanislav Yudin in the spring of 1992.[xc]

CONCLUSION

The exploration and exploitation of oil and gas has always been with some ecological consequences. Damaged land, oil spills, destruction of farmland, accidents and fires and cases of air and water pollution have all been recorded at one time or the other. In present times, the socio-economic effect of oil and gas operations, particularly in remote areas, has also been brought to the fore. The oil and gas industry has been involved for a long time to accomplish the challenge of providing environmental protection. Successes have already been recorded but the industry recognizes that more can be achieved.

Oil and gas exploration and production operations are capable of impacting on the environment in so many ways. These impacts are dependent on the stage of the process, the size and complex nature of the project, the sensitivity of the surrounding environment and how effective planning, pollution prevention, mitigation and control techniques will be.

Once operations begin, monitoring regimes come into force, either through legislation, or by authority inspection and enforcement, or by industry commitment to management systems and

self-regulation. Depending on how responsibilities are shared between the oil company and the government, responsibility for decommissioning and rehabilitation may be borne by the company or the government, or may be shared by both. The moment operations stop and rehabilitation and decommissioning is completed, final approval is needed to satisfy legislative conditions. It is not out of practice for decommissioning requirements to be required in licence approvals and related to the environmental baseline described in the EIA process.

The various institutions saddled with the duty of administration, management or formulation of policies governing the oil industry in Nigeria, should at all times cross breed ideas, synchronise their policies and synergize for efficiency in the management and administration of oil and gas policies in Nigeria, so as to eliminate any gap in oil well drilling in Nigeria.

There are institutions and regulations but adherence to these regulations has been a major challenge. Laws should be made to hold operators liable for negligence in the event that there is well safety failure leading to blowout or leakage.

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