SECURITY OF OIL AND GAS LIQUID TRANSPORTATION: ISSUES AND CHALLENGES*

Abstract
Crude oil is one liquid mineral resource traded globally. Its demand has been growing steadily over the decades. Oil and gas are essential commodities requiring reliable and safe means of conveyance from the platforms to the consumers. It is crucial to explore the safety and efficiency of the various ways it is transported to great distances. One of the sustainable and reliable means of conveying large quantities of oil and gas from one point to another is through the construction of pipelines. Pipelines transportation as a mode is crucial for the distribution of petroleum products in Nigeria. The mode has contributed immensely to the movement of crude oil and refined products within and across the country and for export. The use of this mode is, however, under threat from natural ruptures, vandalization, and sub optimal usage of pipelines. The constraints of other modes in the haulage of refined products over long distances provide a great challenge and opportunity for the pipeline mode to explore. Oil pipelines are important assets, and their security is of utmost importance especially in a country like Nigeria where oil pipelines are the major means of transporting crude oil. Nigeria relies on this means of transportation, which has been the victim of various physical attacks over the years by vandals and militant groups in the oil and gas producing areas. These affected the transportation of crude oil, which is the most important resource sustaining the Nigerian economy, thus putting it in jeopardy. It is against the backdrop of the crucial needs for the use of pipelines to convey petroleum products that this paper appraised the legal and security challenges of oil and gas pipelines in Nigeria. It found that, the laws and institutions responsible for governance of pipelines in Nigeria have been ineffective hence reviewed. It has never been more imperative to critically weigh the benefits of each method as they relate to the security, economy, environment, and regard for human safety and respect.

Keywords: Security, Oil and Gas Liquid, Transportation, Issues and Challenges, Nigeria

1. Introduction

Oil and Gas Pipelines means a pipeline for the conveyance of mineral oil, natural gas and any of their derivatives or components, any substance including stream and water used or intended to be used in the production, refining or conveying of mineral oil, natural gas or any of its derivatives. Transportation is an important aspect in the distribution of petroleum products as the production centers are usually far from consuming areas. A large proportion of the world's refineries are located far from the market. The fluidity of most of the petroleum products makes it amendable to transportation by any agency capable of removing a liquid from one place to another either by trucks, railroads, ships and pipeline[1].However, due to the huge quantity of oil and gas being produced at various platforms, the need to use a more efficient mode of transport is inevitable. One of the sustainable and reliable means of conveying large quantities of oil and gas from one point to another is by purposely constructed Pipelines, specifically, gas pipelines are metallic or polyethylene tubes through which large capacities of oil and gas, can be conveyed from one location to another.

The transportation of crude oil and gas is a component part of oil and natural gas production across the world. It is convenience transportation machinery that uses pipelines to distribute gas, fluid and chemicals. It is also the most common method of transportation for onshore oil and gas companies. It is a safer and faster means of transport of choice in that: Oil and gas transported via pipelines are not affected by bad weather conditions, hence, relatively reliable. Oil and gas pipelines can reduce the transportation distance because they are usually constructed along viable shortcuts unlike road transportation. The transportation of large volume of products can be accomplished within a short time frame; this is because the velocity of the products can be increased from the pump mechanism. It can reduce environmental pollution compared to other means of transportation such as ships and tankers where spills routinely occur at the points of loading and offloading. Pipeline transportation method only requires the laying of pipelines and building of pumping stations. The amount of earth and stone works is much smaller than that of railway construction. Moreover, most of the plain areas are buried underneath, and do not occupy farmlands. The energy consumption is minimal, which is the lowest among various modes of transportation.

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1*AGIP Oil Company Ltd v Kemmer[2001] 8 NWLRPt 716*

[2]Ikporukpo, C. O. (1977), *'Spatial structure and efficiency in physical distribution system: a case study of the Nigerian Gasoline Industry',* Unpublished Ph.D Thesis; University of Ibadan, Ibadan.

The importance of oil pipelines in an economy that is heavily dependent on crude oil, like Nigeria, cannot be overemphasized. Nigeria is the largest oil producer in Africa and fourth biggest exporter of liquefied natural gas in 2015.[2] Oil pipelines are the major means of transporting crude oil in many countries, Nigeria inclusive; hence they are important to Nigerian oil production.[3] The pipelines generally distribute the fuel needed for daily activities across Nigeria. Therefore, they are valuable to the physical and economic output of the nation.[4] Together with the products they carry, pipelines help to provide economic growth to the various communities across the country where they are laid by providing jobs around their maintenance and service.[5]Some of the advantages of transporting oil through pipelines include safety, stability, lower cost, and higher efficiency. Observably, where this mode of transportation is disrupted, it is bound to cause a major setback to the surrounding communities and to the nation at large, given the reliance on this infrastructure.

The security of oil pipelines then becomes an important issue in this context. Oil is without question, one of the main pillars on which Nigeria's economy currently stands. Crude oil being the major source of Nigeria's national income, as well as a key product for the export market, needs to be properly protected and managed. Over the years, there have been recurrent issues over pipeline vandalism in different parts of the country, especially in the Niger Delta region, translating into financial losses sometimes running into several billions of dollars.[6] According to the Nigerian National Petroleum Corporation (NNPC), 700,000 barrels of crude oil per day were lost in 2016 to pipeline sabotage.[7]However, the challenges facing the pipeline mode in the Nigeria's oil industry are woven around its competitiveness with other freight modes namely, rail, water, and road in its specialized product delivery. The shortcomings of these main 'rival, yet complementary' modes provide the opportunities for pipeline transport in Nigeria for specialized goods such as petroleum products. The railway is a good long distance hauler of products, but it is virtually out of contention in freight transport in Nigeria. There were years in which the rail did not convey any good to the Nigerian Seaports for exports. Even the years the rail conveyed goods to the Seaports, the tonnage was small. Although the nature of goods conveyed to the Seaports were not spelt out, the general composition of goods hauled by the rail usually include petroleum products. It, therefore, serves as an inference on the declining role of the rail, and a challenge to the pipeline mode over certain products. A better picture of the challenge of the demise of the rail for pipeline transport is evident in the transportation of petroleum products by rail. This declining haul by rail provides a good 'traffic-divert' in favour of competing modes namely, water, pipeline and the road. There is also the technical configuration of the rail in Nigeria in terms of the gauge of track made the speed to be very slow. This slow speed is not economical for any investor in the distribution business as delays are costly. The limitations of the rail pose a great challenge for pipeline. It is worth noting, however, that the benefits of the challenges are cornered by the road mode.

In spite of the diverted traffic in favour of the road mode, the constraints of the Nigerian road transport system, poor road condition, and tankers that are not road worthy, accidents, congestion and delays, made the cost of transporting petroleum products by road very risky, dangerous and expensive. Water transportation in Nigeria is not well utilized for inland transport. Nigeria has twenty-four rivers[8], but the seasonal nature of these rivers in terms of navigation is challenges to the use of the waterways for inland petroleum products' distribution. These challenges further provide an opportunity for the use of pipeline mode as a better option, which is not subject of challenge to rainfall (water level), and siltation. The slow speed of the rail, high cost of road haulage, seasonal nature of inland water transport and the low tonnage carriage of the water, road and the rail mode bring out the opportunities for the pipeline mode to be exploited. These opportunities for pipeline mode are the issues that mark it out for preference in freight transportation of petroleum products. The issues of speed, safety, cost and volume are crucial in petroleum products distribution. The pipeline mode has a high comparative advantage on these issues over other modes. Apart from the opportunities created for the use of pipelines mode by the inadequacies and ineffectiveness of other modes, there is a rising demand for petroleum products in the country, which will continue into the future. This rise in demand is as a result of a

[2]US Energy Information Administration, '*Country Analysis Brief: Nigeria'* (EIA, 6 May 2016) accessed 31 August 2017.

[3] Consumer Energy Alliance, 'The Importance of Pipeline Infrastructure' (16 May 2017).

[4]Ibid

[5]Ibid

[6] E. Ejoh & P. Okafor *'*Nigeria loses $100b revenue to pipelines sabotage Kachikwu' *Vanguard Newspapers* (15 February 2017) accessed 1 October 2017.

[7]See Premium Times *'*How pipeline vandalism reduced Nigeria's oil production by 40% – NNPC'*, Premium Times* (14 September 2017)

[8] Federal Republic of Nigeria (FRN) (1999) Annual Abstract of Statistics 1999 Edition, Abuja, Federal Office of Statistics.

growing population, increased vehicle acquisition and kilometre-travelled, increased usage of generators due to the inefficiency in electricity generation and distribution, . The pipeline mode plays a prominent role in the distribution, because of this anticipated increase in the consumption of petroleum products. lt is, however, important to note that in spite of these opportunities, the pipeline mode has not utilized these advantages fully. The pipeline mode may not likely take advantage of these opportunities in future too, if certain measures are not taken to improve pipeline transportation of petroleum products in Nigeria.

2. Evolution of Pipelines as a Means of Transportation

Dimitroff[9] and Kingston[10] traced the history of oil and gas pipelines to China in about 2,500 years ago. It is recorded that the Chinese first adopted the use of bamboo pipes to convey natural gas from sub-surface reservoirs in about 400 BC.[11] Kingston[12] explained that 'although pipelines have been in use for centuries, the modern-day pipelines have their origin from Pennsylvania, United States in about 1850 AD.'[13]The United States is reputed to have the largest network of energy pipelines, both oil and natural gas in the world. The oil pipeline network of United States alone is estimated to be more than ten times larger than that in Europe.[14]Prominent among the world famous pipelines in this sector are; Baku-Tbilisi-Ceyham pipeline (BTC); Druzhba pipeline; Lakehead pipeline; Operation Pluto (World's first under sea oil pipeline); Trans-Afganistan pipeline (TAP); Trans-Alaska pipeline system (TAPS)[15]. Pipelines as a convenient means of transporting crude oil and natural gas gained attractiveness in view of the growing need for energy and natural resources across the world. Each day 87 million barrels of oil and almost 225 billion cubic feet of natural gas are produced, transported, processed and consumed around the world. This daily ration is the lifeblood of modern civilization. These hydrocarbons are produced in over 80 countries on 7 continents from more than one million wells. This essential vascular system crosses virtually every national border.[16] Since its discovery, pipelines has since become the nerves and veins serving to convey the basic needs that supports humans, plants and animal species. This is because pipelines are not only crucial for transporting petroleum products but also for transporting water for consumption and irrigation. Furthermore, pipelines are also used to dispose human and material waste including sewage and industrial chemicals. Despite its usefulness, pipelines are very expensive to construct. They also suffer from wear and tear because they often face the risk of degradation occasioned by harsh weather conditions.

3. Legal Framework Regulating Pipelines and Land Use

The main legislation that governs the construction and use of pipelines in Nigeria is the Petroleum Industry Act.[17] which empowers the Authority to grant, renew, modify or extend individual licenses or permits:

The Authority may grant, renew, modify or extend individual licenses or permits, inter alia:

a) If it meets the technical standard required for petroleum operations based on good international petroleum industry practice;[18]
b) The location and size of the areas occupied by the facilities or rights of way is acceptable to the Authority.[19]
c) It meets the health, safety and environmental standards as determined by the Authority.
d) It provides for the effective and economic use of facilities and pipelines

[9]T J. Dimitroff. '*The Journal of World Energy Law & Business'*, Volume 7, Issue 4, 1 August 2014, Pages 287–339, https://doi.org/10.1093/jwelb/jwu024 retrieved 30 April 2018

[10]KG Kingston & EE Woha, 'Legal Inquiry into The Sustainability of the West African Gas Pipeline Project' *Journal of Mineral Resources Law*' 10(1) 1-15

[11]See P. Hopkins, 'Pipelines: 'Past, Present, and Future', The 5th Asian Pacific IIW International Congress Sydney', Australia 7th - 9th March (2007).

[12]Ibid

[13] P. Hopkins, Pipelines: 'Past, Present, and Future. The 5th Asian Pacific IIW International Congress Sydney', Australia 7th - 9th March (2007)

[14]Pipeline (2005) Pipeline lOl(http://www.pipelinelOl.com)

[15]Wikipedia(200S)'Pipeline Transport (http://www.wikipedia.org)

[16]D.R. Langenkamp; *'Cross-Border Pipeline Arrangements - What Would a Single Regulatory Framework Look Like?'*by Ishrak Ahmed Siddiky - Book review' OGEL 5 (2012), Online at:<www.ogel.org/article.asp?key=3332> cited in KG Kingston & EE Woha [n.3] 2

[17] Section 111, Petroleum Industry Act LFN 2022

[18] Section 191, Petroleum Industry Act.

[19]Section 191) (a)

There are duties expected to be done by the license holder in accordance with the Act, and in the manner that best complies with the general obligations : 19

a) Establish and make available to the public at its offices. 20
1. Procedure for obtaining and terminating transmission and interconnecting services; and
ii. Method of response to the request for its services[20]
b. Construct, operate and maintain its petroleum liquids transportation pipelines in a safe, economical and reliable manner taking into account any strategic plans formulated by the Authority;[21]
c. Manage any supply shortfalls and meet on a reasonable endeavors basis….; [22] and
d. Shut down its petroleum liquid transportation pipelines in emergencies and in order to carry out maintenance or in response to curtailment directives issued by the Authority. [23]
e. Provide access on a non discriminatory bases under section 116 of this Act where a license is granted on a common carrier basis and provide for a third party access pursuant to the license conditions where the transportation pipeline is operated for the own account of the licensee.
f. Consult with the Authority and obtain written permission prior to any modification of technical and operational rules of practice concerning the operation of its pipelines
g. Manage its transportation pipeline as a reasonable and prudent operator and
h. Abstain from activities which in the opinion of the Authority may prevent, restrict or distort competition.

The aforementioned provision entails high degree of land use. It is worth noting that pipelines stretch over several kilometres. The Act empowers the operators of pipelines to gain access to private and communal lands and to perform such activities as may be necessary in furtherance of the success of the pipeline constructions. This has severe implications on private and communal land users. In most circumstances, trees have to be removed causing extensive deforestation which are detrimental to the ecosystem and humans that solely depend on the lands for crop and other modes of farming. In some instances, homes have to be evacuated as well as cultural and heritage sites including cemetery and other community reserved cultural sites. The Act stipulates that, prior to the actual entry and commencement of the pipeline constructions *notice* should be given to owner or occupier of the land.[24] In the event that the operator of the pipelines permit fails to serve the statutory notice, the owner or occupier of the land is entitled to damages.[25] However, the Act is silent on the crucial issue of how such damages should be quantified.

Another aspect of Act that may infringe on the rights of private and communal land holders is enshrined in *the Petroleum Industry Act*. The provision expressly empowers the pipeline operators to seek the consent of the Authority where there is the need for the permitted route of the pipelines to be expanded, varied or elongated. Therefore, the holder of the permit may wish to apply to the Authority for variation of the permit to give it wide range in that: The Midstream and Downstream Authority may, upon application by the holder of a permit to survey, vary the route specified in such permit, but such variation shall not invalidate or make illegal any act done by the holder pursuant to the permit prior to such variation, nor prejudice the rights of any person under this Act with reference to any act done by the holder pursuant to the permit prior to such variation.[26] Furthermore, the holder of the permit may apply to the Authority to restrict persons from the pipelines and, it is unlawful for non-permit holders to trespass or undertake any unauthorised activities or constructions of buildings within 100 feet of the pipelines.[27] In the same vein, the permit holder may wish to deviate from the permitted route and enter into adjoining acreage upon receiving a written consent from the President of the Federal Republic of Nigeria.[28] The Act acknowledges the possible hardship that the land holder or occupiers may suffer in respect of the use of their lands for pipeline projects thus, stipulates in *the Act* that, the permit holder is under the obligation to provide accommodation for the occupier of the affected lands. Nevertheless, the Act did not specify the nature and duration of the accommodation to be provided. *Section 17* stipulates an initial timeframe for the use of land for pipelines at *20 years* but the pipelines already laid prior to the enactment of the Act are allowed to remain valid to the end of the original duration given.

[20]Section. 191(ii)
[21]Section 191(b)
[22]Section 191(c)
[23]Section 191(d)
[24]Section 115
[25]Section 191
[26]Section 191[a]
[27]Section 192
[28]Section 192

The complex issue with the time frame of validity of pipelines in Nigeria is that, there is provision in the Petroleum Industry Act for decommissioning of pipelines that have reached the end of their productive lifespan. This constitutes danger to the humans and animal species that shares the acreage with the pipelines. Disused pipelines that have reached the end of their service lifespan generate environmental challenges that are likely to give rise to litigation. However, the Act provides that claims arising from pipelines undertakings should be filed in the Magistrates' court. It is important to note that the Magistrates' courts have very limited monetary value of award it can grant, for instance, the Magistrates' court in Lagos cannot award more than Ten Million Naira and that of Rivers State cannot award more than five million Naira. The Act recognises that claims that are higher than the maximum value of the Magistrates' court may be pursued at the High Court.

Pipelines undertaking is one of the top most projects that utilizes kilometres of land area. It therefore comes within the meaning of public interest within the Nigerian legal classifications. The Petroleum Industry Act relies on the operation of the Land Use Act (LUA)[29] with regards to land use. *Section 1* of the Land Use Act stipulates that: 'All lands comprised in the territory of each state in the federation are hereby vested in the Governor of that state and such land shall be held in trust and administered for the use and common benefit of all Nigerians in accordance with the provisions of this Act'.[30]

Section 1 of the LUA therefore, establishes trust of lands in each state of the country. It gives the legal but not the absolute ownership of the lands to the Governors. By so doing, it altered the breadth of individual, corporate and community lands rights in Nigeria.[31]*Section 28(1)*'It shall be lawful for the Governor to revoke a right of occupancy for overriding public interest.' However, in *Nkwocha v Gov. of Anambra State*[32] revocation can only be valid in the face of overriding public interest[33] including but not limited to the purpose of exclusive government use; development for public good; and on the grounds of preservation of public safety. This was expressed in *Kachalla v. Banki*,[34] and in *Ezennah v. Attah*[35] where it was re-emphasised that, the highest legal rights an individual can have on land is the right of occupancy. This incomplete right is provided in Section 5(1) of the Land Use Act.[36] In view of the aforementioned provisions of the LUA, the operators of pipelines permit may wish to approach the Governor of the State where they intend to construct pipelines and seek for the revocation of rights of occupancy to remove the private and communal owners from the routes of the projects.

3. The Integrity and Challenges of Oil and Gas Pipelines in Nigeria

Pipeline integrity implies that the pipelines must be fit for purpose, free of ruptures, rusts and corrosive fractures. Simply put, the pipelines may be considered to have failed integrity test in the event of damage or defect. In the management of pipelines, the pipeline integrity managers must certify and ensure that pipelines and attached components such as valves and pumps are functioning properly. In the oil and gas sectors, the integrity managers often concentrate on all facets of the pipeline lifespan, that is, from the design, construction, operations, upkeep and decommissioning. The essence of pipeline integrity is to prevent failure; to undertake routine inspections and to undertake repairs.[37]*Hossam and Hossam*, observed that several factors militates against pipeline integrity including but not limited to:

a) Material and construction defects, e.g. defective longitudinal pipe seam, pipe body or joint welds;
b) Mechanical damage from construction, maintenance or third party excavation;
c) Incorrect operation;
d) Corrosion, creep and cracking mechanisms;

[29]Cap L5, Laws of the Federation of Nigeria, 2004

[30]0 Re-affirmed in *Adisa v Oyinwola* (2000) 10 NWLR 116.

[31]KG Kingston & M. Oke-Chinda, 'The Nigerian Land Use Act: A Curse Or A Blessing To The Anglican Church And The Ikwerre Ethnic People Of Rivers State', *African Journal of Law and Criminology*, Volume 6(1) pp. 147-158 (2016)

[32]KG Kingston & M. Oke-Chinda, 'The Nigerian Land Use Act: A Curse Or A Blessing To The Anglican Church And The Ikwerre Ethnic People Of Rivers State', *African Journal of Law and Criminology*', Volume 6(1) pp. 147-158 (2016)

[33]Ibid

[34] (2006) All FWLR (Pt. 309) p. 1420

[35] (2004) All FWLR (Pt. 202) p. 1858 at 1884

[36] KG Kingston & M. Oke-Chinda

[37] AK Hossam & AG Hossam. Review of pipeline integrity management practices. International Journal of Pressure Vessels and Piping 87 (2010) 373-380

e) Device failures and malfunctions;
f) Earth forces such as earthquakes, land slips or telluric currents and weather related threats such as high winds, rough seas or cold/hot temperatures.[38]

The possible reasons why pipelines fail integrity tests are: 'With many kilometres of the pipeline buried in dirt or submerged in water and with coatings that can range in thickness from a few microns to several metres, there are many categories of threats to pipeline integrity.'[39]

In Nigeria, the Midstream and Downstream Regulatory Authority oversees the management of pipelines. The Environmental Guidelines and Standards for the Petroleum Industry in Nigeria[40] are in conformity with the dynamic trends in the global legal development of the oil and gas industry. The Environmental Guidelines and Standards for the Petroleum Industry in Nigeria as comprehensive policy direction, encompasses the important guidelines and standards for eco-friendly eminence management of the activities of the petroleum industry including pipeline construction and management. The policy document enforces severe responsibility on every permit, license and lease holders requiring them to undertake their operations in an environmentally responsive manner. Largely, in the event of the failure to obtain the obligatory environmental permits and fulfill required steps laid out in the Environmental Guidelines and Standards for the Petroleum Industry in Nigeria 'invites fines; custodial sentence; revocation of permit, license or leasehold; payment of compensation and restitution. It is now expedient for oil and gas companies to re-evaluate their policies and practices on health, safety and environmental policies and practices to conform to the guidelines.'[41] Going by the claims of the operators and shareholders of the companies that own the pipelines, it appears to imply that, pipeline integrity failures are not to blame for the oil and gas leakages in Nigeria. It is difficult to verify the claims due to the lack of transparency in the Nigerian oil and gas sector. Some scholars, for example, *Kingston and Bagia*[42] have argued that:

Negligence in the oil and gas industries leads to several causes of action including environmental degradation and pollution. The regulation of the negligent conducts of the oil and gas corporations is globally identified as one of the challenges faced by most oil-rich developing countries. Simply put, it is possible that the operators of the oil and gas pipelines may have wilfully placed the liabilities of the oil spills on the criminals that sometimes rupture the pipelines. This may be the easy ways by which the oil firms are excluding and limiting liabilities. In spite of the significant role of petroleum pipeline in local petroleum products distribution and export in Nigeria, the mode over time has been faced with a lot of problems, which threaten the maximization of its benefits. The major threat to pipeline transportation of petroleum products in Nigeria is the issue of pipeline rupture and vandalization, which ultimately affect the safety of pipeline products; and the impact of product spillage on the environment. These threats were aptly acknowledged under the problems of the mining and quarrying sector which states: 'Events of the past years both at the domestic and international levels have demonstrated the extent to which mining activities, particularly in petroleum production, processing and transportation could be susceptible to such dangers as accidental spillage, pollution and wilful damage to installations.'[43] Once the concept of 'safe arrival' is broken in pipeline transport due to rupture or vandalization of pipelines, the contents are spilled, which have serious consequences on the environment, utilization rate of the system, product loss leading to scarcity, increased maintenance costs, delayed turn around of vessels as loading is hampered, high cost of distributing the products through the road mode as a result of 'bridging'

Vandalism of Oil Pipelines

The pipeline systems in Nigeria are deteriorating and are prone to natural ruptures due to lack of proper maintenance schedule. Also worrisome is the increasing cases of wilful destruction or blowing out of pipelines with the aim of sabotaging supply or stealing of products. This is called vandalization. Vandalism affects adversely the oil companies,

[38]Ibid
[39]Ibid
[40] The Environmental Guidelines and Standards for the Petroleum Industry in Nigeria (EGASPIN) was first issued by the DPR in 1991, subsequently revised in 2002 and at the 18th International HSE Conference on the oil and gas industry in Nigeria held on 26 to 28 November 2018, 'EGASPIN 2018' was launched
[41]KG Kingston & TM Bagia, 'Negligence in the Oil and Gas Industries in Nigeria: Is EGASPIN Socially and Legally Efficient?',*Port Harcourt Law Journal* 8(2) 21-28 (2019)
[42]Ibid
[43] Federal Republic of Nigeria (FRN) (1981) Fourth National Development Plan (1981-1985) Vol. I Lagos: Federal Ministry of National Planning, P.127-135 and 215-248.

government, and even the environment.According to the 2013 Annual Report of the Nigerian Extractive Industry Transparency Initiative (NEITI), Nigeria lost US$10.9 billion to oil theft between 2009 and 2011.[44]The rising cases of pipeline vandalization pose a national security problem given the length of the network itself and the adverse consequences of vandalization on the economy. In the 1990s, vandals, mainly unemployed youths operating in remote areas and communities through which oil pipeline pass, punctured the pipes or took advantage of ruptured or leaking pipes to syphon fuel or other petroleum products into drums, plastic containers or storage cans for sale on the black market. The technology employed was quite rudimentary, involving the use of funnels, drilling tools and plastic hoses to syphon the products. In recent times, pipeline vandalism has assumed an alarming rate mainly because of the increase in the frequency of attacks on these pipelines and the increased sophistication of the technology used.[45]As long as there are ready markets for stolen crude oil and petroleum products, vandalization will not cease. The presence of black marketing of petroleum products in Nigeria encourages the vandalization of pipelines. The siphoned products are sold at black markets locally and beyond the shores of Nigeria.

Pipeline Ruptures

This is another important challenge that affects the security of oil pipelines. It is a major contributor to oil spill incidents. Corrosion of pipes and tanks involves the rupturing or leaking of production infrastructure that is "very old and lack regular inspection and maintenance".[46] Corrosion plays a major role in oil spills because of the small size of the oilfields in the Niger Delta. Moreover, there is an extensive network of pipelines between the fields as well as numerous small networks of flow lines allowing many opportunities for leaks.[47] In onshore areas, most pipelines and flow lines are laid above the ground.[48] Pipelines, which have an estimated life span of about 15 years, are old and susceptible to corrosion.

Pipeline Damages and Sabotage

Deliberate sabotaging and the damage of pipelines are compromises to the security of oil pipelines. Pipelines also are sources of spills, leaks, and fires. Some pipelines are used beyond their life span.[49]Environmental pollution caused by oil pipeline spills could result from human factors to material defects: pipe corrosion, ground erosion, tectonic movements on the bottom, and encountering ship anchors and bottom trawls. Indeed pipeline defects could be the source of small but gradual to long-term leakage or leakage that might lead to an abrupt explosion. In Nigeria, interfering with oil pipelines and installations has assumed huge dimensions and a variety of forms. There are three major identifiable forms, namely, illegal oil bunkering, oil pipeline vandalism and scooping, and oil terrorism. Compared to oil bunkering and pipeline vandalism, oil terrorism[50] is a new vocabulary introduced by security analysts and scholars to describe the deliberate attack on pipeline systems in Iraq and elsewhere in the world by militias, freedom fighters, and insurgents. The penalty for the offence of sabotaging oil pipelines in Nigeria is a very serious one. Section 2 of the Petroleum Production and Distribution (Anti-Sabotage) Act Cap P12 LFN 2004 provides that if a person is convicted, he is to be sentenced either to death or to a maximum term of 21 years imprisonment. The provision of this Act is stringent enough to constitute a deterrent to would-be economic saboteurs. It is doubtful, however, if this provision has ever been enforced.

Illegal Oil Bunkering

Nigeria's most profitable illegal private business in the petroleum industry is illegal oil bunkering. Bunkering is the process of filling a ship with oil (or coal). Illegal oil bunkering, therefore, is a euphemism for oil theft.[51] It involves tapping crude oil straight from the pipelines. Illegal oil bunkering is a dangerous process that persists in the creeks of the Niger Delta where oil pipelines form a grid. Stealing oil from pipelines in the creeks involves building a temporary

[44] N. Onoja, 'Nigeria loses $11bn to oil theft, vandalism-NEITI', *The Vanguard* (30 July 2013). accessed 13 September 2017.

[45] F. C. Onuoha, 'Oil Pipeline Sabotage in Nigeria: Dimensions, Actors and Implications for National Security' (2008) 17 *ASR* 99.

[46] F. C. Onuoha, 'Oil Pipeline Sabotage in Nigeria: Dimensions, Actors and Implications for National Security' (2008) 17 *ASR* 99.

[47]Ibid

[48]Ibid

[49] An estimated 15 years life span.

[50] A. J. Alawode, & I. O. Ogunleye, 'Maintenance, Security, and Environmental Implications of Pipeline Damage and Ruptures in the Niger Delta Region' (2011) 12 *PJST* 565.

[51] Human Rights Watch,'Illegal Oil Bunkering' accessed 13 September 2017.

enclosure around a small portion of the underwater pipe, pumping out water from the enclosure, drilling a hole into the steel casing of the pipe through which the crude passes, and fitting the hole with a pipe and control valve.[52] The creek water is then allowed to flow back and fill the enclosure so that the set-up is underwater and, therefore, hidden from oil company inspectors.[53] When crude oil is being pumped through the pipelines, sometimes at a pressure of 600 pounds per square inch (psi), the thieves are able to fill up to a 1,000 metric tonne barge within hours.[54] The barge is afterwards moved offshore to a ship used for transportation and the oil sold on the high seas.[55] Illegal oil bunkering also involves tapping directly into pipelines at a site removed from oil company facilities and connecting the pipes to barges that are hidden in small creeks under the cover of mangrove forests.[56] It is said that over 10 per cent of the oil exported from Nigeria every year is actually illegally bunkered.[57] Oil bunkering is now an activity that does not necessarily require the assistance of oil company staff to operate the equipment at the wellheads or allow access.[58]

Oil Terrorism

Oil terrorism is the latest of the ills plaguing the Nigerian oil industry. It involves such acts as the blowing up of oil pipelines, installations and platforms with explosives; and the seizure of oil barges, oil wells, flow stations, support vessels, and other oil facilities in order to prevent the exploitation and/or distribution of crude oil or its refined products.[59] The first act of oil terrorism can be traced to December 2005, when the Movement for the Emancipation of the Niger Delta (MEND) blew up Shell's Opobo Pipeline in Delta State.[60] In September 2005, after the arrest of Alhaji Asari Dokubo,[61] militant groups in the Delta region instructed all multinational oil companies to leave the region, as they were preparing for a war with the Nigerian government. Since then militants in the region, seeking to control a greater share of the nation's oil wealth, have adopted a terrorist strategyto impair the capacity of the petroleum industry to export crude oil. By doing so, they hoped that the federal government would lose the substantial revenue needed to sustain the machinery of government, and so be forced to meet their political, economic, and environmental demands of their people.[62]

Inadequate Legal Framework on Oil Pipeline Security and Weak Enforcement

Another key problem in this critical sector of the economy is the lack of diligent enforcement of extant laws that speak to the problem of pipeline destruction and sabotage. For example, Section 1 of the Petroleum Products and Distribution (Anti-Sabotage) Act of 1975 outlaws sabotage, i.e. the willful act of destroying, damaging, or obstructing petroleum installations and transportation infrastructure, thereby hindering petroleum production and distribution processes.[63] This Act makes the willful obstruction or prevention of petroleum production and distribution an offence in Nigeria.[64] The Act criminalizes all acts that disrupt petroleum production and distribution such as pipe vandalism, blow-ups, obstruction of petroleum production or distribution; obstruction of the procurement of petroleum products; or the obstruction of vehicles distributing petroleum products such as motor spirits, gas oil, diesel oil, automotive gas oil, fuel oil, aviation fuel, kerosene, liquefied petroleum gases and any lubricating oil or greases or other lubricant. Under this Act, the offence of sabotage is punishable by a death penalty or a term of imprisonment not exceeding 21 years.[65] This Act seeks to punish the principal offender, as well as anyone who aids, incites, counsels or procures any other person, to commit an act of sabotage, whether or not that other person actually does the act in question or not. Although the blow-up and vandalization of petroleum distribution pipelines, a principal cause of oil spillage in the Niger Delta, has been outlawed by this Act, only a few arrests and prosecutions have ever been carried out under this law. Lack of committed enforcement of this anti-sabotage legislation has resulted in a culture of impunity in the Niger

[52] FC Onuoha (n 43).
[53]Ibid.
[54]Ibid.
[55]Ibid.
[56]Ibid.
[57]Ibid.
[58]Ibid.
[59]Ibid.
[60]FC Onuoha (n 43).
[61]The leader of the Niger Delta Peoples Volunteer Force, who is widely regarded as a leader of the Ijaw nation.
[62]FC Onuoha (n 43).
[63]Petroleum Products and Distribution (Anti-Sabotage) Act of 1975, Laws of the Federation of Nigeria 2004, p. 12.
[64]Ibid.
[65]Ibid.

Delta region. To ensure oil pipeline security in Nigeria, all cases of pipeline sabotage must be thoroughly investigated, while full criminal penalties prescribed by the law must be applied in all proven cases.

Another problem is that there is no single comprehensive, specific law dealing with oil pipeline security in Nigeria. An examination of Nigerian legal framework on pipelines laws reveals that they only have provisions that relate to the general management of oil pipelines and those provisions that give limited roles to organizations such as the Nigeria Security and Civil Defence Corps (NSCDC) to secure oil pipelines. Although relevant laws exist that relate to the general management of oil pipelines, none of them comprehensively addresses the key causes of, and provide solutions to, the problem of pipeline insecurity in Nigeria.[66] For instance, while sabotage is addressed in existing laws, none of the laws addresses other causes of pipeline insecurity such as negligent construction, accidental ruptures, oil terrorism and illegal bunkering. Considering the critical roles that oil pipelines play in Nigeria's oil dependent economy, and in the oil and gas industry, there should be a separate law that deals solely with the all-important issue of pipeline security in the country. There is a need for a focused and committed effort towards ensuring that issues relating to pipeline security are squarely and elaborately dealt with.

4. Promoting Pipeline Security in Nigeria

Given the strategic importance of pipelines in Nigeria and the potential threat to its security, certain urgent steps should be taken to address issues revolving around the security of pipelines. These are discussed in the subsequent sub-sections.

Legal Provisions on Pipeline Integrity Methods

The Petroleum Industry Act provides for pipeline integrity methods in transportation of liquid crude which reduces cases of pipeline corrosion. Pipeline integrity methods include visual inspection, depth of cover survey, External NonDestructive Testing (NDT), cathodic protection monitoring, coating disbandment and damage survey, hydrostatic testing, geometry In-Line Inspection (ILI) tools, and ultrasonic in-line inspection tools.[67] The pipeline network must be rigorously tested to ensure that they meet safety guidelines. When detected, these defects can be repaired. These procedures help identify specific types of defects, such as corrosion, the wastage or thinning of the pipe wall due to a chemical or electrochemical attack, gouging, the mechanical removal of metal from a local area on the surface of the pipe, metallurgical anomalies like hard spots, laminations, slivers, scabs and inclusions, and cracks due to fatigue stress corrosion and weld defects. Notably, hydrostatic testing is the predominant method for ascertaining the strength and reliability of a pipeline section that may be put into active service.[68]

Need for Indigenous Companies to Operate Oil Pipelines

The Petroleum Industry Act supports indigenous oil companies to operate and manage oil pipelines as well as encourage effective participation of Nigerians, especially the local residents along the pipeline routes are located, in developing community surveillance initiatives to protect oil pipelines. When local communities invest in or operate pipelines in their communities, it gives them agreater sense of belonging, therefore motivating them to protect their investments from destruction. Indigenous ownership of pipelines could also lead to employment opportunities for local residents and in the long run reduce sabotage and other destructive activities. To participate in oil pipeline development activities, indigenous companies can apply under the Petroleum Industry Act (PIA)[69] to the Midstream and Downstream Petroleum Regulatory Authority who have the authority to grant "permits to survey routes for oil pipelines" and 'licenses to construct, maintain and operate oil pipelines'[70] for their licences and permits. The Act allows any person to make an application to the Authority for a permit to survey for oil pipelines.[71] It is a fact,that many high profile indigenous and foreign oil companies operate in different parts of the Niger Delta. Nigeria enacted the Nigerian Oil and Gas Industry Content Development Act, 2010, which encourages the development of Nigerian content in the Nigerian oil and gas industry.[72] The Act provides that: Nigerian independent operators shall be given

[66]Examples are: Oil Pipelines Act Cap. O7 L.F.N. 2004 (Oil Pipelines Act); Petroleum Act Cap.P10 L.F.N. 2004; Nigerian National Petroleum Corporation Act Cap N123 LFN 2004 (the NNPC Act).

[67]A. J. Alawode & I. O. Ogunleye.

[68]Ibid.

[69]Petroleum Industry Act, L.F.N 2022.

[70] Section 111, Ibid.

[71]Section 114, Ibid.

[72]See generally the provisions of the Nigerian Oil and Gas Industry Content Development Act, 2010.

first consideration in the award of oil blocks, oil field licences, oil lifting licences and in all projects for which contract is to be awarded in the Nigerian oil and gas industry subject to the fulfilment of such conditions as may be specified by the Authority[73] This provision states that indigenous oil companies will be given first consideration where the award of contracts to maintain oil pipelines is carried out so far as they meet the specifications provided for by the minister of petroleum resources.

Need for a Comprehensive Review of Oil Pipeline Security in Nigeria

Security of oil pipelines has been reviewed by the Petroleum Industry Act. There is the need for an all-encompassing enforcement to deal with this issue of security of oil pipelines squarely. This comprehensive enforcement will have detailed procedure on oil pipeline security and encourage the regulatory agency to implement the provisions of this law religiously. The law should also harmonize the punishments for violating the security of pipelines as contained in several other laws in Nigeria. This calls for a supervision of existing laws on oil pipelines security. The Nigerian Petroleum Midstream and Downstream Regulatory Authority with the sole responsibility for oil pipelines security in Nigeria should be alive with its responsibility. This Authority must be well funded and equipped with the right technology to effectively monitor and secure the pipelines. The Authority can utilize a multi-agency approach to coordinate activities of several relevant security agencies and other stakeholders (especially the oil companies) for operational efficiency.

Proper Funding and the need for Requisite Technology to Secure Oil Pipelines

Relevant security agencies such as the Department of State Security, Army, the police and the Nigerian Security and Civil Defense Corps as well as the communities need to be well-equipped to secure the pipeline networks in Nigeria effectively. Proper funding of the security agencies motivates them to carry out their responsibilities efficiently. A major challenge that usually inhibits their effectiveness is corruption. Security agents can be easily compromised and made to relax on pipeline security. A good remuneration package could make them more effective in their surveillance work. Moreover, the security agencies protecting critical infrastructure such as oil pipelines should also have the latest technology to protect the pipelines. Oil pipelines are long and cover great distances. Use of drone technology would be appropriate for the surveillance of these oil pipelines. There is the need for all security agencies to collaborate to rid the nation of oil theft. The government should give strong encouragement to this. Finally, since Nigeria is not the only oil-producing country in the world, the government should adopt the best international practices from the developed countries so as to overcome hindrances of this nature once and for all.

Proper Funding and the need for Requisite Technology to Secure Oil Pipelines

Relevant security agencies such as the Nigerian military, the police and the NSCDC need to be well-equipped to secure the pipeline networks in Nigeria effectively. Proper funding of the security agencies motivates them to carry out their responsibilities efficiently. A major challenge that usually inhibits their effectiveness is corruption. Security agents can be easily bribed and made to compromise pipeline security. A good remuneration package could make them more effective in their surveillance work. Moreover, the security agencies protecting critical infrastructure such as oil pipelines should also have the latest technology to protect the pipelines. Oil pipelines are long and cover great distances. Use of drone technology would be appropriate for the surveillance of these oil pipelines. There is the need for all security agencies to collaborate to rid the nation of oil theft. The government should give strong priority to this. Finally, since Nigeria is not the only oil-producing country in the world, the government should adopt best oil and gas international operational standard practices from the developed countries so as to overcome hindrances of this nature once and for all.

Need for a Structured 'Multi-Agency Security Response Approach (MASRA)' to Oil Pipeline Security in Nigeria

The Multi-Agency Security Response Approach (MASRA) simply implies the coming together of all relevant security agencies in a formal and organized manner to deal with all issues relating to oil pipelines security in Nigeria. This approach can be backed up by an Act of the Nigerian National Assembly or may result into an agency created by the federal government to deal with oil pipelines security issues. This was the approach that government used to deal with corruption when it created the Economic and Financial Crimes Commission (EFCC) and Independent Corrupt Practices Commission (ICPC). Top officers of these agencies were recruited from the police, customs and similar

[73]Nigerian Oil and Gas Industry Content Development Act, 2010, s 3(1).

security formations in the country. This approach will ensure proper coordination of efforts and the sharing of intelligence to deal with every kind of sabotage of the oil infrastructure. Organizations such as the Nigerian Army, Nigerian Police; Nigeria Security and Civil Defence Corps and other relevant security organizations would be needed for this approach to be successful. These security agencies must be properly funded, and must have requisite skills and technology at their disposal.

5. Conclusion

The Petroleum Industry Act is a welcome development. It has vested the Nigerian Midstream and Downstream Petroleum Regulatory Authority with a supervisory role in the licensing, construction, operation and management use of pipeline transportation which is safer, faster, efficient, less risky and secured. It is also recommended in any economy that is endowed with oil and gas reserves, not only for export but also for internal consumption at minimum transport cost. The pipeline mode in Nigeria should be made to play its desired role as the primary transport mode for petroleum products within the country while other modes such as rail, water and road should serve as the secondary transport modes both in theory and practice. The government should accord the pipeline mode the right priority in terms of funding, maintenance, management and legal cost that will make pipeline transportation effective and efficient. Oil and gas are strategic to the Nigerian economy, and oil and gas pipelines which are used for the transportation of oil and gas resources must be safe, secure and well protected. Issues surrounding security must not be taken lightly especially given the pivotal importance of the petroleum industry to the Nigerian economy and society. Pipeline integrity should be given utmost attention by the Authority: Basically every pipeline integrity management platform should be a reliable procedure for recognising the pipeline segments and disaster mode that are likely to affect a high risk area, most especially the Niger Delta Areas where pipelines vandalization are rampant, with or without warning from militants. Frequent review of strategy, procedures and parameters for the measurement and evaluation to preserve pipelines integrity, identification of precautionary and extenuation measures for protecting the high risk areas must be paid attention to by the Authority.