

Security of Infrastructure and Implications on the Economy: A Theoretical Consideration based on Nigeria's Maritime, Oil and Gas Sectors

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Abstract: The maritime, oil and gas sectors account for over 90% of Nigeria's revenue. This paper presents an overview of maritime security challenges and its effect on the Nigerian economy, using the oil and gas sector as a reference. It utilised secondary data from shipping companies, oil and gas companies, as well as security agencies to establish the relationship among piracy, armed attack, and kidnapping in Nigeria's territorial waters and Nigeria's economy. It was established that armed attack in its various forms has a negative impact on Nigeria's economy. The conclusion and recommendations from this study will help the Nigerian Government develop policy frameworks that will enhance the security of the maritime, oil and gas sector with an attendant improvement in the Federal Government revenue generation and Foreign Direct Investment (FDI).

Keywords: Maritime, Security, Oil and Gas, Economy, Infrastructure.

INTRODUCTION

A primary concern of any responsible government is the provision of facilities or services that enhance the well-being of her citizens. However, the impact of the presence or absence of these facilities or infrastructure on the citizen is to different degrees, highlighting the "criticality" of infrastructures do not have the same level of impact on the citizens. The Commission of the European Communities describe critical infrastructure as "those physical and information technology facilities, networks, services and assets whose disruption or destruction have serious impact on the health, safety, security, or economic wellbeing of citizens or the effective functioning of governments [1]. Following from the above, it could be argued that the infrastructures within the Nigerian transportation (maritime) and oil and gas sectors could be considered as critical infrastructures.

The above position is further strengthened by the observation in [2] that the maritime, oil and gas industries accounts for over 90% of Nigeria's revenue; and with a coastline of over 832 kilometres, an expansive coastal and international shipping activity, Nigeria has a leading sub regional market share volume and value of liner and tram traffics, high crude oil and gas tanker traffics. Again, according to [3], Nigeria ranked as the largest oil producer in Africa and the world's fourth leading exporter of liquefied natural gas (LNG) in 2012, This assertion is supported by the

observation by the Nigerian National Petroleum Corporation that with a crude oil production capacity of 2.5 million barrels per day, Nigeria ranks as Africa's largest producer of oil and the sixth largest oil producing country in the world [4]. It has been observed by authors such as [5] that the presence of natural resources, especially oil and gas, plays an important role in national development strategy. To further strengthen Nigeria's position as a major player in the international gas market, a framework for gas infrastructure expansion within the domestic market with a view to influencing commercial exploration and management of Nigeria's gas sector, thus positioning Nigeria competitively in high value export markets, and guaranteeing a long term energy security for Nigeria [6].

As the delivery of the products from the all-important oil and gas sector is done through transportation networks, transportation could therefore be considered the most significant and impactful of all critical infrastructures; and seaports, being a subset of the transportation infrastructure is therefore a key component of a nation's critical infrastructures [7]. As such, transportation infrastructures have become frequent targets of terrorist attacks as damages and destruction of these have quick ripple effects on the economy [7]. This is reflected in the number of attacks against international shipping asset within the first two month of 2012 [8], as well attacks on foreign ships in

Nigerian waters in September of the same year [9]. The cumulative effect of these attacks is a higher level of maritime insecurity, such that the transportation of

goods through maritime channels is exposed to higher risks which are invariably factored into shipping costs and marine insurance premiums [10].

Table 1: World Seaborne Trade (Millions of tons)

Area	Year	Goods loaded			Total goods loaded	Goods unloaded			Total goods unloaded
		Oil & gas		Dry cargo		Oil & gas		Dry cargo	
		Crude	Petroleum product and gas ^a			Crude	Petroleum product and gas ^a		
World total	2006	1 783.4	914.8	5 002.1	7 700.3	1,931.20	893.7	5,053.40	7,878.30
	2007	1 813.4	933.5	5 287.1	8 034.1	1,995.70	903.8	5,240.80	8,140.20
	2008	1 785.2	957	5 487.2	8 229.5	1,942.30	934.9	5,409.20	8,286.30
	2009	1 710.5	931.1	5 216.4	7 858.0	1,874.10	921.3	5,036.60	7,832.00
	2010	1 787.7	983.8	5 637.5	8 408.9	1,933.20	979.2	5,531.40	8,443.80
	2011	1 759.5	1 034.2	5 990.5	8 784.3	1,896.50	1,037.70	5,863.50	8,797.70
	2012	1 785.7	1 055.0	6 356.0	9 196.7	1,929.50	1,055.10	6,203.80	9,188.50
	2013	1 755.3	1 088.5	6 704.4	9 548.2	1,889.50	1,090.60	6,524.90	9,505.10

Source: Compiled by the UNCTAD secretariat on the basis of data supplied by reporting countries, as published on the relevant government and port industry websites and by specialist sources. Historical statistics on world total volume of international seaborne trade are available electronically at <http://stats.unctad.org/seabornetrade>. Figures for 2013 are estimates based on preliminary data or on the last year for which data were available.

^a Including LNG, LPG, naphtha, gasoline, jet fuel, kerosene, light oil, heavy fuel oil and others.

Maritime transport has contributed substantially to world trade and economic growth; and these contributions have been noted. Rodrigue, Notteboom and Slack [11] note for instance, that maritime transport is a dominant support for global trade. A reasonable inference to be drawn from available information and data is that maritime transport is the backbone of international trade and a major driver of globalization. This argument is supported by [12, 13] who note that about 80% of global trade by volume and over 70% by value are achieved at maritime; these

shares are even higher in the case of most developing countries. **Table 1** above is an indication of the global seaborne trade.

The local scenario in Nigeria is equally in line with the global trend. In terms of volume of cargo, [14] notes that a substantial volume of cargoes imported into Nigeria is through the maritime channels. **Table 2** below is a summary of the maritime transport indicator for Nigeria [15].

Table 2: Maritime Transport Indicators for Nigeria

	2005	2010	2013
Merchant fleet, national flag (thousands DWT)	691	989	3 302
Liner Shipping Connectivity Index (max 2004 = 100)	12.79	18.28	21.35
Container port throughput (TEU)	..	101 007	1 010 836

Source:[15]

Much of the oil and gas exploration and or refining activities in Nigeria are concentrated within the Niger Delta region [16]. These activities have obvious costs associated with them [17, 18]. Motivated by the level of degradation of the environment, Niger Delta activists and other pressure groups have advocated for a commensurate investment in remediation of the environment by both government and oil companies. However, the perceived inability of the Government to positively address the agitation over deprivation from

the oil share as well as environmental pollution has led to wide scale militancy, where seafarers, oil and gas workers, vessels, oil installations and facilities offshore became the targets of attack [19]. The consequence of piracy and vandalism of oil and gas infrastructure such as the petroleum pipeline which [20] consider a highly specialized and essential mode of transport, is that activities in the oil and gas industry to a standstill, resulting to failure to provide maximum customer service at the lowest cost possible.

In view of the foregoing, this study aims to create a better understanding of the economic implication(s) of maritime security challenges in Nigeria's, using the oil and gas sector as a reference point with a view to identifying solutions to these challenges.

Justification

The maritime, oil and gas sectors are the largest sources of revenue for Nigeria, and justifiably, have been the focus of many studies. For instance, [21, 22] focused on the disruptions and challenges (such as lack of proper integration of activities and information technology) facing the industry. Another study, [23] on maritime safety and environmental pollution from the oil in Nigeria focused on vessel conditions and qualified crew. In all these, little or none was done on the impact of maritime security challenges on oil and gas supply chain logistics on the Nigeria's economy. This paper fills this gap in knowledge. Furthermore, it not only seeks to convey an in depth understanding of maritime security issues and its effect on the maritime, oil and gas transport sector, but also to highlight the challenges faced by the Government in proffering direct intervention to these security challenges as a means of preventing future occurrences. The conclusions and recommendations will be beneficial to academic, government/policy makers and all stakeholders in the Maritime, oil and gas sector of Nigeria.

LITERATURE REVIEW

Oil and Gas Supply Chain Logistics

A good starting point for any discussion on supply chain logistics would be an establishment of

what supply chain and supply chain management is all about. A supply chain is an assemblage of retailers, distributors, transporters, storage facilities, and suppliers involved in the production, sales, and delivery of products and services. The key activities carried out in a typical supply chain are the supply of raw materials to the point where it would be converted into finished products, and the movement of these products to consumers. Supply chain management describes the coordination of production, inventory, location and transportation among participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served [21].

Logistics is a customer satisfaction oriented aspect of management [24], that is concerned with getting the right quantity and quality at the right time, to the right place in a safe, secure and cost effective manner in order to satisfy customers. Coyle, Bardi and Langley [25] observe that logistics management is concerned with the management of the flow of goods between the point of origin and the point of use in order to meet the requirements of the targeted market. Other authors view logistics management from cost management perspectives. For instance, [26] describe logistics and supply chain as a process which merges both the internal and external units of a system in order to minimise cost and maximize profit. **Figure 1** below is a schematic of a typical oil and gas supply chain showing the connection and the interaction of the various activities within the chain. An attack on any of the nodes/activity affects the whole chain; none of the activities can be treated independently and must be integrated for efficiency.

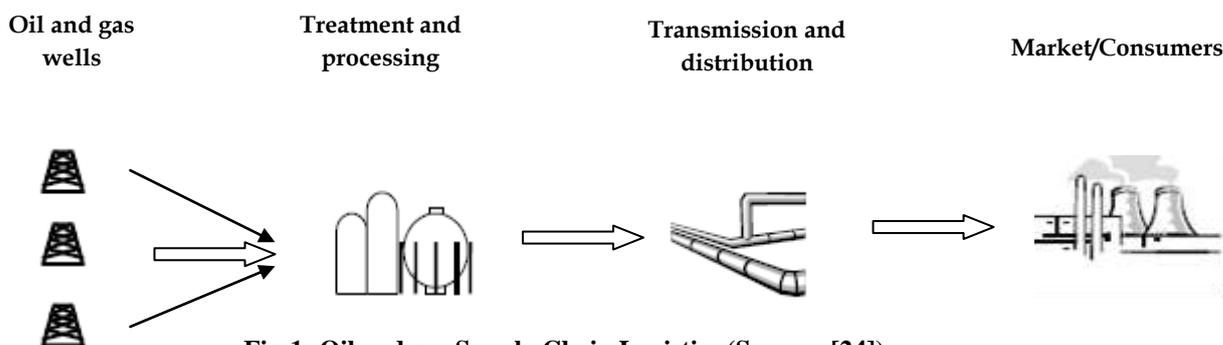


Fig-1: Oil and gas Supply Chain Logistics (Source: [24])

However, to be able to achieve this, certain skill sets are needed. For instance, [27] is of the view that logistics skills (in terms of the movement of product and information, cost management, time and service management, integration of systems and people, security of product and processes, teamwork) makes supply chain management a success. This suggests that the absence of any of these creates gaps potential for delays, errors and failures in the supply chain process.

Overview of Maritime Security

Onuoha [28] defines maritime security as the freedom from or absence of those acts which could negatively impact on the natural integrity and resilience of any navigable waterway or undermine the safety of persons, infrastructure, cargo, vessels and other conveyances legitimately existing in, conducting lawful transactions on, or transiting through territorial and international waterways.

Insecurity across maritime channels refers acts of piracy and armed robbery at sea, theft of oil and other cargo, illegal, unreported and unregulated fishing, as well as trafficking of counterfeit items, people, narcotics and arms [29] that take place across maritime channels.

The level of security within maritime channels is also seen as critical to the achievement of optimum benefits along maritime channels [30]. However, the ability to deliver on this could be impacted upon by either or both internal and external factors. According to [28], disturbances in internal factors such as the quality of the waters, aquatic life among others through deliberate actions such as dumping of toxic wastes etc., others could threaten the intrinsic dimension of maritime security. The external dimension of maritime security concerns the safety of vessels, persons and infrastructure, which do not form part of the basic and essential features of the marine ecosystem but which are of value to a state or entity which has the legal right to make use of the maritime domain[28].

Nigeria's maritime security threats can be grouped under criminal piracy, militant attacks and organized crimes [31]. However, there could be overlaps between the various threat components in the region. For example, a group of militants may also conduct organized criminal activities in the form of crude oil theft; these may equally be involved criminal piracy or kidnap for ransom when they need to generate funding to support their other activities. Stephen [31] further notes that criminal piracy could manifest in the form of armed attack (militant/criminal piracy), sabotage (militancy), armed robbery (militancy/criminal piracy), cargo theft (organized crime), bunkering - oil theft and illegal export (organized Crime), as well as kidnap for ransom (criminal piracy/militancy).

Piracy and Oil Theft

In its most basic form, piracy is "the practice of attacking and robbing ships at sea" (www.oxforddictionaries.com/definition/english/piracy). However, inference from other descriptions is that piracy is far more encompassing than this. For instance, excerpts from Article 101 of the United Nations Convention on the Law of the Sea [32] show that piracy could manifest as: (i) illegal acts of violence or detention, or any act of depredation, committed for private ends either by the crew or the passengers of a private ship or a private aircraft, and directed on the high seas, against another ship or aircraft, or against persons or property on board such ship or aircraft as well as against a ship, aircraft, persons or property in a place outside the jurisdiction of any State; (2) any of voluntary participation in the operation of a ship or of an aircraft, in spite of a prior knowledge that it is a

pirate ship or aircraft; and (3) acts capable of inciting or facilitating any of the acts described in (1) or (2) above. There are observations that the above definition by the United Nations falls short of protecting ships and maritime assets in territorial or coastal waters from piracy and criminal attacks [33, 34]. Hence the modification of this definition by organizations such as the International Maritime Organization (IMO) and the International Maritime Bureau (IMB) [35, 36] to include armed robbery against ships or at sea, inclusive of attacks carried out within territorial waters, internal waters, as well as vessels in ports.

The sharp rise in piracy in West Africa, particularly in the Gulf of Guinea and on the Nigerian waters, has featured prominently in recent news. Nonetheless, pirates in different locations often have different intentions, as could be demonstrated in Nigeria where militants and pirates attack oil and gas offshore installations, either to kidnap crew members for ransom purposes, or to hijack product tankers to steal their lucrative cargo. **Figure 2** below shows areas of with actual and attempted incidents piracy and armed attacks on ships with the Gulf of Guinea. **Figure 3** below shows expanding operational area of Nigerian kidnapping for ransom groups, 2009 through January 2014.

Piracy Activity in Nigeria: Style, Trend and Gain

According to [38], pirates operating within Nigeria's territorial waters typically operate in groups of 4-10, exhibiting impressive level of maritime domain awareness. There are insinuations that these pirates usually monitor the routes target vessels (between oil fields, terminals, and ports), taking note of their schedules and observable security measures. They equally access the vessel information provided to onshore agents, as knowledge of crew composition and nationality is particularly important for assessing the value of potential hostages. Bridger [38] further suggests that although tankers, bulk carriers, tugs and cargo ships are also targeted by pirates, the offshore support vessels are their favourites because of their slow speeds, low freeboards, and predictable routes; with the attackers firing on these vessels and attempting to board using ladders and hooked ropes.

Figure 4 shows the rates of maritime and riverine criminal activities within Nigeria's territorial waters between January 2007 and July 2011. It could be seen that these activities peaked around March-April, 2009, declining after the commencement of the Niger Delta amnesty programme by late President Umaru Musa Yar'Adua, and increasing again after his death, perhaps due to the uncertainty that surrounding who would take over.

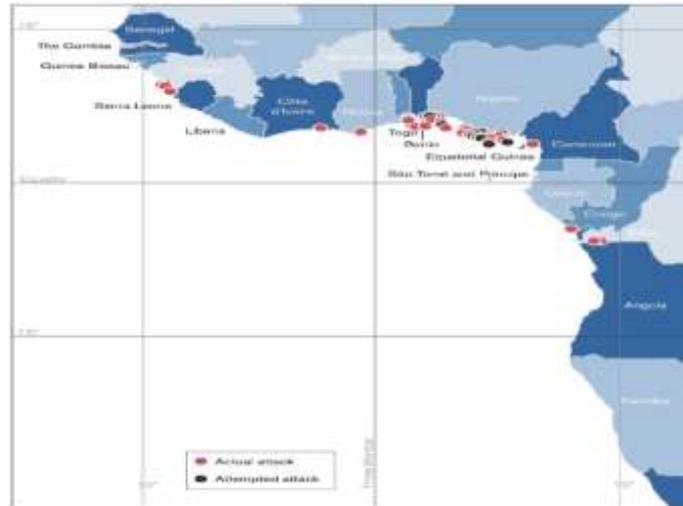


Fig-2: Actual and attempted incidents of piracy/armed robbery in the Gulf of Guinea, 2012 Source: [29]



Fig-3: Area of Nigerian kidnapping for ransom groups (Source: [37])

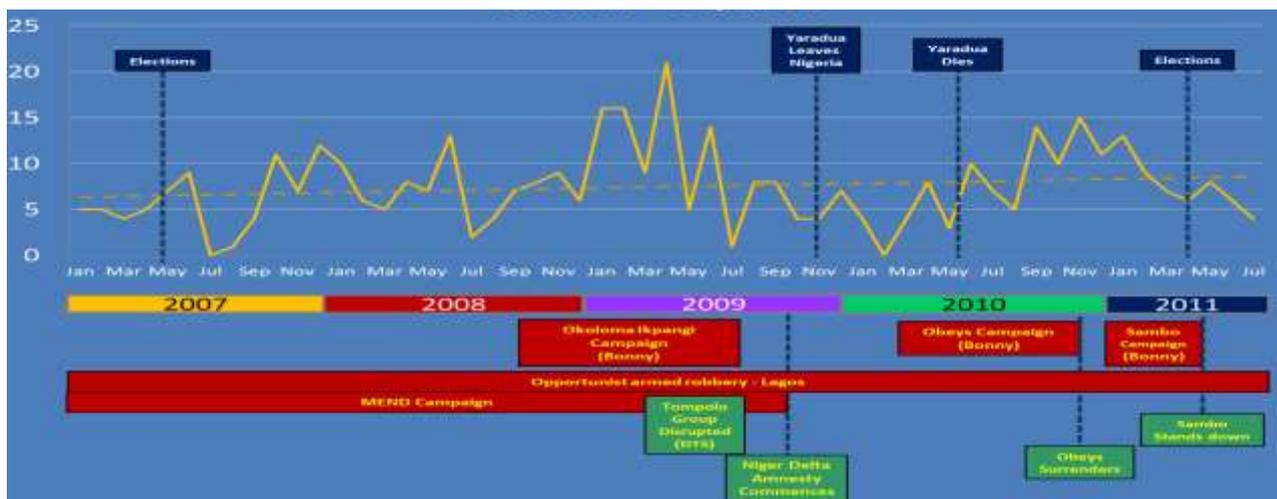


Fig-4: Monthly Maritime and Riverine Criminal Activity Rates for Nigeria (Source: [31])

Furthermore, it should be noted that although the commencement of the amnesty programme brought piracy, organised crimes and militant attacks to a minimal, this was not sustained as most of the militants

became unhappy with the implementation of the programme. This is clearly seen in the table below which highlights few fatal pirate attacks between 2012 and 2014.

Table 3: Fatal Nigerian Pirate Attacks, 2012-2014 (Source: [38])

Date & Location	Incident Details	Casualties
February 13, 2012. 100 nautical miles South of Lagos, Nigeria	Pirates fired on, boarded, and robbed a drifting bulk carrier, MV <i>Fourseas</i> , off the coast of Nigeria. The pirates killed the ship's master during the robbery, while the chief engineer died from injuries sustained during an attempted escape.	Master and chief engineers killed
August 3, 2012 45 nautical miles SW of Bonny Island, Nigeria	Pirates armed with AK-47 overpowered the Nigerian naval personnel guarding an oil barge, <i>Jascon 33</i> , and kidnapped four crew members for ransom.	Two Nigerian guards killed, two guards injured, four crewmembers kidnapped
December 13, 2012 25 nautical miles SW offshore, Bayelsa, Nigeria	Pirates armed with machine guns attacked an offshore supply vessel, PM <i>Salem</i> , and engaged in a 20-minute fire fight with onboard security guards before retreating	One Nigerian guard killed, one guard injured
Feb. 4, 2013. Lagos Anchorage, Nigeria	Pirates attacked and boarded an anchored chemical tanker, <i>Pyxis Delta</i> , conducting STS operations off Lagos. The on board naval security returned fire and eventually repelled the attackers	One crewmember died from injuries sustained during the fire fight. Two pirates were also killed
Feb. 5, 2013. Near Angiama, Niger Delta waterway, Nigeria	Gunmen ambushed an Indian-owned oil barge as a Nigerian military detachment escorted the ship through the Niger Delta.	Two Nigerian soldiers killed, one crewmember killed, three crewmembers wounded
April 29, 2014. 35 nautical miles W offshore Bayelsa, Nigeria	Armed pirates boarded a product tanker, <i>SP Brussels</i> , under way. The on board security forces fired at the pirates before retreating to the citadel along with most of the crew.	Chief engineer killed, third officer wounded. Two pirates were also killed.

Maritime Security Challenges and attendant Cost to the Economy

According to [39], maritime security aims at ensuring freedom from dangers associated with activities around the maritime sector, however, insights from available information is that this has not been as effective as it should be. There are suggestions of high level of insecurity along the waters off Africa's west coast [40]. This perhaps substantiated by the annual Human Cost of Maritime Piracy report noted that more seafarers were attacked in West African waters than off Somalia's coast in 2012 [41]. With specific reference to the oil and gas sector, [40] observes that maritime security is essential to maintaining the flow of revenues from oil and gas, and this has the potential to contribute significantly to development of the region. On a global level, [42] notes that piracy costs the global trade about

US\$12 billion annually, with the primary target being the oil and gas industry.

Disruptions to the oil and gas supply chain due to piracy are catastrophic, as Nigeria's oil and gas supply chains become exposed to risks that have significant impact upon production lines, causing shortfalls in crude oil and petroleum product output levels and by extension, having a negative effect on the Nigerian economy. For instance, [30] notes that the insecurity in Nigeria's territorial waters led to a reduction in oil production with an estimated cost of US\$202 million between 2005 and 2008, and US\$9 billion dollars lost to maritime piracy. Another source has it that the insecurity of oil and gas infrastructure has huge financial implications on Nigeria, with an estimated US\$15 billion is lost annually to bunkerers and vandals in Nigeria [43].

There are both direct and indirect costs associated with maritime piracy. Although it has been observed that the overall cost of piracy was lower in 2012 than in 2011, overall economic cost of maritime piracy in 2012 stood at \$6 billion [44]. In noting that wilful damage of Nigeria's oil and gas infrastructure as crude oil theft and sabotage are major security risks to the country, [45] reports that between January 2009 and December 2011, about 10,473,114bbls of crude oil were lost due to pipeline vandalism and crude oil theft. And between February 2010 and February 2011 the Federal Government of Nigeria lost about N443 million due to continuous sea robbery and piracy attacks in Nigeria's territorial waters [46]. Apart from the costs from vandalised and stolen crude oil, there are also cost associated with procurement and maintenance of equipment as well as personnel cost. It was further noted by [44] that further economic costs of piracy result from additional travel days as a consequence of re-routing of ships; increased insurance costs/trip; increased charter rates caused by fewer tankers available due to longer time spent at sea reduces the availability of tankers; the cost of faster steaming through pirate-affected seas; and greater inventory financing costs for cargoes that remain longer at sea. It is equally observed that Nigeria spent about \$3.8 million per week by Nigeria to keep eight ships on patrol [47]

CONCLUSION

The Maritime, oil and gas market in West Africa is experiencing a period of significant growth in recent decades, however it is a region plagued by serious security challenges. As the global demand for energy supplies continues to increase and more emphasis is placed on African natural resources, it is crucial for all relevant actors to learn how to effectively protect energy infrastructure, employees and assets.

Nigeria as a West African state has in recent times become a hotspot for piracy, theft and illegal oil bunkering. The high-risk area where these attacks are now occurring, extending over 30,000 square miles, is simply too large to effectively patrol. The expansive maze of rivers, creeks, and jungle camps from which the kidnap gangs operate offers the criminals a similar geographical advantage and cover. The Amnesty Programme has reduced the rate and severity of attacks. However, the reduction is possibly not for a longer time, as former militants constantly threaten to return to the swamps and resume the insurgency in the face of the Federal Government's inability to deliver on its side of the amnesty deal. Nigerian and regional authorities have helped curtail tanker hijackings by implementing safe-zones around vulnerable anchorages, but little has

been done to suppress kidnap for ransom attacks off the Niger Delta.

The ambition to form a Coast Guard will likely continue to face political and institutional challenges, while the ambition of the Navy to meet the task it faces in the Exclusive Economic Zone (EEZ) may not be up to the challenge without significant international investment in training and support. Unless there is substantial social development and investment in infrastructure in the region, these armed attacks will still continue of Nigerian Maritime, oil and gas sector with an attendant growth in the Nigerian Economy as pointed by[38].

RECOMMENDATIONS

Piracy and associated maritime crimes jeopardise ocean commerce and transportation, hinder freedom of the seas, impede the lawful flow of commerce, and undermine regional stability. The realisation of this level of negative impact makes the countering this threat is a shared global responsibility.

Based on the finding of this study, find below the recommendations:

1. There is a great need to fight corruption at all levels of Government officials especially those in charge of the Maritime, oil and gas sector.
2. The Amnesty programme should be fully implemented as this will prevent Militants from attacking the maritime, oil and gas sector in Nigeria.
3. There is the high need for skilled manpower in the maritime, oil and gas security sector.
4. There is need for Nigeria to collaborate with other regional and international states to improve security in her maritime domains, oil and gas sector since it is the major source of revenue generation in Nigeria
5. There is the great need to train the maritime security agencies such as the Air force, Navy, Maritime police to help combat these crimes carried out on the Nigerian waters.
6. New sophisticated fleets should be added to these maritime agencies' fleets.
7. Political stability will help in curbing maritime security menace.
8. There should be a pre-transit risk and security assessment and requires up-to-the-minute information on pirate activity and vessel vulnerabilities.
9. Communication security is vital, as pirates are known to select their targets by obtaining route and cargo information.
10. Private maritime security guard is highly recommended as they have served other maritime

nations and oil and gas companies around the world.

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