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Maritime Security Threats and Sustainable Maritime Operations in Nigeria

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Abstract- ***The study examined the effect of maritime security threats on sustainable maritime operations in Nigeria. The independent variable's (Maritime security threats) dimensions comprised piracy, drugs/human trafficking and armed robbery at sea. The dependent variable (sustainable maritime operations) was measured with economic operations, social operations and environmental operations. The theories that underpinned the study included policy implementation theory and the theory of relative state autonomy: Cross-sectional survey research design was used for the study. Primary and secondary sources of data were used as the main data collection methods. Relevant primary data for this study were collected through structured questionnaire. The population of this study comprised the Nigerian ports, NIMASA, National Inland Water Authority and Nigerian Shippers Council (four-4 organisations). The study actually sampled 72 (i.e.,18 x 4) respondents and validly used 68 respondents (representing 94.44% response rate) for the study analysis. The reliability of the research instrument was validated with Cronbach Alpha threshold at 0 .70. The study used descriptive and inferential statistical tools to analyse the data. Specifically, multiple regression analysis of ordinary least square estimation was used to achieve the research objectives and test the hypotheses with the aid of SPSS 25.0. The study revealed that maritime sector organizations witness violent attacks on ships at sea, including theft, detention, and other unlawful acts committed by private individuals for private gain and that there is the plundering, hijacking, or detention of ships in international waters and these have evolved over the centuries but remains a challenge to international law. The study revealed that human traffickers recruit, transport, and exploit their victims via commercial shipping, fishing vessels, cruise lines, and private yachts—from ships at sea to coastal and inland ports and that maritime sector organizations are aware that drug trafficking is a global illicit trade involving the cultivation, manufacture, distribution and sale of substances which are subject to drug prohibition laws. The study revealed that armed robbery incidents underscore the need for enhanced security measures, surveillance systems, and coordinated responses to apprehend these maritime predators. The study concluded that: Piracy has negative and significant effect of on economic operations (t = -3.57); social operations (t = -2.11) and environmental operations (t = -2.12). ii. Drug/human trafficking has negative and significant effect on economic operations (t= -2.62); social operations (t= -3.27) and environmental operations (t= -2.19). iii. Armed robbery at sea has negative and significant effect on economic operations (t= -3.18); social operations (t= -2.97) and negative but insignificant effect on environmental operations (t= -0.29).***

I. INTRODUCTION

Maritime security encompasses the protection of vessels, port facilities, and maritime operations from various threats, including terrorism, piracy, and illegal activities, armed robbery at sea, hostage-taking, kidnapping for ransom, boarding offshore oil platforms, hijacking tankers requiring a multifaceted approach involving security measures, intelligence gathering, and international cooperation (Abiodun & Dahiru, 2020).

In Nigeria, maritime security threats like piracy, oil theft, and illegal fishing undermine sustainable maritime operations and economic development, impacting coastal communities and the blue economy. Addressing these threats through enhanced naval patrols, improved surveillance, and international cooperation is crucial for a safe and secure maritime environment (Abiodun & Dahiru, 2020).

Ensuring that maritime security and sustainable maritime operations are synergized is crucial for economic stability, international trade, and national sovereignty. The Nigerian Maritime Administration and Safety Agency (NIMASA) plays a key role in this, focusing on areas like maritime safety, labour regulation, pollution prevention, and capacity development. Addressing threats like piracy, illegal fishing, and smuggling is essential for unlocking the potential of Nigeria's maritime sector and fostering sustainable growth (Anele, 2022a).

Nigeria is endowed with an abundance of natural resources. For instance, crude oil is the backbone of the economy and is exported, then the money made from this exportation helps the nation's economy to grow. Given the importance of the oil and gas

business, blue economy, coastal and marine tourism, cabotage regime, international trade, and fishing industry in promoting the country's economic advancement, there is need for sustainable maritime operations in Nigeria (Anele, 2022a; Adongoi et al, 2019).

The offshore petroleum and natural gas industry's growth, including platforms, drilling vessels, storage facilities, pipelines, and support vessels, has attracted numerous security risks from pirates to attacks in Nigerian waters. Consequently, incidents of piracy off the Nigerian coast encompass many illicit activities such as armed robbery, hostage-taking, kidnapping for ransom, boarding offshore oil platforms, hijacking tankers, and diversion of crude from tankers (Anele, 2021).

Several variables have aided in the facilitation of piracy and other maritime crimes in Nigeria, as exemplified by the corruption of politicians, government officials, officials of regulatory agencies, and the shipping industry (Nwalozie, 2020). Some of these factors are the underlying root causes of the crime. Using corruption as a case study, the nation's political structure and its underdeveloped state, especially when viewed in the context of the enormous rents received from oil, are at the centre of Nigeria's piracy. State failure or weakness has contributed to poor economic growth due to poor investment of the proceeds from selling crude oil and the lopsided distribution of oil income. This has culminated in a vicious cycle where politicians and the elites depend on the oil business, furthering a culture of patronage, corruption and patrimonialism. Given the absence of the rule of law or effective law enforcement. By the relevant enforcement agencies, in addition to a violent culture and cooperation with extensive criminal networks, impunity is common. This has been exacerbated by pollution and non-compliance with environmental norms, making the inhabitants even disadvantaged due to restrictions on their access to traditional ways of livelihood (Anele, 2022b; Babatunde & Abdulsalam, 2021.; Otto, 2024).

Maritime security threats in Nigeria consistently point to the devastating impact of piracy, oil theft, and other related crimes on sustainable development, particularly in coastal areas. These studies emphasize the need for effective governance, strong security measures, and international collaboration to address these challenges and promote a more secure and prosperous maritime environment for Nigeria. Several studies investigate the impact of maritime security threats on Nigerian maritime environment, such as piracy, robbery at sea, drug and human trafficking, cybercrime and oil theft, on the sustainable development of Nigeria's maritime industry (Abiodun & Dahiru, 2020; Anele, 2023; Arifin & Juned, 2023; Ologe & Ejovwo 2024). These studies highlight the negative consequences of maritime security threats on economic growth, investment, and overall development in coastal areas.

The significance of a safe coastline for riparian states cannot be overstated because it is crucial for promoting international trade and shipping. Furthermore, in order to efficiently use their offshore natural resources, including activities like supply vessels, countries with abundant natural resources need a secure coastal line. Hence, shipping is crucial to the efficacy and effectiveness of global commerce, which necessitates a safe sea lane for ships transporting cargo to transit from one nation to the other; these activities are crucial to the sustainable development of coastal states. However, maritime security threats have adverse impacts on these operations (Côrte-Real, 2022).

The high cost of items often translates to a high cost of living, which has often led to agitation for increased salaries and other fringe benefits by workers. Since there is a significant relationship between the level of maritime insecurity and economic, social and environmental activities/wellbeing in Nigeria (Ojutalayo et al., 2023), the agitations could result in civil unrest in the country (Nwalozie, 2020). Thus, a concerted effort to handle maritime security threats in Nigeria is required to avoid the numerous negative consequences and implications for national security. Bearing in mind the persistence and attendant implications of maritime security threats on national security, the background to the emergence of piracy, drug/human trafficking and armed robbery at sea in Nigeria's maritime space and their resultant effect on sustainable maritime operations with respect to the economic, social and environmental acts in Nigeria, there is need to carefully examine and clearly understand their rudiments and predispositions and proffer useful policy recommendations to mitigate the menace. Studies so far have been conducted

across the globe to figure out the factors that aggravate maritime security threats and their impacts on the economic, social, political, and environmental standpoints of the country. In Nigeria for instance Alamoush et al. (2021) show how maritime security threats increases insurance tariffs and goods prices. Additionally, Nwalozie (2020) indicates that maritime piracy consequently leads to civil unrest, while Ojutalayo et al. (2023) show that maritime security threats and poverty levels are negatively correlated. However, evidence of the sustainable economic, social and environmental operations occasioned by the development of maritime security threats remains unearthed or critically unresearched in Nigeria, hence, the demanding need for this study. Therefore, the study aims to investigate the effects of maritime security threat on sustainable maritime operations in Nigeria.

Research Questions

The following research questions were raised based on the objectives of the study:

i. To what extent do maritime security threats (piracy, drug/human trafficking and armed robbery at sea) affect economic operations of the maritime sector?

ii. To what extent do maritime security threats (piracy, drug/human trafficking and armed robbery at sea) affect social operations of the maritime sector?

iii. To what extent do maritime security threats (piracy, drug/human trafficking and armed robbery at sea) affect environmental operations of the maritime sector?

Conceptual Framework

Basically, there are two major variables being investigated in this study. These variables are: maritime security threats and sustainable maritime operation. Maritime security threats constitute the independent or predictor variable, while sustainable maritime operation is the dependent or criterion variable. The predictor variable is operationalized into three dimensions namely (i) piracy (ii) drug/human trafficking and (iii) armed robbery at sea. These variables have earlier been adopted by Ologe and Ejovwo (2024) and similarly, the criterion variable is operationalized into three measures of (i) economic operations (ii) social operations (iii) and environmental operations. These variables have been adopted in this study in line the works of Ojutalayo and Boniface (2023) and Otto (2024). All these variables are shown in the conceptual framework (Figure 1.1) and scholarly discussed in chapter two.

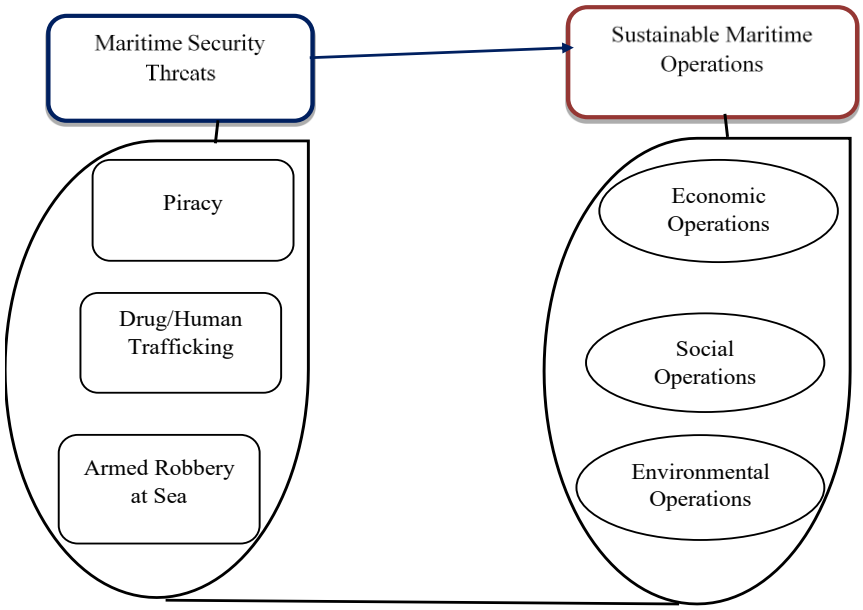

Figure 1.1: Conceptual framework showing the effect of maritime security threats on sustainable maritime operation in Nigeria

Source: Adapted from Ologe and Ejovwo H. (2024); Ojutalayo and Boniface (2023) and Otto (2024).

1.6 Research Hypotheses

The following research hypotheses were tested in the study:

Ho_1: Piracy, drug/human trafficking and armed robbery at sea have no significant effect on economic operations of the maritime sector.

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Ho_2: Piracy, drug/human trafficking and armed robbery at sea have no significant effect on social operations of the maritime sector.

Ho_3: Piracy, drug/human trafficking and armed robbery at sea have no significant effect on environmental operations of the maritime sector

II. LITERATURE REVIEW

The review of the literature will be conducted in this phase under a few sub-headings that are most pertinent to the topic of the study. These sub-headings will be critically scrutinized to identify research gaps and contribute to filling those gaps. Specifically, the following themes will be examined.

Theoretical Framework

Theories such as situational crime prevention (SCP) theory, routine activity theory and economic rationality theory have reviewed in this section to anchor the study:

Situational Crime Prevention (SCP) Theory

Situational crime prevention theory was developed by the Home Office in Britain in the early 1980s under the supervision of Ron Clarke. Clarke went on to become the main proponent of situational crime prevention whose work advocated and contributed to the demise of the rehabilitative ideal (Clarke, 1997). Situational crime prevention (SCP) theory focuses on modifying the environment to reduce opportunities for crime, rather than addressing the characteristics of offenders. It is based on the idea that crime is a result of the interaction between an offender's disposition and the specific situation or setting where the crime occurs. Situational crime prevention (SCP) theory aims to make crime less appealing and more difficult by altering situational factors. Situational crime prevention (SCP) theory involves preventing crime by changing or modifying the situational or spatial features present in the environment so that it is harder to commit a crime but easier to detect the offender. Research has indicated that the appropriate design and effective use of the built environment can lead to a reduction in both the opportunity for crime and fear of crime (Hussein et al., 2017).

Situational crime prevention was heralded as the answer to crime problems as criminological research had previously concluded that immediate situational factors played an important role in crime. Situational crime prevention, also known as physical crime prevention or target hardening, involves preventing crime by changing the situational or spatial features present in the environment so that they make it harder to commit a crime or make it easier to detect the offender. Clarke (1997, p. 18) defines it broadly as involving "the management, design or manipulation of the immediate physical environment so as to reduce the opportunity for specific crimes". Situational Crime prevention "introduces discrete managerial and environmental change to reduce the opportunity for crimes to occur … seeks not to eliminate criminal or delinquent tendencies through improvement of society or its institutions, but merely to make criminal action less attractive to offenders" (Clarke, 1997, p. 2) Therefore the focus is on the environmental setting in which crimes occur and not on the act itself. Clarke goes on to define situational crime prevention as "… a preventive approach that relies, not upon improving society or its institutions, but simply upon reducing opportunities for crime" (1997, p. 3) this is achieved by modifying, manipulating or managing the environment. It was suggested by Clarke (1997) that situational features are more open to manipulation and are therefore more susceptible to change. Situational crime prevention factors – spatial, design and environment – are more easily manipulated and modified than offenders. Clark and Homel (1997), point out that situational crime prevention is based on the assumption that crime is opportunistic and that offenders apply the rational choice model of decision-making when committing a criminal offence.

Situational crime prevention focuses on the settings for criminal acts rather than on the characteristics of offenders. It provides a practical approach to improving safety and challenges criminological theories based on offenders' propensities for mischief. According to situational crime prevention, crime is the result of an interaction between disposition and situation. Offenders choose to commit crime based on their perceptions of available opportunities. Consequently, situational factors can stimulate crime and addressing these factors can reduce crime. Situational crime prevention focuses on very specific categories of crime or disorder, and takes particular note of crime concentrations. Understanding how crimes are committed is critically important to situational crime prevention. It uses an action-research model and demands considering numerous possible alternative solutions. Situational

crime prevention has been widely used across the globe and has been applied to minor deviance (e.g., littering), standard crimes (e.g., burglary and robbery), and to extremely serious crime (e.g., international terrorism and maritime piracy). The evidence for situational crime prevention effectiveness is substantial (Research as indicated by Ezeji and Okeke (2023), clearly demonstrates that Situational crime prevention (SCP) theory can be applied to prevent numerous maritime security threats and achieve maritime sustainable operation in Nigeria.

Routine Activity Theory

In the "Routine Activity Approach", Cohen and Felson proposed that crime is the aftermath of combined result of three indispensable elements: First there must be a motivated offender who is competent of committing felony. Second it is not sufficient for the possible offender to be motivated; he must also be capable to execute his criminal intention. According to Otto (2014) the routine activity approach is based on two rather simple ideas. First, for crime to occur, motivated offenders must meet with suitable targets in the absence of qualified guardians. Secondly, they noted that the likelihood of this situation occurring is influenced by their routine activities including the work, family, leisure, and consumption activities. For example, if we spend more time in public places such as bars and on the street, we increase the tendency that we will come into contact with motivated offenders in the absence of competent guardians. However, routine activity theory does not explain why an offender is motivated to commit a crime, but instead assumes that motivation is constant (Petrossian, 2015). The final element of routine activities theory consists of proficient guardianship, which bears the potential to dissuade or avert crime even in the presence of a motivated offender with a selected suitable target. Capable guardianship is an expansive concept that researchers interpret and study in a variety of ways. Formal types of guardianship such as police officers and other types of law enforcement agents, symbolise a well-recognized form of protection from crime and victimisation. Routine activities theory suggests that the existence of these agents might avert a crime from happening. The routine activity theory is relevant to this study of the effect of maritime security threats on sustainable maritime operation in Nigeria. The absence of protection for these targets exposes the people to incessant attacks by these motivated offenders. Besides, when faced with threat to life, such target usually panics enough to promise their assailants instant wealth reward. Such offers are quite appealing to sea robbers and fuel their appetite for maritime criminality. Therefore, the routine activity theory is very useful for concisely explicating the inadequate strategies put in place by relevant security agencies to curb sea robbery in Nigeria territorial waters.

In Nigeria's maritime domain, the high frequency of commercial vessel traffic, coupled with inadequate naval patrols and surveillance, creates an environment conducive to piracy. Understanding this dynamic can help policymakers devise strategies to enhance maritime security, such as increasing naval presence and improving surveillance technology. Economic Rationality Theory, which is the underpinning theory, proposed by Becker in 1968, posits that individuals engage in criminal activities, including piracy, based on a rational calculation of potential risks and rewards. According to this theory, pirates in the Gulf of Guinea, for instance, assess the high financial gains from ransoms, stolen cargoes, and other illegal activities against the relatively low risk of apprehension and punishment due to limited maritime law enforcement and surveillance capabilities. Pirates consider factors such as the profitability of their criminal endeavours, the effectiveness and presence of law enforcement, and the potential penalties if caught. This rational decision-making process drives their engagement in piracy as they seek to maximise their expected utility (Adesanya, 2023). Addressing piracy from the perspective of Economic Rationality Theory involves altering the cost-benefit analysis that potential pirates perform. This can be achieved through several strategic measures: Strengthening the legal framework to ensure harsher penalties for piracy acts.

Economic Rationality Theory

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Addressing piracy from the perspective of Economic Rationality Theory involves altering the cost-benefit analysis that potential pirates perform. This can be achieved through several strategic measures: Strengthening the legal framework to ensure harsher penalties for piracy acts. This includes longer prison sentences, higher fines, and more stringent punitive measures that significantly increase the cost of engaging in piracy (Ojem, 2023). By making the consequences of piracy more severe, the perceived benefits diminish relative to the risks, deterring potential offenders increasing the likelihood of capture by bolstering maritime patrols and surveillance. This involves deploying more naval assets, improving coordination between national and regional maritime agencies, and utilizing advanced technologies such as drones, satellite monitoring, and real-time tracking systems. Enhanced law enforcement presence increases the probability of pirate apprehension, thereby altering the risk-reward calculation.

Conceptual Review

In this section, concepts such as maritime security threats, piracy, drug and human trafficking, armed robbery at sea, sustainable maritime operations, economic operation, social operation and environmental operation have been reviewed.

Maritime Security Threats

The sophistication of transnational criminal activities and maritime crimes are increasingly expanding, both in types and sizes, hence, pose a threat to international peace and security, as well as threaten people's lives and safety, human rights, and sustainable development (Fedotov, 2019; Bruwer, 2020).

The phrase, "maritime security", was coined towards the twentieth century when States' intervention at sea expanded, and on the recognition that the sea possesses more value for humanity than what was the previous understanding. More recently, the seas have been recognised by states as a new frontier for economic development; hence, they prioritize security in their territorial waters and other maritime zones, which is also a way of contributing to good order on the high seas (Bueger, 2015; Otto, 2020). To many observers, maritime security appears to be a large and unclear concept. The threats which prevail in the maritime domain prompts discussions in the line of maritime security. It elevates understandings about global existential threats, hence, many entities, from international, private and public sectors are involved, with the aim of maintaining good governance at sea, defending and facilitating commerce, and preserving freedom at seas (Feldt et al., 2013; Bueger, 2015; Ryan, 2019). There are many faces to maritime security challenges which include; piracy and armed robbery, illicit trafficking by sea, maritime terrorism, human trafficking, small arms and light weapons trafficking, cargo theft among others (Feldt et al., 2013). Illegal, Unreported and Unregulated (IUU) fishing, unlawful and intentional damage to the marine environment, illegal dumping or discharge of pollutants by vessels are also threats to the maritime domain (Kraska and Pedrozo, 2013).

Maritime security is very important for the sustainability and growth of commerce globally, especially those conducted through the sea. Nigeria is challenged with some security issues on her maritime domain such as; piracy, armed robbery, human trafficking, stowaways, theft/pilferage among others, and have initiated intergovernmental partnerships at both national and regional levels towards enhancement of maritime security. (Onwuegbuchunam et al., 2021). The Gulf of Guinea (GoG) is currently notorious as one of the most dangerous globally, in comparison to the Malacca Straits and the Gulf of Aden. Maritime Security in the GoG region is widely acknowledged to be highly complex, involving a lot of issues which among others include; corruption, legal deficiencies, youth unemployment, political unrest, as well as inadequate military equipment. This portends a grave danger to the prosperity and stability of countries within the region. Countries in the region so far are unable to develop a coherent and cogent maritime security policy, framework or strategy to tackle the menace effectively (Ukeje and Ela, 2013; Jacobsen, 2017). High degree socioeconomic vulnerability is reflected in hostile acts against ships and seafarers. Hostile maritime acts could cause increase in political and social instability, as well as financial losses (Mazaris, 2017), hence, a significant issue in the present world order (Joy, 2021).

"Transnational organized crime in the maritime domain" includes but is not limited to any of the following acts when committed at sea; (a) money laundering, (b) illegal arms and drug trafficking, (c) piracy and armed robbery at sea, (d) illegal oil bunkering, (e) crude oil theft (f) human trafficking, (g) human smuggling, (h) maritime pollution, (i) IUU fishing, (j) Illegal dumping of toxic waste, (k) Maritime terrorism and hostage taking, (l) Vandalization of offshore oil infrastructure". The Yaoundé Code of Conduct alludes to the point of Feldt et al., 2013, which points to the fact that there is limited success in sectoral approach to maritime security, hence, the need for a comprehensive approach; national, regional and international collaborations are of importance.

Also, Otto and Jernberg, 2019; Walker, 2020, stated that regional initiatives or cooperation between States yields the most effective responses to piracy and other maritime security challenges, partly due to the fact that some types of piracy undertaken and causes, are largely driven by the littoral States' geography and by the economic and political developments on land. The ability of States and Agencies to cope and respond are constrained by the transnational nature of threats and crimes at sea. A number of conventions and multilateral treaties play an important role in addressing these maritime security challenges, through encouraging cooperation and the enforcement of rules and common norms (Walker, 2020).

Dimensions of Maritime Security Threats

Scholars like Garba (2022), Otto (2024) and Vasanthy and Chandramohan. (2023) have identified key dimensions of maritime security threats as: Piracy and Armed Robbery: Piracy and armed robbery at sea pose a significant threat to shipping, seafarers, and the overall maritime industry. Oil Theft: Oil theft, including illegal bunkering and pipeline vandalism, undermines Nigeria's economy and environmental sustainability. Illegal Fishing: Illegal, unreported and unregulated (IUU) fishing depletes fish stocks, disrupts marine ecosystems, and harms local livelihoods. Smuggling: Smuggling of goods, drugs, and weapons destabilizes the region and undermines national security. Terrorism: Acts of terrorism against shipping operations and offshore installations pose a serious threat to maritime security and stability. Human Trafficking: The use of maritime routes for human trafficking is a serious concern, endangering vulnerable individuals.

Concept of Piracy

It is well-known that piracy has been a persistent issue throughout history, although the focus here will be on modern piracy, particularly in the 21st century. Piracy has been a momentous problem in recent years, especially along Nigeria's coastline, which is regarded as the hub of piracy in the West African region (Vasanthy & Chandramohan. 2023).

According to Otto (2014), piracy began in Nigeria as a small-scale and minor crime that occurred ashore, where the crew was robbed of their belongings and equipment aboard ships, and it developed into more organized operations run by gangs that purchased inside information from officials, particularly port authority officials, allowing for organised attacks on specific targets. Small boats with low freeboards and few passengers were the main targets at this point, and stolen goods started to show up on neighbourhood streets and marketplaces. Attacks from larger groups of up to 50 people that would attack as many as twelve vessels at once began to occur gradually. Such attacks had become routine by the early 1980s, but by the 1990s, the emphasis had changed from petty theft and robbery to kidnapping for ransom, as well as occasionally annihilation, and local organizations asserted that the attacks had political motivations (Otto, 2024).

UNCLOS Article 101: Piracy consists of any of the following acts: (a) any illegal acts of violence or detention, or any act of depredation, committed for private ends by the crew or the passengers of a private ship or a private aircraft, and directed: (i) on the high seas, against another ship or aircraft, or against persons or property on board such ship or aircraft; (ii) against a ship, aircraft, persons or property in a place outside the jurisdiction of any State; (b) any act of voluntary participation in the operation of a ship or of an aircraft with knowledge of facts making it a pirate ship or aircraft; (c) any act of inciting or of intentionally facilitating an act described in subparagraph (a) or (b) five areas. UNCLOS Article 101(c) finds that piracy includes aiding and abetting for § 1651 purposes.

Piracy in Nigerian waterways is linked to oil exploration in Nigeria's southern part of the Niger

Delta region. The local communities of the region have long complained of marginalization and denial of the region's abundant mineral resources by the federal government, despite being the primary source of the nation's oil wealth. This has led to a variety of issues, including widespread poverty, unemployment, lack of access to basic services, and environmental degradation due to oil spills and other pollution. As a consequence of marginalization, some communities in the region have turned to piracy as a means of survival and a form of protest against perceived injustice (Nwalozie, 2020; Anele. 2020).

Anele (2020) alluded to the fact that piracy in Nigerian territorial waters can be attributed to the importance of the maritime industry to the country's economy, particularly in the energy industry. Due to the nation's inability to refine crude oil domestically, the crude is exported for refining overseas, while refined products are imported, resulting in dense tanker traffic in Nigeria's territorial waters. This makes the crude oil tankers the main target of the attacks.

Ojem (2023) defines piracy as any sea-based criminal act of violence, destruction, or attempt to control a ship or person aboard by force. It is criminalised under relevant national and international laws designed to prevent unlawful acts threatening the safety of ships and their passengers and crews. This definition focuses on violent high-sea crimes against merchant, cargo, and passenger ships, which pose significant concerns for the shipping industry and affect national, regional, and global economies and geopolitically interconnected nations. However, it does not encompass sea-borne economic activities such as fishing and tourism, making it unsuitable for this research.

According to Jacobsen (2020), piracy and armed robbery at sea have continued unabated despite numerous efforts to combat them. Kidnapping for ransom has become the principal aim of pirates in recent years in Nigeria, as opposed to pirate groups targeting vessels to steal cargo oil.

Given that each type of piracy and maritime crime is distinct in terms of where it happens, what it tries to accomplish, how it attempts to accomplish it, and how it affects international and local maritime industries and local communities, they are all part of a larger web of maritime and riverine insecurity in the Niger Delta region of Nigeria and the Gulf of Guinea.

Piracy and Armed Robbery: Maritime piracy and armed robbery at sea are recognized as primary international concerns (Chalk & Hansen, 2012). Since the 1980s, a surge of piracy – specifically in the Straits of Malacca, off the coast of Somalia, the Gulf of Guinea, and the Sulu and Celeb Seas – raised international attention to piracy and armed robbery (Bueger & Edmunds, 2020). In 1992, the International Chamber of Commerce's (ICC) International Maritime Bureau Piracy Reporting Centre was established to provide an online piracy report and maps of piracy and armed robbery incidents (Joubert, 2020). Even though the problem of piracy and armed robbery incidents remains underreported, according to the IMB, the rate of such crimes have dramatically increased by more than 10 percent during the first nine months of 2020 due to the pressure from COVID-19, especially in the areas off the West African coast (The Maritime Executive, 2020; Chalk, 2008; Drew, 2020). The IMB has since reported a concerning increase in incidents of piracy and armed robbery against ships as of 2023 (International Maritime Bureau 2024; IMB Piracy Reporting Centre 2024)(International Maritime Bureau 2024; IMB Piracy Reporting Centre 2024). IMB further reports that violence against crews remains on the rise, and the Regional Cooperation Agreement on Combating Piracy and Armed Robbery against Ships in Asia (ReCAAP) cautioned ships to remain on guard at all times and increase their safety (The ICC, 2021; The Maritime Executive, 2021). Evidently, the fluctuation of piracy attacks might be influenced by a variety of factors ranging from corruption to poverty—which are the root causes of piracy—and still poses a major threat at the global level (Graf, 2019).

While maritime piracy and drug trafficking are crimes against the state, they continue to plague the region. Consequently, the maritime sector and other trading companies have become unfortunate victims of these heinous crimes. Piracy attacks negatively impact Nigeria's GDP, with each incident in local waters decreasing GDP by 34,587.7 units (Ojutalayo et al., 2023). They also blame the non-domestication of certain of the international treaties of the International Maritime Organisation (IMO), which Nigeria has ratified, for the rise in piracy in the Nigerian seas. However, the Nigerian Maritime

Administration and Safety Agency (NIMASA, 2013) states that it is determined to reverse the trend and that the country's economic losses as a result of pirates' and sea robbers' activities will no longer be tolerated, adding that NIMASA is now prepared to address robbery, illegal petroleum product bunkering, and piracy in the nation's waters. The increase in seizures has been most noticeable in the sub-region of West and Central Africa. Nigeria recorded the biggest number of seizures.

Maritime piracy undermines Nigeria's national security by constricting its economic viability as a result of its adverse effect on maritime trade. Maritime trade is a significant contributor to Nigeria's economic development, especially in the areas of revenue generation. Nigeria is heavily dependent on the sea as its lifeline and on the outside world for the import and export of oil, vital food items, industrial machinery, and other raw materials critical for economic growth and national development (Aduwo, 1983). Nigeria is predicted to lose up to US $600 million in export profits due to piracy threats to its fishing sector. Piracy also threatens the fishing industry in Nigeria, which contributes 3 to 5 per cent of the agricultural share of the gross domestic product (GDP) (Olaoye & Ojebiyi, 2018). Similarly, piracy leads to an increase in insurance tariffs on merchant shipping to Nigeria. This tariff is passed on to the consumer in the form of higher prices for goods.

Drug and Human Trafficking

Drug trafficking by sea involves the transportation of illegal drugs, such as cocaine, heroin, and methamphetamine, across international waters using seagoing vessels. This is often done in an attempt to evade law enforcement officials. Human trafficking on the other hand involves the illicit transportation of individuals across international waters for the purpose of forced labor, sexual exploitation, or other forms of slavery. Drug and human trafficking find their routes through the seas, exploiting the vastness and porosity of maritime borders. Criminal syndicates smuggle illicit drugs and engage in the trafficking of vulnerable individuals, exploiting their desperation for a better life. Combating these illicit activities necessitates enhanced maritime patrols, intelligence sharing, and international collaboration to disrupt the networks, rescue victims, and bring the perpetrators to justice (Notteboom & Vernimmen, 2009).

Piracy and illegal fishing are associated with other types of criminal activities, such as drug, human, and wildlife trafficking. Global drug trafficking is valued at roughly $400 billion per year. The most trafficked drugs include cocaine, opium, and cannabis (Fritch, 2009; Papastavridis, 2014; ("World Drug Report" 2023). Known drug trafficking hotspots—where fishing vessel involvement has been routinely reported—exist in the Caribbean, North Atlantic, and Southeast Asia (Belhabib et al., 2020). The fishing industry also intersects with human trafficking, which constitutes the third most profitable transnational organized crime (Stanslas, 2010). Human trafficking victims are typically immigrants from poor countries seeking employment and a better life, and that makes them easy prey for the criminal element of the fishing industry (Mileski et al., 2020; Stanslas, 2010). Aside from undocumented workers, people seeking asylum may become victims of human smuggling as they aim to avoid persecution in their countries of origin (Ventrella, 2015).

For smuggling of bulk quantities, traffickers have taken even the most daring action of the use of commercial containerized cargo. Most importantly, drug traffickers recognized that because of the huge volume of worldwide commercial trade, i.e. almost 80 percent of world trade, is transported by sea, it is almost impossible for custom authorities to inspect every single container / cargo without causing major delays and huge economic losses (Ngada. 2023).

Armed Robbery at Sea

Closely related to piracy, armed robbery at sea poses a significant threat, particularly in coastal areas and busy shipping lanes. Armed robbery at sea as the name connoted encompasses criminal activities and robbery committed in any part of the sea, other than the high sea. Opportunistic criminals target vessels to carry out theft, hijacking, and assault, often with the use of weapons and violence. The rise in armed robbery incidents underscores the need for enhanced security measures, surveillance systems, and coordinated responses to apprehend these maritime predators and prevent further disruptions to trade and safety (Tokulah-Oshoma, 2019).

Armed Robbery Against Ships, in accordance with the Code of Practice for the Investigation of Crimes of Piracy and Armed Robbery against Ships of the International Maritime Organisation (IMO)

Assembly Resolution A.1025(26), is defined as: – 2. "Armed robbery against ships" means any of the following acts: – (a) any illegal act of violence or detention, or any act of depredation, or threat thereof, other than an act of "piracy", committed for private ends and directed against a ship, or against persons or property on board such ship, within a State's internal waters, archipelagic waters and territorial sea; – (b) any act of inciting or of intentionally facilitating an act described above.

– In ReCAAP there are three main pillars namely: information sharing, capacity building, and cooperative regulations. Information sharing is done through the Information Sharing Center. – ReCAAP promotes multiregional collaboration in dealing with piracy and armed robbery at sea. – Articles 2 of ReCAAP defines armed robbery at sea as: "Any illegal acts of violence or detention, or any act of depredation, committed for private ends and directs against a ship, or against persons or property on board such ship, in a place within a Contracting Party's jurisdiction." Therefore, this action must occur within the jurisdiction of the coastal state in order to be included in the armed robbery at sea definition.

Information Sharing Centre (ReCAAP ISC) Report indicates that 51 incidents have occurred on board ships while underway in the Singapore Strait since January 2023. This number far exceeds the 38 such incidents during the same period last year. The Philip Channel, off Pulau Cula, is a hotspot, even though most cases involved petty theft and caused minor or no injuries to crew members. Source: Anh, Thu Nguyen. "Sea robbery in the Singapore Strait." Asian Maritime Security, the Lowy Institute. https://www.lowyinstitute.org/theinterpreter/sea-robbery-singapore-strait. September 13, 2023.

Sustainable Maritime Operations

Sustainable maritime operations encompass minimizing environmental impact, optimizing energy efficiency, promoting social responsibility, and ensuring long-term viability of the maritime industry, including aspects like green ship design, alternative fuels, and waste management (Monte & Moreira, 2017). Maritime sustainability is a broad sector, encompassing maritime security and optimization of logistics, vessel optimization and electrification, alternative low- and-zero-carbon fuels, as well as port decarbonization and infrastructure for renewable energy generation and storage and alternative fuels production (Alamoush et al. 2021).

The enforcement of sustainability regulations in the maritime industry is no easy task, as ships trade globally. Port state control, wherein port authorities enforce these regulations on visiting foreign-flagged ships, is an effective approach to ensuring the compliance of these ships with international laws and regulations. Aiming to improve the efficiency of port state control, Hoa et al. (2020) designed an unsupervised machine learning model—a K means clustering model—to inform port state authorities of the conditions of visiting ships, enabling targeted inspections of substandard ships. Yang (2019) proposed several supervised machine learning models—a traditional linear regression model, a linear regression model with a pairwise comparison loss function, and a support vector machine model with a pairwise comparison loss function—to recommend ships for the port states to inspect.

With the sustainability regulations that are in place, the shipping industry's primary goal remains profitability. Therefore, several studies have explored the operations management strategies that balance environmental and economical sustainability.

Sustainable operations in the maritime industry are vital to both the maritime industry and the global community. A number of efforts have been devoted to the field, yet more are to be seen in the near future (Desai & Shambaugh, 2021).

With respect to maritime industry, the preliminary intention of the International Maritime Organization (IMO) related to sustainability is "the conservation

and the sustainable use of oceans and their resources". Seaports are complex transport nodes in the global transportation network. Further, seaports are disreputable as one of the most polluting industries due to their complex operations as an interface between sea and land. Lack of implementation of sustainability growth-led port policies is an identical problem in the maritime sector in many developing countries. Seaports are in the best position to take a lead in sustainable development goals because of the ports' wide role in the society and their significant contribution to the national and world economy. Now, more than ever ports have begun to incorporate different sustainability practices into their operations because of increasing pressure from regulatory authorities (Nte et al., 2022).

Sustainability in maritime operations aims the integration of sustainability into all port activities/functions. Earlier it was a side-line management concern, it reflects as a core issue directly related to efficiency and competitiveness (Ogbonnaya, 2020). The companies in this industry take ownership of their responsibilities. The major responsibility is environmental awareness. By promoting the design and implementation of more sustainable solutions, they can have the advantages of competitive advantage and clear image on the public related to their broad support. From the business point of view, competitiveness, and attractiveness to shipping lines directly relates to the operational sustainability of a port. When concerning modern port competition, new opportunities to achieve competitive advantage and/or to sustain a competitive place are conclusive sequels for sustainable port development and operations. Implementation of suitable remedies to deduct transport externalities combined with ports is practiced by many global ports because, port operations are a considerable burden for nearby communities (Onyemechi, 2016).

An adverse effect can result in the environment due to the running process/operations of organizations. The trend of coursing coercion on the green, sustainable situation negatively by the trading system which increasingly demands more and more natural resources is as much visible in terminal ports. Contriving more sustainable maritime operations, decreasing potential risks and emboldening relevant authorities to adhere to sustainability agendas and manage development proposals proactively are the deeds supported by building an accessible generic framework (Abiodun & Dahiru, 2020). The incline on the significance of sustainability issues has been increased throughout the decades and ports' sustainability concept was not studied or researched for 10 years from the beginning of 1987 where the pure concept of sustainability was dawned and the year 2018 was a highlighting year which shows a start-up of the higher rising of several focused studies on sustainability issues of ports (Monte & Moreira, (2017).

In the maritime domain, it is also evident that, despite the growing interest, social sustainability remains relatively under-researched compared to environmental sustainability. For example, Gilek et al. (2021) note that maritime spatial planning research is largely dominated by environmental issues and neglects social sustainability. Pantouvakis and Vlachos (2020) surveyed 308 shipping companies in 2018 and uncovered five sustainability dimensions (environmental resources, environmental impact, environmental compliance, social sustainability, and economic sustainability). Social sustainability in the maritime sector differs from other sectors due to the uniqueness of the seafaring profession. Specifically, seafarers are persons who work in a confined environment and cannot leave their workplace or evacuate it in case of a crisis (Doyle et al., 2016). Seafarers are far from their families and friends for long periods, as well as they live within the same physical environment, during both working and leisure hours, for long periods (Liu et al., 2022). As a result, their family, maritime, and ashore social well-being and sustainability are affected by adverse factors such as working under pressure due to tight time schedules, visiting different time zones during their work, frequent bad weather conditions, increased turnaround time in ports, job stress due to reduction in the number of crew members, social isolation, and limited access ashore resulting from increased security measures at ports (Chung et al., 2017, Exarchopoulos et al., 2018).

The sustainable maritime operation in Nigeria represents a significant opportunity for workable economic growth by utilising the country's vast marine and coastal resources. This concept, rooted in global efforts to balance economic development with environmental sustainability, focuses on the sustainable use of ocean resources to drive job creation, improve livelihoods, and ensure the health of marine ecosystems. As a coastal nation, Nigeria

has an extensive coastline and a large Exclusive Economic Zone (EEZ), positioning it to benefit immensely from its sustainable maritime operation. However, while sectors such as shipping, fisheries, offshore oil and gas, and coastal tourism hold immense potential, challenges like piracy, environmental degradation, and weak governance have hindered progress (Anele, 2020).

Globally, the sustainable maritime operation has been embraced as a strategy for fostering economic development without compromising the integrity of marine environments. According to the UNCTAD (2024), the sustainable maritime operation involves the sustainable management of ocean resources to maximize long-term economic benefits. This idea is particularly crucial for coastal and island nations that rely on marine sectors for trade, energy, and food security. In Nigeria's context, the sustainable maritime operation includes key sectors such as fisheries, shipping, offshore energy, and coastal tourism, all of which play crucial roles in economic diversification and sustainable development. One of the major components of Nigeria's sustainable maritime operation is its maritime sector, which is central to the country's international trade. Over 90% of Nigeria's trade is conducted through sea routes, making the maritime industry vital to the economy (Nigerian Ports Authority (NPA), 2020). The efficient management and expansion of Nigeria's ports and shipping infrastructure could further boost trade, enhance logistics, and generate significant revenue. Additionally, the country's oil and gas sector, particularly offshore drilling, forms a critical part of the sustainable maritime operation, contributing about 70% of government revenue and a large share of its foreign exchange earnings (NIMASA, 2024).

Measures of Sustainable Maritime Operation

Ojutalayo et al. (2023) submit that sustainable operations in maritime industry" has 10 papers, which can be divided into three categories: the enforcement of sustainability regulations, the operations management that balances environmental and economical sustainability, and the research directions for sustainable maritime operations. Also, studies such as Onifade (2020), Ferrari et al. (2021) and Gunawan et al. (2020) identifies the measures of sustainable maritime operation to generally three aspects and, taking possible overlaps into account, six categories: (1) environmental; (2) social; (3) economic; (4) environmental and social; (5) environmental and economic; and (6) social and economic. It is worth noting that Onifade (2020) focused on the social aspect with environmental and economic aspects and none of the articles only focused on social aspects. Similarly, 5 articles focused on economic aspects along with social and environmental issues, but none focused solely on economic considerations. On the other Gunawan et al. (2020) investigated the sustainable performance of ports from an environmental perspective. Including papers whose foci overlapwith social and economic aspects, environmental issues in ports were addressed by many other studies.

According to Ferrari et al. (2021) one way of achieving economic operation is by collaborating with the financial system to fix the value chain problems in the maritime sector, since economic development is about enhancing the productive capacity of an economy by using available resources to reduce risks, and remove impediments which, otherwise, could hinder investment. Nnodim (2023) maintain that economic operation or benefits can get to the poor using strategic objectives that enhance poorer households and the informal economy. It is also necessary for micro, small and medium-sized businesses to generate more jobs worldwide and boosting a nation's economy is one of the best ways to tackle poverty reduction (Nsan-Awaji, 2019).

Economic operation looks at how wealthy and fruitful is the country's social status showing if the Nigerian economy is flourishing and thriving with good fortune. Progress in each sector of a country's economy spurs advances in the others, with the result that the long-sought alignment of the stakeholders' prosperity with the best interests of the country seems not only possible but inevitable (Iheanachor et al. 2021). Economic operation can be achieved in Nigeria, if the government; invests in maritime sector to provide adequate transport facilities and infrastructure in the country for all, deregulate the oil sector of the economy thereby attracting more investments in oil refineries in Nigeria and introduce healthy competition in the industry which will attract foreign direct investments.

Social Operation

Social operation is the contribution made by organizations to support the development of the environment (Oluyemi, 2020). It looks at what the

entity has to offer to the society as a whole; it is the entities' obligation or duty to the environment/society, which will ensure balance within the economy and the ecosystem.

Social operations in the maritime sector are of paramount importance. While being socially sustainable, maritime industry takes action—internally and externally—to improve issues regarding employees, community, supply chain members and stakeholders. Social operations have been aggregated to encompass employees' rights, safety and security, community and seafarers. As indicated by Gani (2017) various measures can be utilised to realize relevant actions, thereby improving the welfare of employees, decreasing accidents and socially engaging and supporting the community. For example, vocational training in port skills for low-income young people (community) aims at social inclusion and, in so doing, enhances logistics careers for youth in the region. Furthermore, ports as a hub contribute to the employment of communities' personnel (Foroudi et al., 2021). Open and transparent sustainability reporting is a negative measure ports take towards showing the community their robust stance in corporate responsibility (Garba, 2022). Sustainable maritime operation reports exist, and typically include environmental and social operations and measures, e.g., sustainable maritime operation report of seafarers welfare (Nze et al., 2020).

Environmental Operations

Environmental operation refers to the recognition by managers of the importance of environmental issues facing their firms (Pu & Lam, 2020). It can be conceived as a firm's strategic operation of operating in a sustainable manner and constitutes an integral part of its overall strategic stance that guides its strategy development and business operations (Psaraftis, 2021). In their study of environmental upgrading in global value chains: The potential and limitations of ports in the greening of maritime logistics corporate environmentalism, Gunawan et al. (2020) identified two types of environmental operation: "internal" and "external." Internal environmental operation (IEO) refers to the firm's internal values and ethical standards regarding the level of commitment it should render to environmental protection and is often manifested by its environmental policies and procedures, sustainability report, and environmental training for employees (Weerasinghe et al., 2023). External environmental operation (EEO) reflects the firm's perceived urgency with which it should tackle the environmental demands of external stakeholders (Okpara & Okpara, 2022). Consistent with the premise of the strategic operation literature (Nsan-Awaji, 2019). Prior environmental management research has revealed that firms exhibiting high levels of environmental operation are more prone to integrate their environmental concerns into their corporate culture, decision-making, and operations (Vasanth & Chandramohan. 2023). Drawing on the resource-based perspective, Sarah (2021) has demonstrated that the firm's environmental operation is essential for the development of its eco-capability, namely, its ability to transform corporate resources into creating valuable eco-friendly offerings.

Ports' regular waste needs to be separated and classified along with litter control mechanisms (Sumaila et al., 2020). On the other hand, for ships, ports provide ballast treatment facilities, and reception facilities (sewage treatment), including trash. This is important for cruise ships as they generate large amount of sewage and trash. Ports introduce floating or mobile reception facilities with the ability to collect, classify and separate various types of ship waste (Giovannini & Psaraftis 2019). In addition, environmentally friendly services (e.g., ships' hull and propeller cleaning) can be delivered, while, on the other hand, care should be taken to observe the standard of ship's sanitation equipment (European Commission, 2020). Oil and chemical spills, from liquid bulk ships, are common within and around ports. In this manner, oil spill contingency plans cover measures that should be taken to prevent, control, and respond to any spill. Spillages can be secured by deploying booms and skimmers (Gani, 2017).

The world we live in is our environment; it is an asset all human beings share in common, so the responsibility of protecting the earth is common to all men. The environment is at the center of the concern for environmental sustainability meaning that the next thing to man's life is his environment (Garba, 2022). Environmental operation means protecting the environment, an individual, an organization from harm. Due to the rise in activity and new technological advancement, the springing up of industries continuously degrades our environment (that is the built environment and the natural

environment), sometimes this degradation stays permanently (Jović et al., 2022).

The stakeholders in the maritime sector need to consider the strategic nature of ports their context of business knowing that, it is vital to the economy. To achieve this, and to maintain and uphold the intergenerational equities. The people of today's generation utilizing the natural resources available so that there will be enough to carry the future generation, and the intra-generational equity; equally using and sharing the natural resources of today within the people of today (Kurniawan et al., 2022). Environment protection is there to provide a balance in the environment between human beings and the other components of the environment (Ikechukwu et al., 2022). The environmental operation laws should be compulsorily enforced to eliminate the damage to the environment because a well-protected environment enhances social operation, development, and a sustainable economy. Environmental operation will benefit the country by, minimizing decay of natural and social environment, reducing poverty and disharmony/conflict in Nigeria (Anele, 2023).

Empirical Review

Essien and Adongoi (2023) studied sea piracy and security challenges of maritime business operations in Bayelsa State, which is slightly different from the focus of this study, which is focused on Rivers and Delta States. The previous study found that sea piracy attacks have significant effect on maritime businesses in Bayelsa State is slightly related to the findings of this study by pointing out the fact that the nature of sea piracy in Bayelsa State is destructive since it impacts negatively on maritime business. However, the findings of the study are different from the findings of this study in terms of depth of issues covered.

Okafor-Yarwood et al. (2020) also explore the relationship between maritime governance themes and security challenges in the Gulf of Guinea region. The findings show that countries in the Gulf of Guinea region have developed in terms of maritime security. However, underdeveloped coastal welfare in littoral states, corruption, and onshore security threats still undermine maritime stability.

Maritime Security Threats and Economic Operations

Since there is not a widely accepted conceptualization of maritime social sustainability, we compared maritime with other industries to explore similarities and differences between maritime social sustainability and the social sustainability of other industries.

Despite the existence of similarities in social sustainability dimensions or indicators, e.g. Kumar and Anbanandam, 2019, Kumar and Anbanandam, 2022, Sarkis et al., 2010 who explore the social sustainability dimensions of internal human resources, external population, stakeholder participation and macro social performance it seems that many studies utilize adapted frameworks of social sustainability to account for the specific characteristics of the examined industrial sectors, revealing thus the absence of a consensus on reaching a universal conceptualization, set of dimensions or criteria (Staniskiene and Stankeviciute, 2018).

The proposed framework of maritime social sustainability is in line with relevant studies in the transportation literature, which address employees' aspects highlighting their physical and emotional well-being, but disregards external (societal) or stakeholder perspectives on social sustainability (Okpara & Enyioko, 2022). The proposed construct is not based on hard social sustainability indicators, as sometimes used in surveys in other transport sectors (Lane, & Pretes, 2020). However, it is constructed to account for employees' perceptions and to reflect the restricted environment of a vessel through the five proposed factors: the physical and functional factors to account for the elements of the vessel (as seafarers live and work in the same place for months), the healthy factor to account for health issues related to vessel movement and nutrition, the communication factor to address the opportunities for keeping social relationships with those onshore and the cultural factor to consider multiculturalism onboard.

Maritime Security Threats and Social Operation

Failed or weak state theory contributes to the emergency of piracy. It presupposes a country that lacks the wherewithal to protect the lives and properties of its citizens, among other things. A failed state implies that the government is unable to maintain the rule of law and punish lawbreakers.

Consequently, corruption by government agencies both in the oil industry and the maritime sector buttresses the point. Most of the corrupt government officials and officials of maritime enforcement agencies that aid and abet pirates in Nigeria have not been prosecuted (Jacobsen 2022). Again, the issue of resource control has led to the maiming and killing of the Niger Delta agitators by the state security agencies, and this has led the youths of the Niger Delta to use violence (piracy) to respond to such aggression by the government (Anele 2022).

Weak governance and lack of political will on the part of the government to prosecute those who have been linked to corrupt practices and corruption within law enforcement agencies, some officials may have been complicit in or turned a blind eye to pirate activities due to bribery (Wrigley & Duthie, 2020). More so, politicians in the Niger Delta region of Nigeria provide arms and ammunition to the youth in a bid to intimidate their rivals during elections (Psaraftis, 2021)). After the elections, these weapons were not recovered as the unemployed youths made use of them to attack vessels off the coast of Nigeria. In fact, pirates are known to support certain politicians with a view to getting the support of the politicians when the pirates are arrested for piracy (Psaraftis, 2021)).

Therefore, maritime social sustainability includes the physical and functional components of the environment (vessel), the healthy component, the ease of communication, and the cultural aspects onboard. This conceptualization primarily draws upon the Servicescape literature, which argues that the places, in which employees work are part of their experiences and the workplace setting influences employee behaviours and outcomes, such as satisfaction, stress or employee productivity (Onyena & Sam, 2020).

The above brief discussion on Servicescape reveals that existing literature lies not only on the "traditional" physical and functional dimensions of an environment, but the focus is also on considering other elements (e.g., taste), as well as on addressing social and cultural elements of Servicescape. The roles that employees perform differ not only in terms of what is required from them but also in terms of the environment in which they work (Parish et al., 2008). Seafarers' work requires spending a significant amount of time in their workplace (i.e., the vessel), as well as specialized knowledge, skills and (in some roles) physical labour. Thus, it can be said that seafarers' work is challenging, as it is done totally in a place (the vessel) and is high role-demanding (both emotionally and physically). Literature has shown that employees who perform demanding roles and spend a significant amount of time in their workplaces form certain perceptions of their environment, which in turn impact their satisfaction (Denton & Harris, 2019a).

According to Anele (2022), piracy in Nigeria is attributed to underdevelopment, unemployment, and poverty that permeate the Niger Delta communities where crude oil is exploited in the country. The activities of International Oil Companies (IOCs) in the production and exploration of oil in the Niger Delta region of the southern part of Nigeria, which is a major oil-producing region in the country, have had significant environmental impacts over the years. These include oil spills, gas flaring, deforestation, water and environmental pollution, which affected the livelihoods of local communities, particularly those reliant on fishing and farming.

Maritime Security Threats and Environmental Operation

The environmental operation includes dimensions of the atmosphere, such as lighting, noise, temperature, air quality, and ventilation. Studies conducted in onshore workplace settings have revealed that air quality, the amount of light or the levels of temperature and noise are associated with employee satisfaction (Côrte-Real, 2022).

According to Ofosu-Boateng (2017) maritime piracy has long troubled both the world shipping and the people living near the coast. The modern-day piracy has even become a common threat to international commercial shipping today. The study by Michael (2020) on world economic growth and seaborne trade volume: Quantifying the relationship revealed attack incidents of 229 in the year 2020, including incidents of wounding and holding hundreds of people hostage.

Munim and Schramm (2018) analyzed maritime piracy incidents in the Gulf of Guinea region between the year 2002 and 2015. The study result showed that most attacks incident happened in Nigeria. Study performed by Papastergiou and Polemi (2018) on the impact of maritime piracy on

trade and transport, shows that piracy attacks are not homogenously distributed across the oceans of the world but rather affected the coastal areas of developing countries more than others and presented the frequency of attack distribution between 2015 and 2020 revealed that majority of the attack occurred in the Gulf of Guinea totaling 385, seconded by the South China Sea with 344 incidents and then the Malacca Strait with 283 incidents.

An empirical study conducted by Sandkamp et al; (2021) using 91 countries with seaports to inquiry into the broader economic contribution of seaborne trade, from a port infrastructure quality and logistics performance perspective. The authors used a structural equation model (SEM) to provide empirical evidence of significant economic impacts of port infrastructure quality and logistics performance. The results of the study revealed that high quality port infrastructure contributes to better logistics performance, which leads to higher seaborne trade, yielding higher economic growth.

III. METHODOLOGY

Research Design

Research design refers to the overall plan or structure that guides the process of conducting a research study. It outlines the specific methods and procedures that researchers will use to collect and analyze data in order to address the research questions or hypotheses. Research design encompasses various elements, including the type of study, data collection methods, sampling techniques, and data analysis procedures, all of which are carefully selected to ensure the validity, reliability, and generalizability of research findings.

Population of the Study

The research population, also referred to as the target population, is the entire group of individuals or elements that the researcher is interested in studying and drawing conclusions about in a research study. It represents the larger group to which the research findings are intended to be generalized or applied. The population can vary in size and scope depending on the research objectives, but it typically consists of individuals who share common characteristics or attributes relevant to the research topic.

Sampling Procedure and Sample Size

The process of drawing a sample out of population is known as sampling. In this study, Census Technique is adopted, and so, all the elements in the population shall be studied. However, the study shall be at organizational level therefore, 18 respondents from each of the 4 organisations, namely; Nigerian Ports Authority, NIMASA, National Inland Water Authority and Nigerian Shippers Council making a total of 72 (i.e.18 x 4) respondents constituted the respondents of the study. The respondents would be drawn from Health Safety and Environment Department, Security Department, Shipping and Navigation Department, Maritime Labour Services Department, Administration and Hunan Resource Department, Financial Services Department, Planning Research and Data Management Department and Terminal Operations Department

Methods of Data Collection

Data collection methods refer to the techniques and procedures used by researchers to gather information or data relevant to their research objectives. The choice of data collection method depends on the nature of the research questions, the type of data required, and the resources available. This study adopts survey and interview methods of data collection.

Instrument Design and Administration

The structured questionnaire was divided into three sections. Section A was designed to collect respondents' demographics, section B was for survey questions and section C was for subjective questions. Thus, section B was a semi-structured questionnaire or closed-ended designed in the Likert five-point scale of "very high extent to very low extent", and it will be produced and distributed to the target respondents. The structured questionnaire had 32 items measuring the variables in the study. In other words, each variable was measured by 4 questionnaire items. However, section C was an open-ended questionnaire designed to collect qualitative data. This section had four questions bordering on how the predictors determined sustainable maritime operations in Nigeria.

Operational Measures of Variables

This study has 3 major variables. These variables are; Maritime security threats, sustainable maritime operation, and maritime security threats operationalized into four dimensions namely (i) piracy (ii) Drug and Human Trafficking (iii) and

Armed Robbery at Sea. Similarly, sustainable maritime operation is operationalized into three measures of (i) economic operations (ii) social operations and (iii) environmental operations. Furthermore, each of these variables shall be measured by 4 items in the questionnaire. Thus, there are 24 items measuring the variables in the questionnaire.

Goodness of Data

Goodness of data refers to the quality, reliability, and appropriateness of the data collected for a research study. It encompasses various aspects such as accuracy, completeness, consistency, and relevance of the data to the research objectives. Ensuring the goodness of data is essential for producing valid and trustworthy research findings, as data quality directly impacts the validity and reliability of research results.

Reliability of Research Instrument

Reliability in research refers to the consistency, stability, and dependability of measurement tools, procedures, or data over time and across different conditions. It reflects the extent to which a research instrument or procedure yields consistent and reproducible results when applied repeatedly under similar conditions (Ghauri et al. 2020). A reliable measurement tool or procedure should produce similar results upon repeated administration to the same individuals or under the same conditions. There are several aspects of reliability that researchers consider when assessing the reliability of measurement instruments or procedures: internal consistency reliability, test-retest reliability, inter-rater reliability, and parallel-forms reliability.

Validity of Research Instrument

Validity is the extent to which a research instrument is able to measure what it is designed to measure (Gholami & Salimi, 2014). The instrument for this research was subjected to validity test. Its face validity was confirmed by experts consisting of the research supervisor, scholars and managers in the maritime industry who have good knowledge of the subject of study. The content validity was determined by my supervisors and members of the Maritime Department's Post Graduate Board.

Methods of Data Analysis

As the scope of the research investigation broadened, the methods of statistical tools that were used for data analyses emerged and they were organized into an understandable form. The answers given by this step allowed the further widening of the research, revealed some trends and answered the initial questions. Analysis, as defined by Ghauri et al. (2020) is the breaking and ordering of the quantitative information gathered for research purposes into their component parts to uncover their interrelationships, understand their nature or to determine their essential ingredients. It also involves searching for trends and patterns of organisations, relationships, and differences among these data or groups of data.

In this study, percentages, ratios, frequency distribution, scaling, ranking and other statistical tools were used to analyse and achieve the research objectives. Nevertheless, stepwise regression was used to test the moderating variable. Regression analysis was used to test the extent of the effect individual and collective variable(s) on the other. Also, regression analysis was used to test the hypotheses formulated in the study. All these analyses were computed through the use of statistical package for social sciences (SPSS) IBM SPSS Statistics 25 version.

Model Specification

$Y_1 = b_o + b_1x_1 + b_2x_2 + b_3x_3 + e$ ----(1) {for Objective 1, Research Question 1 & Hypothesis 1 (Ho_1)}
ECO = f (P, DHT, ARS)
Where;
ECO = Economic operations
P = Piracy
DHT = Drug and Human Trafficking
ARS = Armed Robbery at Sea
$Y_2 = b_o + b_1x_1 + b_2x_2 + b_3x_3 + e$ ----(2) {for Objective 2, Research Question 2 & Hypothesis 2 (Ho_2)}
SOP = f (P, DHT, ARS)
Where;
SOP = Social Operation
P = Piracy
DHT = Drug and Human Trafficking
ARS = Armed Robbery at Sea
$Y_3 = b_o + b_1x_1 + b_2x_2 + b_3x_3 + e$ ----(3) {for objective 3, Research Question 3 & Hypothesis 3 (Ho_3)}
ENVOP = f (P, DHT, ARS)
Where;
ENVOP = Environmental Operation
P = Piracy
DHT = Drug and Human Trafficking
ARS = Armed Robbery at Sea

Statistical Model Specification

This study used economic operations, social operations and environmental operation as the dependent (criterion) variables while piracy, drug/human trafficking and armed robbery at sea are to be used as independent (predictor) variables. The model is therefore specified thus:

$Y_1 = b_o + b_1x_1 + b_2x_2 + b_3x_3 + e;$

$Y_2 = b_o + b_5x_5 + b_6x_6 + b_7x_7 + e;$

$Y_3 = b_o + b_9x_9 + b_{10}x_{10} + b_{11}x_{11} + e;$

Where;

Y_1 = Economic operations; Y_2 = Social operations; Y_3 = Environmental operation;

X_1= Piracy

X_2 = Drug and Human Trafficking

X_3 = Armed Robbery at Sea

b_o = The parameter which represents the intercept, b_1, b_2, b_3, b_4, b_2, b_3 = the regression parameters were used in determining the significance of the effect of each of the independent variables x_1, x_2, x_3, x_4 on the dependent variables Y_1, Y_2, Y_3,. e = Random disturbance term. These include the variables which (although not specified) in this model may also affect maritime security threats and sustainable maritime operation in Nigeria. They include government policies, political instability, corruption, environmental maritime security threats problems etc. The effects of maritime security threats on the dependent variables were measured in interval and ratio scaling. The coefficient of determination (R^2) was used to measure the rate at which the independent variable was explained by dependent variables. The a priori expectations for the coefficients are as follows: $\beta_0 > 0$; $\beta_1 > 0$; $\beta_2 > 0$; $\beta_3 > 0$

IV. RESULTS

Data Presentation

Data Refinement

Data refinement is practically done to ensure rationality in the study and the need to show reliability of the instrument in terms of the measurement of the concepts and constructs investigated in the study. To achieve this, reliability has been ascertained relying on Cronbach alpha using the Nunnally and Bernstein's (1994) threshold, alpha values for the examined constructs and items are as follows:

Table 1: Test of Reliability

Construct	No of items	Alpha(α)
Piracy	5	0.771
Drug/human trafficking	5	0.857
Armed robbery at sea	5	0.740
Economic operations	5	0.722
Social operations	5	0.877
Environmental operations	5	0.796
Total		4.763
Mean Reliability	4.763÷ 6	0.7938

Source: Survey Data, 2024, and IBM SPSS Statistics 25 Window Output

From the alpha outcomes in Table 1, the instrument is a dependable one and identified with the topic of the study. The information gathering instrument was tried for unwavering quality utilizing Cronbach's Alpha is within the acknowledged scope of 0.70 or more as the overall reliability test of the instrument is 0.7938. This has been achieved in line with Li et al. (2021). position that the use of the SPSS software package would practically help in testing of the reliability of instruments. Validity test was additionally done, utilizing specialists proficient in the subject matter under investigation, experts and supervisors' endorsement to determine that the instruments were significant and measured what they were designed to measure. The predictors and the criterion variables were found to be dependable as the constructs have alpha values above the Nunnally threshold of 0.7 (Akujuru & Enyioko, 2018).

Administration and Retrieval of Questionnaire

Collection of data was carried out by the researcher through Monkey Survey which involved the administration of the copies of questionnaire to the seaport workers through ports' email addresses. After administering the instruments, the respondents were given a time space of three months to respond to the instruments. Thereafter copies of questionnaire were retrieved through established email contacts of the seaports by the help of Monkey Survey. A total number of 70 copies of questionnaire were distributed to the respondents from 7 seaports in Nigeria. A total of 68 copies of questionnaire were retrieved from them. After editing the retrieved copies of questionnaire, the copies found useful were

68. The 68 copies of questionnaire were considered as valid and suitable for data analysis in this study. The administration and retrieval of copies of the questionnaire are shown in table 4.2 below:

Table 2: Administration and Retrieval of Questionnaire

S/N	Staff	Copies Distributed	Copies Retrieved	Copies Found Useful	Response Rate
1.	Managers	7	7	7	100.00
2.	Traffic Managers	7	6	6	85.70
3.	Logistics Managers	7	7	7	100.00
4.	Tariff and Billing Managers	7	7	7	100.00
5.	Operations Managers	7	7	7	100.00
6.	IT Managers	7	7	7	100.00
7.	Safety Managers	7	7	7	100.00
8.	Warehouse Managers.	7	7	7	100.00
9.	Financial Managers	7	7	7	100.00
10.	Divisional Managers	7	6	6	85.70
	Total	70	68	68	97.14

Source: Survey Data, 2024, and IBM SPSS Statistics 25 Window Output

Table 2 shows the details of how the copies of questionnaire (survey instruments) were distributed and retrieved from the respondent seaports' staff through the Monkey Survey. The breakdown shows that each seaport received 10 copies of questionnaire that resulted in the distribution of 70 copies of questionnaire to 7 seaports in Nigeria. The data collection shows that 7 copies of questionnaire each were administered to the managerial staff ranging from Tariff and Billing Managers, Traffic Managers, Logistics Managers, Port Managers, Operations Managers, IT Managers, Safety Managers, Warehouse Managers, Financial Managers to Divisional Managers. In all, 72 copies of questionnaire were administered to the management staff of the four (4) maritime sector organisations in Nigeria and 68 copies of questionnaire were actually retrieved. However, after going through them 68 copies of questionnaire were (representing 97.14% response rate) were found useful for the study analyses.

Demographic Information of the Respondents

The demographic issues raised in this study included gender of the respondents; current job position of the respondents, respondents' years of experience and respondents' education.

Table 3: Gender Distribution of the Respondents

Sex	Number of Respondents	Percentage Performance
Male	46	68.15
Female	22	32.85
Total	68	100.00

Source: Survey Data, 2024, and IBM SPSS Statistics 25 Window Output

Table 3 shows the gender distribution of the respondents and this section enables the study to determine the number of men and the number of women that participated in the survey. The Table reveals that 45 males (68.15%) responded correctly to the questionnaire while 22 females (32.85%) responded correctly to the questionnaire. This indicates that the male respondents are in the majority.

Table 4: Respondents' Years of Experience in the Port

Options	Number of Respondents	Percentage Performance
0 – 5 years	10	14.70
6 – 10 years	14	20.59
11 – 15 years	18	26.47
16 – 20 years	12	17.65
Above 20 years	14	20.59

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Total	68	100.00

Source: Survey Data, 2024, and IBM SPSS Statistics 25 Window Output

Table 4 shows the years of experience' distribution of the respondents in their present seaports. The data reveal that 10(14.70%) of the respondents have been in in the ports for 0-5 years; 14(2.59%) of the respondents have been in in the ports for 6-10 years; 18(26.47%) of the respondents have worked in their present seaports for 11-15 years; 12(17.65%) of the respondents have been in their present seaports for 16-20. Finally, Table 4.4 shows that 14(20.59%) of the respondents have been in their present seaports for above 20 years.

Table 5 Respondent's Level of Education

Options	Number of Respondents	Percentage Performance
National Diploma	5	7.35
B.Sc. /BA/B. Ed/HND	34	50.00
Masters' Degree	16	23.53
PhD Degree	8	11.77
Professional Certificate	5	7.35
Total	68	100.00

Source: Survey Data, 2024, and IBM SPSS Statistics 25 Window Output

Table 5 shows that 5(7.35%) of respondents are holding National Diploma or its equivalent; 34(50.00%) of the respondents are holders of B.Sc. /BA/B. Ed/HND; 16(23.53%) of the respondents possess Masters' Degree; 8(11.77%) of the respondents are PhD Degree holders; 5(7.35%) of the respondents are professional certificate holders.

Presentation of Univariate Data

The study presents the univariate data analysis on the examined dimensions of the construct. Chen et al. (2019) opine that a researcher will form hypotheses regarding population means based on sample data. This involves going beyond the simple mechanisms incorporated in a frequency distribution and calculation of means.

The study involved three major variables - namely the predictor variables, criterion variables, and the moderating variable. The predictor variable in this study is maritime security threats, which has the following dimensions: , Piracy, Drug/human trafficking and Armed robbery at sea. The criterion variable is sustainable maritime operations in Nigeria, which has economic operations, social operations and environmental operations as its measures. The moderating variable of the study is . has been used by scholars such as Chen and Wang (2020); Alshawaf et al. (2021); Liu et al. (2021); Wang and Ducruet (2021) and Yang et al. (2021) to moderate maritime security threats in various studies.

The univariate analysis on each of the operationalized variables is presented. In generating the data on the operationalized variables, the study used a 5-point Likert scale instrument. Therefore, in interpreting the mean values, the study is relying on Li et al. (2021) categorization of responses with mean ($\overline{X}$) thus: 1-2 = low; 2.5-3.5 = moderate; 3.5-4.5 = large and 4.5 and above = very large. In this study the data were measured using a 5-point Likert scale on the basis of "very large extent" (5); "large extent" (4); "moderate extent" (3); "low extent" (2); "very low extent" (1). Based on this scale; options, responses and associated rating points, the mean, standard deviation, variances and responses to issues raised in the research are presented below, using the SPSS software package window output, version 25.0. The analysis is commenced with the table on .

Piracy as a predictor variable of Maritime security threats

In order to ascertain the extent to which piracy as a predictor variable or component of maritime security threats affects sustainable maritime operations in Nigeria, the study used 4 question items on the 5-point scale as shown in Table 6.

Table 6: Piracy as a Predictor Variable of Maritime Security Threats

	Question Items	Mean	Standard Deviation
1	To what extent does your organization witness violent attacks on ships at sea, including theft, detention, and other unlawful acts committed by private individuals for private gain?	3.5188	1.16516
2	Has your organization seen a long history, dating back centuries, and continues to be a challenge to maritime security and trade?	3.3910	1.34747
3	To what extent do organistion encountered the plundering, hijacking, or detention of a ship in international waters—has evolved over the centuries but remains a challenge to international law?	3.6992	1.10086
4	To what extent do your organisation bumped into serious threat to the safety of cargo, ships, and crews, which can cause enormous losses to stakeholders, highlighting the significance of piracy risk assessment and prevention to the maritime industry?	3.7820	1.06841

Source: Survey Data, 2024, and IBM SPSS Statistics 25 Window Output

As shown in Table 6 above, the responses of the respondents have indicated the mean and standard deviation scores of 3.7820±1.06841, showing that the respondents collectively agreed that to a large extent their organization witness violent attacks on ships at sea, including theft, detention, and other unlawful acts committed by private individuals for private gain. Also, with the mean and standard deviation scores of 3.6992±1.10086 it is quite obvious that the respondents indicated on the aggregate that to a large extent their organization has seen a long history, dated back centuries, and continued to be a challenge to maritime security and trade. As to the extent to which organistion encountered the plundering, hijacking, or detention of a ship in international waters—has evolved over the centuries but remains a challenge to international law 3.6316±1.06936 indicate aggregately that organistion encountered the plundering, hijacking, or detention of a ship in international waters—has evolved over the centuries but remains a challenge to international law. The data additionally revealed that to large extent organisation bumped into serious threat to the safety of cargo, ships, and crews, which can cause enormous losses to stakeholders, highlighting the significance of piracy risk assessment and prevention to the maritime industry; this is shown by mean and standard deviation scores of 3.5188±1.16516.

Drug/human Trafficking as A Predictor Variable of Maritime Security Threats

Table 7 shows the descriptive statistical results on the effect of drug/human trafficking as a predictor variable of maritime security threats on sustainable maritime operations in Nigeria. The outcomes from the four question items on the 5-point-scale show a distribution indicating that Drug/human trafficking is a veritable platform for maritime security threats and with reference to sustainable maritime operations in Nigeria.

Table 7: Drug/human trafficking as a Predictor Variable of Maritime Security Threats

S/N	Question Items	Mean	Standard Deviation
1	To what extent does human traffickers recruit, transport, and exploit their victims via commercial shipping, fishing vessels, cruise lines, and private yachts—from ships at sea to coastal and inland ports?	3.7895	1.13520
2	To what extent does your organization aware that drug trafficking is a global illicit trade involving the cultivation, manufacture, distribution and sale of substances which are subject to drug prohibition laws?	3.4962	1.14564

3	To what extent organization know that criminal networks traffic a range of drugs including cannabis, cocaine, heroin and synthetics such as methamphetamine and fentanyl?	3.3008	1.36507
4	To what extent does your organization know that criminal networks traffic a range of drugs including cannabis, cocaine, heroin and synthetics such as methamphetamine and fentanyl?	3.6015	1.16085

Source: Survey Data, 2024, and IBM SPSS Statistics 25 Window Output

Table 7 shows that the mean and standard deviation scores of 3.7895±1.13520 as indicated by the respondents implying that to a large extent human traffickers recruit, transport, and exploit their victims via commercial shipping, fishing vessels, cruise lines, and private yachts—from ships at sea to coastal and inland ports. Also, the mean and standard deviation scores of 3.6015±1.16085 imply that the respondents were favorable to the large extent option that organization aware that drug trafficking is a global illicit trade involving the cultivation, manufacture, distribution and sale of substances which are subject to drug prohibition laws. The data revealed that the mean and standard deviation scores of 3.4962±1.14564 as indicated by the respondents confirm moderately that organization know that criminal networks traffic a range of drugs including cannabis, cocaine, heroin and synthetics such as methamphetamine and fentanyl. The mean and standard deviation scores of 3.4211±1.23221 depict moderate agreement by the respondents regarding the extent to which organization know that criminal networks traffic a range of drugs including cannabis, cocaine, heroin and synthetics such as methamphetamine and fentanyl.

Armed Robbery At Sea As A Predictor Variable of Maritime Security Threats

Table 8 shows the descriptive statistical results of armed robbery at sea as a predictor variable of maritime security threats.

Table 8: Armed robbery at sea as a predictor variable of Maritime security threats

	Question Items	Mean	Standard Deviation
1	To what extent does your armed robbery incidents underscore the need for enhanced security measures, surveillance systems, and coordinated responses to apprehend these maritime predators and prevent further disruptions to trade and safety?	3.7970	1.05715
2	To what extent does your organization come across armed robbery at sea' when inside Nigerian territorial waters or internal waters?	2.2782	1.24531
3	To what extent does your organization encountered any unlawful act of violence, detention, or depredation, including threats, committed against a ship or people on board, but within a nation's territorial waters?	3.3985	1.31966
4	To what extent does organization witnessed aggravated form of theft that involves the use of a lethal weapon to perpetrate violence or the threat of violence (intimidation) against a victim?	3.6917	1.10220

Source: Survey Data, 2024, and IBM SPSS Statistics 25 Window Output

Table 8 revealed the mean and standard deviation scores of 3.7970±1.05715 indicating that to large extent armed robbery incidents underscore the need for enhanced security measures, surveillance systems, and coordinated responses to apprehend these maritime predators and prevent further disruptions to trade and safety. Also, the mean and standard deviation scores of 3.6917±1.10220 signpost the fact that to large extent organization come across armed robbery at sea' when inside Nigerian territorial waters or internal waters.

The data as indicated by the respondents have revealed the mean and standard deviation scores of 2.2782±1.24531 implying that to a low extent organization encounter any unlawful act of violence, detention, or depredation, including threats, committed against a ship or people on board, but within a nation's territorial waters. Also, the mean

and standard deviation scores of 3.3985±1.31966 indicate that to a moderate extent organization witnessed aggravated form of theft that involves the use of a lethal weapon to perpetrate violence or the threat of violence (intimidation) against a victim.

Economic Operations as A Measure of Sustainable Maritime Operations in Nigeria

Table 9 shows the descriptive statistical results on economic operations which is measured with four question items on the 5-point scale. The response distribution as shown by the results is indicative that economic operations will enhance sustainable maritime operations in Nigeria.

Table 9: Economic operations as a Measure of Sustainable maritime operations in Nigeria

	Question Items	Mean	Standard Deviation
1	To what extent does organization engage in projects that are operated with the intent to maximize the sum of the benefits less the sum of the costs and a pre-determined public-private partnership cooperation (PPPC) approved margin?	3.7744	1.01217
2	To what extent organization significantly sustain the underlying principles to achieve efficiency and productivity by allocating resources effectively to maximize output and minimize waste/reduce cost?	3.9624	1.85213
3	To what extent does your organization improve on techniques used to estimate and minimize transmission losses, which impact the overall cost of power generation and distribution?	3.8195	1.16668
4	To what extent do organization's goal to maximize the overall benefits of a project while minimizing costs, potentially including a pre-determined margin of profit.	3.9098	0.90837

Source: Survey Data, 2024, and IBM SPSS Statistics 25 Window Output

Table 9 shows the mean and standard deviation scores of 3.9624±1.85213 indicating that the consensus opinion of the respondent is that to a large extent organization engage in projects that are operated with the intent to maximize the sum of the benefits less the sum of the costs and a pre-determined public-private partnership cooperation (PPPC) approved margin. Also, the mean and standard deviation scores of 3.9098±0.90837 imply that to a large extent organization significantly sustain the underlying principles to achieve efficiency and productivity by allocating resources effectively to maximize output and minimize waste/reduce cost. The statistical result of 3.8195±1.16668 (mean and standard deviation scores) show that to a large extent organization improve on techniques used to estimate and minimize transmission losses, which impact the overall cost of power generation and distribution. Table 4.13 also reveals the mean and standard deviation scores of 3.7744±1.01217 implying that the respondents agreed that to a large extent organization's goal to maximize the overall benefits of a project while minimizing costs, potentially including a pre-determined margin of profit.

Social Operations as A Measure of Sustainable Maritime Operations in Nigeria

Table 10 shows how social operations as a measure of sustainable maritime operations in Nigeria was examined and empirically expressed through the raising descriptive statistical analysis of 5 question items.

Table 4.10: Social operations as a Measure of Sustainable maritime operations in Nigeria

S/N	Question Items	Mean	Standard Deviation
1	To what extent are your organization has enhanced social Operating Mechanisms for systems or processes that cut across various functions, disciplines, and hierarchies within the society?	3.7519	1.06889
2	To what extent is your organization streamline operations processes that include the procedures and activities essential for the daily functioning of a business, such as procurement, manufacturing, and customer service?	3.7744	1.04168

3	To what extent is organization have devices that facilitate new information flows and working relationships, thereby improving transparency and collective action?	3.8496	0.93336
4	To what extent do organization initiate interaction that occur repeatedly; by social processes individuals and groups interact and establish social relationships. There are various of forms of social interaction such as cooperation, conflict, competition and accommodation?	3.9323	1.05310

Source: Survey Data, 2024, and IBM SPSS Statistics 25 Window Output

As shown in Table 10 above, the responses of the respondents have indicated the mean and standard deviation scores of 3.9323±1.05310 showing that to large extent organization has enhanced social Operating Mechanisms for systems or processes that cut across various functions, disciplines, and hierarchies within the society. Also, the mean and standard deviation scores of 3.8496±0.93336 imply that to a large extent organization streamline operations processes that include the procedures and activities essential for the daily functioning of a business, such as procurement, manufacturing, and customer service. With the mean and standard deviation scores of 3.7744±1.04168, the respondents have indicated that to a large extent organization have devices that facilitate new information flows and working relationships, thereby improving transparency and collective action. Table 10 shows the mean and standard deviation scores of 3.7519±1.06889 proving that the respondents indicated that to a large extent organization initiate interaction that occur repeatedly; by social processes individuals and groups interact and establish social relationships. There are various of forms of social interaction such as cooperation, conflict, competition and accommodation.

Environmental Operations as a Measure of Sustainable Maritime Operations in Nigeria

Environmental operations as a measure of sustainable maritime operations in Nigeria was examined and empirically expressed in table 4.12.

Table 11: Environmental Operations as A Measure of Sustainable Maritime Operations in Nigeria

S/N	Question items	Mean	Standard Deviation
1	To what extent does your organization significantly reduce labour costs and minimize environmental hazards?	3.5489	1.13128
2	To what extent is organization have accurate, real-time information on vessel positions, cargo status, and port operations in their environment?	3.6692	1.22302
3	To what extent does your organization have security mechanisms to carry out operations in a way that reduces unexpected breakdowns and prolongs the lifespan of assets in the environment?	3.5639	1.04703
4	To what extent does your organization include the considerations for regulations, stakeholders, and any other external influences that could impact the system or activity in decision-making?	3.8120	1.00868

Source: Survey Data, 2024, and IBM SPSS Statistics 25 Window Output

Table 11 shows that the respondents through their responses aggregated on the mean and standard deviation scores of 4.0752±0.90975 proving that to a large extent, organization significantly reduce labour costs and minimize environmental hazards. Also, the mean and standard deviation scores of 3.8120±1.00868 indicate that to a large extent organization have accurate, real-time information on vessel positions, cargo status, and port operations in their environment. The mean and standard deviation scores of 3.6692±1.22302 indicate the respondents' agreement that to a large extent organization have

security mechanisms to carry out operations in a way that reduces unexpected breakdowns and prolongs the lifespan of assets in the environment. The mean and standard deviation scores of 3.5639±1.04703 indicate that to a large extent organization include the considerations for regulations, stakeholders, and any other external influences that could impact the system or activity in decision-making.

Statistical Test of Hypotheses and their Interpretations

As a result, four research objectives, four research questions and four multiple hypotheses were raised to that effect. The next step of the study analysis tested the outcomes on the examined dimensions and measures of the variables in terms of relationship. Therefore, this section tested and interpreted the hypotheses formulated in this study.

Model 1: $Y_1 = b_o + b_1x_1 + b_2x_2 + b_3x_3 + e$ ----------(1) {for testing Ho_1}
For Objective 1, Research Question 1 & Hypothesis 1 (Ho_1)}

Effect of Maritime security threats (Piracy, Drug/human trafficking and Armed robbery at sea on Economic operations

Hypothesis one has earlier been raised to determine the effect of maritime security threats on economic operations. In line with this objective, the study formulated the following hypotheses: Ho_1: Piracy, drug/human trafficking and armed robbery at sea have no significant effect on economic operations of ports.

The data in Table 12 have been used to test hypotheses one, two, three and four in this study

Table 12: Results of Maritime security threats (MST) and Economic operations (ECO)

Maritime security threats (Independent Variables)	Unstandardized Coefficients		Standardized Coefficients	t - value	Significant/ Probability Value	Decision
	B	Std. Error	Beta			
(Constant)	-2.127	0.185		11.495	0.000	
Piracy (P)	0.224	0.063	0.431	-3.570	0.001	Significant
Drug/human trafficking (DHT)	0.220	0.084	-0.294	-2.621	0.010	Significant
Armed robbery at sea (ARS)	0.028	0.080	0.033	-3.18	0.001	Significant

Source: Survey Data, 2024, and IBM SPSS Statistics 25 Window Output (Appendix I)
a. Dependent Variable: Economic operations
b. Predictors: (Constant) Piracy, Drug/human trafficking, Armed robbery at sea

$Y_1 = b_o + b_1x_1 + b_2x_2 + b_3x_3 + e$ ----------(1) {for testing H_1}
Y_1(Economic operations) = -2.127 + 0.224P +0.220DHT +0.028ARS +e
t = (--3.570) (--2.621) (-3.18)

Table 12 above shows the results of the test of hypothesized statements - The result of hypothesis 1 further revealed strong negative and significant effect of piracy on economic operations with t- value outcome of t = --3.570 @ p0.001<0.05. Also, hypothesis 1 (H_1) as shown in Table 4.14 revealed negative and significant effect of drug/human trafficking on economic operations with t-value outcome of --2.621 @ p0.010<0.05. In the case of Armed robbery at sea and economic operations, the result of the hypothesis 1 (H_1) tested, show negative and significant effect of armed robbery at sea on economic operations with t- value outcome of -3.18 @ p0.001<0.05.

From the inferential statistical analysis so far, it can be stated that:
1. Piracy as a predictor variable of maritime security threats has negative and significant effect on economic operations. This simply means that Piracy as a maritime security threats strategy negatively influences economic operations which is a measure of sustainable maritime operations in Nigeria and it

contributes to the success of maritime security threats performance.

2. Drug/human trafficking as a predictor variable of maritime security threats has negative and significant effect on economic operations as a measure of sustainable maritime operations in Nigeria. This simply means that Drug/human trafficking contributes negatively to economic operations and it is a measure of sustainable maritime operations in Nigeria.

3. Armed robbery at sea as a predictor variable of maritime security threats has a negative and significant effect on economic operations which is a measure of sustainable maritime operations in Nigeria. This simply means that armed robbery at sea as a maritime security threats instrument influences economic operations negatively and significantly as one of the key performance indicators for measuring seaport performance.

From the various outcomes of the effects of maritime security threats on economic operations as a proxy of sustainable maritime operations in Nigeria it simply means that economic operations is a factor that determines key critical performance indicator for the improvement and operational success of seaports.

Model 2: $Y_2 = b_o + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + e$ ----------(2) {for testing Ho_2}

For Objective 2, Research Question 2 & Hypothesis 2 (Ho_2)}

Effect of Maritime security threats (Piracy, Drug/human trafficking and armed robbery at sea) on Social operations

To test the effect of maritime security threats on social operations, the study formulated this hypothesis: Ho_2: piracy, drug/human trafficking and armed robbery at sea have no significant effect on social operations of ports.

Table 13: Results of Maritime security threats (MST) and Social operations (SOS)

Maritime security threats (Independent Variables)	Unstandardized Coefficients		Standardized Coefficients	t - value	Significant/ Probability Value	Decision
	B	Std. Error	Beta			
(Constant)	2.260	0.213		10.615	0.000	
Piracy (P)	0.222	0.072	0.227	-2.691	0.009	Significant
Drug/human trafficking (DHT)	0.316	0.097	0.408	-3.268	0.001	Significant
Armed robbery at sea (ARS)	-0.034	0.092	0.038	-2.97	0.007	Significant

Source: Survey Data, 2024, and IBM SPSS Statistics 25 Window Output (Appendix I)

a. Dependent Variable: Social operations

b. Predictors: (Constant), Armed robbery at sea, Drug/human trafficking, Piracy

$Y_2 = b_o + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + e$ ----------(2) {for testing H_2}

Y_2 (Social operations) = 2.260 + 0.079ADP + 0.222WA + 0.316AIM -0.034TA +e

t (0.852) (-2.691) (-3.268) (-2.97)

Table 13 above shows the results of the test of hypothesized statements – H_2. The result of hypothesis 2 (H_2) revealed Piracy has negative and significant effect on social operations with t-value outcome of -2.691 @ p0.009<0.05. By this piracy has a significant negative effect on social operations of ports. With respect to hypothesis 2(H_2), the result in Table 15 revealed that Drug/human trafficking has negative and significant effect on social operations with t-value outcome of -3.268 @ p0.001<0.05, therefore, hence – "Drug/human trafficking has a negative significant effect on social operations of ports". For the effect of armed robbery at sea on social operations which is also part of hypothesis 2 (H_{O2}), the result shows that armed robbery at sea has negative and significant effect on social operations with t- value outcome of -2.97 @ p0.007<0.05, denoting that a negative effect which is significant

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exist between armed robbery at sea and social operations, therefore, automated transportation has negative significant effect on social operations of ports.

From the inferential results, it can be stated as follows:

1. Piracy as a predictor variable of maritime security threats has a negative and significant effect on social operations as a measure of sustainable maritime operations in Nigeria.
2. Drug/human trafficking as a predictor variable of maritime security threats has a negative and significant effect on social operations as a measure of sustainable maritime operations in Nigeria.
3. Armed robbery at sea as a predictor variable of maritime security threats has a negative and significant effect on social operations which is a measure of sustainable maritime operations in Nigeria.

Model 3: $Y_3 = b_o + b_1x_1 + b_2x_2 + b_3x_3 + e$ ----------(3) {for testing Ho_3}
For Objective 3, Research Question 3 & Hypothesis 3 (Ho_3)}

Effect of Maritime security threats (Piracy, Drug/human trafficking and armed robbery at sea) on Environmental operations

This subsection was used to critically examine the effect of maritime security threats on environmental operations. To achieve this, the hypothesis has been formulated:

Ho_3: Piracy, drug/human trafficking and armed robbery at sea have no significant effect on environmental operations of ports.

Table 14: Test Results of Maritime security threats (MST) and Environmental operations (ENVO)

Maritime security threats (Independent Variables)	Unstandardized Coefficients		Standardized Coefficients	t - value	Significant/ Probability Value	Decision
	B	Std. Error	Beta			
(Constant)	2.417	0.204		11.859	0.000	
Piracy (P)	0.146	0.069	-0.285	-2.115	0.036	Significant
Drug/human trafficking (DHT)	0.008	0.092	0.011	-2.191	0.027	Significant
Armed robbery at sea (ARS)	0.025	0.088	0.030	-0.285	0.776	Insignificant

Source: Survey Data, 2024, and IBM SPSS Statistics 25 Window Output (Appendix I)
a. Dependent Variable: Environmental operations
b. Predictors: (Constant), Armed robbery at sea, Drug/human trafficking, , Piracy

$Y_3 = b_o + b_9x_9 + b_{10}x_{10} + b_{11}x_{11} + b_{12}x_{12} + e$ ---------(3) {for testing H_3}
Y_3 (Environmental operations) =2.417+0.240ADP+0.146WA + 0.008AIM +0.025TA +e
t = (2.880) (-2.115) (-2.191) (-0.285)

Table 14 shows the inferential statistical test results of the effects of maritime security threats on environmental operations as a measure of sustainable maritime operations in Nigeria. The result of the hypothesis 3 tested, shows that piracy has negative and significant effect on environmental operations with t-value outcome of -2.115 @ p0.036<0.05. Hence – "piracy has a negative significant effect on environmental operations of ports". With respect to drug/human trafficking has negative and significant effect on environmental operations with t-value outcome of -2.191 @ p0.036<0.05, hence – "drug/human trafficking has a negative significant effect on environmental operations of ports". For the effect of armed robbery at sea on environmental operations, the result shows negative and insignificant effect of armed robbery at sea on social operations with t- value outcome of -0.285 @ p0.776 > 0.05, denoting that a negative effect which is not significant exist between armed robbery at sea and

environmental operations. Hence – "armed robbery at sea has no significant effect on environmental operations of ports".

From the inferential results, it can be stated as follows:

1. Piracy as a predictor variable of maritime security threats has a negative and significant effect on environmental operations as a measure of sustainable maritime operations in Nigeria.
2. Drug/human trafficking as a predictor variable of maritime security threats has a negative and significant effect on environmental operations as a measure of sustainable maritime operations in Nigeria.
3. Armed robbery at sea as a predictor variable of maritime security threats has a negative and insignificant effect on environmental operations which is a measure of sustainable maritime operations in Nigeria.

Table 15: Summary of the Results on Test of the Research Hypotheses

Research Hypotheses	t-value	Significant/ Probability Value	Result	Decision
Ho_1				
Piracy has a significant effect on economic operations of ports	-3.57	0.001	Negative and Significant effect	Reject
Drug/human trafficking has a significant effect on economic operations of ports	-2.62	0.010	Negative and Significant effect	Reject
Armed robbery at sea has no significant effect on economic operations of ports	-3.18	0.001	Negative and significant effect	Reject
Ho_2				
Piracy has a significant effect on social operations of ports	2.69	0.009	Negative and Significant effect	Reject
Drug/human trafficking has a significant effect on social operations of ports	-3.27	0.001	Negative and Significant effect	Reject
Armed robbery at sea has no significant effect on social operations of ports	-2.97	0.007	Negative and significant effect	Reject
Ho_3				
Piracy has a significant effect on environmental operations of seaports	-2.12	0.036	Negative and Significant effect	Reject
Drug/human trafficking has a significant effect on environmental operations of ports	-2.19	0.027	Negative and Significant	Reject
Armed robbery at sea has no significant effect on environmental operations of seaports	-0.29	0.776	Negative and Insignificant effect	Accept

Source: Research Data 2024, and IBM SPSS Statistics 25 Window Output

Table 15 has revealed in summary that the study accepted part of null hypotheses: Ho_1 - Ho_2 - Armed robbery at sea has no significant effect on social operations of ports and Ho_3 - Armed robbery at sea has no significant effect on environmental operations of ports. Table 4.17 also revealed that the study rejected part of the null hypotheses: Ho_1 - Piracy has significant effect on economic operations of ports; Drug/human trafficking has significant effect on economic operations of ports; Armed robbery at sea has significant effect on economic operations of ports Ho_2 - Piracy has significant effect on social operations of ports; Drug/human trafficking has significant effect on social operations of ports, armed robbery at sea has significant effect on social operations Ho_3 - has significant effect on environmental operations; Piracy has significant effect on environmental operations of ports; Drug/human trafficking has

significant effect on environmental operations of ports

V. DISCUSSION

Effect of Maritime security threats (Piracy, Drug/human trafficking and Transport Automation) on Economic operations of Seaports in Nigeria

The findings of the study linked to the effect of maritime security threats (piracy, drug/human trafficking and armed robbery at sea) on economic operations of seaports in Nigeria revealed significant issues. A critical appraisal of the finding reveals that the study further found that the effect of piracy on economic operations of ports in Nigeria is negative and significant as the t-value of -3.57 attests to this position. The study found that Piracy and armed robbery at sea: Incidents of boarding, hijackings, theft, kidnapping in Gulf of Guinea / Nigerian waters. The study found that drug trafficking & smuggling via ports: large volumes of illicit substances trafficked through or intercepted at Nigerian seaports (e.g. Apapa, Tin Can Island, Onne). Human Trafficking / Stowaways: Instances of unauthorized access, stowaways, human trafficking via maritime routes and ports. Agreeing on this Anele (2022b)

The study found that the t-value of -2.62 is an indicative of the fact that the effect of drug/human trafficking on economic operations of ports in Nigeria is negative and significant.
The finding of the study relating to the effect of drug/human trafficking on economic operations of maritime sector organisations in Nigeria is negative and significantly inclined. The evidence is clear as the results show both negative and significant effect of drug/human trafficking on sustainable maritime operations in sum. Critical examination of the findings reveals that drug/human trafficking on has negative effect that is significant on economic operations of ports, a result that support the finding of Côrte-Real (2022; Denton and Harris (2019a).

The study further found that the effect of armed robbery at sea on economic operations of ports in Nigeria is negative and significant because of the study's result @ t-value of -3.18. There is negative and significant effect of armed robbery at sea on economic operations of ports in Nigeria the study has revealed. Denton and Harris (2019b) investigated the impact of illegal fishing on maritime piracy: Evidence from West Africa; the investigation revealed that insecurity increases costs and delays, which reduces competitiveness of Nigerian ports compared to ports in more stable regions. This can lead to diverted trade routes, loss of foreign direct investment, loss of revenue for port authorities and government. This study is also in agreement with the works of Garba (2022).

Effect of Maritime security threats (Piracy, Drug/human trafficking and Armed robbery at sea) on Social Operations of Seaports in Nigeria

The effect of piracy on social operations of ports in Nigeria is there is negative and significant as the t-value of 2.69 has attested to the position. Ngada. (2023) corroborated that most attacks incident happened in Nigeria and that. piracy attacks are not homogenously distributed across the oceans of the world but rather affected the coastal areas of developing countries more than others and presented the frequency of attack distribution between 2015 and 2020. Admittedly, this study's findings align with Nsan-Awaji (2019) Nwalozie (2020) (Ogadi, 2021).

The study also revealed that the effect of drug/human trafficking on social operations of ports in Nigeria is strong negative and significant with the t-value of -3.27 that the quality of interaction between seaport staff and customers relates to brands on piracy that directly influence purchase decision in sustaining the maritime sector and that passing maritime security threats information on piracy leads to the achievement of the expected maritime security threats results of digital orientation in sustaining the maritime sector.
Effect of Maritime security threats (Piracy, Drug/human trafficking and Armed robbery at sea) on Environmental operations of Seaports in Nigeria

Regarding the effect of piracy on environmental operations, the study found that a negative and significant effect situation exist in their midst in sustaining the maritime sector as the t-value of -2.12 confirmed by (Alamoush et al., 2021). Özer et al. (2020; Sandkamp et al. (2021)

Also, the effect of drug/human trafficking on environmental operations because the t-value of -2.19 attests to this finding. This study has revealed negative indications which are significant between

drug/human trafficking and sustainable maritime operations in Nigeria (economic operations, social operations and environmental operations). Corroborating on this Onyena and Sam (2020) contend that drug/human trafficking constitutes a key maritime security threat as it significantly affects environmental operations.

This study is of the view that engaging in maritime security threats strategy with particular interest on drug/human trafficking is a key to extending the seaports operations. This is because it is important for ports to be able to reach their customers through maritime security threats activities. Onyemechi (2016) assert that economic activity is hampered in the because of maritime security threats.

Also, the study found that the effect of armed robbery at sea as a predictor variable of maritime security threats on environmental operations as a measure of sustainable maritime operations in Nigeria is negative and insignificant as the t-value of -0.29 authenticates this position. Armed robbery at sea gives the ability to gain access to multiple social networks, the study has revealed. It gives the scope to publish content that engages customers, fans and clients and drives leads to local and global organizations. Also, the study found blue economic activity helps to realize business goals, build brand awareness, deliver customer care and generate sales with social engagement. This finding aligns with the works of Otto (2024).

VI. CONCLUSION

Confronting maritime security threats is not merely about policing threats but creating a transparent, efficient, and trustworthy port environment that boosts trade competitiveness. By addressing piracy, terrorism, and corruption through coordinated security management and institutional reforms, Nigerian ports can significantly improve their operational efficiency, restore confidence among stakeholders, and position themselves as reliable maritime gateways in Nigeria.

Based on the findings of the study, the following conclusions have been made:

i. Piracy has negative and significant effect of on economic operations (t = -3.57); drug/human trafficking has negative and significant effect on economic operations (t= -2.62) and armed robbery at sea has negative and significant effect on economic operations of seaports (t= -3.18).

ii. Piracy has negative and significant effect of on social operations (t = -2.11); drug/human trafficking has negative and significant effect on social operations (t= -3.27) and armed robbery at sea has negative and significant effect on social operations of seaports (t= -2.97).

iii. Piracy has negative and significant effect of on environmental operations (t = -2.12); drug/human trafficking has negative and significant effect on environmental operations (t= -2.19) and armed robbery at sea has negative but insignificant effect on environmental operations of seaports (t= -0.29).

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