WORLD MARITIME UNIVERSITY

ASSESSMENT OF ENVIRONMENTAL EFFECTS OF ABANDONED SHIPWRECKS IN NIGERIA

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A dissertation submitted to the World Maritime University in partial fulfilment Of the requirements for the award of the degree of Master of Science in Maritime Affairs

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Declaration

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

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Abstract

Title of Dissertation: **Assessment of Environmental Effects of Abandoned Shipwrecks in Nigeria**

Degree: **Master of Science**

The dissertation titled "Assessment of Environmental Effects of Abandoned Shipwrecks in Nigeria" explores the significant environmental impacts caused by abandoned shipwrecks in Nigeria's coastal waters. This research is crucial as shipwrecks pose a substantial threat to marine ecosystems, disrupt local fisheries, and create hazards for navigation, leading to economic losses and ecological degradation. The study aims to assess these effects by investigating the physical, chemical, and biological consequences of shipwrecks on the marine environment. Through a combination of field observations, water and soil sampling, and interviews with stakeholders, the research evaluates the extent of pollution, habitat destruction, and loss of biodiversity associated with shipwrecks.

The findings reveal that abandoned shipwrecks in Nigerian coastal waters contribute to oil spills, the release of hazardous substances, and the disruption of local ecosystems, resulting in a decline in species diversity and health. Additionally, the study highlights the economic impact on local communities reliant on fishing and tourism. The research concludes with recommendations for improved management and removal of shipwrecks, to mitigate the environmental effects and promote sustainable maritime practices in Nigeria.

KEYWORDS: Abandoned Shipwrecks, Environmental Impact, Marine Biodiversity, Maritime Stakeholders, Navigational Hazards, Technical Organization, Identification Assessment, Nigerian Maritime, Oil Spill.

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List of Abbreviations

IMO	International Maritime Organization
EMSA	European Maritime Safety Authority
NIMASA	Nigerian Maritime Administration and Safety Agency
NPA	Nigerian Port Authority
WRC	Nairobi International Convention on the Removal of Wrecks
ALDFG	Abandoned, Lost or Otherwise Discarded Fishing Gear
EIA	Environmental Impact Assessment
ICZM	Integrated Coastal Zone Management
IUCN	International Union for Conservation of Nature
MSA	Merchant Shipping Act
NOSDRA	National Oil Spill Detection and Response Agency
UNESCO	Convention on the Protection of the Undersea Cultural Heritage
EGASPIN	Environmental Guidelines and Standards for the Petroleum Industry in Nigeria.

Chapter 1

1 Introduction

1.1 Background of the study

About 850 kilometres of Gulf of Guinea coastline aptly place Nigeria as having one of the most important hubs of maritime operations, trade, and transportation. International shipping routes, such as those in its coastal waters, play an important part in global commerce. The underlying rich biodiversity underpins the economy through fishing and tourism, while there is also offshore oil and gas exploration that has yet to be realized. The coastline is connected to world markets via the Lagos, Port Harcourt, and Calabar ports. These have become strategic and important in both regional and international trade. Nigerian coastal waters are strategically important for regional and global trade and business.

Nigeria's coastal waters are indeed full of shipwrecks, and Nigerian waters is reached in oil exploitations and deserted shipwrecks which carry significant implications for the environment, economy, and maritime safety, deserted shipwrecks acting as quiet reminders of the country's maritime heritage. Not only is it important for academic purposes to analyse the spatial distribution and characteristics of these wrecks, but it is also a crucial undertaking for the preservation of the environment, cultural legacy, and maritime safety. By using a variety of methods, including field surveys, historical documents, and remote sensing techniques, researchers hope to solve the puzzles about the locations, kinds, sizes, and states of abandoned shipwrecks along Nigeria's coastline. In Nigeria's coastal seas, remote sensing technology is essential for mapping and keeping an eye on abandoned shipwrecks. Researchers can explore large areas of coastline for possible wreck locations using satellites fitted with sophisticated imaging sensors. High-resolution satellite imagery offers valuable hints for more research by providing precise insights into underwater structures that may be shipwrecks. Drones equipped with appropriate sensors apply in the aerial surveys, which complement

satellite photography since they have the ability to permit detailed mapping and measurement of wreck sites, offering improvements in our knowledge of their spatial distribution and size. Shipwrecks abandoned within Nigeria's coastal waters have implications for safety at sea, marine environments, and cultural heritage sites. A full understanding of the spatial distribution and characteristics of wrecks is highly essential for devising strategies that mitigate navigational hazards, protect marine ecosystems, and safeguard cultural heritage sites. By combining information on remote sensing, historical records, and field surveys, researchers can establish a complete inventory of abandoned shipwrecks that would contribute to the planning of conservation and policy formulation for the maritime heritage of Nigeria in service of future generations. An in-depth look at the geographical extent and features of abandoned shipwrecks present within Nigeria's territorial waters is essentially a multidisciplinary task regarding its execution through inputs needed from different disciplines. Such oceanic findings would have their mystery unveiled by incorporating remote sensing technology, historical research, and field surveying in order to reveal some of Nigeria's underwater heritage and coordinate efforts with those for the protection of the ecosystem in relation to the protection of navigation routes. History is full of accounts of the traces and fates of all abandoned shipwrecks along the shores of Nigeria. These maritime records and historical documents provide credible evidence of past maritime activities and occurrences. Records from the navy, along with accounts of maritime disasters, are important for ascertaining the identity of the vessels, dates when the vessels were submerged, and probable causes of maritime disasters. In the light of such a historical background, our knowledge is enhanced: we understand the spatial distribution and nature of deserted shipwrecks as a window to Nigerian maritime history (Ani & Maduekwe, 2017).

Field surveys serve as a vital component in validating remote sensing data and historical research findings. Marine archaeologists and survey teams venture into the depths of Nigeria's coastal waters to conduct first hand assessments of wreck sites. Through meticulous documentation and analysis, researchers gather information on

the structural integrity, marine life colonization, and environmental impacts of abandoned shipwrecks. These field surveys not only confirm the findings of remote sensing and historical research but also provide very important data for conservation and maritime management policy.

It is important that an ecological assessment of the abandoned shipwrecks on marine habitats at the coast be done in proper detail to be able to understand implications on ecosystem health and biodiversity as a result of marine accidents. Research into the quantification of habitat damage and loss due to shipwrecks, through field observation and underwater surveys with resultant mapping of habitats, is carried out to understand the ecological impacts that marine-related accidents pose to the coastal waters of Nigeria. Shipwrecks that have been abandoned pose a serious danger to coral reefs arising from physical damage caused by vessel grounding, anchors, and leakage of pollution. Field observation and underwater surveys enable researchers to carry out an assessment of the extent of destruction to coral reefs caused by ship wrecks: smothering by silt, abrasion, and fragmentation. According to (Graham et al., 2006) Habitat deterioration and loss can be measured to clarify ecological consequences of ship wreck-induced disruptions to coral reef ecosystems. The ecological impact assessment of abandoned shipwrecks on marine coastal habitats runs the gamut from direct habitat destruction to large-scale ecological effects. Habitat degradation and loss from such disturbances due to shipwrecks have cascading effects on marine biodiversity, ecosystem functioning, and resilience. It is for this reason that quantifying such habitat damage and loss linked to abandoned shipwrecks is yet another means through which research contribute to the preservation and sustainable management of coastal ecosystems, informing decision-making processes in attempts to mitigate environmental risks and safeguard marine biodiversity within Nigeria's coastal waters.

The Nigerian coast is one of the most varied globally due to species and types of ecosystems, hence highly prone to the various environmental issues presented by abandoned and derelict ships. Oil spills from such derelict vessels might result in

serious damage to the marine life and coastal ecosystems. For example, Ogboru and Ebinimi, in their 2019 study, called for proactive action that would avoid the occurrence of, or reduce vulnerability to, such disasters, using the case of the environmental impact of an oil spill from a derelict shipwreck off the Niger Delta region. By estimating the potential for oil spills and other pollutants from abandoned ships, researchers can thus establish strategies that reduce environmental impacts and protect marine coastal biodiversity. Other hazardous materials that can be associated with derelict and abandoned ships include, among others, heavy metals, asbestos, and chemicals used in shipbuilding and maintenance. This is evident in the degradation of these vessels, allowing these materials to leach into coastal waters and pose risks both to marine life and human health. A case study by Oduwole et al. (2016) involved heavy metal contamination in sediment samples around abandoned shipwrecks along the Nigerian coast. It emphasized the need for environmental monitoring and remediation efforts. It enables researchers to identify and quantify the hazardous materials present in the derelict ships and, based on that information, evaluate the potential risk associated with water quality and marine biodiversity, along with proposing mitigation strategies.

Physical occurrence of abandoned and derelict ships may alter habitats along coastlines and disturb marine ecosystems. Shipwrecks may provide a physical barrier to the flow of water and alter sediment transport patterns. They also provide a substrate for invasive species colonization, which can alter local biodiversity and ecosystem dynamics. Researchers can conduct field observations and ecological surveys concerning the ecological impact brought about by derelict ships on the habitats along the coasts to find strategic ways through which they can minimize marine ecosystems' impacts. Marine resources are utilized by Nigerian coastal communities for purposes related to their cultural identity, food security, and subsistence. Pollution of seafood stocks by abandoned and derelict ships places health and wellbeing risks on the people living in the coasts (Ajadi et al 2020) conducted research to indicate the contribution of pollution coming from shipwrecks, with socioeconomic effects in fishing

communities around Lagos and integrated approaches toward managing environmental risk burden for livelihood protection along coasts. The researchers, in this manner, would collaborate with local communities and stakeholders to further explore the socio-economic consequences of environmental hazards caused by shipwrecks and also work out ways to mitigate their effects on coastal ecosystems and communities. Communities within the coastal parts of Nigeria are highly dependent on marine resources for self-sustenance, income generation, and cultural identity assertion. Environmental degradation of one's doorstep through shipwrecks might stop traditional fishing and threaten livelihoods across the various coasts. This paper presents a case study by (Ajadi et al., 2020), while it accounted for socio-economic challenges emanating from shipwreck-related pollution on fishing communities in the Lagos area, reduced fish catches, increased health risks, and decreased economic earnings. It is by assessing the economic costs and social consequences of abandoned shipwrecks that researchers can advocate for policy interventions or community-based management approaches to address the challenges facing coastal communities.

The fishing industry also serves many purposes in the Nigerian economy, providing employment, enhancing economic growth, and ensuring food security. Degradation of the ecosystem caused by shipwrecks, if not salvaged, also contributes to negative impacts on fisheries production and marine biodiversity, entailing financial losses for companies involved in fishing. This paper by Eneh et al. (2018) assessed the socioeconomic effects of habitat degradation due to shipwrecks on artisanal fishers of the Niger Delta and emphasized the need for sustainable management techniques as a way out to save coastal resources and maintain livelihoods. By assessing the social and economic effects of abandoned ship wrecks, researchers can provide substantial information for political decisions and resource management methods that would help enhance fisheries and coastal development in a sustainable manner. Apart from affecting the fisheries industry, environmental degradation due to ship wrecks can affect the tourism industry, which relies on clean coasts and marine attractions for tourists and income generation. Places with abandoned shipwrecks along coasts may

suffer from decreased visitors and profitability due to environmental degradation, safety, and aesthetics. The studies by Ukaegbu et al. (2017) assessed abandoned shipwrecks at the Nigeria coastline for their socioeconomic impacts on coastal tourism. The authors paid particular attention to the possible effects that these might have on visitor perceptions of beach quality and tourism infrastructure. By assessing the financial and societal impacts of environmental degradation due to shipwrecks on the tourism industry, scholars will be able to devise proposals to foster environmentally-friendly tourism behaviour and improve coastal resilience.

Moreover, shipwreck-engendered environmental degradation may have broader impacts on the level of society, which includes community well-being, public health, and cultural heritage. Toxic wastes from abandoned vessels can contaminate seafood and waterways, posing risks to human health and food security. Shipwrecks can also have cultural significance as historical sites or artefacts that contribute to the character and history of a coastal town. In this, the researchers involve the local stakeholders in participatory assessments to understand the social impacts of environmental degradation caused by shipwrecks and to allow communities' involvement in decision-making that targets the preservation of coastal resources and livelihoods.

1.2 Problem Statement

The environmental impact of abandoned shipwrecks in the Nigerian coastal waters has always been a subject of proper assessment. Like abandoned ships, there can be certain environmental hazards in terms of oil spills and leakages of hazardous materials that disrupt the marine ecosystem. As the decay of wrecks proceeds, they are able to emit pollutants into surrounding waters, hence putting marine life in danger and staking healths of coastal communities. This has been compounded by the fact that no serious efforts have ever been made towards systematic appraisal and seeking measures in mitigating such environmental risks, hence making the Nigerian coastal waters susceptible to irreparable ecological degradation.

It requires multifaceted approach in terms of proactive measures to identify and mitigate environmental risks emanating from abandoned shipwrecks. This would necessarily lead to comprehensive surveys and analyses in respect of location and condition, including abandoned vessels and their conditional state of environmental threat. This would have to be in collaboration with government agencies, environmental organizations, and interested parties within the maritime sector in collating data and prioritizing areas for intervention. Another basic need is functional regulation and enforcement, which ensure newly abandoned wrecks are actually taken out of commission and disposed of by the parties responsible. More rigorous regulation, with punitive measures against derelict vessels, would ensure irresponsible behaviour is punished and standards for environmental care upheld. Lastly, public and community awareness needs to be created to instil a sense of environmental stewardship amongst its coastal residents. It can be achieved by public awareness of the hazards posed to the general public through shipwrecks that are abandoned, active participation by local communities in the clean-up process, thereby encouraging actions in the protection of the coastal environment across communities for future generations.

1.3 Research Aims and Objectives

This work will put into perspective the environmental impacts of abandoned ships within the coastal waters for a better understanding and reduction of ecological risk associated with vessels that have become derelicts. This work also recognizes the fact that their presence in the waters poses serious threats to marine ecosystems, not limited to but including probable oil spills, release of hazardous materials, and physical damage to coral reefs and other sensitive habitats.

The full solution requires a multidimensional approach to this problem; this involves.

1.4 Research Questions

- To examine in detail the spatial distribution and nature of abandoned shipwrecks in the coastal waters of Nigeria.
- To study the socioeconomic impacts of the environmental hazards arising from this environmental degradation
- To conduct integrated management strategies for the derelict and abandoned ships environmental impacts.
- What are the specific environmental hazards presented by the abandoned and derelict ships in Nigeria's coastal waters?

1.5 Research Methodology

Therefore, the research methodology shall be a holistic approach to the assessment of environmental impacts of abandoned shipwrecks at the coastal seas of the Nigerian nation. The approach shall first lie in data compilation from official documents and Nigerian law concerning national laws and regulations on environmental conservation and those on shipwrecks. Books, portions from various periodicals, journalistic articles, official reports from various governmental bodies, and annual reports from technical organizations involved in environmental management and maritime affairs are some of the materials that shall be gathered. These resources shall provide enlightening information concerning the legislation, regulations, and procedures that govern environmental preservation and the removal of wrecks in Nigeria. The chosen methodology was appropriate for the research topic, as it allowed the giving of an in-depth analysis of the legal and regulatory issues pertinent to the matter under study.

The methodology also included a study of the parts of international maritime conventions, mainly those drafted by the global Maritime Organization (IMO), in order to learn how global best practices and standards are concerning wreck removal and environmental management.

Accounts of marine casualties in relation to wreck removals will also be considered as a way of trying to understand what real-life scenarios pose in terms of challenges and experiences. The research methodology has thus attempted to carry out a more realistic and wholesome review of the environmental implications of abandoned shipwrecks within Nigeria's coastal waters through a wide array of sources and analytical techniques.

1.6 Delimitations

Geographically, such review is limited to the maritime areas of Nigeria and includes its territorial seas, exclusive economic zone, and internal waters. This text does not mean to cover the high seas, and also excluded are the marine jurisdiction areas of other states bordering Nigeria.

The scope of this study does not cover anything to do with the salvage of wrecks because the main focus is on the environmental effect of abandoned shipwrecks in the coastal waters of Nigeria. A brief comparison will be made between legal structures which deal with idle and abandoned wrecks, though there are no significant international legislations or regulations dealing particularly with this area. Instead, wrecks and abandoned ships will be treated separately within the purview of Nigeria's maritime authority on their environmental effects.

1.7 Dissertation Structure

This dissertation on the assessment of environmental effects of abandoned shipwrecks within Nigeria is systematically arranged in five chapters, each chapter discussing different aspects that relate to the subject. Chapter 1 introduces the background necessary to appreciate the significance and implications of the topic. This marks the basis upon which subsequent chapters take foundation, by describing the scope and objectives of the following research. To this end, Chapter 2 is on Wreck Removal Activity and Importance. In this regard, the discussion on the wreck removal activity- a very important activity in safeguarding marine environments and coastal communities. Chapter 2 gives considerations to the ecological, socio-economic, and

implications of abandoned shipwrecks; hence, proactive action is called to resolve environmental risks. Chapter 3 discusses how the domestic law in Nigeria has implemented international maritime instruments. It goes on to explore how such instruments will shape the legal landscape in Nigeria with respect to wreck removal and protection of the environment. It also discusses organizations involved in the administration of maritime activities and environmental care, while Chapter 4 does a case study of the hypothetical removal of the wreck in the EEZ of Nigeria. From a legal, environmental, and logistical perspective, it contemplates the problems and considerations associated with such operations. Chapter 5 is the Conclusion and Recommendations: This final chapter makes conclusions from the findings of the research and recommendations from the analysis conducted in the dissertation. It indicates the position of the author on the ratification of relevant international conventions, including the Wreck Removal Convention; further, it proffers some actionable steps with respect to the environmental impact of abandoned shipwrecks in Nigerian waters.

Chapter 2

2 Wreck Removal Activity and Importance

2.1 Preamble

This chapter examines the environmental implications of abandoned shipwrecks in Nigeria through theoretical frameworks and literature reviews that are supposed to lead to discoveries on how these shipwrecks will affect marine and coastal habitats, mostly focusing on the issues concerning pollution, habitat disruption, and ecological degeneration. The present research identifies the degree of environmental degradation and the causes which contribute to such processes through assessment of shipwrecks at various coastal spots in Nigeria. This chapter shall discuss the impacts of the abandoned shipwrecks on the ecosystem, including their impacts on coastal geomorphology, discharging dangerous compounds into the environment, and disruption of marine biodiversity. It will be looking into the direct and indirect impacts these wrecks have on local fisheries, coastal communities, and marine ecosystems. The review will also look at how effective the various existing policies and procedures related to environmental protection and disaster mitigation are. Such a review with its conceptual, empirical, and theoretical components shall offer an appropriate understanding of the environmental questions posed by abandoned shipwrecks.

2.2 Environmental Hazards of Abandoned shipwrecks

Abandoned shipwrecks can, of course, be imposing acute environmental hazards to marine ecosystems and biodiversity, such as those of Nigeria's coastal waters. Shipwrecks, if abandoned, create many harmful effects on the surroundings. The major concerns include hazardous substances, including crude oil and fuel, leaking from such shipwrecks. This can lead to the pollution of marine water, which may influence the microbial community in the water and change the composition of the biofilm within the ocean. In this respect, shipwrecks can be sources of pollution, deteriorating the

quality of water and reaching the sea life in general. Further, abandoned shipwrecks can act as traps of marine debris, which also consists of lost, abandoned, or discarded fishing gear. Floating trash, abandoned, lost, or other forms of discarded fishing gear, is considered one of the major threats to marine biodiversity because of its entangling feature and habitat destruction in general. Presence of Abandoned, Lost or Otherwise Discarded Fishing Gear (ALDFG) is known to inflict direct harm on marine fauna and cause economic loss.

However, some shipwrecks have unintended and surprising positive impacts on marine ecosystems. Shipwrecks can behave like artificial reefs and provide hard substrate that attracts and supports diverse marine life. They serve as de facto Marine Protected Areas due to the fact that fishing pressure is lower in these areas compared with surrounding habitats and therefore offer a refuge to marine fauna. Shipwrecks can thus also impact diversity in the sediment micro biome, adding to overall biodiversity within the marine environment.

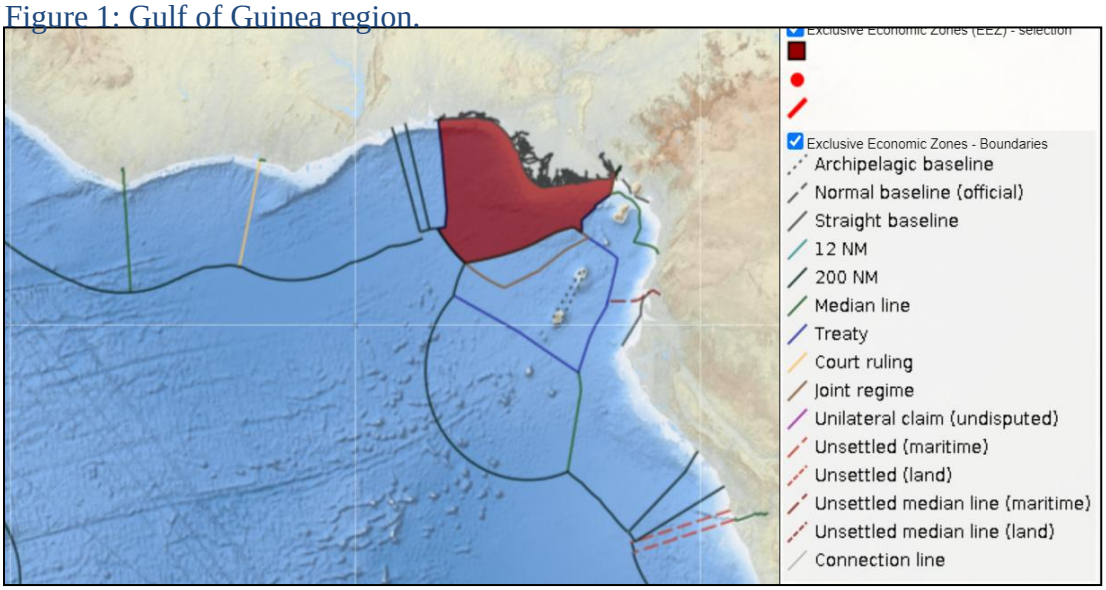
Special management strategies need to be adopted regarding abandoned shipwrecks, since they pose a threat to the natural environment. In this respect, one of the appropriate strategies could be regular monitoring and assessment of shipwrecks with a view to preventing leakage of hazardous materials and reducing environmental impacts. Efforts should be made in order to take out marine debris pertaining to shipwrecks to mitigate harms to marine life and its habitats. The complex interactions between shipwrecks and marine ecosystems, once understood, would give people the ability to develop sustainable practices so as to minimize environmental risks and protect biodiversity.

2.3 Case Study of Environmental Damaged Caused By Shipwrecks in Nigeria

Several case studies highlight the environmental damage caused by shipwrecks in Nigeria. These cases illustrate the diverse and far-reaching impacts of abandoned

shipwrecks on marine ecosystems and biodiversity. Nigeria is strategically located along one of the most important and resource endowed coastal regions- in the Gulf of Guinea.

Figure 1: Gulf of Guinea region.



Source: Marineregions.org

Here is a table summarizing the details of the abandoned ships in Nigeria from 2008 to 2024. These wrecks are important due to the impacts on issues related to maritime safety, environmental concerns, and even tourism. Generally, their solutions involve several departments that include the government, agencies of maritime, and organizations caring for the environment.

Table 1: The numbers of Abandoned ships in Nigeria from 2008 to 2024

Vessel Name	Date Abandoned	Location	Details
MT Torm Aalesund	November 2008	Near Lagos	Heavily damaged by a pirate attack; parts of the wreckage remain, affecting navigation.

MV Ebusit	March 2010	Near the Bight of Bonny	Bulk carrier ran aground and broke apart; remains abandoned, posing navigational hazards and environmental concerns.
MV Cape Vision	March 2020	Near Lagos	Damaged in a collision and partially abandoned; poses risks for local shipping and environmental concerns.
MT Princess Sola	February 2021	Near Calabar	Petroleum tanker suffered a major fire; remains are an environmental concern due to potential pollution.
MV Ojuola	July 2021	Near Calabar	Freighter ran aground and was abandoned;

			obstructs navigation and poses environmental risks.
MV King David	June 2022	Off the coast of Warri	Severely damaged by a storm; partially submerged and creates hazards for local shipping routes.
MT Apollo	February 2023	Near the Bonny River	Oil tanker experienced an explosion; partially abandoned with significant environmental concerns due to potential oil leakage.
MV Olokun	August 2023	Near the Bonny River	Encountered severe weather; remains a significant obstacle in the

			river, impacting marine traffic.
MV Guardian	September 2024	Off the coast of Lagos	Research vessel encountered severe weather, partially sinking; remains a hazard with ongoing salvage efforts.
Abandoned Fishing Vessels	Ongoing	Coastal regions including Lagos, Bayelsa, and Rivers states	Numerous small fishing boats abandoned; contribute to marine pollution and navigation hazards.

Source from the Wreck unit NIMASA.

The Ekolo Reef Wreck:

The Ekolo Reef, which is located off the shore from the Niger Delta, has been subjected to at least a few wrecks. Mechanical damage has led to the destruction of significant parts of coral. The discharge of pollution and poor waste management further deteriorated the reef ecosystem, which often applies to the general biodiversity and health of marine species in reefs (Ansa & Francis, 2007).

Bonga Oil Spill:

In 2011, there was a significant spill due to leakage in an FSO vessel in the Bonga offshore oil field. While this might not be considered a shipwreck in the proper definition of the word, the environmental impact experienced in the waters was similar

to that of a regular shipwreck, as hundreds of litres of oil polluted the water and damaged marine life across a large radius of space. The mangroves and the seagrass beds, which are the habitats of most of the species were completely decimated during the spill (Nwilo & Badejo, 2006).

The Escravos Channel Shipwrecks:

It contains a number of wrecks, which constitute continuous environmental hazards along the Escravos Channel, which is a major shipping route in the Niger Delta. The wreckage and debris gathered over time block the water flow and alter the sedimentation processes, hence affecting the mangrove health and biodiversity they host. Contamination from these wrecks has affected fish populations in the area; there have been reports of fish kills and reduced catch rates reported by Adekola et al. (2012).

Abandoned shipwrecks pose serious environmental dangers, as in the case of Nigeria, since they not only threaten diverse marine ecosystems but also overall biodiversity in its entirety. The chemical contamination, physical hazards, habitat disruption, and introduction of invasive species that come with the wreckage could lead to long-term ecological damages. The list is endless, and far-reaching implications involve coral reefs, mangroves, sea grass beds, and marine fauna. It affects not only the environment but also the means of livelihood and economies in coastal communities. Finding solutions to environmental risk from abandoned shipwrecks calls for comprehensive strategies, including pollution control, habitat restoration, and enforcement of rules and regulations that mitigate these impacts and protect the marine ecosystem.

The wrecks scattered in the waters of Nigeria significantly pose environmental hazards to navigation and could threaten life. These wrecks give rise to coastline erosion and deteriorate water quality through discharge from rusted metals and harmful substances that threatens marine life. Drifting towards the coast, these wrecks affect natural phenomena, such as currents and sedimentation processes, accelerating erosion and

further destroying ecosystems. The legal changes, increased law enforcement, and removal of wrecks are feasible ways to address this situation. Prioritizing the passage of regulations against ship discarding, enhancing maritime authority capabilities, and promoting eco-friendly shipping are crucial steps to mitigate the environmental impact and protect coastal ecosystems and communities (Shipsandports.com.ng, 2018; DW, 2018). During the study, these three dimensions of abandoned vessels, (independent variables or predictor variables) that is sunken vessel, unclaimed vessel and distressed vessel have been looked into. Following these aspects was done in alignment with Bonnor (2012), EMSA (2017), IMO (2017) and Suttmeier (2017).

Figure 2: Images of abandoned shipwrecks in Nigerian Waters

Source: Ships &Ports

2.4 Concept of Abandoned Vessels

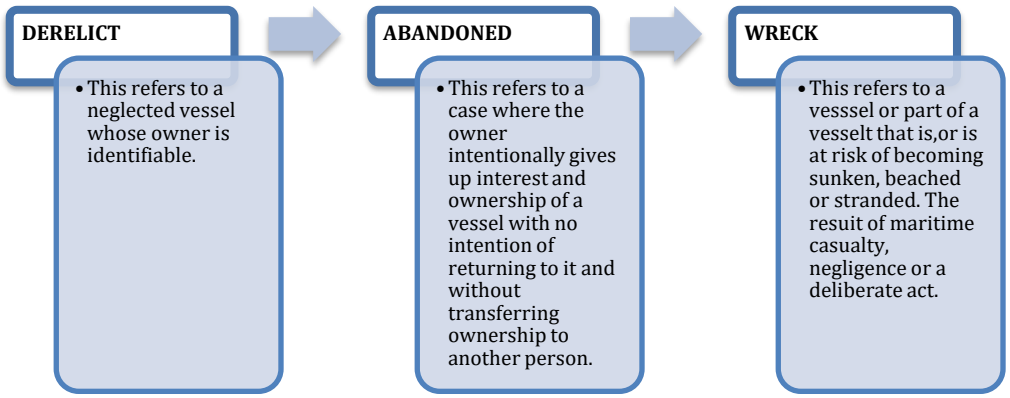
Abandoned vessels are those the owner intentionally abandons, there is no declaration of intent of returning to it and there is no change of ownership (Agbor, 2015). Derelict vessels are non-functional vessels that are equal to burden on the society. (Gregori, 2016). In the field of maritime, the term "wreck" may be understood in various ways. It is basically the remains of a ship that has catastrophically sunk.

Anciently, the term was used in a more restricted sense to designate those parts of the ship or cargo which came to land. The place of that property was crucial it would imply that the Admiralty court's jurisdiction over a wreck was restricted to foreign wreck cast where there was no jurisdiction-prohibiting order (Zachariah2014).

In Nigeria the Merchant Act, 2007, section 361(2) provides that Wreck means: (a) sunken, stranded, or in other words ships that contain anything else on board, whether lost or sunken at sea or shipwrecked; or (b) ships that are almost or at risk of being wrecked either by collision or stranding or incidents of navigation, or any other occurrences on-board or external the ship causes material damage and an immediate risk of material damage. This means that any occurrence must dealing with the first

two of the three categories to be included in the study (including just derelict vessels or wrecks since they may not necessarily be abandoned or ignored by their owners). The below diagram shows the interpretation illustrating the terms above

Figure 3: Diagram illustrating the concept of abandoned vessels



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Source: Prepared by Author

2.5 Environmental Impacts of Abandoned Shipwrecks in Nigeria.

The environmental importance of unattended wrecks in the Nigerian coastal line is noteworthy and from the given sources apparent such as the negative consequences shown on the environment. These impacts include:

i. **Oil Spills:** Abandoned shipwrecks can cause oil spills, the toxins of which harm to marine environment are substantial. Through oil leakage and other dangerous materials from the wrecks, marine ecosystems, and their biodiversity and water quality become harmed by theses leaks (Odiegwu & Enyioko, 2022b).

ii. **Debris Pollution:** Shipwrecks contribute marine pollution in Nigerian waters. Abandoned boats cause a build-up of trash that consists of rusted metal, batteries and other instruments in the attempt to environ and the habitat (Olukoya, 2018).

iii. **Habitat Destruction:** There is the potential for disturbed natural environment and even habitation loss. The derelict shipwrecks change marine habitats and can result in habitat destruction. They are found to be navigational hindrances,

disturbing fishing works, and exposing many to potential hazards resulting in death; overall a bad environmental indicator (Vanguard Newspaper, 2018).

iv. **Navigation Hazards:** There is the dilemma of wrecked ships which present navigational danger, even for the small craft such as fishing boats. This submarine wreckage can invade waterways and this could lead to, not only damage of boats/fishing equipment but also cause accidents which can possibly be fatal.

v. **Economic and Social Impacts:** The environmental effects of a submerged shipwreck that has lost touch with its opportunities include economic and social sphere as well. Coastal cities may feel the pressure of the extra relief efforts needed to clean the beaches, health issues that may arise, and reduction of tourist income because of these sinks. The consequences of dumping of debris in the Nigerian coastal waters are huge, potential benefit the marine environment, biodiversity, navigation safety and coastal communities. All these impacts can be tackled only with proper policy dedicated to this problem, timely enforcement of laws and regulations.

2.6 The Determinant Risk of Hazardous in Shipwreck Removal operations in Nigeria

The removal of shipwrecks from Nigeria's waterways poses significant safety and hazard risks requiring effective risk management. Research by Darbra and Casal (2004) identified key risk factors including the wreck's structural integrity, financial constraints, water currents, and the expertise of the removal team. Structural instability can lead to dangerous debris, while hazardous materials like oil and chemicals pose environmental and health threats. Abramowicz and Hejmlich (2015) emphasized the importance of skilled personnel and proper planning. Agbor (2015) highlighted the need for thorough inspections, safety protocols, and specialized equipment. Effective risk management and continuous improvement of safety practices are essential for successful shipwreck removal operations (Darbra & Casal, 2004).

2.7 IMO International Instrument and its Challenges in Managing Abandoned Shipwrecks.

In international law, definitions on terms can generally be found in different international instruments. The instrument offering a definition on wrecks is the Nairobi International Convention on the Removal of Wrecks (WRC). In this convention, a ship means "…a seagoing vessel of any type whatsoever and includes hydrofoil boats, air-cushion vehicles, submersibles, floating craft and floating platforms, except when such platforms are on location engaged in the exploration, exploitation or production of sea-bed mineral resources. Moreover, in the same Convention a definition is set regarding wrecks. The Convention provides that wrecks are defined as, following; a marine casualty, a sunken or stranded ship, or part thereof, as well as any object that is sunken, stranded or adrift at sea from a ship, or a ship that is about, or may reasonably be expected, to sink or strand where effective measures to assist the ship or any property in danger are not already being taken. (IMO, 2024). Abandoned shipwrecks can pose certain problems that may affect maritime safety, marine environments, and the economies of communities living around coasts.

1. Environmental Issues: Wrecks are a major concern for the environment due to the release of various types of pollutants such as heavy metals, oils, and chemicals that can cause great harm to marine ecosystems and species (Pinder, 2016). They can reduce the flow of marine currents and alter the sedimentation pattern which can lead to further ecological hazards, especially in sensitive areas such as coral reefs and sea grasses (Pinder, 2016). This demands the introduction of proper risk assessment and mitigation methods.

2. Logistical Issues: Decommissioning abandoned shipwrecks provides a variety of logistical issues in the way, such as finding a wreck, access to a place, and hazardous material management. Often, costs are high, which fetters comprehensive effort by a local agency (Dromgoole, 2013; Pinder, 2016).

3. Stakeholder Involvement: Management would require cooperation among government agencies, maritime authorities, environmental groups, and local

communities. It is said that a necessary requirement for any form of management to be effective involves clear communication, shared goals, and unified effort. In the particular case of Nigeria, the situation is made worse by indefinite jurisdictional authority and scarcity of resources.

2.8 Factors Contributing to Shipwrecks.

The stock of shipwrecks in Nigerian waters can be attributed mainly by the combined elements of ship accidents, conflicts and natural calamities. Navigational difficulties such as finding hidden obstructions underwater and worsened weather conditions are among the main causes of accidental sinking of cargo ships and fishing vessels. Apart from this, complicated legal processes surrounding the ownership and removal of the wrecks have made it challenging for the authorities to respond promptly to the issue (DW, 2018). Another vital aspect is that the vessels are dumped deliberately by their owners who no longer want them. Ships' owners are said to prefer junking them in Nigerian waters than incurring the expenses of properly disposing of them which could be exorbitant due to the legal and financial implications. This fishing method has turned Nigeria into "a shipwreck graveyard of the world," as described Prince David Omaghomi (Ships & Ports, 2023).

2.9 Measures Directed Toward Shipwreck Problem.

Nigerian government and a number of environmental organizations became aware of the urgency of the problem with ever-growing abandoned shipwrecks. The Nigerian Maritime Administration and Safety Agency (NIMASA) has ordered the community of local and international carriers not to dump their vessels in Nigerian waters, with the possibility of sanctions being imposed for any non-compliance. Nevertheless, ineffective enforcement as well as legal complexities concerning the shipwrecks ownership have held up the process of cleaning them up and proper disposal. There are various efforts made by some institutions like the Eco Restoration Foundation, to remove individual ships having disastrous immediate effects on the environment.

Although, a more inclusive and coordinated approach is imperative for the solution of shipwrecks in Lagos waters. This could be in the form of well-developed laws, improved enforcement procedures, and budget allocation for the regular scrapping and disposal of these disregarded vessels (Ships & Ports, 2023).

2.9.1 Measures Taken to Address the Issue of Shipwreck in Nigeria's Coastal Waters

i. **Removal of Shipwrecks:** The Federal Executive Council (FEC) approved the removal of over 3,000 wrecks between Badagry and Tincan Island to improve navigation and safety (Akabogu, 2021).
ii. **Legislation and enforcement:** It was stated that the NIMASA directed that abandoned ships should be removed to prevent accidents and ensure a certain degree of safety in maritime activities (Akabogu, 2021).
iii. **Financial Allocation:** The government of Nigeria has assigned the sum of N4.3 billion for the issue of the abandoned vessels (Akabogu, 2021).
iv. **International Cooperation:** Collaboration with the international shipping community and recognition for curbing piracy have been pursued (Akabogu, 2021).
v. **Environmental Conservation:** Initiatives like the Eco Restoration Foundation are focused on removing underwater wrecks to protect the coastal ecosystem (Akabogu, 2021).
vi. **Security Measures:** NIMASA has deployed security assets, including ships and helicopters, to enhance maritime security and reduce piracy (Akabogu, 2021).

2.9.2 Summary Report on Status of The Wrecks Removal Project in the year 2024

Table 2: Summary report on Status of Wrecks Removal Project in 2024.

SN	COMPANY	NO OF WRECKS AWARDED	NO OF WRECKS REMOVED	ON-GOING	YET TO BE REMOVED	DUMPSITE	PROJECT STATUS
1	Humber Marine Werks LTD	14	11	1	2	NMRDC Jetty kirirkiri and Commandant Jetty, Nigerian Correctional Service Yards Kirikiri.	In progress
2	Genesis Technical Company LTD	7	4	1	2	NMRDC Jetty kirirkiri	In progress
3	Joemarine Nautical Company Nigeria Ltd	6	2	2	2	Esiso Jetty, Enerhen Warri	In progress
4	Steadfast Maritime Services Nig Ltd	9	5	2	2		In progress

Source: NIMASA Wreck Unit

In 2024, the Nigerian government launched a strategic project for the removal of hazardous wrecks within its coastal waters and has awarded contracts to four specialized maritime companies. This would then promote the safety of marine navigation and protect the marine environment against hazards, and consequently remove the navigational hazards dangerous to vessels and coastal activities.

The companies involved in this project are Humber Marine Werks LTD, Genesis Technical Company Ltd, Joemarine Nautical Company Nig. Ltd, and Steadfast

Maritime Services Nig. Ltd. Each company was assigned a specific number of wrecks to remove, and significant progress has been made in the early stages of the project.

Humber Marine Werks LTD was awarded the contract to remove 14 wrecks. So far, they have removed 11 wrecks, with 1 being worked on and 2 yet to be removed. Depositing of the removed wrecks is at the NMRDC Jetty Kirikiri and the Commandant Jetty Nigerian Correctional Service Yard Kirikiri. The project is yet ongoing.

Genesis Technical Company Ltd was assigned 7 wrecks, of which 4 have been removed, 1 is ongoing, and 2 are pending removal. All removed wrecks are being stored at the NMRDC Jetty Kirikiri. This project is also in progress.

Joemarine Nautical Company Nig. Ltd was contracted to handle 6 wrecks. To date, they have removed 2 wrecks, with 2 more under removal and 2 pending. The wrecks are being taken to the Esiso Jetty in Enerhen Warri. The project remains in progress.

Steadfast Maritime Services Nig. Ltd. was awarded the removal of 9 wrecks. The company has removed 5 wrecks, with 2 ongoing and 2 yet to be addressed. The specific dumpsite for their wrecks has not been disclosed, and their project is also in progress.

Overall, while substantial progress has been made by all contractors, the wreck removal efforts are ongoing, and further work is required to complete the assignments. The success of this project is crucial for improving maritime safety and environmental conditions in Nigeria.

2.10 Environmental Impact Assessment Framework

Environmental Impact Assessment (EIA) is crucial for evaluating potential environmental consequences before project implementation. It involves several stages: screening to categorize projects by impact potential, scoping to identify critical issues and involve community participation, prediction to assess impacts on environmental

factors, mitigation to reduce negative effects, and monitoring to evaluate mitigation effectiveness. EIA frameworks are essential in addressing shipping accidents by understanding potential environmental impacts such as oil spills and chemical releases. This framework helps in devising strategies for managing these impacts and ensuring effective clean-up and monitoring, ultimately contributing to environmentally responsible project planning and development (Echefu et. al, 2002).

2.11 Methods and Techniques for Assessing Environmental Effects of Abandoned Shipwrecks.

Understanding the environmental impact of abandoned shipwrecks involves complex and multidimensional approaches. Remote sensing, including air and satellite imagery, is crucial for assessing wrecks' effects on the seafloor, detecting oil or chemical spills, and evaluating potential further damage (Ballard et al., 2016). Underwater surveys using technologies like side-scan sonar, multi-beam echo sounders, and remotely operated vehicles (ROVs) provide detailed data on wreck structures and surrounding hazards (Dunkley et al., 2020). Sediment analysis helps identify contaminants such as heavy metals from wrecks, as demonstrated by Plets et al. (2016) in the North Sea. Ecological monitoring assesses shifts in biological communities and ecosystem processes near wrecks, with studies like Grehan et al. (2005) revealing changes in invertebrate species diversity. Integrating these techniques enables comprehensive impact assessments and informs effective management and remediation strategies to protect marine environments.

2.12 Policy Implications and Recommendations for sustainable Coastal Management and Conservation.

Sustainable coastal management and conservation are essential for preserving biodiversity and supporting coastal economies. Integrated Coastal Zone Management (ICZM) frameworks, which integrate human activities with natural systems, are crucial. These frameworks should be based on ecosystem management principles, stakeholder involvement, and adaptive governance to address changing environmental

conditions (Douvere, 2008; Pomeroy & Douvere, 2008). Capacity building, knowledge sharing, and monitoring are vital for successful long-term sustainability. Education and skill development for stakeholders and collaborative efforts through coastal partnerships can improve management and reduce resource exploitation (Christie & White, 2007; Armitage et al., 2009). Adopting a systemic, ecosystem-driven approach will enhance coastal management and conservation efforts (McLeod et al., 2015; Salm & Clark, 2000).

Nigeria's marine governance policies against threats to its coastal regions, including pollution, illicit fishing, oil prospecting, and development. It compares Nigeria's approach with Belize's best practices, revealing major shortcomings such as poor coordination, insufficient financial resources, poor enforcement of regulations, and low public awareness. Survey data from mid-career professionals and experts in marine governance revealed that improved institutional capabilities and greater financial resources could help address these issues. Therefore, there is need for sustainable marine management in Nigeria.

2.13 Integrated Management approaches for mitigating the environmental effects of abandoned shipwrecks.

Abandoned shipwrecks causes environmental pollution which occurs due to the leakage of hazardous materials like fuels, chemicals and unexploded munitions. Integrated management solutions are particularly important for avoiding or minimizing these harmful effects. A holistic management framework is added through the identification and evaluation of the most polluting wrecks. Based on the International Union for Conservation of Nature (IUCN) data, about three million sunken and abandoned vessels are found in the ocean and about 8500 of them are identified as the “potentially polluting wrecks”. These wrecks, from World War I and II to the present, contain over 6 billion gallons of hazardous materials, including oil use of different flavours. We are talking about more than ten times the volume of oil spilled by the Exxon Valdez and Deep water Horizon accidents as both have protected

the nature for quite a long period. To treat the matter, comprehensive surveys and detailed risk assessments must be organized to distinguish the more dangerous wrecks and to further prioritize their remediation (Hossain, 2020).

2.14 Summary

The reports on the impact assessment of abandoned ships' wrecks within Nigeria present some critical and severe concerns. Some studies emphasize the fact that as a source of danger to the environment, safety of mariners and coastal residents, ships abandonment is detrimental in Nigeria. Research reveals that there is an economic, environmental and the human health impacts for the abandoned and neglected ships. These ship pieces not only interfere with maritime operations but also can cause aesthetic degradation, extra expenses for beach cleaning, public health and safety concerns, and loss in income from tourism. Moreover, derelict vessels not only affect wildlife but also ecological functions, and navigation which can result in extirpation of local species as well as abandonment of local recreational facilities.

Studies also want to address the issue of quick and right dismantled of old shipwrecks to avoid these negative consequences. The Nigerian Maritime Administration and Safety Agency (NIMASA) is concerned to see through the provision of innovative way forward towards the efficient removal of the abandoned vessels from Nigerian coastal waters. These include increasing public awareness, training technical personnel and putting in place safety enhancement programs are therefore recommended to counter the environmental and safety hazards wrought by shipwrecks that lie in wait of Nigeria’s coastal waters. Essentially, the literature points to the required holistic strategies with close collaboration under the formulation of which the water bodies hosting abandoned shipwrecks can be made environmental friendly, the marine ecosystem saved, safety of mariners ensured and livelihoods of people living close to water preserved.

Chapter 3

3 Implementation of International Maritime Instruments

3.1 Overview of the International Legal Framework and International Maritime Instruments

There are several international legal instruments that regulate the handling of abandoned shipwreck, these consists of significant number of maritime treaties and accords. This leads to some legal challenges arising in abandoned shipwreck management making it a very complex issue due to gaps in national laws, different governmental approaches, and deficiencies in international conventions. Often, national legislation lacks provisions related to ownership, liability, and enforcement regarding wreck removal (Soria, 2023). These legal documents delineate the entitlements and responsibilities of states concerning shipwrecks, and furnish directives for their identification, extraction, and elimination. The most significant international agreements are outlined below.

i. **United Nations Convention on the Law of the Sea (UNCLOS). UNCLOS,** or the United Nations Convention on the Law of the Sea, popularly called the "constitution for the oceans," was adopted in 1982. It presented a broad legal regime for every human activity occurring on the high seas. In general, the UNCLOS describes the rights and duties of states regarding use of the world's oceans, including sections about wrecks. UNCLOS addresses flag states' obligations, coastal states' rights, and generally addresses wreck matters under Articles 2, 56, 94, 98, 192, 211, and 303, among others. (Rothwell & Stephens 2016).

ii. **Nairobi International Convention on the Removal of Wrecks**: The Nairobi International Convention on the Removal of Wrecks, 2007, is an international convention that serves as a legal instrument catering to the removal of the remains of ships that form any obstacle to the navigable waters or the marine environment. It was adopted under an IMO Diplomatic Conference held in

Nairobi in 2007 and came into force on April 14, 2015. It is supposed to guarantee that wrecks beyond the territorial sea are taken out swiftly and effectively to avoid possible threat to the lives, goods, and property at sea, as well as the marine environment (Michel, 2007).

iii. **UNESCO Convention on the Protection of the undersea Cultural Heritage, 2001** attempts to protect the submerged archaeological and historical monuments, including shipwrecks, as well as any other form of undersea cultural heritage. As noted by (Argyropoulos &Stratigea, 2019), the convention provides for the basic principles and rules for the protection of the cultural heritage, including standards relating to the prudence maintenance and preservation of the wrecks that have been abandoned.

iv. **International Salvage Convention 1989:** The said Convention provides a legal framework for salvage, especially those operations that are dangerous or abandoned wrecks. It offers a system for deciding on the duties and rights of the salvor along with the criteria as to who is eligible to receive the remuneration on account of salvage services (Ekhator, 2016).

3.2 Rights of a Coastal State under International Law

Under UNCLOS, the rights of coastal governments to sovereign and jurisdictional powers over maritime zones are wide. States exercise full sovereignty in the territorial sea, up to 12 nautical miles from the baseline, including rights with respect to natural resources and marine scientific research. Within the 200 nautical mile EEZ, states can explore and exploit natural resources of whatever kind, whether living or non-living. Art factual islands and marine scientific research can also fall within the purview of its jurisdiction and control. Seabed resources are also subject to exploration and exploitation of the state provided the area in which these resources are situated is beyond the boundaries of the EEZ. Under Article 220 of UNCLOS, there are obligations imposed on the coastal states for the prevention of pollution and preservation of the environment. (UNCLOS, 1982).

3.3 Jurisdictional Authority and Powers of Enforcement

Under international law, UNCLOS gives to a great extent sovereign rights and jurisdictional authority to coastal states over their respective maritime zones. Over the territorial sea, which extends to 12 nautical miles from the baseline, coastal states possess full sovereignty, subject to particular regulations concerning the safety of navigation, customs, immigration, environmental protection, and prevention and control of pollution. They can also exercise on foreign ships rights relating to the use of designated sea lanes and traffic separation schemes.

In the contiguous zone, extending up to 24 nautical miles, the coastal states can enforce laws on customs, fiscal, immigration, and sanitation in order to prevent and punish infringements occurring within its territory or territorial sea. In the Exclusive Economic Zone with a limit up to 200 nautical miles, coastal states have the authority to exercise sovereignty over exploration and exploitation of living and non-living natural resources. They may also exercise jurisdiction over artificial islands, marine scientific research, and protection and preservation of the marine environment. The enforcement measures available within the EEZ are boarding and inspection, arrest, and judicial proceedings. One or two challenges: disputes over maritime boundaries; to balance properly the exercise of the sovereign rights with due regard for international freedoms; and resource requirements substantial. One or two opportunities include more international cooperation, drawing on improved technology, and sustainable use of marine resources (Jessen O, 2015).

3.4 Key Provisions of the Wreck Removal Convention

The Convention on Wreck Removal provides a number of key provisions that spell out state and ship-owners responsibilities and liabilities in the removal of wrecks.

i. Definition of Wreck: For the purpose of this Convention, wreck means:

- A sunken or stranded ship.

- Any part of a sunken or stranded ship, including any object that is or has been on board such a ship.
- Anything whatsoever which is lost overboard from a ship and stranded, sunken or adrift at sea.
- A ship which is on the verge of sinking or stranding and where effective measures to assist the ship or any property in danger are not already being taken.

ii. Liability of Ship owners:

Moreover, the convention renders ship owners financially responsible for the cost related to locating as well as marking and removing wrecks. This shall be accomplished through a requirement for the owners of the ships to take out insurance or other financial security to cover these costs. The registered ship owner is charged with the responsibility of removing the wreck except in instances when the wreck shall have been located within the territorial waters of the state.(Gaskell, &Forrest, 2019)

iii. Article 12 imposes a compulsory insurance regime upon vessels of 300 gross tonnage and above carrying on board a certificate issued by or on behalf of a State-Party to the Convention. The flag state, if that state is a party to the Convention, should issue such a certificate. If the flag state is not a party, the owner has to find a state party willing to issue the certificate.

iv. Criteria to Establish Hazard

The convention lays down 15 criteria to establish that a wreck is hazardous. It includes:

- The wreck's form, size, and construction
- The depth of the waters
- Tidal range and currents
- Proximity of shipping routes or established traffic lanes
- Traffic density and frequency
- The nature and amount of cargo carried in the wreck
- The vulnerability of port facilities
- The prevailing meteorological and hydrographical conditions
- The submarine topography of the area

v. Time Limits for Recovery of Costs:

Time limits are set under the convention for recovering costs. Rights to recover costs are extinguished unless an action is brought within three years from the date when the hazard was determined. However, in no case shall an action be brought after six years from the date of the maritime casualty that resulted in the wreck.

vi. Settlement of Disputes:

It also establishes that disputes shall be settled by negotiation, enquiry, mediation, conciliation, arbitration, judicial settlement, resort to regional agencies or arrangements, or other peaceful means. If no settlement is possible within a reasonable period, the provisions relating to the settlement of disputes set out in Part XV of the UNCLOS apply (Parlov, 2022).

3.5 Implementation Challenges and Enforcement Issues

While the Nairobi International Convention on the Removal of Wrecks, 2007, established a solid legal regime in respect of wreck hazards, there are several challenges in implementation and enforcement. The current issues include the very limited ratification by states, including the United States, to the Convention. These affect decision-making and development alike. Most states currently lack the financial, technical, and institutional lack of fund for effective wreck removal. There is complicated coordination among government agencies and various international partners; adding to that, the engagement of various stakeholders like coastal communities and environmental groups makes it even more difficult. Besides these, technological and environmental challenges, particularly in very sensitive marine areas, also emerge. Overcoming all these challenges is key to proper implementation in order to protect the marine environment (Michel, 2007).

3.6 Relevance to Managing Shipwrecks in Nigeria

The above-mentioned international legal regime is very pertinent to the management of abandoned ship wrecks in Nigeria, considering the country's long coastline and numerous abandoned wrecks that constitute a source of many risks.

i. **Jurisdiction and Ownership:** With regard to ownership and the question of legal status, UNCLOS addresses the question of who is responsible for the management of abandoned wrecks. Nigeria ratified the UNCLOS on August 14, 1986. It being a party to UNCLOS and having a 200-nautical-mile EEZ wherein one is able to exercise authority over abandoned wrecks, this provides the state with legitimate backup in solving wreck issues which are within its waters to address associated damages.

ii. **Wreck Removal:** Nairobi Convention provides an elaborated regime for the removal of hazardous wrecks addressing the deficiencies noted in UNCLOS, which only serves to provide broad principles regarding wrecks. The country accessed the Nairobi convention on June 23rd 2016 and it also contains liability and cost recovery provisions.

3.7 Challenges and Opportunities in Implementing the International Legal Framework

While the international legal framework provides a solid foundation for managing abandoned shipwrecks, its effective implementation in Nigeria faces several challenges:

i. **Capacity and Resources:** Nigeria may face major challenges in providing the substantial institutional, financial, and technical resources needed to manage abandoned wrecks in an effective manner. The nation's capacity to recognize, evaluate, and remove dangerous wrecks may be hampered by a lack of finance, specialized tools and skilled workers.

ii. **Cooperation and coordination:** Handling the problem of abandoned shipwrecks frequently calls for collaboration and coordination between different government departments as well as with regional and global partners. Putting in place efficient systems.

3.7.1 Opportunities in Implementing the International Legal Framework

i. **Legal and Policy Reform:** The ratification and domestication of relevant international conventions provide an appropriate platform on which Nigeria can implement a nationally sound legal and policy framework with regard to wreck management.

ii. **Capacity Building and Funding:** The government of Nigeria should seek technical and financial assistance from international organizations and development partners in the development of its capacity with regard to identification, assessment, and removal of wrecks. This includes, among others, training programs, procurement of equipment, and direct access to specialized expertise.

iii. **Regional Cooperation:** Nigeria might share with neighbouring countries in the Gulf of Guinea region the development of joint strategies and sharing of experiences on the issue of abandoned wrecks through available regional mechanisms and initiatives.

iv. **Stakeholder Engagement and Public Awareness:** Wherein, Nigeria, through proactive means, engages various stakeholders, including the communities along its coasts, the maritime industry, environmental groups, etc., to build awareness and gather inputs for collaborative ways of conducting wreck management. This will help in considering the interests of all related parties.

The international legal framework consists of some basic maritime conventions and agreements that provide principles, rules, and guidelines relating to the management of abandoned shipwrecks. The international legal framework is thus very relevant to Nigeria, a country with a considerable number of wrecks causing a variety of risks along its coastline. More effective strategies for the identification, assessment, and removal of abandoned shipwrecks would thus be put in place for Nigeria by drawing upon the international legal framework of instrument ratification and domestication, enhancement of institutional and technical capacity, regional cooperation, and multi-

stakeholder involvement as a means of laying the basis for improved maritime safety, marine environmental protection, and underwater cultural heritage preservation.

3.8 Authorities Responsible for the Removal of Wrecks in Nigeria by Virtue of Acts

The Merchant Shipping Act 2007 and the NIMASA Act 2007 provide the legislative framework for the removal of wrecks in Nigeria's territorial waters. The Acts do indeed designate some responsibilities to different authorities, but most noticeably to the agency known as NIMASA, which is declared the official Receiver of Wrecks. This further indicates that the legal framework provides a system to address ship wrecks resulting from the hazards they pose to navigation and the marine environment.

3.8.1 Obligation under the Merchant Shipping Act, MSA 2007

The MSA states obligation and procedure for wreck removal, mainly resting on the ship owner. In this regard, in an event of shipwreck, the ship owner is under obligation to remove the wreck within a reasonable time as determined by the Receiver of Wreck, a position maintained by NIMASA. If the action is not initiated by the ship owner, NIMASA takes over the responsibility of ensuring the removal of the wreck. This includes identifying whether the wreck is considered to be a hazard, marking it, providing notice to the owner of the vessel, specifying a time in which the removal of the wreck must be carried out, and, where necessary, removing it at the owner's cost.
For the purpose of the MSA, "hazard" is defined as any condition that is likely to be dangerous to navigation or likely to result in significant harm to the marine environment or coast of Nigeria. "Removal" for this purpose would involve any activity which prevents, mitigates, or eliminates these hazards. These are the provisions giving NIMASA the authority to regulate and supervise the wreck removal operations so that such hazards are promptly dealt with.

Role and Powers of NIMASA under the NIMASA Act of 2007

As provided under the NIMASA Act, the Agency is the statutory body with responsibility for wreck receipt and removal. The Act grants the Agency the right to stipulate regulations with regard to the removal of wrecks, particularly those viewed as dangerous to navigation or environmental concern. The Agency is to supervise such wreck removal activities and ensure full compliance with the regulations.

However, NIMASA does not have exclusive jurisdiction; indeed, there are other enactments on Nigerian ports which would expect the agencies to cooperate, even when wrecks fall within areas demarcated as ports. This no doubt presents overlapping jurisdiction, and a situation where coordination between NIMASA and other agencies, such as NPA, becomes compelling to ensure that there are no possible conflicts, with the view to ensuring efficient wreck management.

Inter-Agency Relations and the Role of the Nigerian Ports Authority (NPA)

The NPA is also involved heavily in the management of wrecks within the port limits set by the NPA Act. As part of the functions of control over pollution in port areas, the NPA is supposed to manage hazardous wrecks. While the NPA Act does not, in express words, grant the authority to remove wrecks to NPA, such responsibilities are included in the general power of the authority over pollution control and environmental management within the ports. Places such as ocean beaches within 100 meters of the high-water level, waterways, creeks, swamplands below the highest astronomical tide level, and even port infrastructure like piers and jetties fall under the purview of the NPA. This agency is, therefore, supposed to be responsible for wrecks in such places particularly those that can lead to environmental hazards.

In view of this, it gets crystal clear that the boundaries between areas of responsibility of NIMASA and the NPA indeed overlap; proper communication and coordination are hence indispensable. Both agencies must collaborate to ensure wrecks are effectively managed, particularly in regions where their jurisdictions intersect.

3.8.2 Procedure for Removal

Under the MSA, the Receiver of Wreck, NIMASA is under compulsion to notify the time, which must be reasonable within which wreck removal is done whenever there is a wreck. The deadline notification to the ship owner is always in writing and carries with it a warning that failure to comply will lead to the carrying out of such removal by NIMASA at the owner's expense. Where the owner does not remove the wreck, NIMASA is entitled to remove the wreck and recover the cost from the owner. If the owner of the ship either fails or refuses to pay for the cost incurred, or if the wreck is unclaimed, it entitles NIMASA to declare a maritime lien on the vessel or sister ship until good payment is made. If a wreck remains unclaimed for over a year, NIMASA is allowed to sell it in order to cover costs.

3.8.3 Legal and Financial Considerations

The MSA also provides several legal and financial mechanisms that are necessary in ensuring compliance with wreck removal obligations. Costs preponderantly incurred by NIMASA in the removal of wrecks are normally recoverable against the ship owner. If the ship-owner disputes such costs or refuses to pay, then the lien by the Receiver against the vessel or sister ship would be a means of securing such costs.
The sale of unclaimed wrecks presents another tool available to NIMASA, which, upon sale, enables the Agency to recover some expenses incurred during removal operations. In this regard, even when the owner of the ship cannot be identified or made accountable, costs of wreck removal can still be mitigated.

Wreck removal in Nigeria is an involved process presided over by the Merchant Shipping Act 2007 and the NIMASA Act 2007. Whereas NIMASA serves as the statutory Receiver of Wrecks and holds a prime position in the administration of wreck removal activities, its authorities are indeed under the restraint of other laws, notably on port management under the Nigerian Ports Authority Act.

These legal frameworks, therefore, give a holistic approach to the perils occasioned by wrecks, with clear statements of responsibilities of ship owners, NIMASA, and other relevant authorities. Effective coordination between NIMASA and NPA is very critical in managing wrecks within the Nigerian waters, at least for areas where their jurisdictions overlap. This will ensure that wrecks are managed in a manner that will not bring damage to navigational safety, the marine environment, and interests of coastal communities.

Chapter 4

4 Wreck Removal Operation in Nigeria Exclusive Zone (EEZ)

4.1 Preamble

Wreck removal in an Exclusive Economic Zone (EEZ) involves the management and Removal of Shipwrecks located within a state's EEZ. An EEZ is a maritime zone extending up to 200 nautical miles from a coastal state's baseline, where the state has special rights regarding the exploration and use of marine resources. While an EEZ grants a state economic rights, it does not grant full sovereignty like in territorial waters. Wreck removal in Nigeria involves in dealing with shipwrecks that pose risk to navigation, the environment and economic activities.

Nigeria has conducted several notable wreck removal operations as shown in table1 (2.8.2) of chapter 2, often in response to environmental risks or threats to maritime navigation. These operations typically involve collaboration between Nigerian authorities, such as the Nigerian Maritime Administration and Safety Agency (NIMASA), international salvage companies, and environmental agencies. (Martinez et al., 2017)

4.2 Challenges and Considerations of Managing Shipwrecks in Nigeria's EEZ

Nigeria has jurisdiction under the United Nations Convention on the Law of the Sea (UNCLOS), which grants sovereign rights over resources and responsibility for environmental protection within its 200-nautical-mile EEZ. Nigeria's Merchant Shipping Act (2007) mandates ship owners to bear wreck removal costs, while the Nairobi International Convention on the Removal of Wrecks (2007), offers a legal framework for compensation claims. The ship-owner and insurers are liable for wreck removal expenses and potential damages to marine traffic, fisheries, and the

environment. International salvage operators would likely be involved, raising legal questions on salvage rights and compliance with Nigerian law.

Given an account of the danger pose from the environmental perspective, this study proffer insight to manage activities of the sea therefore, sunken tanker, containing 10,000 metric tons of crude oil, poses severe threats. Oil spills could devastate marine ecosystems, including fishing grounds and coral reefs, while toxic materials in the ship's hull could leach into the water. Nigeria's environmental regulations, particularly EGASPIN, would guide the operation, with NOSDRA monitoring pollution. Immediate mitigation strategies, such as deploying oil containment booms, pollution monitoring, and techniques like in-situ burning, would be necessary to prevent environmental damage. Deep-water wreck removal is complex, requiring specialized vessels like remotely operated vehicles (ROVs) and underwater cranes. Nigeria's limited equipment may necessitate international collaboration, with operations staged from ports such as Lagos or Port Harcourt. Rough seas and unpredictable weather add complications. Wreck removal costs are high, potentially reaching hundreds of millions, with funding from ship-owner insurance or government support if necessary. Efficient coordination between stakeholders is vital to ensure smooth operations.

4.3 Interview Analysis respondents

A total number of (12) twelve interview questions as shown in the appendix below which were formulated in this study, whereby officials from maritime authorities such as NIMASA and NPA, together with maritime stakeholders like wreck removal companies, participated in an interview session to address the topic. The interview session was conducted via secured video and audio call utilizing zoom and WhatsApp audio call coded by **P** Alphabet. This sessions were recorded with the consent of the participants, securely stored and analysed to provide valuable insights into the issue at hand. The analysis of the responses involved thematically analysing the responses to group the responses obtained from the interview of various participants so as to have similar opinions and contrasting opinions on same topics under the same theme. This

responses were further grouped and used in addressing each of the research questions formed.

The participants involved in the interview sessions whom includes seasoned experts from NIMASA, NPA and key stakeholders involved in wreck sectors of Nigeria were selected to address the research questions. The table below provides the details of the participants and their relevant years of experience in the maritime sector.

Table 3: This table shows number of participant with their various specializations and number of years in their organizations. Coded with P alphabet.

S/N	Interviewee	CODE	Agency	Years of Experience	Department
1	Participant 1	P1	NIMASA	20 YRS	MARINE ENVIRONMENT MANAGEMENT DEPT
2	Participant 2	P2	NPA	15 YRS	HSE DEPT
3	Participant 3	P3	NIMASA	13 YRS	HYDROGRAGPY UNIT
4	Participant 4	P4	WRECK HANDLING COMPANY	10 YRS	DEPARTMENT OF SAFETY RESPONSE.
5	Participant 5	P5	NIMASA	10 YRS	MARITIME SAFETY UNIT
6	Participant 6	P6	LOCAL COMMUNITY	25 YRS	COMMUNITY LEADER
7	Participant 7	P7	NIMASA	12 YRS	WRECK UNIT
8	Participant 8	P8	NIMASA	10 YRS	SEARCH AND RESCUE UNIT
9	Participant 9	P9	SHIP OWNER REPRESENTATIVE	20 YRS	ORION

Based on the provided response, I've grouped the interviewees' responses according to each interview question to form a thematic grouping that best addresses each research questions. Here’s a consolidated list of responses for each question across different interview participants:

1. **What are the significant effects that abandoned shipwrecks have on Nigeria's marine environment and its marine biodiversity?**
    - **P1:** Abandoned shipwrecks cause habitat degradation and pollution from leaking oil and chemicals; they can also serve as conduits for invasive species. They obstruct navigation channels and have economic impacts on tourism, fisheries, and other activities.
    - **P6:** Major impacts include hazardous substance pollution, impairment of navigation, and habitat destruction likely to injure sensitive environments like coral reefs. The economic impact is also profound since it affects fishing and local economies.
    - **P7:** Wrecks can be very polluting, especially due to oil leakage, which hugely affects the marine environment, biodiversity, and local communities whose life depends on the sea.
    - **P5:** Amongst the environmental impacts are dangerous navigation, which can cause accidents and loss of life, especially in inland waterways.
    - **P1:** Methods include visual inspection, water and sediment sampling, remote sensing, ecological surveys, chemical analysis, and collaboration with local communities to gather data.
    - **P7:** Methods mentioned include biological monitoring, satellite imaging, and chemical analysis of pollutants like heavy metals and hydrocarbons.
    - **P2:** Methods include physical assessments, mechanical assessments using technology and equipment, and scientific methods like bioremediation.
    - **P8:** NIMASA collaborates with NOSDRA to monitor environmental impacts, though specific methods were not detailed.
    - **P4:** Emphasized the importance of systematic assessment to inform eventual removal strategies, without specifying methods.

2. **What methods are adopted to assess the level of pollution and ecological damage resulting from abandoned wrecks?**

- **P1:** Methods include visual inspection, water and sediment sampling, remote sensing, ecological surveys, chemical analysis, and collaboration with local communities to gather data.
- **P7:** Methods mentioned include biological monitoring, satellite imaging, and chemical analysis of pollutants like heavy metals and hydrocarbons.
- **P2:** Methods include physical assessments, mechanical assessments using technology and equipment, and scientific methods like bioremediation.
- **P8:** NIMASA collaborates with NOSDRA to monitor environmental impacts, though specific methods were not detailed.
- **P4:** Emphasized the importance of systematic assessment to inform eventual removal strategies, without specifying methods.

3. **Are there external factors that influence the environmental risks associated with submerged shipwrecks?**
    - **P7:** External factors include water conditions like currents and tides, climate change, and existing pollution levels.
    - **P8:** Factors such as water temperature, current, tides, and external pollution sources were highlighted as influences on the environmental risks.
    - **P9:** External factors include abandonment due to political or legal issues rather than accidents.
    - **P6:** Coastal communities were mentioned as external factors due to their resistance to wreck removal efforts.
    - **P1:** Acknowledged external factors but emphasized human interactions with the environment as significant contributors to environmental risks.

4. **What regulations and policies are currently in place for managing abandoned shipwrecks in Nigeria?**

- **P3:** Mentioned the Merchant Shipping Act, NIMASA regulations, and IMO conventions.
- **P7:** Discussed the role of NIMASA and other regulations and IMO conventions.
- **P5:** Highlighted a new regulation on wreck removal and ongoing efforts to enforce existing laws.
- **P1:** NIMASA is mandated by IMO to remove wrecks, following a process that includes legal notifications before removal.
- **P8:** Cited the Merchant Shipping Act and the importance of regulations in ensuring navigational safety.

5. **How does NIMASA implement the adopted regulations and policies?**
   - **P3:** NIMASA undertakes surveys, with partners and stakeholders, and issues fines and public education against breach of regulations.
   - **P5:** NIMASA enforces such regulations through the provisions for the removal of wrecks and other sanctions against defaulting vessels.
   - **P1:** This is achieved through the enforcement via sea patrol and newly commissioned patrol boats.
   - **P8:** NIMASA has a strict process of publication and notification before wreck removals.
   - **P7:** NIMASA ensures compliance through enforcement and making necessary adjustments based on legal guidelines.

6. **How effective is the implementation and enforcement of the existing regulations?**
   - **P7:** Effectiveness is limited by challenges like funding, logistics, and lack of comprehensive data.
   - **P8:** Regulations are somewhat effective, but there are gaps due to funding and coordination issues.

- **P3:** Enforcement is hampered by bureaucratic bottlenecks and resource limitations.
- **P5:** Effectiveness is estimated at 80%, but litigation from ship owners and resistance from local communities are major hurdles.
- **P1:** Effectiveness is constrained by the high cost of enforcement and the need for better funding mechanisms.

7. **What are the challenges in the effectiveness of enforcement and management strategies?**
   - **P2:** Challenges include limited resources, and inadequate data management.
   - **P9:** Mentioned issues with funding, enforcement, and the need for better collaboration between agencies.
   - **P4:** Bureaucratic delays and the need for approvals were identified as significant challenges.
   - **P6:** The main challenges are resistance from local communities and legal obstacles from ship-owners.
   - **P9:** There are high costs involved, and coordination between various stakeholders needs to be improved.

8. **What do these abandoned shipwrecks do to the communities along Nigeria's coastline?**
   - **P6:** The communities are affected in the case of pollution, health risks, and economic disruptions, as the levels of fishing activities are brought to a minimum.
   - **P8:** Pollution from shipwrecks affects water quality and disrupts economic activities like fishing.
   - **P1:** Toxic metal leakage from wrecks impacts water quality and community health.
   - **P5:** Communities suffer economically due to the dangers posed to fishing activities and passenger boats.

- **P9:** The economic impact is significant, with fishing and other livelihoods being severely disrupted.

9. **What roles do local government, community leaders, maritime, and environmental experts play in addressing the issues caused by these shipwrecks?**
    - **P6:** Local governments and community leaders help in sensitization and enforcement efforts, working closely with NIMASA.
    - **P9:** They play roles in policy implementation, resource allocation, and community engagement.
    - **P5:** Collaboration with local governments and community leaders is essential for effective enforcement.
    - **P1:** Community leaders are engaged in discussions to ensure smooth operations during wreck removal.
    - **P3:** Agency leads supported by leaders in the community and other experts help mitigate the effects of wrecks.

10. **Are there coordination problems among different stakeholders, such as government agencies, NGOs, and local communities?**
    - **P2:** Unclear responsibilities, a breakdown in communication, and conflicting priorities.
    - **P9:** Each stakeholder may have different interests and priorities, hence coordination problems.
    - **P4:** Everybody wants to claim responsibility for the removal of wrecks since they generate money, hence the conflict.
    - **P6:** Coordination is problematic due to the different personal interests and settling with the local communities.
    - **P5:** Stakeholders' deliberate delays and litigation are major challenges in coordination.

11. **Which strategies you would suggest for creating a better involvement of local Stakeholders and community regarding the hazards related to abandoned shipwrecks?**
    - **P1:** Public awareness campaign, outreach in the community, and stakeholder engagement forums should be recommended.
    - **P6:** Suggested more frequent sensitization and engagement efforts with local communities.
    - **P2:** Emphasized the importance of community sensitization and using media like radio and TV for outreach.
    - **P8:** Recommended increasing discussions with community leaders and engaging youth groups to reduce conflicts.
    - **P9:** Advocated for consistent engagement and creating a sense of shared responsibility among stakeholders.

12. **What do you believe are the biggest obstacles to effectively managing abandoned shipwrecks in Nigeria?**
    - **P1:** Obstacles include funding limitations, lack of clear policies, and insufficient public awareness.
    - **P4:** High costs and resistance from local communities are the major obstacles.
    - **P5:** Bureaucratic delays and the lack of insurance coverage for wreck removal are the part of biggest obstacles for managing abandoned shipwrecks in Nigeria.

The responses received during the interview process has helped provide a general perspective across different representative stakeholders involved in the key aspect of the wreck sector in Nigeria on the research questions which was formed. From this responses, it is easy to provide a summarized theme which provides detail information to address different issues which had been categorized into three subtopics such as: Environmental impact, assessment and monitoring, Policy, stakeholders and community engagement, challenges in management and enforcement and

recommendations. Here's a tabulated summary of the themes with grouped interviewees' responses associated with each theme:

Table 4: Showing the Theme of the Interview Responses

Theme	**Sub-Themes/Details**	**Interviewee Responses**
Environmental Impact	**Pollution**	The following acronym P1, P2, P3, P4 and P6 agreed that Nigerian abandoned shipwrecks pose significant public health and safety risks due to chemical and oil pollution, affecting marine life, water quality, and increasing the likelihood of accidents.
	Habitat Destruction	P1, P2 and P5 agreed that Shipwrecks cause significant harm to habitats like mangroves and coral reefs, disrupting ecosystems and causing frequent physical environmental damage.
	Obstruction and Safety Hazards	P1, P2 and P4 agreed that shipwrecks obstruct navigation channels and pose dangers, potentially leading to accidents and fatalities.
	Biodiversity Loss	P1, P2 and P3 agreed that "Shipwrecks disrupt ecosystems,

		severely impacting biodiversity and marine life."
	Economic Consequences	Due to the economic consequences, P1, P2, P3 and P5 agreed that it has an impact on reliant of fishing and communities endanger with significant effects on tourism.
Assessment and Monitoring	**Assessment Methods**	P1,P2,and P3 finalize that the involvement of remote sensing, biological monitoring, visual inspection, sampling of water and sediment, chemical analysis, satellite imagery, scientific procedures, mechanical and physical evaluations are needed.
	Collaboration with Agencies	P1 and P3 agreed that there should be collaboration between NIMASA and other relevant maritime authorities including NOSDRA for environmental impact assessment.
	Challenges in Data Collection	P1 agreed that Limited access to comprehensive data hinders effective assessment.

Policy and Regulatory Framework	**Existing Regulations**	P1, P2, P3, P4 andP5 agreed that Merchant Shipping Act, NIMASA Act and IMO conventions and other existing regulations.
	Policy Implementation	P1, P2 and P4. In addition to conducting surveys, NIMASA should introduce fines and awareness efforts to ensure compliance, Sea patrols for enforcement, stringent publication and notification procedures prior to removal.
	Legal and Bureaucratic Challenges	P1, P2, and P4. Legal obstacles and bureaucratic delays hinder enforcement**.** Bureaucratic delays and the need for approvals are significant challenges. Litigation and community resistance are major challenges.
Stakeholder and Community Engagement	**Impact on Coastal Communities**	P1, P2, P3, P4 and P6 Communities impacted by health concerns, economic disruption, and pollution. Shipwreck pollution affects local economies. Water quality and public health are impacted by toxic metal leaks. Economic effects on fishing-dependent communities.

	Roles of Local Governments and Community Leaders	P1, P2, P4 and P5. Local governments and community leaders help with enforcement and community engagement. They play roles in policy implementation, resource allocation, and community engagement in ensuring smooth operations.
	Challenges in Coordination	P1, P2, P3 and P4. Coordination issues due to unclear responsibilities and conflicting priorities. Differing interests among stakeholders cause coordination problems. Conflicts over control of wreck removal as a revenue source and Coordination issues due to personal interests.
Challenges in Management and Enforcement	**Resource Limitations**	P1, P2, P3 and P4. Limited resources and funding for effective management. Resource limitations impact enforcement efforts. Bureaucratic bottlenecks are a major challenge. High costs and community resistance are significant challenges.
	Corruption and Inefficiency	P1 Corruption within regulatory bodies hinders effective management.

	Community Resistance	P1and P4 Resistance due to economic dependencies on wrecks from local communities.
Recommendations and Best Practices	**Increased Awareness and Engagement**	P2, P3 and P4 "Public awareness campaigns, stakeholder engagement, and community outreach are essential for effective sensitization and involvement."
	Policy Enhancements	P1 and P3. Legal and judicial reforms to speed up processes and ensure compliance with better enforcement mechanism.
	Financial Solutions	P1 and P5 Creation of dedicated funds and contributions from ship-owners for removal and maintenance.
	Legal and Judicial Reforms	P1 and P3 Faster legal processes and mandatory insurance coverage for ships to prevent abandonment and to expedite wreck removal processes.
Economic and Social Considerations	**High Costs of Removal**	P1, P3 and P4 agreed that, High removal costs are a major obstacle to effective wreck management.

	Impact on Local Economies	P1, P2, P3 and P6"Shipwrecks cause significant economic disruption to fishing, tourism, and coastal communities."
	Community Participation	P1, P3 and P6 Involving communities in wreck reporting and removal efforts is essential.

This table organizes the themes identified from the interviews and associates specific responses from the interview with each theme.

4.4 Analysis of Data

The responses from the interviews showed enormous concerns about the abandoned shipwrecks and their possible impacts on the marine environment of Nigeria. The abandoned shipwrecks act like sources of pollution and habitat destruction in the Niger Delta environment; they remain as navigation hazards and affect marine biodiversity and the livelihood of coastal communities who depend on fishing.

The assessment of the damage in this wrecks include ocular observations, testing of water and sediments, and coordination with marine agencies such as NIMASA. However, proper management and law enforcement can hardly be done due to limited resources, inefficiency in gathering data, and delay in action due to bureaucratic orders.

The current regulatory framework through the Merchant Shipping Act, NIMASA regulations, among others encourages the management of ship wrecks. In most instances, however, their effectiveness is hampered by funding constraints, coordination issues among stakeholders, and legal obstacles, especially from ship owners and local resistance to such regulations.

The community involvement is very instrumental in these problems, recommendations go as far as to advocate more awareness among the populace and the use of local

leaders to drive the enforcement process. Financial constraints comprise yet another major handicap, in which high costs of shipwreck removal and the requirement of appropriate funding mechanisms feature.

4.5 Discussion of Findings

The findings that have emerged call for broad strategies on funding, clarity of policy, community engagement, and efficiency of administration in managing abandoned ship wrecks in Nigeria.

1. **Significant Effects of Abandoned Shipwrecks on the Marine Environment and Marine Biodiversity of Nigeria**

Abandoned shipwrecks have a large impact on the marine environment and biodiversity within Nigeria due to pollution, habitat destruction, and blocking navigation routes. A study carried out by Nwokedi et al. in 2017 has shown that wrecks in most instances lead to hazardous substances releases such as oil and chemical pollutants emanating from wreck sites into marine ecosystems and hence are a great threat to marine life. An added complication of over 3,000 abandoned vessels, according to Anyanwu (2014), exasperates these by serving physical barriers that disrupt natural environments and routes of navigation in which marine life thrives. Besides, degradation of coral reefs and other sensitive environments is very critical, with shipwrecks causing habitat destruction and bringing along invasive species. But the aesthetic and safety issues these wrecks create further complicate the socio-economic dynamics of the fishing and tourism-dependent livelihoods prevalent in coastal communities. Responding to the impacts of abandoned shipwrecks is, thus, the necessary step for protection of marine biodiversity and toward a sustainable future of Nigeria's coastal ecosystems.

2. **Methods Used to Assess Pollution and Damage to Ecology**

Various techniques have been employed in evaluating pollution and ecological destruction in Nigeria due to abandoned shipwrecks; some of these techniques include

ocular observation, water and sediment sampling, and ecological surveys. Studies by Elenwo and Akankali (2015) affirm that these techniques are significantly useful in establishing the level of contamination and its impact on marine life. This is also highly important for the detection of heavy metals and hydrocarbon pollutants, which have very serious implications for marine biodiversity as well as for human health. To that end, a suite of other remote-sensing technologies has been on the increase to monitor marine environmental changes over time. At such times, collaboration with local communities is highly helpful in gathering historical data and refining the assessment scope. In short, the multi-faceted method can play a profoundly important role in the ecological assessment and remediation strategies for abandoned shipwrecks by applying both conventional assessment methods and advanced technologies.

3. External Factors Influencing Environmental Risks

External factors significantly influence the environmental risks associated with submerged shipwrecks in Nigeria. Key factors include water conditions such as currents and tides, climate change, and existing pollution levels. Research by Zabbey (2019) highlights that these environmental conditions can exacerbate the degradation of wrecks, leading to increased pollution and habitat destruction. Additionally, socio-political factors, including abandonment due to legal or political issues, complicate management efforts (Elenwo & Akankali, 2015). The resistance from coastal communities, driven by economic interests and local governance issues, further complicates the landscape of environmental risk management. Against this backdrop, the interplay between natural and anthropogenic factors necessitates a comprehensive understanding of the external influences on shipwreck management to develop effective mitigation strategies.

4. Regulations and Policies to Govern Abandoned Shipwrecks

Various regulations and policies govern the handling of abandoned shipwrecks in Nigeria. This includes the Merchant Shipping Act, among other NIMASA regulations.

The NIMASA Act has stated that the agency shall remove wrecks, which are considered navigational hazards.

It is true that the Nairobi International Convention on the Removal of Wrecks, of which Nigeria is a party, envisages timely removal of hazardous wrecks. Its implementation still proves difficult due to the conflict in provisions between the existing laws and lack of comprehensive enforcement strategies. With this in mind, further development of clearer policies and improved coordination among stakeholders would be indispensable. This is particularly effective when there is commitment by the government agencies, and the enforcement processes underpin active engagement by the local communities, hence underpinning the relevance of collaborative governance in addressing the crisis of shipwrecks.

5. NIMASA Implementation of Regulations and Policies

NIMASA plays an important role in implementing regulations and policies on abandoned shipwrecks in Nigeria. Surveys, stakeholders' consultation, and regulatory inspection and sanctions are undertaken by the agency. Also, it is expected that NIMASA will remove wrecks and ensure standards for maritime safety. A study by Elenwo and Akankali, 2015, states that most of NIMASA's activities were marred by delays in bureaucratic processes, limited funding and inadequate public awareness. Against this background, the agency has introduced several initiatives to enhance stakeholder involvement and operational efficiency, including developing a Maritime Intelligence Unit. However, the ultimate effectiveness of these initiatives is contingent upon funding and collaboration from other agencies in terms of ensuring not only that the regulations are provided but also that they are indeed applied.

6. Effectiveness of Implementation and Enforcement of Existing Regulations

These often negate the effectiveness of institution and enforcement of existing regulations on abandoned shipwrecks in Nigeria. Indeed, studies have shown that funding constraints, bureaucratic bottlenecks, and inadequate data have been some of the causes of a general weakness in enforcement efforts in Nigeria. Whereas some

respondents put the effectiveness of regulation at about 80%, in reality, much of the shipwreck remains unattended due to systemic problems. These considerations form the backdrop against which increased coordination by government agencies and local communities is particularly essential for the betterment of enforcement mechanisms. More stringent penalties, coupled with an orientation toward public awareness, may also be useful in reinforcing regulatory frameworks. Resolving these issues is instrumental in ensuring the regulations can play the role they were created to play: protecting the marine environment in Nigeria.

7. Challenges in Effectiveness of Enforcement and Management Strategies

Abandoned shipwrecks in Nigeria are presenting serious problems in terms of developing strategies on how to manage or enforce them. Among the complications include resource constraints, and poor data management. In fact, study has shown that the responsibility of indistinct stakeholders has usually led to breakdowns in communication and conflicts of priority, which further complicates efforts in such management (Nwokedi et al., 2017). Apart from these, other complications involve the local communities showing resistance and legal impediments which are raised by the ship owners. In this regard, moving an integrated approach to solve these problems is very essential. This needs stakeholder cooperation improvement, along with data management practices and sufficient funding for addressing such issues to ensure abandoned ship wrecks' effective management in Nigeria.

8. Impact on Coastal Communities

Ship wrecks abandoned in Nigerian waters have a very high effect on coastal communities in terms of pollution, disruption of economic activities, and health hazards. Research shows that pollution caused by ship wrecks degrades the water quality and constitutes serious health hazards to the inhabitants, according to Zabbey (2019). This is economically disastrous, too, because fish activities-the source of livelihood for most of the people living along the coast-is being hugely disrupted because of the dangers wrecks will create according to Elenwo & Akankali, 2015.

Within this framework, the visual pollution and safety hazards linked to these wrecks further complicate the socio-economic dynamics of such communities. Returning abandoned shipwrecks to their former states means preserving not only the marine environment but also the livelihoods and health of coastal populations.

9. Responsibilities of Local Government, Community Leaders, and Experts

Other major contributors include the local government, community leaders, and experts who deal with specific maritime and environmental issues. It has been observed that local governments allow sensitization and enforcement, in close cooperation with NIMASA for the implementation of policies (Egoale, 2022). The community leaders will also be helpful in engaging the locals so that their concerns would also be taken care of during the wreck removal activities (Zabbey, 2019). This is further supported by the technical capabilities and advice from experts in marine and environmental matters on the best practices relating to ecological effects that arise from shipwrecks. In this regard, coordination among these stakeholders is viewed as amounting to designing prudent measures to reduce risks that arise from abandoned shipwrecks. A multi-stakeholder model that allows communication and cooperation can lead to better management outcomes.

10. Stakeholder Coordinating Challenges

The main problem in the management of abandoned wrecks within Nigeria is coordination by different stakeholders, which includes government agencies, NGOs, and local communities. Indeed, some issues have been identified such as some looming problems, which include unclear responsibilities, communication breakdown, and consequent conflicting priorities among stakeholders. Other causes of conflict and delays in decision-making are personal interests and the desire to exercise control over the removal of wrecks. Against this backdrop, increased collaboration and well-thought-out roles by the stakeholders are paramount and very essential in the search for effective management.

11. Means of Increasing Community Engagement and Awareness

The issue of community engagement and stakeholder awareness on the dangers of abandoned shipwrecks can be accomplished through a number of strategies. According to this study, public awareness and community outreach programs sensitize the local populations about the dangers of shipwrecks. Outreach may be expanded by the use of media platforms, such as radios and social media, in making sure that such information is appropriately given out for a better outreach. This way, community leaders and youth groups should be given the opportunity for open discussions in order to share an aspect of responsibility and ownership of the problem. The stakeholder consultation forums can also be established where there is differently set dialogue and collaboration with regard to shipwreck management. These strategies will consequently give communities the leading role in addressing abandoned shipwreck challenges.

12. Problems in Effective Management of Abandoned Shipwrecks

Abandoned shipwrecks face a lot of challenges in management within Nigeria. Funding shortcomings, incoherent policies, and red tape impede involvement in their management. This present study has shown that inability to engage adequate funds contributes much to an ineffective wreck removal and management system. Besides, unclear policies and guidelines ensure enforcement is difficult and confusion among stakeholders abounds. Against this backdrop, local community resistances and litigations from owners have further made the task of management even more difficult. Such challenges obviously require multi-faceted approaches to finding solutions, involving adequate funding, clearly spelt-out policies, and responsible stakeholder collaboration. By so doing, Nigeria will be in a better position to surmount her current capacity limitations toward effective wreck management and the protection of her marine environment.

Chapter 5

5 Summary, Conclusions and Recommendations

5.1 Summary of the Study

The study investigated the assessment of environmental effects of abandoned shipwrecks in Nigeria. Stakeholders from registered wreck removal companies in Nigeria, coastal local communities affected by shipwrecks, and officials and staff from the Nigerian Maritime Administration and Safety Agency were selected interviewed to represent the population of the study.

5.2 Conclusion

It is therefore, evident that abandoned shipwrecks within Nigeria pose serious ecological problems in relation to environmental impact. This study aims to illustrate how shipwrecks usually lead to hazardous material including oil, chemicals, and heavy metals, into the ocean environment. Such toxicants act to degrade water quality while disrupting local marine ecosystems, from which flora and fauna may equally suffer. Such toxins built up further bring about long-term changes in marine species' biodiversity and health and, therefore, ecological imbalance in such waters. Abandoned ship wrecks can lead to physical damage to the coast and marine environment. The occurrence of such wrecks normally interferes with the ongoing natural processes along the coast, including erosion and sedimentation problems. Moreover, such wrecks may collapse with time and release debris and other hazardous materials into the ocean. Such physical disturbance can disrupt the habitat of several marine organisms and eventually reduce their populations, thus changing the overall dynamics of the marine ecosystem. Abandoned shipwrecks also bear immense economic importance. Such degradation of marine environments can have negative implications for the local fishing industries and tourism, which are very important to coastal communities in Nigeria. The presence of shipwrecks will discourage tourists,

eventually leading to reduced revenues for those businesses dependent upon marine-based tourism. Additionally, with reduced fish populations, the livelihood of local fishermen could also be negatively affected, thus posing economic burdens on communities reliant on marine resources.

Different aspects of the environmental impacts of abandoned shipwrecks are to be treated in a complex approach: on the one hand, government agencies, environmental organizations, and local communities will have to work out effective strategies for regular monitoring of coastal waters, elaboration of policies regarding shipwrecks removal, and proper disposal, besides measures of prevention against abandonment. It therefore follows that the steps taken in Nigeria may help reduce the effects of shipwrecks on its coastal environment and go an extra mile in sustaining its marine resources for future generations.

5.3 Recommendations

- The following recommendations were therefore made at the end of this study:
- There is a dire need for officials at NIMASA to actually initiate and implement a detailed plan for the management of shipwrecks.
- The plan should be targeted at identifying, monitoring, and removing abandoned shipwrecks in Nigeria.
- More so, NIMASA has to create a specific Task Force that will attend to environmental issues that pertain to shipwrecks in collaboration with other world maritime organizations to make sure that the best global practices are adhered to.
- Furthermore, NIMASA needs to develop stringent laws and sanctions concerning the abandonment of shipwrecks as a deterrent to avoid non-compliance.
- They should carry out periodic impact assessments and environmental impact analyses concerning pollution and ecological damage by shipwrecks. Such agencies should create an awareness campaign in the community along coasts

about the environmental hazards due to shipwrecks and involve them in the reporting and addressing of such incidences.

- Management and mitigation of environmental effects stemming from shipwrecks should involve communities living in coastal regions. Contribution from local stakeholders, such as fishermen and tourism operators, by reporting abandoned shipwrecks and participating in the clean-up activities, needs to be encouraged.
- Best industry practices in decommissioning and vessel disposal should be carried out in efforts to eliminate future ship wrecks.
- Additionally, communities must advocate that proper waste management and recycling programs be implemented so that minimal pollution results from shipwrecks.
- Shipping firms must ensure that their vessels are well maintained and managed in their operating life for minimizing abandonment.
- The industry players must further liaise with the regulatory bodies and environmental organizations to facilitate research and development to adopt advanced solutions that apply to the removal of shipwrecks and protection of the environment. Furthermore, creating industry-wide guidelines and training programs on environmental stewardship would go a long way toward further limiting the environmental impact of shipwrecks.

5.4 Suggestions for further studies

To foster more on existing discussions and findings, I would like to suggest that this study be replicated by other researchers using different location and environment and also to confirm or refute its validity and to expand the scope of work previously done.

It is of my opinion and suggestion that, The Maritime authorities that have the obligation for the removal of wrecks in Nigeria should create a Comprehensive

National Law and Policy Framework, and implement strong national laws and policies that are dedicated to the clearance and management of abandoned shipwrecks.

Ship-owners, operators, and the government should all have their obligations outlined in this policy, along with the consequences of abandoning a vessel in Nigerian waters. Bolster global alliances and collaborations globally with regional and maritime organizations, including the International Maritime Organization (IMO).

Shipwreck removal and management can be facilitated by these collaborations, which can offer finance, technical experience, and support. Boost up Allocation of Funds and Resources Set aside sufficient funds and make budgetary preparations for the methodical detection, removal, and disposal of abandoned shipwrecks.

Strengthen Port State Control (PSC) measures, implement stricter PSC and involve Public Private Partnership (PPP), this can provide additional resources, expertise and innovation in tackling the problem.

Finally rewards or recognition can be offered for verified report, this can serve as whistle-blower which can help in then timely identification and removal of these hazards.

Future studies may take up in the marine biodiversity perspective to study the effects of abandoned shipwrecks in Nigeria waters.

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Appendices

Appendix 1: Protocol

WMU Research Ethics Committee Protocol

Name of principal researcher:	Michael Abiodun Ojo
Name(s) of any co-researcher(s):	None
If applicable, for which degree is each researcher registered?	MSc in Maritime Affairs (MSEA)
Name of supervisor, if any:	Prof. Henning Jessen
Title of project:	Assessment of Environmental Effects of Abandoned Shipwrecks Within Nigerian Coastal Waters.
Is the research funded externally?	No
If so, by which agency?	None
Where will the research be carried out?	The research will be carried out at the World Maritime Univeristy (WMU) Malmo, Sweden.
How will the participants be recruited?	The participants are registered wreck removal company in Nigeria with NIMASA, Coastal Local Communities in Nigeria and the Department of wreck unit in Nigerian Maritime Administration and Safety Agency (NIMASA)
How many participants will take part?	10
Will they be paid?	Participants will not be paid
If so, please supply details:	None
How will the research data be collected (by interview, by questionnaires, etc.)?	The research data will be collected through interviews
How will the research data be stored?	The data will be password protected
Is a risk assessment necessary? If so, please attach	Risk assessment is not necessary

Please delete as appropriate:

- I am a student carrying out the research as part of a Master's level programme of study. I will delete all data completely as soon as my degree is awarded.

Signature(s) of Researcher(s)  Date: 16/7/2024

Signature of Supervisor:  Date: 17/7/2024

Please attach:

- A copy of the research proposal
- A copy of any risk assessment
- A copy of the consent form to be given to participants
- A copy of the information sheet to be given to participants

Appendix 2: Consent Form

Dear Participant,

Thank you for agreeing to participate in this research survey, which is carried out in connection with a Dissertation which will be written by the interviewer, in partial fulfilment of the requirements for the degree of Master of Science in Maritime Affairs at the World Maritime University in Malmo, Sweden.

The topic of the Dissertation is **ASSESSMENT OF ENVIRONMENTAL EFFECTS OF ABANDONED SHIPWRECKS IN NIGERIA.**

The information provided by you in this interview will be used for research purposes and the results will form part of a dissertation, which will later be published online in WMU's digital repository (maritime commons) subject to final approval of the University and made available to the public. Your personal information will not be published. You may withdraw from the research at any time, and your personal data will be immediately deleted.

Anonymised research data will be archived on a secure virtual drive linked to a World Maritime University email address. All the data will be deleted as soon as the degree is awarded.

Your participation in the interview is highly appreciated.

Student's name	**Michael Abiodun Ojo**
Specialization	**Maritime Safety and Environmental Administration (MSEA)**
Email address	**W1015636@wmu.se**

* * *

I consent to my personal data, as outlined above, being used for this study. I understand that all personal data relating to participants is held and processed in the strictest confidence, and will be deleted at the end of the researcher's enrolment.

Name: .....

Signature: .....

Date: .....

Rev August 2021

Appendix 3: Research Questionnaire

DISSERTATION RESEARCH PROPOSAL

ASSESSMENT OF ENVIRONMENTAL EFFECTS OF ABANDONED SHIPWRECKS IN NIGERIA.

Interview questions

Dissertation proposal on "Assessment of Environmental Effect of Abandoned Shipwrecks in Nigeria" My interview questions is been organize into three key subtopics that align with the main areas of my study: **Environmental Impact**, **Policy and Enforcement**, and **Stakeholder and Community Engagement**. Here are some questions that can be structured under each subtopic: These questions are designed to explore the depth and breadth of the issues related to abandoned shipwrecks in Nigeria's coastal waters, focusing on understanding the environmental impact, assessing the effectiveness of existing policies, and enhancing stakeholder collaboration. Each question targets key elements of my research objectives and aims to gather insights that will contribute to a comprehensive understanding of the topic and development of effective solutions.

Subtopic 1: Environmental Impact

1. What are the major impacts of abandoned shipwrecks on Nigeria's marine environment and marine biodiversity?
2. What methods are adopted to assess the level of pollution and ecological damage resulting from abandoned wrecks?
3. Are there external factors that influence the environmental risks associated with submerged shipwrecks?

Subtopic 2: Policy and Enforcement

4. What Regulations and policies are currently in place for managing abandoned shipwrecks in Nigeria?
5. How does NIMASA implement the adopted Regulations and policies?

6. How effective is the implementation and enforcement of the existing Regulations?
7. What are the challenges hindering the effectiveness of enforcement/management strategies?

Subtopic 3: Stakeholder and Community Engagement

8. How are the coastal communities affected by the abandoned shipwrecks along the Nigerian coast?
9. What roles do local governments, community leaders, maritime and environmental experts play in addressing the issues caused by these shipwrecks?
10. Are there challenges in coordinating efforts between different stakeholders, including government agencies, NGOs, and local communities? If Yes, what are the main challenges?
11. What strategies would you recommend for increasing community engagement and stakeholders awareness about the dangers of abandoned shipwrecks?

General Questions for All Stakeholders

12. Perceptions and Attitudes: What do you believe are the biggest obstacles to effectively managing abandoned shipwrecks in Nigeria?

Appendix 4: Abandoned wrecks

Submerged Wrecks