TRANSPORTATION PROBLEMS AND SOLUTIONS OF INLAND WATERWAYS IN NIGERIA

A CASE STUDY OF NEMBE WATER WAY

BY

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CERTIFICATION

This is to certify that this research project titled "Transportation Problems Affecting Inland Water ways in Nembe, Bayelsa State" was carried out by Izegbuwa Osazuwa-Oronsaye with matric number DM12313674 and meets the requirements for the award of National Diploma in Maritime Studies, Information and Communication Technology, Faculty of Engineering, University of Benin, Benin City.

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ABSTRACT

This study examined the transportation problems affecting inland waterways in Nembe, Bayelsa State. A sample of 110 respondents, including boat operators, passengers, and residents, provided data through structured questionnaires. The findings revealed that insecurity and piracy constitute the most critical challenge affecting waterway transportation, alongside poor infrastructure, lack of safety equipment, and weak regulatory enforcement. These challenges lead to increased transportation costs, delays, loss of lives and property, and reduced economic activity. The study recommends improved security patrols, better infrastructure, strict enforcement of safety regulations, and increased government involvement and funding. The findings provide insights that can guide policy interventions to improve waterway transportation in Bayelsa State.

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DEDICATION

This work is dedicated to God Almighty and to my family for their support and encouragement throughout this research.

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CHAPTER ONE

1.1. Background of Study

Transportation plays a vital role in the economic, social, and cultural development of any nation, as it facilitates mobility, trade, and access to essential services. In Nigeria, inland waterways constitute an important component of the national transport system, offering an alternative route for the movement of people, goods, and services (Filani, 2012; Rodrigue, Comtois, & Slack, 2020). With over 10,000 km of navigable waterways, the country has significant potential to ease pressure on road transport, reduce travel costs, and enhance trade, especially in riverine and coastal communities (NIWA, 2017; World Bank, 2016). Despite this potential, inland water transportation in Nigeria remains underdeveloped and underutilized, facing numerous challenges that limit its effectiveness (Aderamo & Mogaji, 2010).

The Niger Delta region, in particular, depends heavily on waterways as the primary means of transportation due to its difficult terrain, extensive network of creeks, and limited road accessibility (NDDC, 2019). Nembe, located in Bayelsa State, is one such riverine community where inland waterways serve as the major transportation link between settlements and nearby urban centers. However, users of the Nembe waterway experience several transportation problems, including poor infrastructure, unsafe vessels, inadequate government support, erosion, sedimentation, and security challenges (Onyema, 2019; Ologunorisa, 2006). These

problems not only hinder economic activities but also pose serious risks to lives and property.

The Nigerian government and relevant agencies have made efforts to develop inland water transport through policies, regulations, and investment programs aimed at improving navigation, safety, and infrastructure (Federal Ministry of Transportation, 2020; NIWA, 2018). However, the impact of these interventions has remained limited due to poor implementation, corruption, and inadequate maintenance of facilities (Badejo, 2014). Consequently, there is a growing need to examine the specific problems affecting inland waterways and propose sustainable solutions that reflect the realities of riverine communities.

This study focuses on the Nembe waterway as a case study to assess the transportation problems faced by users, evaluate existing solutions, and recommend practical strategies for improving inland water transport in Nigeria. Understanding these challenges and opportunities is essential for enhancing mobility, promoting economic growth, and improving the overall quality of life of residents in riverine communities (World Bank, 2016).

The waterway suffers from poor infrastructural development such as inadequate jetties, lack of dredging, and absence of modern navigation facilities. Many of the boats used for transport are old, overcrowded, and lack essential safety equipment, leading to frequent accidents and loss of lives. Additionally, natural

challenges such as sedimentation, erosion, and fluctuating water levels further restrict smooth navigation.

Security issues, including piracy and armed robbery on the waterways, discourage travelers and increase the cost of transportation. Government interventions through agencies like the National Inland Waterways Authority (NIWA) have been insufficient or poorly implemented, leaving most riverine communities underserved. As a result, travel along the Nembe waterway remains risky, slow, and expensive, hindering economic development and limiting access to health care, education, and markets.

1.2. Statement of the problem

Despite Nigeria's vast network of inland waterways and the strategic importance of water transport—especially in the Niger Delta—this mode of transportation remains largely underdeveloped. The Nembe waterway, which serves as the primary route for movement within Nembe and neighboring communities, continues to face persistent challenges that affect mobility, safety, and economic activities.

1.3. Aim and Objectives

Aim

To examine the transportation problems affecting inland waterways in Nigeria and propose practical solutions, using the Nembe waterway as a case study (Filani, 2012).

Objectives

The objective of the study aims to:

i. Identify the major transportation challenges faced by users of the Nembe waterway.
ii. Examine the causes of these transportation problems, including environmental, infrastructural, and security-related factors.
iii. Assess the effects of these transportation challenges on the socio-economic activities of residents and travelers in Nembe.
iv. Evaluate the effectiveness of government interventions, policies, and regulations related to inland water transportation in the Nembe area (NIWA, 2018).
v. Propose feasible and sustainable solutions for improving transportation safety, efficiency, and reliability on the Nembe waterway.

1.4. Significance of study

This study is significant because it addresses persistent challenges affecting inland water transportation in Nembe, a riverine area where waterways serve as the primary means of movement (NDDC, 2019). The findings will be useful to government agencies such as NIWA and the Bayelsa State Government by providing insights that can guide policy formulation, infrastructural development, and safety regulation enforcement (Federal Ministry of Transportation, 2020).

Transport operators and boat owners will benefit from the study through increased awareness of safety standards, operational challenges, and the importance of proper maintenance for reducing accidents and improving efficiency (Badejo, 2014). Local

communities and waterway users will benefit from improved safety, reduced travel time, and enhanced access to essential services such as healthcare, education, and markets (World Bank, 2016).

The study also contributes to academic knowledge on inland water transportation in Nigeria, particularly within the Niger Delta, and will serve as a reference for future research (Aderamo & Mogaji, 2010). Development agencies and NGOs can use the findings to design effective interventions aimed at improving mobility, safety, and economic activities in riverine communities.

This study is significant because it addresses the persistent challenges affecting inland water transportation in the Nembe region, a vital area where waterways are the primary means of movement. The results of this research will be useful to several groups in the following ways:

i. Government and Policy Makers

The findings will provide valuable insights to government agencies such as the National Inland Waterways Authority (NIWA), Bayelsa State Government, and maritime regulators. The study will help them understand the real challenges faced by waterway users and guide them in designing better policies, improving infrastructure, and implementing effective safety regulations.

ii. Transport Operators and Boat Owners

The study will highlight safety lapses, operational challenges, and areas requiring improvement. Transport operators and boat owners will benefit from understanding

how improved standards, modern equipment, and proper maintenance can enhance efficiency and reduce accidents.

iii. Local Communities and Waterway Users

Residents of Nembe and surrounding riverine communities will benefit from improved safety, reduced travel time, and enhanced access to markets, healthcare, education, and other essential services. The study also emphasizes the socio-economic importance of efficient water transport.

iv. Researchers and Academics

The research contributes to existing literature on inland water transportation in Nigeria, providing updated data and a focused case study on the Niger Delta. It will serve as a reference material for future studies and stimulate further academic inquiry.

v. Development Agencies and NGOs

Organizations involved in community development, infrastructure planning, and disaster management can use the findings to design interventions that improve mobility, safety, and economic activities in riverine areas.

vi. Future Water Transport Projects

The recommendations of this study will guide future investments and modernization efforts aimed at promoting safer, more reliable, and more sustainable inland water transport systems in Nigeria.

1.5. Scope of the Study

This study is geographically limited to Bayelsa State, with particular emphasis on the Nembe waterway, one of the major inland transportation routes in the state (NDDC, 2019). It focuses on transportation challenges affecting riverine communities where waterways are the primary or only means of movement due to difficult terrain and limited road networks.

The thematic scope includes transportation problems such as inadequate infrastructure, unsafe vessels, high transportation costs, environmental hazards, and security challenges, as well as the socio-economic effects of these problems and existing government policies related to inland water transport (NIWA, 2017).

The study covers transportation challenges within the last 5–10 years to reflect current conditions affecting waterway users. Data are obtained from both primary sources (interviews, questionnaires, observations) and secondary sources such as government reports and academic publications.

The scope covers the following key areas:

i. Geographical Scope

The research is restricted to the Nembe axis of Bayelsa State, including surrounding creeks and settlements that rely on the Nembe waterway for transportation. Other waterways in Nigeria are referenced only to provide background information and context.

ii. Thematic Scope

Transportation problems such as inadequate infrastructure, unsafe vessels, high transportation costs, poor maintenance, environmental hazards, and security issues.

Socio-economic effects of these problems on residents of Nembe and other Bayelsa riverine communities. Existing government efforts and policies related to water transportation in Bayelsa State.

Practical solutions that can improve safety, efficiency, and accessibility of inland water transport within the state.

iii. Time Scope

The study focuses on recent and current transportation challenges within the last 5–10 years, reflecting present conditions and ongoing issues affecting Nembe waterway users.

iv. Content Scope

Collection of primary data through interviews, questionnaires, and observations in Nembe and neighboring communities.

Review of secondary data such as government documents, reports, academic studies, and publications related to inland water transport in Bayelsa.

Overall, the study does not attempt to cover all inland waterways in Nigeria but limits its investigation to Bayelsa State, with the Nembe waterway serving as the central case study for understanding transportation problems and developing effective solutions.

1.6. Limitations of the Study

The study is limited by a number of factors among which are:

Time factor: The researcher had to spent a lot of time in this research work and at the same time facing his normal academic activities which was very stressful since writing a detailed research work requires a lot of time.

Financial constraints: it is normal that every reliable research work requires a lot of finance to carryout and this was not an exceptional case as finance almost hindered the researcher from not completely this work.

1.7. Definition of Terms

Inland Waterways

These are navigable bodies of water such as rivers, creeks, lakes, and canals used for the transportation of people, goods, and services within a country.

Water Transportation

A mode of transport that involves the movement of passengers or goods through rivers, streams, creeks, or oceans using boats, ferries, ships, or canoes.

Nembe Waterway

A major inland water transportation route located in Nembe Local Government Area of Bayelsa State, used by residents for travel, trade, and access to essential services.

Transportation Problems

Challenges or obstacles that affect the smooth, safe, and efficient movement of people and goods—such as poor infrastructure, unsafe vessels, high transport costs, and insecurity.

Sedimentation

The accumulation of sand, mud, and debris in waterways, which reduces the depth of the water and makes navigation difficult or unsafe.

Dredging

The process of removing sediments and debris from the bottom of a waterway to make it deeper, safer, and easier for boats to move.

Navigation Facilities

Tools and equipment used to guide boats safely on waterways, including buoys, signposts, lights, and communication systems.

Infrastructural Facilities

Physical structures needed to support water transport, such as jetties, terminals, waiting areas, loading bays, and safety equipment.

NIWA (National Inland Waterways Authority)

The Nigerian government agency responsible for regulating, managing, and developing inland waterways across the country.

Riverine Communities

Settlements located around rivers or creeks where water transportation is often the primary means of movement due to limited road access.

Maritime Safety

Measures and practices aimed at ensuring the safe operation of boats and vessels, preventing accidents, and protecting passengers and cargo.

Socio-Economic Activities

The social and economic interactions of a community, such as trading, fishing, transportation, schooling, and access to healthcare, which can be influenced by transportation conditions.

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Concept of Transportation

Transportation refers to the movement of people, goods, and services from one place to another using various modes such as road, rail, air, and water. It is an essential component of economic development, enabling trade, social interaction, and access to essential services. Efficient transportation systems reduce travel time, lower costs, and promote regional integration.

Inland waterways are made up of navigable rivers, lakes, coastal creeks, lagoons and canals (Aderemo and Mogaji, 2010). The movement of goods and services along inland waterways is one of the oldest means of transporting goods and services from point to point (Fellinda, 2006) This is largely due to the fact that inland water transport (IWT) offers the most economical, energy efficient and environmental friendly means of transporting all types of cargo from place to place (Ojile, 2006). It also offers safer and cheaper rates in areas where water exist naturally. This facilitates commerce, promotes wealth creation, poverty alleviation, and creates job opportunities for youths within such regions. The ancillary sector of boat building industry also generates employment through active engagement of the youths in welding and fabrication process (Gray, 2004).

In Nigeria, Ezenwaji (2010) noted that inland waterways transverse 20 out of the 36 states within the nation and that areas adjacent to the navigable rivers

represents the nations' most important agricultural and mining regions. The direct impact of IWT, for instance, was highlighted for the deltaic areas of southern Nigeria by Abubakar (2002 cited by Obeta; 2014) who noted that IWT is very vital and critical for all facets of development in the region. Gray (2006) also noted that about 48% of all the rural residents in the region live in remote, isolated and inaccessible communities with no motorable roads and another 29% live in communities with limited services. For such people IWT is absolutely imperative for survival and for accessing social services-education, health etc.

Recently, Obed, (2013) lamented that there has been a considerable decline in the use of IWT in Nigeria. This was attributed to several physical constraints impending growth and performance in the IWT sector in Nigeria. This creates an urgent need for innovative actions and strategies which can radically improve the sector so that it continues to remain the bedrock of trade, industrial and economic growth. In the same vein, Igbokwe, (2007. 16) had observed earlier that the IWT in Nigeria is "untapped goldmine for investors" This shows that the capacity of IWT sector to impact on the economy can be significantly boasted. Indeed, there is increasing awareness that IWT could become an alternative means of transportation to road particularly in Anambra, Imo, Delta, Rivers, Edo, Lagos, Cros-River Akwa Ibom, Ondo and even Borno states. (Ojile, 2007).

2.1.2 Inland Water Transportation in Nigeria

Inland water transportation involves the movement of goods and passengers along rivers, creeks, lakes, and canals within a country. It is often the most affordable and

suitable mode of transport for regions with difficult terrain, especially in areas where road networks are limited, such as Bayelsa State. Inland waterways support fishing, trading, tourism, and inter-community mobility.

Since 1960 several attempts have been made by the Nigerian government to pay special developmental attention to the river transportation in the estuarine Niger Delta region because of its uniqueness; by establishing development agencies to plan, organize and implement necessary phases of the service delivery process (CASS, 2002). This region of the Niger Delta suffers a major lack of basic physical infrastructure, badly maintained road and water networks, along with unemployment the region is virtually cut off from the entire country be virtue of living in water surrounded environment (Abam, 2001).

The Nigeria inland waterways operations and management has long since time immemorial been in service but are yet to meet with her state's expectation seeing the various natural features on ground as tools to facilitate its operations. This study is all about the critical evaluation of the operations and management of the Nigeria inland waterways system with emphasis on the coastal shipping (cabotage) Act, its formation purposed, and implementation effected or not Nigeria inland waterways would generally center on the coastal and inland shipping (cabotage) Act which was passed into law on the 30th of April 2003.

The significant contribution of the maritime sector to the socio-economic and political development of Nigeria cannot be over-emphasized; of major significant to

the Nigerian economy is the maritime sector with about 100kilometers of navigable waterways added to the numerous lagoons and channels with deep waters. Despite the tremendous contributions and level of economic activities revolving around the coastal waters, one would assume that Nigeria is a major maritime nation, sadly and unfortunately this is not the case which is greatly published through the challenges and problems experienced by the operations and management of the inland waterways systems of Nigeria (Imorataria Dogood et al, 2023).

Cabotage policy has not fully be practiced in Nigeria because at present it's faced with the problems of proper operational implementation and lack of infrastructural facilities; although the effectiveness and efficiency of cabotage will improve the Nigeria shipping industries, eliminate competition between indigenous and foreign shipping, improves the economy and National coastal security. Inland waterways operations and management would be more recognized and appreciated if not globally when the cabotage policies related to all its sectors are fully reasonably enforced (Imorataria Dogood et al, 2023).

2.2 Characteristics of Inland Waterways

Nigeria has the second longest length of waterways in Africa. It has 8,600 kilometers of inland waterways and an extensive coastland of about 852 kilometers. Nigerians centre on its longest rivers, River Niger and Benue, which cuts across the country into the cardinal east, west and north sections. The two rivers run into each other at Lokoja and flow into the Atlantic Ocean.

The coastal waterways extend from Badagry region through Warri to Calabar; however, water transport scores a distant second to road transport with an average share of about 1.6% of Nigeria gross domestic product i.e. internally generated cargoes, although water transport is slow and while unsuitable for passenger movement, an efficient coastal and inland waterways operation and system generally can minimize the pressure on a country's rail and road transport infrastructure (Ndikom, 2008).

Inland water transport operation is advantageous in terms of costs of moving heavy traffic; especially where speed is not put in consideration than cost, instance, a single 15-barge tow is equivalent to above 225 rail- road cars or 870 tractor-trailer trucks. This would be of more optimum benefits in the transportation of tonnes of agricultural products from the middle belts areas to the Delta areas via this medium and vice-versa; hopefully bringing about a fall in food prices in the regions, likewise other coastal generated cargo and passenger movements from and to where they are of more value and demand (Obed B.C. 2012).

This mode of transport will equally play an important role in the export and import of raw materials such as materials importation via Delta area ports for use at the Ajaokuta steel complex, which is a major industrial centre on the Niger and will likewise benefits from the importation and use the same route to export its products.

This states that Nigerian inland waterways despite its great potentials are underpriorised, underutilized and highly underdeveloped.

The characteristics of inland waterways in Nigeria include their extensive networks of navigable waterways, particularly in the southern deltaic areas, which significantly impact the nation's economy by reducing haulage costs, expanding business opportunities, creating jobs, and generating revenue for stakeholders in the inland water transport sector. The study also highlights socio-cultural challenges that impede inland water transport and recommends that the federal government review its investment strategies in the sector and that water transport operators prioritize safety, quality, speed, and flexibility in their operations ((Obed B.C. 2012).

2.4 Overview of Bayelsa State Water Transport System

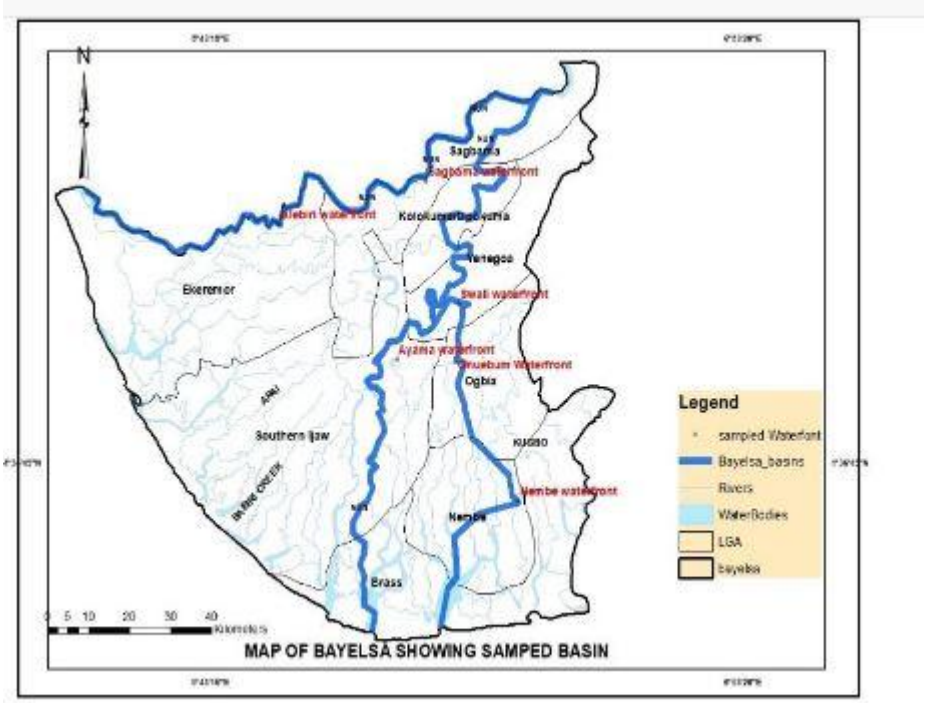
Bayelsa state is geographically located between latitudes 04°15′North, 05° 22′ South and longitude 05° 22′ west and 06° 45′ East. It is one of the major oil producing States in Nigeria contributing over 40% of the daily production in the country. It is one of the six states that make up the south-south geopolitical region of Nigeria and has boundaries with Rivers State in the east, Delta State in the west and Gulf of Guinea in the south.

It has a population of 1,121,693 spread over a land area of 12,000 square kilometer most of which is water or wet lands (John 2013).Mean temperature is generally 28.0°C. The State has eight local government areas (LGAs), namely; Brass, Ekeremor, Kolokuma/Opukuma, Nembe, Ogbia, Sagbama, Southern Ijaw and Yenagoa and has developed in many sectors since its creation in October 1, 1996 (Bayelsa State Government, 2008).Vegetation is mainly the mangrove and

salt water swamps, but a major part had largely beendestroyed by oil exploration. (Ezenwaji et al.,2013)

The state is made up of mangrove and tropical rain forest with morethan three quarter of this area covered by water. In the North It has a thick forest with arable lands for cultivation of various food and cash crops (Clement & Ekio, 2020).Transportation in the state is mainly water transport owing to the fact that over 70% of the state is covered by water. As such majority of the communities within Ekeremor, Southern Ijaw, Brass, Nembe and parts of Sagbama and Ogbia LGA's of the state can only be accessible by water. Road network is basically concentrated within Yenagoa, Kolokuma/Opokuma and parts of Ogbia LGAs of the state (Olowoyo, 2011).

Bayelsa State is a predominantly riverine area where water transport is the primary means of movement. Communities such as Nembe, Brass, and Southern Ijaw rely heavily on boats and ferries for daily mobility. The state's terrain makes road construction difficult and expensive, increasing the dependence on waterways. Despite the importance of this mode, many waterways in Bayelsa face challenges such as erosion, piracy, lack of modern boats, and poor safety standards.



Source: Toboulayefa 2024.

The state is drained by so many rivers which are at their advanced stage and such rivers include Orashi which forms the State's eastern border with Rivers State, Forcados which forms the western border with Delta State, Nun,Brass,Apoi, Kugba and numerous creeks which drain the state's hinterland (Ezenwaji et al., 2013). Annual rainfall amounts range from2,500 mm in the northern parts of the State to 4,000 mm in its southern areas, while mean temperature is generally 28.0°C (Olowoyo, 2011). Its topography is that of a moderately lowland which lies almost below sea level stretching from Ekeremor to Brass with a maze of meandering creeks and swamps which all flow southwards into the Atlantic ocean via major rivers such as Forcados, San Bartholomew, Brass,

Nun, Ramos, Santa babara, St. Nicholas, Sangana, Fish-town, Ikebiri creek, Middleton, Digatoro creek, Pennington and Dobo (Clement and Ekio, 2017).

2.5 Theoretical Review

2.5.1 Transport Geography Theory

Transport Geography Theory emphasizes the relationship between spatial location and transportation flow. It argues that physical terrain affects transport development. This theory explains why riverine regions like Bayelsa depend more on water transport due to swampy terrain and limited road access.

2.5.2 Systems Theory

Systems Theory views transportation as a system made up of inputs (infrastructure, vessels), processes (navigation, regulation), and outputs (safety, mobility). Failures in any part of the system result in problems such as accidents, delays, and inefficiency. This theory helps explain how poor jetties, lack of dredging, and inadequate regulation contribute to transportation problems in Nembe.

2.5.3 Weber's Least-Cost Theory

This theory proposes that transport cost influences economic activity. In riverine communities, waterways often provide the least-cost route compared to building long and expensive roads. However, when waterways become unsafe or unreliable, the cost advantage reduces, affecting local trade and productivity.

2.6 Empirical Review

Studies on inland water transportation in the Niger Delta reveal persistent safety, security, infrastructural, and environmental challenges that undermine efficient mobility in the region. One of the most critical issues identified is the high incidence of boat accidents, which are often attributed to overloading, excessive speeding, and the non-use of safety devices such as life jackets. Weak enforcement of maritime safety regulations and the predominance of poorly trained boat operators further exacerbate the risk of accidents on inland waterways (Adeyemo, 2012; Badejo, 2014; National Inland Waterways Authority [NIWA], 2016). These safety challenges pose serious threats to human lives and reduce public confidence in water transport services.

In addition to safety concerns, insecurity remains a major obstacle to inland water transportation in the Niger Delta. The prevalence of sea piracy, armed robbery, and militant activities along major waterways has disrupted movement, increased travel costs, and exposed passengers and operators to significant danger. These security threats have also discouraged investment in water transport infrastructure and services, thereby limiting the sector's growth and effectiveness (Akinwale, 2011; Niger Delta Development Commission [NDDC], 2017; World Bank, 2018).

Infrastructure decay is another prominent challenge affecting inland water transport in the region. Many jetties and landing sites are poorly constructed, inadequately maintained, or completely dilapidated, making embarkation and disembarkation unsafe for passengers. The lack of modern navigational aids and

functional terminals has further contributed to delays and accidents along the waterways (Onakomaiya, 1986; Odufuwa, 2007; NIWA, 2019).

Environmental degradation, particularly pollution resulting from oil exploration and exploitation activities, has also negatively impacted water transportation in the Niger Delta. Oil spills, waste discharge, and floating debris obstruct navigable channels, damage boat engines, and reduce water depth, thereby hindering smooth navigation. These environmental challenges not only increase operational costs but also pose long-term threats to the sustainability of inland waterways (Salau, 1993; Nwafor, 2006; World Bank, 2018).

Furthermore, the cost of water transportation in the Niger Delta has remained relatively high due to fuel scarcity, long travel distances between riverine settlements, and insecurity. These factors have collectively led to increased fares, making water transport unaffordable for many residents, particularly those in rural and low-income communities. As a result, accessibility to essential services such as healthcare, education, and markets is significantly constrained (Filani, 1995; Aderamo & Magaji, 2010; Solanke, 2013). Empirical evidence from these studies aligns closely with conditions observed along the Nembe water route, where similar challenges of safety, infrastructure, environmental degradation, and high operational costs persist (Ibiene & Abumere, 2013; Bayelsa State Ministry of Transport, 2018).

Research focusing on Bayelsa State waterways emphasizes the crucial role of water transportation as the primary, and in many cases the only, means of movement

for numerous riverine communities. Due to the state's deltaic terrain and limited road infrastructure, residents largely depend on boats and ferries for economic, social, and administrative activities. However, despite its importance, water transportation in Bayelsa State continues to face significant challenges (Alagoa, 1999; Ibiene & Abumere, 2013; Bayelsa State Ministry of Transport, 2018).

One of the major challenges identified is the impact of seasonal variations on navigability. During the dry season, reduced water levels lead to shallow waterways, making navigation difficult and sometimes impossible in certain creeks and channels. These seasonal constraints increase travel time, restrict access to some communities, and heighten the risk of accidents (Abam, 2001; Anyadike, 2009).

Another critical issue affecting water transportation in Bayelsa State is the lack of government-owned ferry services and the weak regulation of private operators. The dominance of private boat operators, coupled with inadequate monitoring and enforcement by relevant authorities, has resulted in unsafe practices, inconsistent service delivery, and arbitrary fare charges. This situation has negatively affected service quality and passenger safety across the state's waterways (Onokala, 2012; NIWA, 2019; Omoleke, 2010).

Environmental pollution and the presence of floating debris also pose serious challenges to navigation in Bayelsa waterways. Pollution arising from oil-related activities, domestic waste disposal, and aquatic vegetation obstructs channels and

damages vessels, thereby reducing the efficiency and reliability of water transport services (Salau, 1993; Nwafor, 2006; Olokesusi, 2004).

Additionally, delays in water transportation are common due to the narrow and shallow nature of many creeks and passages in the state. These physical constraints limit boat capacity and speed, resulting in prolonged travel times and increased operational costs for operators (Abam, 2001; Onakomaiya, 1986). Emergency response systems on Bayelsa waterways are also largely inadequate, as rescue facilities, communication equipment, and coordinated response mechanisms are limited or absent. This inadequacy has worsened the impact of accidents and emergencies on the waterways, often leading to avoidable loss of lives and property (Badejo, 2014; NIWA, 2016; World Maritime University, 2017).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Questions

This study is guided by the following research questions:

1. What are the major transportation challenges affecting the Nembe waterway in Bayelsa State?

2. What environmental, infrastructural, and security factors contribute to these challenges?

3. How do transportation problems along the Nembe waterway affect the socio-economic activities of residents and travelers?

4. What measures have government agencies, including NIWA and the Bayelsa State Government, implemented to improve inland water transportation?

5. What feasible solutions can be proposed to enhance the safety, efficiency, and reliability of transportation along the Nembe waterway?

3.2 Research Design

This study adopts a descriptive survey research design. The method is suitable because it enables the researcher to gather data directly from individuals who use or operate along the Nembe waterway and to describe existing transportation problems and possible solutions based on their experiences and perceptions.

3.3 Area of the Study

The study is conducted in Nembe Local Government Area of Bayelsa State, a predominantly riverine area accessible mainly by waterways. The Nembe waterway connects several communities and serves as a major transportation route for movement to and from Yenagoa, Brass, Ogbia, and other coastal settlements.

3.4 Population of the Study

The population comprises:

i. Water transport users in the Nembe area

ii. Boat operators and transport workers

iii. Community leaders

iv. Government officials involved in water transportation

v. Traders and residents who rely on the Nembe waterway

The estimated population affected directly or indirectly by water transportation in Nembe runs into several thousands, but only a portion will form the sampling frame

3.5 Sample Size and Sampling Technique

The study employs a purposive and simple random sampling technique.

Purposive sampling will be used to select key informants such as boat operators, community leaders, and transport officials.

Simple random sampling will be used to select regular passengers and residents.

A sample size of 110 respondents will be selected to ensure adequate representation.

3.6 Method of Data Collection

Data will be collected using:

a. Primary Data

Structured questionnaires

Interviews with boat operators, government officials, and passengers

Direct observation of waterway activities, boat conditions, and jetties

b. Secondary Data

Government reports (NIWA, Bayelsa State Ministry of Transport)

Journals, textbooks, and academic articles

Previous studies on inland waterways

3.7 Research Instruments

The main instrument for primary data collection is a structured questionnaire divided into sections based on research questions. The questionnaire will use both closed-ended and open-ended items to obtain quantitative and qualitative data. An interview guide will also be used for key informants.

3.8 Method of Data Analysis

Data collected will be analyzed using:

Descriptive statistics such as frequency tables, percentages, and charts.

Narrative analysis for qualitative responses from interviews.

The analysis will be tied directly to the research questions.

3.9 Validity of the Instrument

To ensure validity, the questionnaire will be reviewed by the project supervisor and experts in transport studies. Necessary adjustments will be made before distribution. A pilot test may also be conducted in a nearby community.

3.10 Reliability of the Instrument

Reliability will be ensured using the test–retest method, (a method that involves giving the same test to the same group of people at two different points in time and then comparing the results). The researcher will administer the questionnaire to a small group twice within a short interval and compare responses. Consistency will indicate reliability.

3.11 Ethical Considerations

i. Respondents will be informed about the purpose of the study.

ii. Participation will be voluntary.

iii. Confidentiality of all information collected will be assured.

iv. No respondent will be pressured or harmed during the process.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter presents the data collected from respondents, analyzes the results, and discusses the key findings in relation to the research questions. The analysis focuses on identifying the major transportation challenges affecting the Nembe waterway in Bayelsa State, their causes, effects, and the perceived adequacy of existing interventions.

4.2 Data Presentation and Analysis

4.2.1 Demographic Characteristics of Respondents

A total of 120 questionnaires were administered, and 110 were retrieved, giving a response rate of 91.6%. Respondents included boat operators, passengers, business owners, and community residents who use the Nembe waterways.

Table 4.1: Gender Distribution

Gender	Frequency	Percentage (%)
Male	68	61.8
Female	42	38.2
Total	110	100

Source: Researchers' field work: 2025

Interpretation: A majority of respondents were male, which is consistent with the fact that men dominate water transport operations in Nembe.

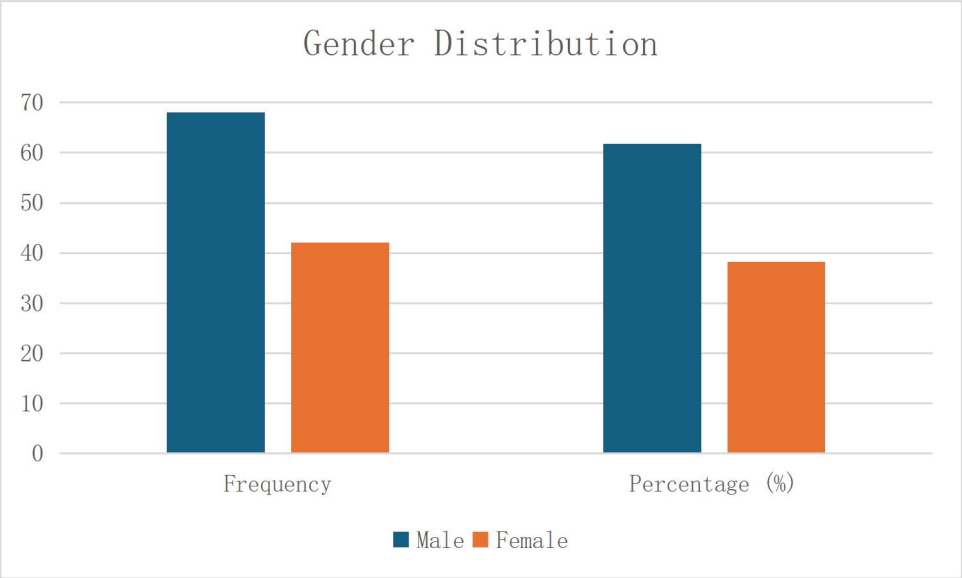


Figure 1: Gender Distribution

Table 4.2: Age Distribution

Age Range	**Frequency**	**Percentage (%)**
18 – 25	20	18.2
26 – 35	38	34.5
36 – 45	32	29.1
46+	20	18.2
Total	110	100

Source: Research fieldwork: 2025:

Table 4.2 shows that most of the respondents fall within the age group of 26 -35 (34.5%) this implies majority of respondents are of working age, this is follows by the age group 36 – 45 (29.1%), the remaining of the respondents are children and senior citizens which have the same percentage level.

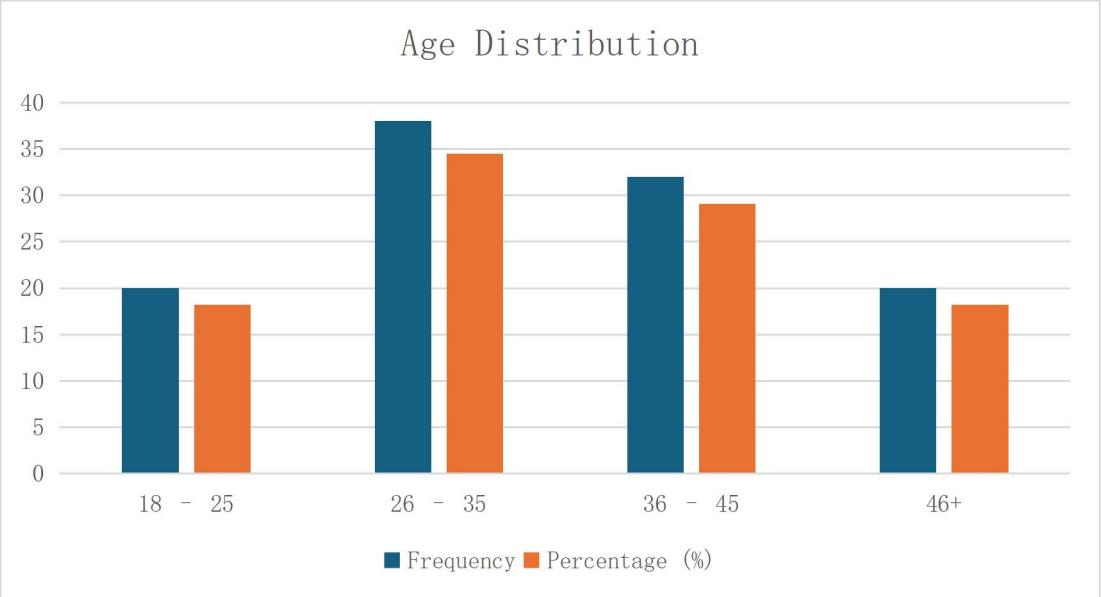


Figure 4.2: Age Distribution of respondents

4.3 Analysis Based on Research Questions

Research Question One: What are the major transportation problems affecting the Nembe waterway in Bayelsa State?

Table 4.3 Common Transportation Problems

Research Questions 1: What are the major transportation problems affecting the Nembe waterway in Bayelsa State	**Frequency/ percentage (%)**	
	Yes	**No**
Poor Boat conditions and overloading	95 (86.36%)	15 (13.6%)
Inadequate life jackets	82 (74.54%)	28 (25.4%)

High incidence of accidents	70 (63.6%)	40 (36.36%)
Bad weather challenges	67 (60.9%)	43 (39.1%)
Piracy and insecurity	90 (81.81%)	20 (18.19%)
Poor jetty infrastructure	88 (80%)	22 (20%)

Source: Field work: 2025.

From table 4.3: shows that majority of the respondents strongly opined that Poor Boat conditions and overloading, Inadequate life jackets, High incidence of accidents, Bad weather challenges, Piracy and insecurity are the main problems facing Nembe waterway in Bayelsa State.

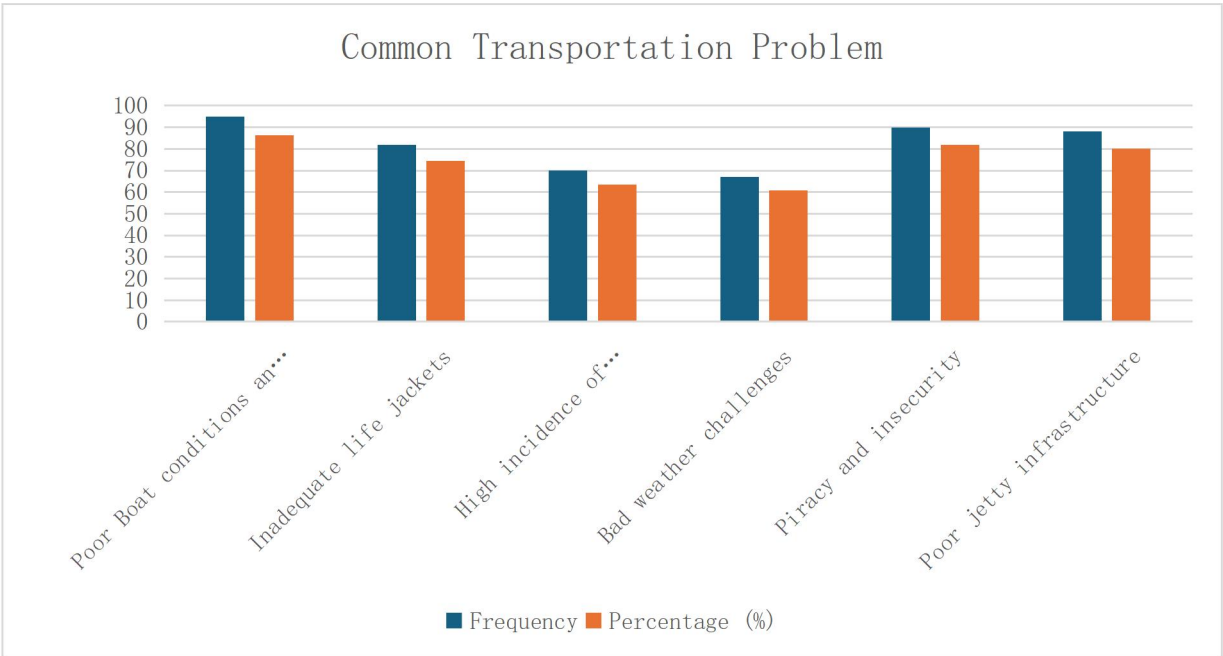


Figure 4.3: Common Transportation Problems

Research Question Two: What are the major causes of transportation problems on the Nembe waterway?

Table 4.4 Causes of Inland Waterway Transportation Problems

Research Questions 2: What are the major causes of transportation problems on the Nembe waterway	**Frequency/ percentage (%)**	
	Yes	**No**
Lack of Government Regulation	90 (81.2%)	20 (18.18%)
Poor enforcement of safety standards	85 (72.3%)	25 (22.7%)
Inadequate funding for water transport	92 (83.6%)	18 (16.4%)
Environmental/Seasonal hazards	78 (70.9%)	32 (29.1%)
Negligence by boat operators	88 (80%)	22 (20%)

Source: fieldwork 2025:

Table 4.4 shows that majority of the respondents are of opinion that lack of government regulation, poor enforcement, and inadequate funding, suggesting that institutional failure significantly contributes to waterway problems. For example, 92 (83.6%) of the respondents strongly agreed that Inadequate funding for water

transport is a major challenge affecting Nembe waterway while 18 (16.4%) of the respondents disagreed. 78 (70.9%) of the respondents are of the opinion that Environmental/Seasonal hazards are major problem in Nembe waterway while the remaining 32 (29.1%) disagreed.

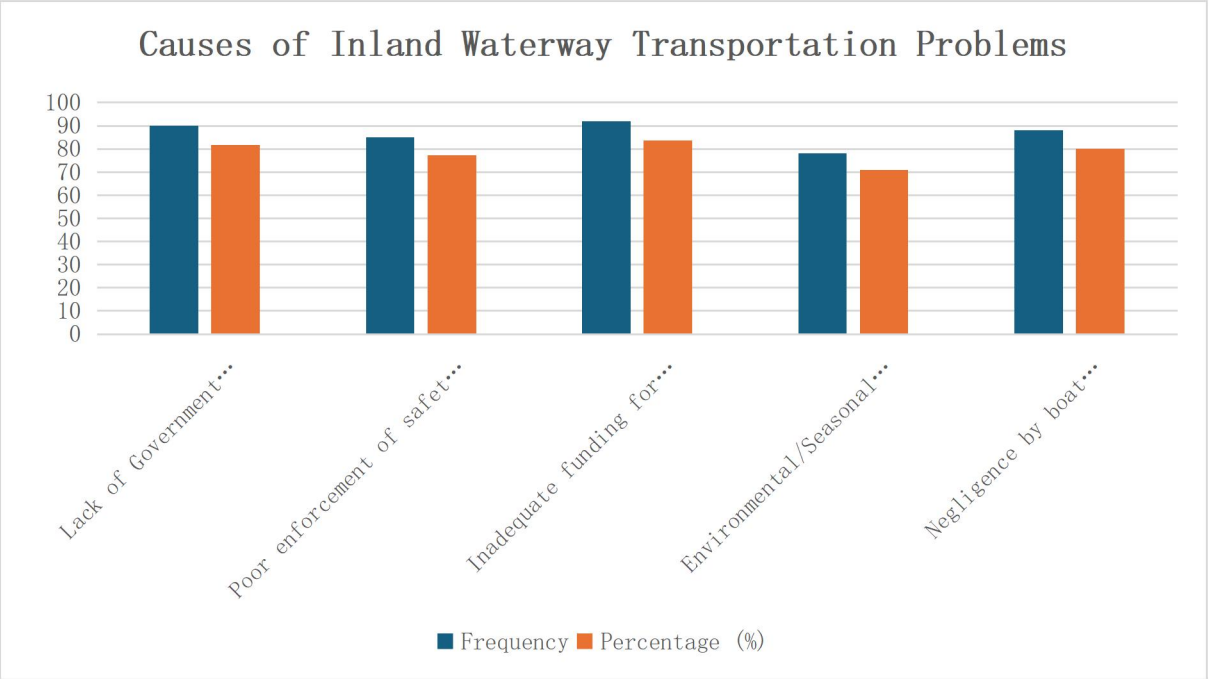


Figure 4.4: Causes of Inland Waterway Transportation Problems

Research Question Three: What are the effects of these transportation problems on the socio-economic activities of Nembe residents?

Table 4.5 Socio-economic Effects

Research Questions 3: What are the effects	**Frequency/ percentage (%)**

of these transportation problems on the socio-economic activities of Nembe residents	Yes	No
Delay in movement of goods and people	95 (86.3%)	15 (13.7%)
Increased transportation cost	88 (80%)	22 (20%)
Loss of lives and properties	75(68.2%)	35(31.8%)
Reduction in business activities	82(74.5%)	28(25.5%)
Fear and psychological stress	90 (81.8%)	20 (18.2%)

Source: Researcher's field work 2025.

Interpretation:

Table 4.5 based on the statistics above hown that Delay in movement of goods and people, Increased transportation cost, Loss of lives and properties, Reduction in business activities, Fear and psychological stress are the major effects of waterway transportation problems on the socio-economic activities of Nembe residents.

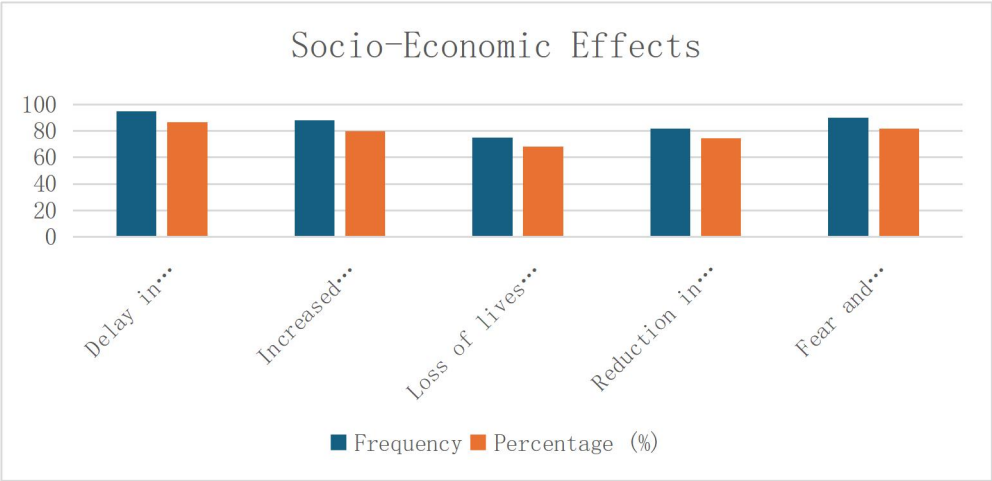


Figure 4.5: Socio-Economic Effects

Research Question Four: How effective are current government policies and interventions?

Table 4.6 Assessment of Government Interventions

Assessment	Frequency	Percentage (%)
Highlight effective	5	4.5
Moderately effective	20	18.2
Ineffective	85	77.3

Source: Researcher's field work: 2025

Interpretation:

Most respondents (77.3%) believe that government interventions are ineffective, indicating a need for urgent policy reform and active enforcement.

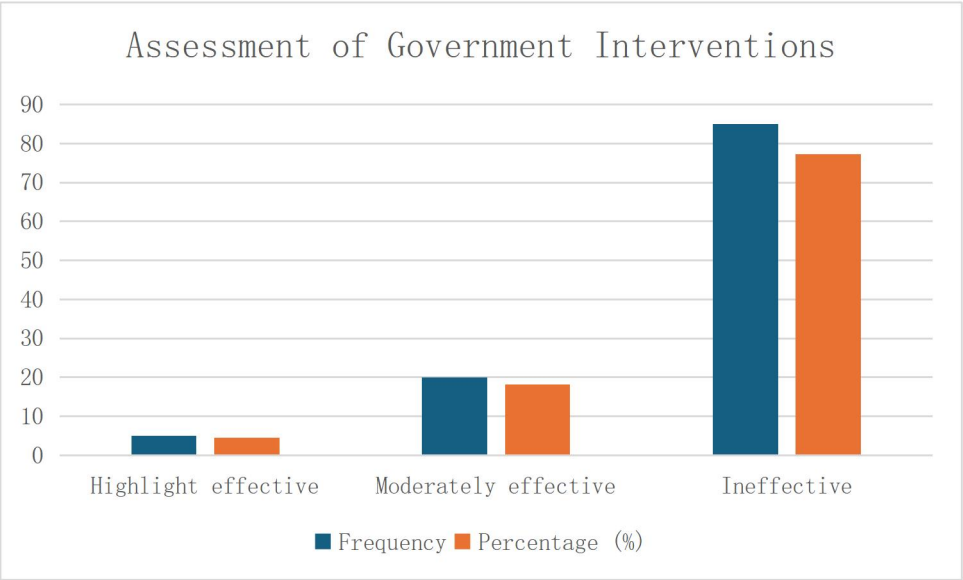


Figure 4.6: Assessment of Government Intervention

Research Question Five: What solutions can improve waterway transportation in Nembe?

Table 4.7 Proposed Solutions

Research Questions 5: What solutions can improve waterway transportation in Nembe?	**Frequency/ percentage (%)**	
	Yes	**No**
Provide modern boats and safety gear	100 (90.9%)	10 (9.1%)
Construct modern jetties	95 (86.4%)	15 (13.6%)
Deploy marine police/improve security	102 (92.7%)	8 (7.3%)
Regular safety training for operators	88 (80%)	22(20%)
Strong government regulation	97 (88.2%)	13 (11.8%)

Source: fieldwork: 2025.

Interpretation:

Table 4.7 shows that majority of the respondents are agreed that Provide modern boats and safety gear, Construct modern jetties, Deploy marine police/improve security, Regular safety training for operators, Strong government regulation are possible solutions improve waterway transportation in Nembe?.

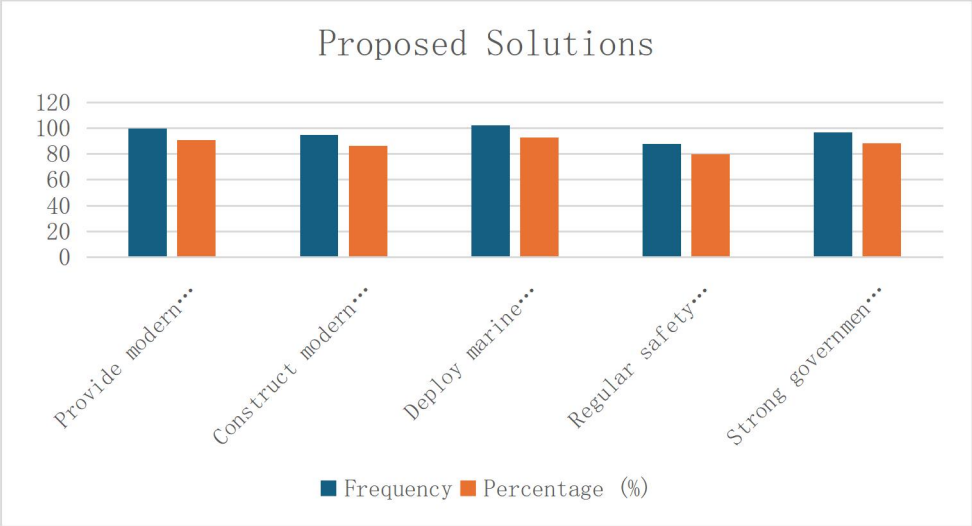


Figure 4.7: Proposed Solutions

4.2 Discussion of Key Findings

This section discusses the major findings of the study based on the data collected, with a deeper focus on the key issues affecting inland waterway transportation in Nembe, Bayelsa State. The study revealed that insecurity, particularly piracy, sea robbery, and militant activities—is the most significant challenge affecting the Nembe waterway. With over 81% of respondents identifying insecurity as a major problem, it becomes clear that the safety of lives and properties on the waterways is severely compromised. This fact is supported by Jinfen et al., 2016 who opined that Safety and security are very crucial factors in water transportation sector due to the

fact that various accidents such as groundings, collisions, capsizing amongst others often results in great economic loss, fatalities and contamination of the environment.

Piracy discourages business owners, traders, and transport operators from freely engaging in waterway travel. Goods are often seized, and passengers sometimes lose both valuables and cash. This directly undermines the economic strength of communities relying heavily on water transport. Many travelers experience fear whenever they have to travel by boat, especially early in the morning or late in the evening. This fear reduces mobility and leads people to postpone travel, limit economic activity, or avoid the route altogether.

Due to constant threats from pirates, boat operators often travel at irregular hours or take longer routes to avoid known danger zones. This increases travel time, reduces operational efficiency, and increases fuel consumption.

Emergencies such as medical referrals, supply shortages, or urgent travel needs are hindered because people must assess the level of insecurity before embarking on a journey. In some cases, delays resulting from fear of attacks have led to fatalities.

The high rate of piracy highlights the weakness of law enforcement agencies on the waterways. Many respondents believe the lack of marine patrol is a major factor enabling criminals, which points to systemic government failure.

Overall, insecurity stands out as the strongest and most influential factor affecting not only transportation, but the entire socio-economic life of Nembe and the Bayelsa waterways.

Another major finding is the prevalence of poorly maintained boats, frequent overloading, and shortage of life jackets. Over 74% of respondents indicated insufficient lifejackets, and more than 86% pointed out that many boats are overloaded or in poor condition.

This situation increases accident rates, especially during periods of high tide, storms, or heavy rainfall. Many passengers are exposed to danger due to the operators' lack of adherence to safety regulations. This emphasizes the need for strict enforcement of safety standards and inspection of boats.

The study also discovered that jetty facilities along the Nembe route are insufficient or poorly maintained. About 80% of respondents agreed that the existing infrastructure is inadequate. Many jetties lack proper loading platforms, passenger waiting areas, lighting, and rescue facilities. This contributes to discomfort, delays, and higher risks during embarkation and disembarkation

Environmental factors such as flooding, strong currents, and heavy rainfall were identified as secondary causes of transport difficulties. These factors increase the risk of accidents but become more dangerous because they interact with human factors like poor boat maintenance.

Respondents noted a lack of strict government regulations and enforcement. Even though maritime laws exist, enforcement remains weak. This contributes to safety violations, price exploitation, and unregulated operations. Transportation problems negatively affect businesses, increase the cost of goods, reduce access to

healthcare, and restrict movement. Many respondents noted delays in transporting fish, farm produce, and household items, which affects livelihoods.

Summary of Discussion

The key findings show that insecurity and piracy represent the most critical challenge affecting the Nembe waterway, significantly influencing all aspects of water transport. Poor boat conditions, inadequate safety equipment, and weak infrastructure further compound the problems. While environmental factors and weak regulation also contribute, they play a secondary role compared to the overwhelming impact of insecurity.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the study, conclusion, and recommendations derived from the major findings of the research. It also outlines the limitations of the study and suggestions for further research.

5.2 Summary of the Study

This research investigated the transportation problems affecting the Nembe inland waterway in Bayelsa State, identifying the major challenges, their causes, and their socio-economic implications on residents and travelers. The study also assessed the effectiveness of government interventions and proposed solutions for improvement.

The research was guided by the following key areas:

1. Identification of major transportation problems on the Nembe waterway

2. Determination of the causes of these transportation challenges

3. Assessment of the effects of these problems on socio-economic activities

4. Evaluation of government interventions and policies

5. Proposal of feasible solutions for improving waterway transportation

A total of 110 respondents participated, including boat operators, passengers, and residents. Descriptive statistics were used to analyze data collected through questionnaires.

The key findings are summarized as follows:

i. Insecurity and piracy emerged as the most significant transport challenge, affecting the movement of goods and people.
ii. Other problems include poor infrastructure, faulty boats and overloading, lack of safety equipment, and environmental hazards.
iii. Major causes include weak government regulation, poor enforcement, inadequate funding, and operator negligence.
iv. The socio-economic effects include increased transportation costs, delays, loss of goods and lives, reduction in business activities, and psychological stress.
v. Government interventions were rated largely ineffective, as authorities such as NIWA do not conduct routine enforcement or infrastructure upgrades.
vi. The study concludes that improving waterway transportation in Nembe requires urgent action from government, private operators, and community stakeholders.

5.3 Conclusion

Based on the findings, this study concludes that the Nembe waterway faces numerous transportation problems that hinder safe, reliable, and efficient travel. Among these, insecurity and piracy stand out as the most critical and urgent challenge, significantly crippling economic activities and discouraging transportation.

Other contributing factors—such as poor infrastructure, unsafe boats, inadequate safety measures, and weak regulatory enforcement—combine to create a risky

transport environment for users. As the primary route for accessing the Nembe area, the waterway's inefficiency severely affects trade, education, healthcare access, and overall quality of life for residents.

Therefore, improving inland water transportation in Nembe is essential not only for mobility but also for the socio-economic growth of Bayelsa State as a whole. Without strong intervention and policy enforcement, the waterway will continue to pose danger and hardship to its users.

5.4 Recommendations

Based on the findings and conclusions of this study, the following recommendations are made:

I. Strengthen Waterway Security

Deploy more marine police and Navy patrols.

Establish community policing units to provide intelligence reports.

Install communication and emergency response systems at jetties.

II. Improve Water Transport Infrastructure

Construct modern, safe, and properly equipped jetties.

Provide sheltered waiting areas, ticket points, and emergency medical points.

Introduce standardized boat terminals similar to those in Lagos and Port Harcourt.

3. Enforce Strict Boat Safety Regulations

NIWA should enforce boat capacity limits, engine standards, and regular inspections.

Only certified and well-maintained boats should be allowed for commercial use.

4. Mandatory Use of Safety Equipment

Government should supply subsidized life jackets.

Boat operators must ensure every passenger wears a functional life jacket before departure.

5. Capacity Building for Boat Operators

Organize regular training on navigation skills, safety procedures, and first aid.

Create a licensing system that ensures only trained operators run commercial boats.

6. Government Funding and Policy Intervention

Increase government budget allocation for inland waterway development.

Set up a monitoring task force to check compliance and penalize defaulters.

7. Community Awareness and Education

Conduct sensitization campaigns on water safety.

Encourage passengers to report unsafe practices.

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APPENDIX

QUESTIONNAIRE

Transportation Problems Affecting Inland Waterways in Nembe, Bayelsa State

Dear Respondent,

This questionnaire is designed to gather information for a research project on Transportation Problems Affecting Inland Waterways in Nembe, Bayelsa State. Your responses will be treated with confidentiality and used purely for academic purposes.

Please tick (✓) where appropriate or provide honest answers where required.

SECTION A: DEMOGRAPHIC INFORMATION

1. Gender:

☐ Male

☐ Female

2. Age Range:

☐ 18–25

☐ 26–35

☐ 36–45

☐ 46 and above

3. Occupation:

☐ Boat Operator

☐ Passenger

☐ Business Owner/Trader

☐ Civil Servant

☐ Student

☐ Other (specify) _____

4. How often do you use the Nembe waterway?

☐ Daily

☐ Weekly

☐ Occasionally

☐ Rarely

SECTION B: TRANSPORTATION PROBLEMS

5. Which of the following transportation problems have you experienced on the Nembe waterway? (You may tick more than one)

☐ Insecurity / Piracy

☐ Poor jetty infrastructure

☐ Overloading of boats

☐ Lack of life jackets

☐ Poorly maintained boats

☐ Bad weather conditions

☐ High transport cost

☐ Frequent accidents

☐ Others (specify): _____

6. How would you rate the level of insecurity on the Nembe waterway?

☐ Very High

☐ High

☐ Moderate

☐ Low

☐ Very Low

7. Have you or someone you know experienced any incident of piracy or sea banditry on the waterway?

☐ Yes

☐ No

If yes, briefly describe: _____

SECTION C: CAUSES OF TRANSPORTATION PROBLEMS

8. Major causes of transportation problems (tick all that apply):

☐ Lack of government regulation

☐ Poor enforcement of safety rules

☐ Negligence by boat operators

☐ Inadequate funding/investment

☐ Poor weather conditions

☐ Lack of public awareness

☐ Other causes (specify): _____

9. Do you think the government is doing enough to regulate waterway transportation?

☐ Yes

☐ No

☐ Not sure

SECTION D: EFFECTS OF TRANSPORTATION PROBLEMS

10. How have transportation problems affected your daily activities? (tick all that apply)

☐ Delay in movement

☐ Increased cost of travel

☐ Loss of goods

☐ Loss of income/business

☐ Fear and stress during travel

☐ Reduced access to health/school

☐ Others (specify): _____

11. Do transportation problems affect economic activities in Nembe?

☐ Yes

☐ No

If yes, explain: _____

SECTION E: POSSIBLE SOLUTIONS

12. What solutions do you think can improve waterway transportation? (tick all that apply):

☐ Improved security patrols

☐ Provision of modern boats

☐ Construction of better jetties

☐ Enforcement of safety regulations

☐ Provision of life jackets

☐ Training for boat operators

☐ Subsidizing transport costs

☐ Government intervention and monitoring

☐ Others (specify): _____

13. Do you support the idea of establishing a permanent marine security base in Nembe?

☐ Yes

☐ No

14. Additional comments or suggestions: