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MARINE TRANSPORTATION AND LOGISTICS ADVANCEMENT TOWARDS THE GROWTH AND DEVELOPMENT OF BLUE ECONOMY IN NIGERIA

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ABSTRACT

The study examines marine transportation and logistics advancement for the growth and development of Blue Economy in Nigeria. Among others, the objectives of the study were to: evaluate the current state of marine transportation infrastructure in Nigeria and explore opportunities for investment and public-private partnerships in Nigeria's marine transportation and maritime logistics. The study used survey design which involved questionnaire and interview. Descriptive statistics and thematic analysis was used to analyze the data generated. The Taro Yamane formula was used to determine the sample size of 431 out of a population of 18,966. The study finds, amongst others, that existing port facilities in Nigeria are not adequate to support the current demands of marine transportation; maritime auxiliary services provided at Nigerian ports do not meet international standards to support Blue Economy in Nigeria; there is ineffective coordination between different stakeholders to ensure efficient marine transportation in Nigeria; and inasmuch as regulatory frameworks in Nigeria are aligned with international standards in marine logistics, corruption within regulatory bodies has undermined safety and security efforts, and insufficient infrastructure such as navigational aids and emergency response facilities have also impacted negatively on safety and security. Accordingly, the study recommends that government should improve maritime and logistics infrastructure, integrate all actors (Customs, shipping lines, ports, haulers) into a single logistics ecosystem, enforce anti-corruption policies in cargo handling and clearance procedures and expand access to mobile and cloud-based logistics solutions for last-mile operators in Nigeria.
Keywords: maritime auxiliary services, infrastructure, public-private partnerships, Blue Economy, investment

1.0 INTRODUCTION

According to the Federal Ministry of Marine and Blue Economy (2021), the Blue Economy has the capacity to generate up to ₦6 trillion in annual revenue, create over 200,000 jobs annually in the short term, and contribute up to 16% to Nigeria's GDP in the medium and long term. To

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realize this prospect, the advancement in marine transportation and maritime logistics would enhance the growth and development of Nigeria's Blue Economy.

The marine transport sector (made up of maritime transport services, maritime auxiliary services, and port services) and maritime logistics constitute a linchpin in Nigeria's Blue Economy, because they drive economic growth, facilitate job creation, and enhance the country's global recognition. They help to connect Nigeria to international markets and foster trade, investment, and job opportunities (Eto, 2021; Eto & Okon, 2025).

The coastal and marine tourism sector of the Blue Economy draws vital force from marine transportation and maritime logistics. Efficient maritime shipping infrastructure, cruises, resorts, and waterfront facilities are essential for the growth and development of Blue Economy in Nigeria. The investment opportunities include tourism infrastructure development, resort and cruise ventures, and cultural and eco-tourism projects are tied to the efficiency of marine transportation and maritime logistics advancement. However, there are daunting challenges such as weak coordination between stakeholders (port authorities, shipping companies, terminal operators, and government agencies) in Nigeria's marine transportation and logistics sector, and they are capable of affecting the growth and development of Blue Economy in Nigeria (Okon & Eto, 2024).

The Problem

Based on the study by the World Bank Group (2017), a reasonable number of Blue Economy activities depend on marine transportation and maritime logistics functions. Some of such activities are coastal and marine tourism and recreation, seaborne trade, seabed mining, extraction of marine non-living resources, and harvesting of marine living resources, which are bedeviled with certain operational and institutional challenges.

Nigeria has established a legal framework for marine transportation; however, the enforcement of these regulations faces significant hurdles that impact its consistency and effectiveness. Thus, addressing the issues related to resource constraints, corruption, monitoring capabilities, and stakeholder engagement is crucial for improving the overall enforcement environment. Continuous reform efforts, capacity building for regulatory agencies, and fostering transparent dialogue with industry stakeholders could pave the way for more effective enforcement of marine transportation regulations in Nigeria (Eto, 2019).

Nigeria's policies governing marine transportation aim to promote local participation and develop the sector. However, their impact on fair competition and market access can be complex. Accordingly, addressing the issues related to regulatory barriers, corruption, and infrastructure could enhance competition and ensure equitable market access for all stakeholders in the marine transportation sector. Furthermore, continuous review and adaptation of these policies in consultation with industry stakeholders could lead to a more balanced and competitive maritime environment (Agbakoba, 2024).

The challenges confronting the advancement in marine transportation and maritime logistics towards enhancing the growth and development of Blue Economy in Nigeria revolve around infrastructure deficit, inconsistent policies and regulations, and deficient workforce that require training and capacity development. The challenges preventing Nigeria's inland waterways transportation from optimum performance include port connectivity, intermodal transportation, and infrastructure enhancement (Federal Ministry of Marine and Blue Economy, 2021).

The investment opportunities in ports and terminals (which are marine transportation facilities that enhance maritime logistics) include infrastructure development, port modernization projects, efficient logistics and cargo handling solutions. Nevertheless, infrastructure deficits and complex bureaucratic procedures are the notable challenges bedeviling maritime transportation and

maritime logistics which could hinder the investment prospects and this needs policy action (Federal Ministry of Marine and Blue Economy, 2021).

Furthermore, in respect of investment opportunities in the marine transportation and logistics, while there are regulatory frameworks in place to ensure compliance with international standards, ongoing challenges and areas for improvement need to be addressed to guarantee the highest standards of support services at Nigerian ports (Wigmore Trading, 2021; Agbakoba, 2024)

It is against this backdrop that the objectives of the study were to: (1) Evaluate the current state of marine transportation infrastructure in Nigeria (2) Examine the role of policy and regulatory frameworks governing marine transportation and logistics in Nigeria; (3) Assess the economic impact of marine transportation on coastal communities in Nigeria.

Literature Review and Conceptual Clarification

Marine Transportation

Marine transportation is all-encompassing, including transportation of "passengers and freights, ferry transport, marine towing, ship chartering, marine cargo handling, harbour and port operations, marine salvage, piloting services, and marine shipping agencies" (Anindiya, 2004). The marine transportation sector has three types of activities which are *maritime transport services, maritime auxiliary services,* and *port services* (Igberi & Ogunniyi, 2013).

Maritime transportation is significant for Nigeria's Blue Economy, yet her shipping lanes are facing several challenges, including: piracy and security risks, particularly in the gulf of guinea which is a known piracy hotspot, posing threats to shipping activities (Vanguard Newspapers, 2022).

According to Igberi and Ogunniyi (2013), maritime auxiliary services refer to the support services that facilitate the operation of ships, ports, and other maritime activities, which include: (1) Pilotage Services: Providing experienced pilots to guide ships through ports and waterways (2) Towage Services: Offering tugboats to assist ships in berthing, unberthing, and navigating through congested waters (3) Mooring Services: Providing personnel and equipment to secure ships to berths or anchors (4) Bunkering Services: Supplying fuel and lubricant to ships (5) Provisioning Services (Chandlering): Providing food, water, and other supplies to ships (6) Waste Management Services: Collecting, treating, and disposing of waste generated by ships (7) Ship Repairs and Maintenance Services: Providing facilities and personnel to repair and maintain ships (8) Cargo Handling Services: Loading, unloading, and storing cargo (9) Stevedoring Services: Loading and unloading cargo from ships (10) Maritime Security Services: Providing security personnel and equipment to protect ships, ports, and cargo (11) Weather Forecasting Services: Providing weather forecasts and warning to support safe navigation (12) Icebreaking Services: Providing icebreakers to assist ships in navigating through icy waters (13) Salvage Services: Providing surveyors to inspect and assess ships and cargo.

Maritime Logistics

Calliskan and Ozturkoglu (2016) describe maritime logistics as a combination of transshipment functions and maritime services. It has to do with the planning, implementation, and control of the movement and storage of goods in the maritime sector. Whereas Hult, Ketchen and Arrfelt (2007) have defined the value of maritime logistics as facilitating the higher efficiency and effectiveness of a maritime logistics service, Panayides (2006), views maritime logistics as "the integrated demand for maritime transport brings on a maritime logistics concept" at ports. Summed up, maritime logistics involves the integration of various activities, including: Shipping: Booking cargo space on vessels, managing freight rates, and ensuring timely delivery;

Freight forwarding: Arranging transportation, customs clearance, and warehouse for cargo; Customs clearance: Ensuring compliance with regulations, duties, and taxes; Warehousing and storage: Managing inventory, storing cargo, and providing value-added services; Transportation management: Coordinating with carriers, managing routes, and optimizing transit times; Supply chain visibility: Tracking cargo, monitoring vessel schedules, and providing real-time updates and Risk management: Mitigating risks associated with cargo damage, loss, or theft.

Benefits of Effective Maritime Logistics

According to Panayides (2006), maritime logistics offer the following benefits: (a) Improved efficiency: Streamlined processes and optimized routes reduce transit times and costs (b) Enhanced visibility: Real-time tracking and monitoring enable better decision-making (c) Increased security: Effective risk management and customs compliance reduce the risk of cargo loss or damage (d) Better customer service: Reliable delivery times and accurate tracking information improve customer satisfaction (e) Cost savings: Optimized logistics reduce fuel consumption, lower freight rates, and minimize demurrage fees.

Challenges in Maritime Logistics

The challenges associated with maritime logistics have been identified by Calliskan and Ozturkoglu (2016) to include: (a) Complexity: Managing multiple stakeholders, regulations, and variables in the supply chain (b) Uncertainty: Dealing with weather-related disruptions, vessels delays, and changes in demand (c) Security concerns: Piracy, kidnapping, theft, and cyber threats pose risks to cargo and vessels (d) Sustainability: Reducing carbon emissions and environmental impact while maintaining efficiency (e) Regulatory compliance: Navigating complex and changing regulations, such as customs, safety, and environmental standards.

Theoretical Framework

Supply Chain Management Theory

In the view of Vorst (2004), the focus of the supply chain management theory is efficient management of the flow of goods and services. On the other hand, the paper focuses on marine transportation and maritime logistics, which are about the flow of goods and services through maritime space. A driving force behind SCM is the recognition that sub-optimization occurs if each organization in a supply chain attempts to optimize its own results rather than to integrate its goals and activities with other organizations to optimize the results of the chain. This theory emphasizes the importance of managing supply chain activities to achieve economic growth. The relevance of this theory to the study is that it lends credence to how the optimization of marine transportation and maritime logistics could enhance the competitiveness and sustainability of the blue economy.

Empirical studies

In their study Canbay and Kirca (2025) aimed to determine whether there was any causal relationship between maritime transport and economic growth variables in Belgium, France, Germany, Italy, Netherlands, Spain, Türkiye, and the United Kingdom, which have the highest maritime transport among European countries. According to their finding, there is a causal relationship between economic growth and maritime transport in all countries except Italy and the Netherlands. The authors affirm that there is a causal relationship between maritime transport and economic growth in Türkiye and the United Kingdom. Their conclusion is that in order for maritime countries to experience economic growth, they need more coherent and articulate maritime transport policies.

Investing in maritime logistics allows private stakeholders to tap into coastal development zones in the quest to harness the economic potential of the blue economy. With seaports handling over 90% of seaborne trade, maritime logistics has a huge role to play towards the growth and development of the global blue economy (World Business Outlook, 2025).

In an attempt to link marine transportation to the growth of Blue Economy, Kip (2025) in a study titled "The Blue Economy in Nigeria: Harnessing Its Potentials While Mitigating Climate Change", asserts that 80% of international goods traded are transported by sea and the volume of seaborne trade is expected to double by 2030 and quadruple by 2050. And that ocean and coastal tourism (an economic activity in the Blue Economy), which depends heavily on marine transport, can create jobs and engender economic growth.

2.0 MATERIALS AND METHODOLOGY

The study used survey design which involved questionnaire and interview for the collection of data. Descriptive statistics and thematic analysis were used to analyze the data generated.

Population for the Study

The population for this study was made up of 18,966 individuals made up of three private terminal operators operating in Nigeria's ports and four government maritime regulatory agencies. The workers of the organizations involved are the major stakeholders. The population of the study is shown below in Table 1.

Table 1: Population of the study

S/N	Organizations	Number of staff
1	Nigerian Ports Authority	1,457
2	Nigerian Maritime Administration and Safety Agency	1,653
3	Nigerian Shippers' Council	333
4	Nigerian Customs Service	13,000
5	ENL Consortium	311
6	AP Moller	1,450
7	SIFAX Group	762
	Total	18,966

Source: Eto, Okon and Ufia (2025)

Sampling Technique and Method of Data Collection

The sampling process consists of selecting a small group of elements drawn from the study population through a particular sampling technique. For this study the simple random and stratified sampling techniques were adopted to cover very large proportion of the population.

In determining the sample size for this research, the Taro Yamane's formula given as *(equ 1)* was used:

$n = \frac{N}{1+N(e)^2} =$ ..... *(1)*

Where:

n = sample size
N = population size (18,966)
e = level of significance (our level of significance is chosen at 5%)

Applying the formula at significant level of 5%;

$$n = \frac{18{,}966}{1 + 18{,}966(0.05)^2}$$

$$\frac{18{,}966}{1 + 47.41}$$

$$\frac{18{,}966}{48.41}$$

$$= 391.78$$

Therefore, the sample size = 391.78, which is approximated to be 392. However, 39 (i.e.10%) is added to accommodate non-response and this brings the sample size to 431.

Sample Size Determination

The sample size for the study was 431. Below is the number of copies of questionnaire that were administered to each group of respondents. Probability proportional to size (PPS) method was employed in selecting the sample size of respondents from each of the selected group of respondents. This was utilized in order to have an equal sample size representation and adequacy of the respondents in each of the group of respondents. The formula used to achieve this representation from each group of respondents is as follows:

$$\frac{\text{Number of questionnaires} \times \text{population of each group of respondents}}{\text{Grand total}}$$

Table 1 Population of the study

S/N	Respondents	Population	Proportion	Sample size
1	Nigerian Port Authority	1457	$\frac{431\ (1457)}{18{,}966}$	33
2	Nigerian Maritime Administration and Safety Agency	1,653	$\frac{431\ (1{,}653)}{18{,}966}$	38
3	Nigerian Shippers' Council	333	$\frac{431\ (333)}{18{,}966}$	8
4	Nigerian Customs Service	13,000	$\frac{431\ (13{,}000)}{18{,}966}$	295
5	ENL Consortium	311	$\frac{431\ (311)}{18{,}966}$	7
6	AP Moller	1,450	$\frac{431\ (1{,}450)}{18{,}966}$	33
7	SIFAX Group	762	$\frac{431\ (762)}{18{,}966}$	17
	Total	**18,966**		**431**

Source: Researcher's compilation, 2025

3.0 RESULTS AND DISCUSSION

Summary of Questionnaire Distributed

The questionnaire distributed and the number of copies retrieved is presented in Table 3.

Table 3: Copies of Questionnaire Administered

Number of copies of Questionnaire Distributed	Number of copies of Questionnaire Retrieved	Registrar of Copies of Questionnaire Retrieved
431	**418**	**96.98**

Source: *Field survey* (2025)

A total of 431 copies of the questionnaire were distributed to major stakeholders in the maritime transport sector. 418 copies were returned to represent 96.98% response rate as shown in the Table above.

4.2 Socio-economic Characteristics of Respondents

The gender distribution of the respondents is shown in Table 3. The distribution shows that 263 or 63% of the respondents were male while 155 or 37% were female. This shows that majority of the respondents were male.

Table 3: Demographic Analysis of Respondents

Characteristics	Frequency	Percentage
Male	263	63
Female	155	37
Total	**418**	**100**

Source: Field survey (2025)

The age distribution in Table 4 shows that there were no respondents less than 18 years of age. Those whose age fell into the age bracket 18-35 years were in the majority and they numbered 238 or 57%. Those who fell within the 36-64 years range were 167 or 40%, and they happened to be the majority. The respondents whose age was above 65 years were 13 or 3%.

Table 4: Age Distribution of Respondents

Age	Respondents	Percentage (%)
Less than 18	Nil	Nil
18-35	238	57
36-64	167	40
Above 65	13	3
Total	**418**	**100**

Source: *Field survey* (2025)

The formal education of respondents as shown in Table 5 shows that all the respondents attained various degrees of formal education. Those who only attained Primary School education were 19 or 5%. Those who attained Secondary School education were 105 or 25% and the respondents who happened to attained Tertiary education, were 290 or 70%.

Table 5: Educational Level

Educational Level	**Respondents**	**Percentage (%)**
Primary	19	5
Secondary	105	25
Tertiary	290	70
Total	**418**	**100**

Source: *Field survey* (2025)

The occupation distribution shown in Table 6 indicates that 51 or 12% were Human Resources staff. Freight forwarders owners were 82 or 20%. Civil servants were 48 or 11%. Safety & Regulation Compliance workers were 47 or 11%. Emergency Mgt Services were 48 or 12%. Shippers were 97 or 23% and Quality Control workers were 45 or 11%.

Table 6: Occupation of Respondents

Occupation	Frequency	Percentage
Human Resources	51	12
Freight forwarders	82	20
Civil servants	48	11
Safety & Regulation Compliance	47	11
Emergency Mgt Services	48	12
Shippers	97	23
Quality Control staff	45	11
Total	**418**	**100**

Source**:** Researchers' Computation (2025)

The status distribution of respondents shown in Table 7 indicates that 106 or 25% were Top-Level Management. Majority of the respondents, who were 243 or 58%, fell within the Senior-Level Management while those who were of the Junior Management cadre were 69 or 17%.

Table 7: Status Distribution

Status	**Respondents**	**Percentage (%)**
Top-Level Management	106	25
Senior-Level Management	243	58
Junior-Level Management	69	17
Total	**418**	**100**

Source: Researchers Computation (2025)

4.3 Discussion of Results

Tables 8 to 12 show the responses to 4-point Likert Scale questions based on objectives 1

Table 8: Objective 1: To evaluate the current state of marine transportation infrastructure in Nigeria

S/N	Question Items	SD	%	D	%	A	%	SA	%	Total	%
1	The existing port facilities in Nigeria are adequate to support the current demands of marine transportation	263	63	78	19	41	10	36	8	418	100
2	The shipping lanes in Nigeria are well-maintained and efficiently managed	276	66	82	20	39	9	21	5	418	100
3	The support services (maritime auxiliary services such as pilotage, towage, and mooring) provided at Nigerian ports meet international standards	258	62	76	18	41	10	43	10	418	100
4	The current infrastructure for cargo handling and storage at Nigerian ports is sufficient to handle the volume of trade	237	57	69	16	58	14	54	13	418	100
5	There is effective coordination between different stakeholders (e.g., port authorities, shipping companies, and government agencies) to ensure efficient marine transportation in Nigeria	284	68	57	14	43	10	34	8	418	100

Objective 1 aimed to evaluate the current state of marine transportation infrastructure in Nigeria. The questions aimed to assess the existing marine transportation infrastructure in Nigeria in order to identify gaps and opportunities for improvement. This includes evaluating port facilities, shipping lanes, and support services to determine their adequacy in supporting the Blue Economy.
Based on objective 1, Table 8 shows the responses to question 1 which states that: The existing port facilities in Nigeria are adequate to support the current demands of marine transportation. The Table shows that 263 (63%) respondents strongly disagreed that the existing port facilities in Nigeria are adequate to support the current demands of marine transportation; 78 (19%) disagreed; 41 (10%) agreed while 36 (8%) strongly agreed. This implies that the existing port facilities in Nigeria are not adequate to support the current demands of marine transportation.

The Table also shows responses to question 2, which states that: The shipping lanes in Nigeria are well-maintained and efficiently managed. The Table shows that 276 (66%) respondents strongly disagreed that the shipping lanes in Nigeria are well-maintained and efficiently managed; 82 (20%) disagreed; 39 (9%) agreed, while 21 (5%) strongly agreed. This implies that the shipping lanes in Nigeria are not well-maintained and efficiently managed.

The Table shows responses to question 3, which states that: The support services (maritime auxiliary services such as pilotage, towage, and mooring) provided at Nigerian ports meet international standards. The Table shows that 258 (62%) respondents strongly disagreed that the support services (maritime auxiliary services such as pilotage, towage, and mooring) provided at Nigerian ports meet international standards; 76 (18%) disagreed; 41 (10%) agreed, while 43 (10%) strongly agreed. This implies that the support services (maritime auxiliary services such as pilotage, towage, and mooring) provided at Nigerian ports do not meet international standards.

The Table also shows responses to question 4, which states that: The current infrastructure for cargo handling and storage at Nigerian ports is sufficient to handle the volume of trade. The Table shows that 237 57%) respondents strongly disagreed that the current infrastructure for cargo handling and storage at Nigerian ports is sufficient to handle the volume of trade; 69 (16%) disagreed; 58 (14%) agreed, while 54 (13%) strongly agreed. This implies that the current infrastructure for cargo handling and storage at Nigerian ports is not sufficient to handle the volume of trade.

Furthermore, Table 8 also shows responses to question 5, which states that: There is effective coordination between different stakeholders (e.g. port authorities, shipping companies, and government agencies) to ensure efficient marine transportation in Nigeria. The Table shows that 284 (68%) respondents strongly disagreed that there is effective coordination between different stakeholders (e.g., port authorities, shipping companies, and government agencies) to ensure efficient marine transportation in Nigeria; 57 (14%) disagreed; 43 (10%) agreed, while 34 (8%) strongly agreed. This implies that there is ineffective coordination between different stakeholders (e.g., port authorities, shipping companies, and government agencies) to ensure efficient marine transportation in Nigeria.

Table 10: Objective 3: Examine the Role of Policy and Regulatory Frameworks governing marine transportation and logistics in Nigeria

S/N	Question Items	SD	%	D	%	A	%	SA	%	Total	%
1	The current maritime regulatory frameworks effectively ensure safety and security in Nigeria's marine transportation sector	65	16	34	8	76	18	243	58	418	100
2	The policies governing marine transportation in Nigeria promote fair competition and market access	78	19	41	10	81	19	218	52	418	100
3	Regulatory frameworks in Nigeria are aligned with international standards and best practices in marine logistics	46	11	39	9	94	23	239	57	418	100
4	The enforcement of marine transportation regulations in Nigeria is consistent and effective	276	66	56	13	48	12	38	9	418	100
5	Policy initiatives in Nigeria have successfully addressed environmental concerns related to marine transportation and logistics	43	10	29	7	65	16	281	67	418	100

Objective 3 aimed to examine the role of policy and regulatory frameworks governing marine transportation and logistics in Nigeria. The questions aimed to evaluate the effectiveness, fairness, alignment with international standards, enforcement, and environmental considerations of the policy and regulatory frameworks in Nigeria's marine transportation and logistics sector.

Based on objective 3, Table 10 shows the responses to question 1 which states that: The current maritime regulatory frameworks effectively ensure safety and security in Nigeria's marine transportation sector. The Table shows that 65 (16%) respondents strongly disagreed that the current maritime regulatory frameworks effectively ensure safety and security in Nigeria's marine transportation sector; 34 (8%) disagreed; 76 (18%) agreed while 243 (58%) strongly agreed. This implies that the current maritime regulatory frameworks effectively ensure safety and security in Nigeria's marine transportation sector.

The Table also shows responses to question 2, which states that: The policies governing marine transportation in Nigeria promote fair competition and market access. The Table shows that 78 (19%) respondents strongly disagreed that the policies governing marine transportation in Nigeria promote fair competition and market access; 41 (10%) disagreed; 81 (19%) agreed, while 218 (52%) strongly agreed. This implies that the policies governing marine transportation in Nigeria promote fair competition and market access.

The Table shows responses to question 3, which states that: Regulatory frameworks in Nigeria are aligned with international standards and best practices in marine logistics. The Table shows that 46 (11%) respondents strongly disagreed that regulatory frameworks in Nigeria are aligned with international standards and best practices in marine logistics; 39 (9%) disagreed; 94 (23%) agreed, while 239 (57%) strongly agreed. This implies that regulatory frameworks in Nigeria are aligned with international standards and best practices in marine logistics.

The Table also shows responses to question 4, which states that: The enforcement of marine transportation regulations in Nigeria is consistent and effective. The Table shows that 276 (66%) respondents strongly disagreed that the enforcement of marine transportation regulations in Nigeria is consistent and effective; 56 (13%) disagreed; 48 (12%) agreed, while 38 (9%) strongly agreed. This implies that the enforcement of marine transportation regulations in Nigeria is not consistent and effective.

Furthermore, Table 10 also shows responses to question 5, which states that: Policy initiatives in Nigeria have successfully addressed environmental concerns related to marine transportation and logistics. The Table shows that 43 (10%) respondents strongly disagreed that Policy initiatives in Nigeria have successfully addressed environmental concerns related to marine transportation and logistics; 29 (7%) disagreed; 65 (16%) agreed, while 281 (67%) strongly agreed. This implies that policy initiatives in Nigeria have successfully addressed environmental concerns related to marine transportation and logistics.

Table 11: Objective 4: Assess the Economic Impact of Marine Transportation on Coastal Communities

S/N	Question Items	SD	%	D	%	A	%	SA	%	Total	%
1	Marine transportation has created significant employment opportunities in coastal communities	263	63	38	9	35	8	82	20	418	100
2	The presence of marine transportation infrastructure has led to increased economic activities in coastal areas	259	62	47	11	51	12	61	15	418	100
3	Marine transportation has positively influenced the income levels of individuals in coastal communities	247	59	51	12	49	12	71	17	418	100
4	The development of marine transportation has attracted investments and businesses to coastal regions	253	61	48	11	37	9	80	19	418	100
5	Marine transportation has contributed to improved living standards in coastal communities	246	59	43	10	46	11	83	20	418	100

Objective 4 aimed to assess the economic impact of marine transportation on coastal communities. The questions were designed to explore the perceived economic benefits, such as employment, economic activity, income levels, investment attraction, and living standards, resulting from marine transportation in coastal communities.

Based on objective 4, Table 11 shows the responses to question 1 which states that: Marine transportation has created significant employment opportunities in coastal communities. The Table shows that 263 (63%) respondents strongly disagreed that marine transportation has created significant employment opportunities in coastal communities; 38 (9%) disagreed; 35 (8%) agreed while 82 (20%) strongly agreed. This implies that marine transportation has not created significant employment opportunities in coastal communities.

The Table also shows responses to question 2, which states that: The presence of marine transportation infrastructure has led to increased economic activities in coastal areas. The Table shows that 259 (62%) respondents strongly disagreed that the presence of marine transportation infrastructure has led to increased economic activities in coastal areas; 47 (11%) disagreed; 51 (12%) agreed, while 61 (15%) strongly agreed. This implies that the presence of marine transportation infrastructure has not led to increased economic activities in coastal areas.

The Table shows responses to question 3, which states that: Marine transportation has positively influenced the income levels of individuals in coastal communities. The Table shows that 247 (59%) respondents strongly disagreed that marine transportation has positively influenced the income levels of individuals in coastal communities; 51 (12%) disagreed; 49 (12%) agreed, while 71 (17%) strongly agreed. This implies that marine transportation has not positively influenced the income levels of individuals in coastal communities.

The Table also shows responses to question 4, which states that: The development of marine transportation has attracted investments and businesses to coastal regions. The Table shows that 253 (61%) respondents strongly disagreed that the development of marine transportation has attracted investments and businesses to coastal regions; 48 (11%) disagreed; 37 (9%) agreed, while 80 (19%) strongly agreed. This implies that the development of marine transportation has not attracted investments and businesses to coastal regions.

Furthermore, Table 11 also shows responses to question 5, which states that: Marine transportation has contributed to improved living standards in coastal communities. The Table shows that 43 (10%) respondents strongly disagreed that marine transportation has contributed to improved living standards in coastal communities; 29 (7%) disagreed; 65 (16%) agreed, while 281 (67%) strongly agreed. This implies that marine transportation has not contributed to improved living standards in coastal communities.

According to a cross section of the respondents interviewed, emerging technologies, such as automation, digitalization, and blockchain, can be integrated into Nigeria's maritime logistics systems to enhance efficiency, reduce costs, and improve service delivery. The respondents observed that digitalization of logistics processes in Nigeria has begun to reduce operational costs**,** but the overall impact is still limited and uneven across the sector**.** Cost savings are evident where digital tools are effectively used, but systemic challenges continue to blunt their full potential. They noted the following thematic areas in which digitalization have reduced costs:

1. *Customs and Cargo Clearance*: (a) Digital tools like NICIS II (Nigeria Integrated Customs Information System) and PAAR (Pre-Arrival Assessment Report) have reduced the need for physical paperwork and cut down on some clearing delays (b) Cost Impact**:** Lower administrative costs, reduced demurrage and storage fees for compliant traders.
2. *E-Booking and Freight Platforms*: (a**)** Online platforms for truck booking, freight matching, and cargo tracking (e.g., Kobo360, Lori Systems) have: (i) Reduced time wasted searching for haulage (ii) Enabled dynamic pricing and route optimization. (b) Cost Impact**:** Lowered fuel use, idle time, and inflated intermediary margins.
3. *Inventory and Warehouse Management*: (a) some large logistics providers have adopted warehouse management systems (WMS) and inventory tracking tools (b) Cost Impact**:** Reduced stock loss, better asset utilization**,** and minimized storage overheads**.**

Discussion of Results

On the existing port facilities in Nigeria, respondents were of the opinion that they were not adequate to support the current demands of marine transportation. They observed that the current infrastructure for cargo handling and storage at Nigerian ports was largely insufficient to efficiently handle the volume of trade the country experiences. These views agree with that of the Federal Ministry of Marine and Blue Economy (2021), who asserts that infrastructure deficits are the notable challenges bedeviling maritime transportation and maritime logistics in Nigeria, which could hinder the investment prospects and this needs policy action.

Respondents observed that the shipping lanes in Nigeria are not well-maintained and efficiently managed and consequently, the shipping lanes are facing several challenges, including: piracy and security risks, posing threats to shipping activities; infrastructure deficits such as inadequate port facilities and congestion (recurrent at key ports), which slow down trade and regulatory bottlenecks, resulting in lengthy customs procedures thereby hindering the smooth flow of goods (Vanguard Newspapers, 2022).

Respondents agreed that the current maritime regulatory frameworks effectively ensure safety and security in Nigeria's marine transportation sector. However, Vanguard Newspapers (2022) notes that corruption within regulatory bodies has undermined safety and security efforts. This has resulted in insufficient infrastructure such as navigational aids, communication systems, and emergency response facilities; all of which have combined to impact negatively on safety and security. This shows the gap between policy design and policy implementation/enforcement.

Respondents observed that digitalization of logistics processes have not reduced operational costs in the Nigerian logistics sector. However, Eto (2023) notes that digitalization of logistics processes in Nigeria has begun to reduce operational costs, even though the overall impact is still

limited and uneven across the sector. Cost savings are evident where digital tools are effectively used, but systemic challenges continue to blunt their full potential.

Conclusion

The existing maritime and logistics infrastructure in Nigeria is not fully sufficient for current trade volumes. While there are remarkable developments, especially with the opening of new ports and modernization efforts, considerable upgrades in logistics, equipment, digitalization, and intermodal transport are still required to satisfy the demands of Nigeria's growing Blue Economy. Continuous reform efforts, capacity building for regulatory agencies, and fostering transparent dialogue with industry stakeholders could pave the way for more effective enforcement of marine transportation regulations in Nigeria.

Additionally, while there are regulatory frameworks in place to ensure compliance with international standards, ongoing challenges and areas for improvement need to be addressed to guarantee the highest standards of support services at Nigerian ports. Overall, while Nigeria's policies governing marine transportation aim to promote local participation and develop the sector, their impact on fair competition and market access can be complex. Therefore, addressing issues related to regulatory barriers, corruption, and infrastructure could enhance competition and ensure equitable market access for all stakeholders in the marine transportation sector. Continuous review and adaptation of these policies in consultation with industry stakeholders could lead to a more balanced and competitive maritime environment.

Consequently, the study recommends that government should improve maritime and logistics infrastructure, integrate all actors (Customs, shipping lines, ports, haulers) into a single logistics ecosystem, enforce anti-corruption policies in cargo handling and clearance procedures and expand access to mobile and cloud-based logistics solutions for last-mile operators in Nigeria.

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