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Operational Challenges of Inland Waterways Transportation in the Coastal Communities of Niger Delta, Nigeria

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Abstract: The study examined the operational challenges of inland waterways transportation in the coastal communities of the Niger Delta. The study adopted a cross – sectional research design.Four hundred copies of questionnaire were administered on the boat users of inland waterways and oral interviews for ninety boat operators using a simple random sampling technique in the 38 selected jetties. Descriptive tools such as percentage and frequency distribution, factor analysis and multiple regression analysis were used for data analysis.The factor analysis showed inadequate safety jacket, inadequate government control, substandard boat terminal and presence of water hyacinth are the major challenges along the waterways transportation in the study area; which accounted for 56.7%, 10.7%, 9.7% and 5.7%) of the variance respectively. There is a significant relationship between volume of passenger traffic and some operational challenges (R=0.839; R^2 = 0.703). The study concluded that amidst these huge operational challenges experienced by operators and boat users, this sub-mode of water transportation is still experiencing significant passenger patronage. The study recommended thatgovernment and private boat operators should provide adequate covered speed boats and safety jackets for all users, boat repair yard, intermittent dredging of water channels, wrecks and water hyacinth removal, stabilization of transport fare, zero alcohol/drugs intake and speed limiter devices.

Keywords: Operational Challenges, Inland Waterways, Transportation

1. Introduction

Transport plays a significant role in territories as well as in promoting regional cooperation through the flow and exchange of people, goods and services. Sustainable transport development is channelled in the developmental process for the economy and society to grow healthy, this is because transport influence and it's been influenced by other sectors of the society (Atubi, 2013). The necessity of transportation infrastructure to the functioning of a modern economy is evident; London cannot be imagined without the underground, or business activity without a road network, Improvement in transport infrastructure and services bring benefits to users, the existing and new.

In Nigeria, Nigerian Inland Waterway Authority [NIWA] (2018), noted that despite its great potential and opportunities to provide economic development, the national waterway resource is grossly underutilized and underdeveloped. In order to stimulate efficient, prudent and profitable utilization of the Nigeria inland waterway transport system, the Federal government was poised to transforming inland waterways infrastructure facilities towards a modern competitive multi-modal inland water transport system with best practices and services consist with current global standard. Despite the wholesome idea, the Nigerian Inland Waterway Authority has maintained that the inland waterways huge infrastructures deficit has thrown up opportunities for investments in virtually all physical infrastructures.

Some aspect of infrastructural intervention to include dredging to remove silt and other impediments, river ports and jetties, installations and maintenance of navigational aids such as dam, dyke and groin to ensure the achievement of highest level of efficiency and seamless operation. Others include; river banks protection, maintenance of dredged channels and improvement of jetty/port linked flow in landward connection to the ports. The adequacy of inland waterways infrastructure and the general transportation system helps determine Nigeria's success and failure diversifying its production, expanding both domestic and foreign trade, with it growing population, reducing poverty and improving in economic growth (NIWA, 2018).

Poor transport infrastructure as it is experienced in Nigeria over the years encourages unemployment and high level of poverty. The 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 by virtue of living in water surrounded environment (Adegbenle, 2016).

In recent times, emphasis has been placed on urban roads transport, with less regard to rural transportation development, especially river transport for instance modern jetties do not exist with empirical evidences to show at the time of this study, which is essential for the movement of the majority of mobility activities not just for the rural population. Bayode & Ipingbemi (2016) observed that water is one of natural

resources which Nigeria have in abundance and that the country have the opportunity to service most landlocked countries in West Africa such as Chad, Mali, Niger, and Burkina Faso.

Untapped economic benefit abound in Nigeria's inland waterways system. The vitality is waiting to be converted into highly rewarding and profit oriented venture. Vast and extensive is the entire waterways which is said to be one of the longest in the world by the sheer size of its length (Badejo, 2010). The benefits, potentialities and inherent attributes of the inland waterways are not only vast but indicate limitless and endless opportunities are yet to be fully harnessed for sustainable development.

Amidst these huge benefits arising from the under developed Inland waterways across Nigeria with it vast body covering the coastal communities of entire Niger Delta states, this sub sector of maritime transport has been neglected by successive governments in Nigeria. And faced with huge operational challenges such as; blocked transport routes, shallow access channels, no functional/standard boat yards, unsafe speed boats, unsafe/dilapidated jetties, seasonal water level, presence of sand bars, other problem to include no hard and soft technological application, problem of integration with various modes, and capital investment difficulty. The major and concerned problem faced by the Inland waterways transportation sector of the Niger Delta region deals with its infrastructural state and lack of trained experts to manage the sector operations. The main objective of this paper is to determine the operational challenges of inland waterways transportation in the coastal communities of the Niger Delta

2. Methodology

The Niger Delta region is located within the tropical rainforest climate zone lies between latitudes 4.15°N - 7.17°N and longitudes 5.05°E - 8.68°E, (Federal Republic of Nigeria (FRN), 2007). According to the FRN the region is situated in the southern part of Nigeria and bordered to the south by the Atlantic Ocean and to the East by Cameroon, occupies a surface area of about 112,110 square kilometres. Research design is the specification of procedures for collecting and analysing the data necessary to help solve the problem at hand. The study adopted a cross – sectionalresearch design.The primary data and secondary data sources were utilised. The importance of primary data in empirical research cannot be overstated. Therefore, the tools used for primary data collection in this study included a reconnaissance survey to determine the total number of operational jetties and their characteristics across the Niger Delta, oral interviews were held with 90 operators, security operatives such as the Joint Task Force, and NAVAL Officers, boat drivers, passengers and National Inland Waterways Authority officials (Interviews were recorded and extracts presented in related themes). 400 questionnaire were administered to the boat users of inland waterways transport. While the secondary data for this study was obtained from relevant literature, research reports published in academics Journals, Statistical reports, Governments documents and the internet (Websites). Data collection method was achieved by approaching the operators of the jetties, we inform them about the research and seek their permission to speak to passengers and administer questionnaire to them. The users' questionnaire was administered 30 minutes to departure time when the passengers were in the boat/terminal. The passengers were briefed on the nature and purpose of the survey. Other information collected were designed for the operators of the jetties to include; details of the jetties/waterside, operational characteristics and challenges they experienced, etc; while the users' questionnaire (i.e., for the passengers) was classified into one sections, to examine the challenges of inland waterways transportation in the coastal communities of Niger Delta, Nigeria. The researcher employed descriptive tools such as percentage and frequency distribution, and factor analysis (principal component analysis) to analyse data generated from the field.

The Population used in this study comprises of 90 boat operators and 822,795 (passengers) users of inland waterways transportation across the Niger Delta (Author's field work, 2018). The selected jetties were done based on their economic viability of the jetties measured by volume of passengers' traffic generated, the population was further reduced to a manageable size using the Taro Yamane's formula. The simple random sampling technique was applied during the study survey.

Taro Yamane (1967) provides a simplified formula to determine the sample size.

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

Where: n = the sample size

N = the total population

e = the error of sampling/accepted error limits (0.05)

1 = the constant figure/level of precision

The Taro Yamane formula is applied to the above population to determine the sample size:

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

$$n = \frac{822795}{1 + 822795\,(0.05)^2}$$

$$n = 399.8$$

Approximately 400.

The study instrument was adequately distributed to each jetty using a proportionate method of allocation derived by the author's from Bowley's (1926) &Oyegun (2003).

Formula: $n = \frac{Np \times n}{N}$

Where Np = number of passengers of each jetty
n = sample size of the study
N = total passengers population carried by all jetties.

3. Results and Discussions

The factor analysis (principal component analysis) carried out on the identified operational challenges as shown in table 1 shows output from the analysis as "descriptive statistics" for all the variables under investigation. It showed the mean, standard deviation and number of respondents (N) who participated in the survey. Looking at the mean from the table it could be seen that the variable with the highest mean was inadequate government control (3.66).

From table 2 which is the 'rotated component matrix' was used to identify the major operating challenge amongst others. Factors ≥ 0.50 were considered in the rotated component matrix table which forms the basis of the analysis. Loadings in the first component (1) with high correlations are considered very significant. Hence, inadequate safety jacket, inadequate government control, substandard boat terminal, Presence of water hyacinth, Instability of fare, Frequent boat breakdown, rickety boats, illegal bunkering, inadequate marine security, blocked terminals, over speeding, shallow access channel and driving under the influence of alcohol.

Table 3 showed the total variance explained. The first column (Eigen value) reflects the number of extracted factors which was subjected to factor analysis as eigen values greater than one (1) were considered reliable. It is seen that the first four components had eigen values greater than one (14.175, 2.683, 2.413 and 1.421) which are for Inadequate safety jacket, Inadequate government control, Substandard boat terminal and Presence of water hyacinth respectively, accounted for (56.7%, 10.7%, 9.7% and 5.68%) of the variance respectively (see column 6). All the remaining factors are not significant.

A brief description of variables indicated as the operational challenges of inland waterways transportation in the Niger Delta as generated from the study questionnaire show that 99.8% of sampled respondents indicated that the Government lack total control in the operation of inland waterways transport. This sub-mode of water transportation highly suffers from inadequate safety jacket usage (97.3%), substandard boat terminal (97.3%), shallow access channels (96.3%), instability of fare (95.3%), inadequate marine security (91.3%), presence of water hyacinth (89%), Extortion of passengers by security operative on luggage's/goods (87%), illegal bunkering (76.3%), frequent boat breakdown (76.3%), rickety boats (75.3%), effects of extreme weather (67%), over speeding (66.5%), luggage at owners risk (62.8%), driving under influence (62.3%), Night time robbery attacks at jetty (58%), reckless/ untrained boat drivers, (51.3%), blocked channels (50.3%), armed robbery attack along routes (49.5%), kidnapping (41.5%), overloading of boat (36.3%), blocked channel/routes (33.5%), loss of luggage (25%), inadequate speed boat (25%), and presence of security operatives (25%).

Table 1. Principal Component Analysis of Operational Challenges of Inland Waterways Transportation

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
Inadequate safety jacket	2.89	.999	400
Presence of water hyacinth	2.63	.863	400
Shallow access channels	3.45	.688	400
Extortion of passengers by security operative on luggage's/goods	3.25	.555	400
Illegal bunkering	2.97	.864	400
Kidnapping	1.63	.547	400

Blocked channels/routes	1.67	.473	400
Blocked terminals	1.50	.501	400
Inadequate speed boat	1.81	.506	400
Rickety boats	2.80	.917	400
Overloading of boat	1.69	.547	400
Driving under the influence of hard drugs and alcohol	1.38	.485	400
Reckless/untrained boat drivers	1.49	.500	400
Substandard boat terminal	3.13	.934	400
Armed robbery attack along coastal routes	1.63	.674	400
Frequent boat breakdown	1.24	.426	400
Inadequate marine security	1.09	.283	400
Over speeding	1.34	.473	400
Luggage at owners risk	1.37	.484	400
Instability of fare	3.56	.850	400
Presence of security operatives	3.36	.669	400
Extreme weather	3.22	.875	400
Loss of luggage	2.65	1.072	400
Night time robbery attacks at jetty	2.39	1.264	400
Inadequate government control	3.66	.728	400

Table 2.Principal Component Analysis of Operational Challenges of Inland Waterways Transportation

Rotated Component Matrix[a]

	Component			
	1	2	3	4
Inadequate safety jacket	.886			
Inadequate government control	.881			
Substandard boat terminal	.870			
Presence of water hyacinth	.864			
Instability of fare	.846			
Frequent boat breakdown	.812			
Rickety boats	.764			
Reckless/untrained boat drivers		.526		
Illegal bunkering	.702		.555	
Inadequate marine security	.699		.539	
Blocked terminals	.694	.542		
Over speeding	.585	.504	.569	
Kidnapping		.804		
Loss of luggage		.795		
Armed robbery attack along coastal routes		.785		
Overloading of boat		.783		
Inadequate speed boat		.731		
Night time robbery attacks at jetty		.611		
Extortion of passengers by security operative on luggage's/goods			.925	
Luggage at owners risk			.911	

Shallow access channels	.569		.684	
Blocked channels/routes		.589	.655	
Extreme weather				.722
Driving under the influence of hard drugs and alcohol	.508			-.623
Presence of security operatives				.583

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

Table 3.Principal Component Analysis of Operational Challenges of Inland Waterways Transportation

	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	14.175	56.700	56.700	14.175	56.700	56.700	8.813	35.251	35.251
2	2.683	10.733	67.433	2.683	10.733	67.433	5.446	21.785	57.036
3	2.413	9.651	77.084	2.413	9.651	77.084	4.758	19.033	76.069
4	1.421	5.683	82.767	1.421	5.683	82.767	1.674	6.698	82.767
5	.921	3.683	86.450						
6	.579	2.315	88.765						
7	.518	2.072	90.838						
8	.458	1.834	92.672						
9	.320	1.281	93.953						
10	.288	1.154	95.106						
11	.228	.911	96.017						
12	.219	.874	96.891						
13	.159	.637	97.528						
14	.142	.569	98.098						
15	.105	.419	98.516						
16	.082	.329	98.845						
17	.075	.300	99.145						
18	.058	.234	99.379						
19	.041	.165	99.544						
20	.036	.143	99.687						
21	.030	.122	99.809						
22	.018	.074	99.882						
23	.014	.055	99.938						
24	.010	.039	99.977						
25	.006	.023	100.000						

Extraction Method: Principal Component Analysis.

Table 3 of the multiple regression analysis on the tested hypothesis which states that the operational performance of inland waterways transportation in the Niger Delta region is not influenced by its operational challenges measured by insecurity, water hyacinth infestation, shallow access channels, non-compliance to safety measures, piracy and kidnapping, no functional/standard boat yards, unsafe dilapidated jetties and presence of wrecks.

Table 4 of the model summary revealed that a significant relationship between volume of passenger traffic and some operational challenges with a correlation coefficient of R = (0.839) and R^2 of 0.703 which suggeststhat operational challenges can explain 70.3% of the variation in the volume of passengers' traffic. The

Coefficient table revealed the parameter estimates that were used to form the regression model as (α = 134.782, β_1= 0.523, β_2= -0.173, β_3= -0.109) and the regression model in Equ.1 says:

Volume of passenger traffic = 134.782 +0.523(non-compliance to safety measures) -0.173 (Kidnapping) -0.109(Piracy) (p=0.05) …… Equ.1

The regression model in Equ. 1 reveal that an increase in compliance to safety measures will result to a corresponding increase in volume of passenger traffic whereas an increase in kidnapping and piracy will result to a decrease in the volume of passenger traffic.

Table 4. Multiple Regression Analysis

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	134.782	17.569		7.672	.000
non-compliance to safety measures	54.246	6.631	.523	8.180	.000
Kidnapping	-18.074	6.661	-.173	-2.714	.007
Piracy	-11.138	4.645	-.109	-2.398	.017

a. Dependent Variable: Passenger Traffic

Table 5. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.839[c]	.703	.681	104.657

Predictors: (Constant), non-compliance to safety measures, Kidnapping, Piracy

4. Conclusion

It is vital to understand that amidst these huge operational challenges experienced by operators and boat users, this sub-mode of water transportation is still having some great number of passenger patronage across the Niger Delta. This is so because of the lack of alternative mode of transportation (road, rail affordable air transport) to distinct locations across the coastal waters of Niger Delta communities. Based on the study findings, the study therefore suggests that the government and private boat operators should provide adequate covered speed boats and safety jackets for all users, cold storage building, first aid kits, handling equipment, luggage racks, transit sheds, warehouse and boat repair yard. Also, intermittent dredging of water channels, removal of wrecks and water hyacinth by relevant government agencies (NIWA, NIMASA and Ministry of Transport).Finally there should be adequate government control of the operations of jetty terminals and passenger boats to foster the following; stabilize transport fare, zero alcohol/drugs intake by boat drivers and speed limit among other issues identified in the study.

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