E-ISSN: 2676-6167 | P-ISSN: 2538-5100

Journal of Applied Research on Industrial Engineering

www.journal-aprie.com

J. Appl. Res. Ind. Eng. Vol. 10, No. 2 (2023) 196–202.

Paper Type: Research Paper

Assessment of Passenger's Safety Implementation in Water Transportation (a Case Study of Kurutie, Okerenkoko and Escravos Waterways)

Silas Oseme Okuma[1,*], Akpofure Awerosuoghene Enughwure[2]

[1] Department of Mechanical Engineering, Faculty of Engineering, Nigeria Maritime University, Okerenkoko, Nigeria; silasoseme@gmail.com.

[2] Department of Electrical Engineering, Faculty of Engineering, Nigeria Maritime University, Okerenkoko, Nigeria; akpofureenughwure@gmail.com.

Citation:

Okuma, S. O., & Enughwure, A. A. (2023). Assessment of passenger's safety implementation in water transportation (a case study of Kurutie, Okerenkoko and Escravos waterways). *Journal of applied research on industrial engineering, 10*(2), 196-202.

Received: 18/01/2022 Reviewed: 20/02/2022 Revised: 11/04/2022 Accept: 15/05/2022

Abstract

The purpose of this research is to investigate the safety of inland waterway transportation in Kurutie, Okerenkoko, and Escravos River, Nigeria. The study used a cross-sectional research design, and the study's target group includes passengers who are technical experts, maritime workers, non-academic, academic personnels and students of Nigeria Maritime University, and self-employed passengers who live in the study locations. Questionnaires and field observations were used to obtain data. 378 questionnaires were delivered throughout the study area. According to the study, most cases of maritime boat mishaps beleaguered the inland waterway in the study area due to unskilled boat drivers, overloading/overcrowding of boats, and a lack of enforcement of safety laws by government agencies within the study area. The study recommended that relevant authorities, such as the Nigeria Inland Waterways Authority, enforce safety regulations among jetty operators and boat drivers; that training and certifying boat drivers are enforced; and that government involvement be increased by developing a sensitization program to educate passengers on the importance of adhering to safety practices along the waterways.

Keywords: Safety, Passengers, Implementation, Visualization, Maritime, Boat mishap.

1 | Introduction

Inland waterways have a distinctive role in Nigeria's transportation system, accounting for over 8,600 kilometres and a vast coastland of approximately 852 kilometres, and boasting the second-longest waterways in Africa [1]. According to Ibeawuchi [2], the three major components of water transportation that can be considered in Nigeria are the ocean, coastal water, and inland water transports; Badagry to Warri coastal waterways. The safety of maritime transportation is an establishment based on measures deemed capable of protecting human life, materials, and non-material property associated with marine transport, either directly or indirectly.

Safety at coastal waterways is a fundamental component that can be divided into the following categories: institutions bringing legal regulations, those in charge of implementing and overseeing

Corresponding Author: silasoseme@gmail.com

https://doi.org/10.22105/jarie.2022.325274.1440

safety measures and standards, legal instruments related to coastal waterway safety and international maritime conventions, and coastal water users [3].

Passenger boat accidents are prevalent in coastal and interior transportation, particularly when necessary maritime safety laws are not strictly observed and monitored. Commercial passenger boats, on the other hand, are regarded as one of the most successful modes of transportation functioning today, with commercial demand demonstrating its stakeholders and consumers' reliance on it in terms of economical movement of goods and passengers from one destination to another. According to National Inland Waterways Authority (NIWA) [4], the Nigerian waterways system is connected to approximately 880 kilometres of Intracoastal waterways from Lagos via Warri, Port Harcourt, and Calabar. According to the NIWA, there is roughly 3000 km of undeveloped although developable and navigable inland waterways.

Water safety refers to the state of knowing that no detrimental effects will be caused by some agents under specific conditions. Many passengers believe that the government does not take safety concerns seriously. Some waterway travelers have accused the government and stakeholders of failing to take the essential safety precautions to save lives while on the water [5]. In Lagos' waterways, overcrowding of boats, jetties, canoes, and ferries has been identified as a major issue [6]. Passengers, on the other hand, are often unaware of or unconcerned about safety precautions, and opt not to wear life jackets during travels.

According to the water transportation regulating agency in Nigeria, 22 of the 36 states use water as a mode of transportation, and over 296 Nigerians died as a result of boat disasters in 2013 [7]. Despite the potential of the country's inland waterways, Nigeria has a lengthy history of neglect by both the government and the private sector [8]-[13]. Inland water transport systems have received little attention. This is partly due to policy inconsistency, minimal private sector involvement, and disagreements among authorities involved inland water transport management in Nigeria [14].

Other studies on water transportation have been conducted [15]-[19], evaluated the death rates of boat and ferry accidents in Nigeria's inland waterways, with a particular focus on the Port Harcourt waterways. According to [17], the introduction of motorized transportation has expanded our mobility and enriched our lives by widening our perspectives; but, it has also raised the cost of transportation in terms of human lives and suffering caused by accidents. Ill-equipped marine police, nonfunctional boats, and wrecks are all factors responsible for boat mishap [20]. Several studies have also been conducted on the potential and problems of water-based transport, as well as its origin and management of water [19]-[21], [26], [27] discovered in their respective investigations, most jetties in Nigeria and indeed Africa are poorly constructed.

The data from Nigeria Watch revealed that 1,607 lives were lost in 180 boat accidents between June 2006 and May 2015, according to Nwankwo and Ukoji [1]. According to these figures, water transportation has come to play a pivotal place in the nation's economy, especially given the complexities of road transportation.

Mishaps involving boats are more common than ever in Nigeria, owing to the growing use of water transportation, although water transport is one of the safest modes of transportation when compared to road transport, the safety and utilization of commercial passenger boats in developing countries still need to be improved. Passenger boat safety is an issue in most poor countries, and Nigeria is no exception, as seen by the frequency of recent commercial boat disasters. Passenger safety is a vital component, this article aims to investigate passenger safety in inland waterways in Kurutie, Okerenkoko and Escravos, as well as the best strategies to improve safety implementation in these coastal waterways' transportation.

2 | Materials and Methods

2.1 | Study Area

The study was limited to the coastal islands of Kurutie, Okerenkoko, and Escravos because these communities rely solely on marine transportation as the only means of movement of goods and services from one community to another. Nigeria is a coastline nation with a coastline of 853 km and a land mass of about 923,768 sq.km, the coastline lies on the Gulf of Guinea is bordered on the south by the Republic of Benin, and on the north by the Republic of Niger. Nigeria is geographically located between longitudes 30 E and 150 E and latitudes 40 N and 140 N [14].

2.2 | Study Design

The cross-sectional research design was chosen in the study because it allows the investigator to measure both the result and the exposures in the study participants at the same time. To accomplish this goal, the researcher used structured questionnaires that were distributed to passengers, boat operators, and government authorities in the study area.

This is to ascertain their opinion and awareness of the risks involved in inland water transportation, as well as how these risks might be managed to the greatest extent possible.

2.3 | Sample and Sampling Technique

The operators, passengers, and government regulators in the research areas are the targeted population for the study; this population is direct target who commonly use the services of these coastal waterways'transportation [28], [29]. The survey is aimed at 12,000 respondents, including inland waterway operators, passengers, and government regulators in the Warri South Local Government Area of Delta State. As a result, Taro Yamane's formula was used to compute the study's sample size. The formula is as follows:

$$n = \frac{N}{1 + Ne^2} \text{ ---------- } 2.3,$$

where n = Sample Size, N = Study Population, e = Margin error (5%).

Therefore

$$n = \frac{12000}{1 + 12000\,(0.05^2)},$$

$$n = 387.$$

2.4 | Statistical Analysis

To examine the results of these subjective judgments for quantitative data analysis, statistical techniques were employed as input data, and suitable tests were run. The outcomes of this investigation are analyzed using descriptive analysis. The statistical findings were provided in table form with detailed descriptions and assessed in conjunction with qualitative data.

3 | Result and Discussion

After collecting and reviewing the data for null and/or missing values, various visualizations were built to depict the demographic parameters of the respondents, as shown in *Fig. 1*. This survey has 387 participants. Only 28.94% of the respondents were female. The majority of survey participants are between the ages of 20 and 29, accounting for 39% of the total. This statistic has a good correlation

with our findings in the occupation category, where 100 of the survey contributors were students, resulting in a 25.84% correlation. Only 16.28% of respondents have primary education as their highest level of education, implying that the majority of respondents comprehended the survey questionnaires.

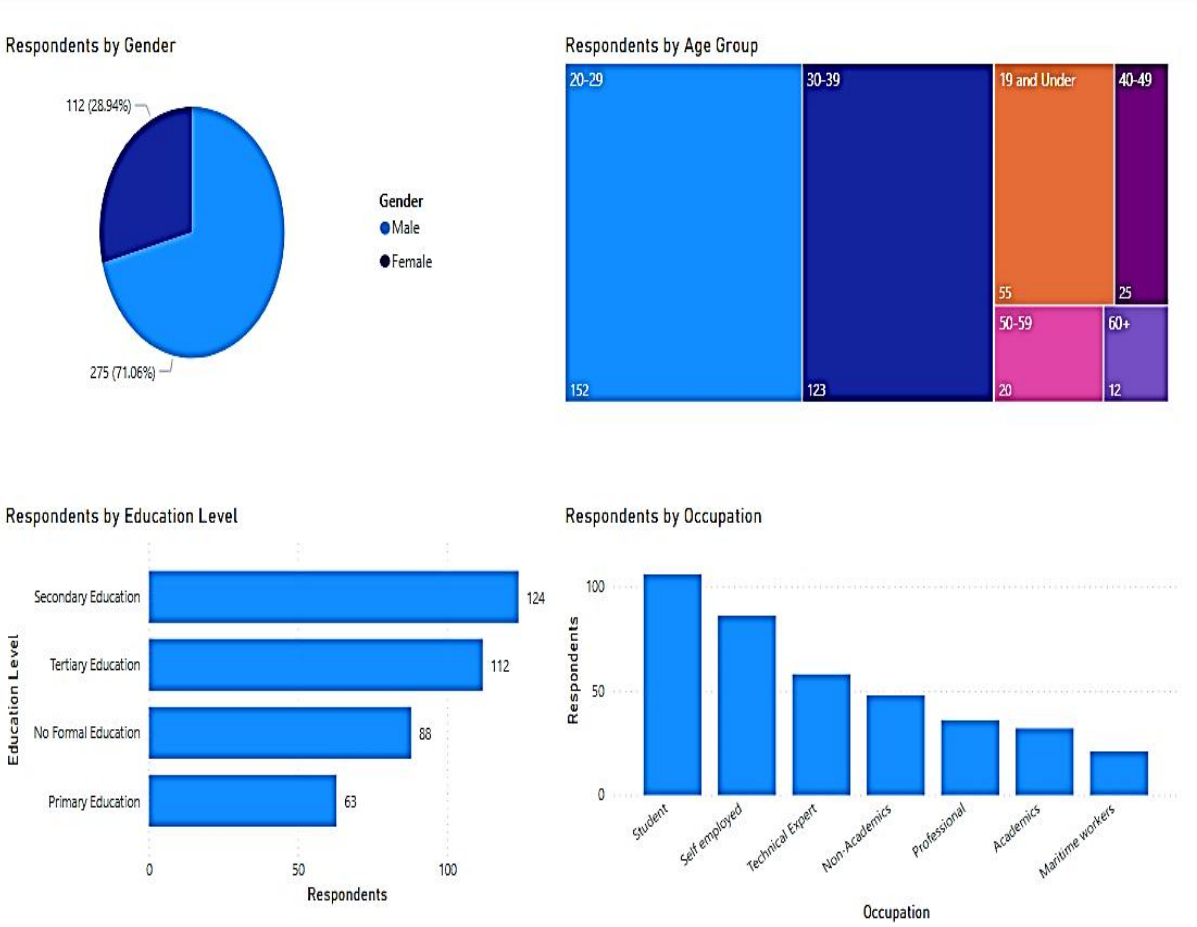

Fig. 1. Demographic visualization on respondent data.

What are the factors responsible for boat mishap in Kurutie, Okerenkoko and Escravos waterways?

The survey responds to the question "what variables are responsible for boat mishaps in the Kurutie, Okerenkoko and Escavos waterways?" *Table 2* clearly shows that 64.1% of participants disagree that boat incidents in the research area are caused by poor boat maintenance.

This assessment has a strong correlation with the faulty engine malfunction question where only 20.67% of the survey contributors suggest that it is the main reason for boat mishap. 32.56% believe boat grounding due to unfamiliarity with the waterway routes is responsible for boat mishaps. This suggests most of the boat drivers are quite familiar with the waterway routes in the study area. 58.40% pointed at the boat driver inexperience as a factor of the boat mishaps in these locations in recent times. 54.5% perceive that the lack of enforcement of safety regulation by government agencies has led to boat mishaps in this study area. This factor most likely played a role in the overloading/overcrowding of boats by jetty operators where three-quarters of the survey partakers suggested it is the reason for boat mishaps. 41% strongly agree that overloading is the main cause of boat mishaps. The findings in these questionnaires reaffirm the earlier study of [30].

Table 2. Respondent data on the causes of boat mishap.

S/N	Causes of Boat Mishap	SD	D	N	A	SA	% in Agreement
1	Poor maintenance of the boat	103	89	56	54	85	35.9
2	Faulty engine malfunction	167	96	44	34	46	20.67
3	Weather condition/high tide	68	74	66	93	86	46.25
4	Lack of enforcement of safety regulation by government agencies against defaulter	55	63	58	103	108	54.5
5	Boat grounding as a result of unfamiliarity with waterway routes	121	98	42	41	85	32.56
6	Inexperience on the part of the boat driver	45	61	55	121	105	58.4
7	Over loading/overcrowding of boat by jetty operators	55	45	21	132	159	79.19

To what extent will be enforcement of life vest/Safety gadgets on boat improve safety.

Table 3 shows the impacts of the enforcement of safety vests as a way to reduce boat accidents in the study area. 54.5% of the survey respondent suggested that the lack of enforcement of safety regulation by government agencies played a role in the boat mishap in this study area. There was a need to access the respondents' views on enforcing the use of safety gadgets in a bid to reduce boat accidents in the interesting waterways. 71.83% perceive that the use of a safety vest can reduce fatality in case of water accidents. 38% stood strongly on this call: the use of safety vests by passengers as they ply these routes. 24.81% feels the enforcement of the use of a safety vest will boost their confidence level when boarding a boat while 24.55% believes it will also improve the quality of service provided by the transporters.

Table 3. Respondent data on the enforcement of safety gadgets as a way to reducing boat accidents.

S/N	Enforcement Safety Vest	SD	D	N	A	SA	% in Agreement
1	It will reduce fatality in case of water accidents.	58	46	62	131	147	71.83
2	It boosts the confidence level of passengers when boarding a boat.	117	98	76	34	62	24.81
3	It will improve on the quality service provided by the transport provider.	65	73	154	60	35	24.55

Table 4. Respondent data on the measures that can implement passengers' safety.

S/N	Enforcement Safety Vest	SD	D	N	A	SA	% in Agreement
1	Creation of awareness program on safety in water transportation by related agencies	67	56	83	98	83	46.77
2	Training and certification of boat operators and drivers	52	73	55	96	111	53.49
3	Strict measures should be taken by government agencies on jetty management/boat operators	66	45	61	147	109	66.15

What are the measures that can be taken to implement safety of passengers?

Table 4 above outlines the potential measures that could be used to ensure the safety of passengers. Only 46.77% of respondents believe that safety awareness programs run by associated agencies can help with the safety call. Training and certifying boat operators and drivers, according to 53.49%, will increase passenger safety on these waterways. Respondents made a strong request to governmental agencies to guarantee that they oversee the operations of jetty managers and boat operators. This was reflected in their responses, which revealed that 66.15% of them agreed. These findings have a good correlation with the result in previous study [12].

4 | Conclusion

According to the study, it is worth noting that the attributing factors that lead to the increase in boat accidents in the study areas include poor maintenance of the boat, faulty engine malfunction, high tide/unfriendly weather condition, drivers' unfamiliarity with waterway routes, drivers' lack of experience, overloading and overcrowding and lack of enforcement of safety regulations by government agencies. These findings support [31] work that states that these factors have a high correlation with boat accidents in Lagos waterways. One key finding in this study shows that overcrowding and overloading of boats in the study area is the main reason for boat mishaps and passengers' perceive the following measures will minimize the occurrence of water accidents to a great extent: the use of safety gadgets like safety vest, adequately loading of the boats, training and certification of the boat drivers to ensure they know the basics maritime transportation law and practices, government involvement by creating sensitization program to educate passengers on the need to adhere to safety practices as well as monitor and control the boat operators' quality of service at the jetty and on the waterways. We recommend government stamp their authority on the jetty and boat management systems, provide an awareness program for passengers in a bid to sensitize them on their compliance to safety measures as well as training courses for boat operators.

References

[1] Nwankwo, U. V., & Ukoji, U. V. (2015). Boat accidents in Nigeria: general trends and risk factors. *Journal of advanced research in humanities and social science, 2*, 1-9. http://www.nigeriawatch.org/media/html/Ukoji2015.pdf

[2] Nze, I. C. (2013). Analysis of the fatality rates of boat and ferry accident on inland waterways in Nigeria. *IOSR journal of business and management (IOSR-JBM), 11*(2), 17-20.

[3] Galić, S., Lušić, Z., & Skoko, I. (2014). The role and importance of safety in maritime transportation. *6th international maritime science conference* (pp. 186-200), Solin, Croatia. Faculty of Maritime Studies Split. https://www.bib.irb.hr/721047/download/721047.IMSC2014_proceedings.pdf#page=194

[4] NIWA. (2004). *Waterways are very important to the Economy of Nigeria*. https://niwa.gov.ng/nigerian-waterways/

[5] Adeniyi, K. (2017). *Lagos waterways passengers decry safety measures*. https://www.premiumtimesng.com/regional/ssouth-west/248679-%E2%80%8Elagos-waterways-passengers-decry-safety-measures.html?tztc=1

[6] Tosin, J. (2014). *Causes and prevention of boat mishap*. https://pmnewsnigeria.com/2014/05/26/causes-and-prevention-of-boat-mishap/

[7] Azenda, V. (2014). *NIWA: Nigeria lost 296 lives to boat mishaps in 2013 on this Day*. https://allafrica.com/stories/201411170948.html

[8] Agbota, S. (2023). *How substandard boats, night voyages kill people on waterways*. https://sunnewsonline.com/how-substandard-boats-night-voyages-kill-people-on-waterways/

[9] Iheamnachor, D. (2014). *We lose engines, 10 colleagues to pirates monthly-rivers boat operators*. https://www.vanguardngr.com/2014/12/lose-engines-10-colleagues-pirates-monthly-rivers-boat-operators/#sthash.GqU46Lks.dpuf

[10] National Bureau of Statistics (NBS). (2014). *Sector Statistics*. https://www.nigerianstat.gov.ng/

[11] Oyadongha, S. (2014). *Piracy activities heighten in Niger Delta*. https://integritynigeria.org/piracy-activities-heighten-niger-delta/

[12] Tosin, J. (2014). *Causes and prevention of boat mishap*. https://pmnewsnigeria.com/2014/05/26/causes-and-prevention-of-boat-mishap/

[13] Asikia, C. I. I., Phd, N. E., Nwabueze, E., Nwoloziri, C. N., & Mattias, U. (2022). Healthcare Maintenance and Safety Policy: Evidence from Port Harcourt Seaport. *International journal of geography & environmental management (IJGEM), 8*(2), 64-88.

[14] Lagos, E. A. (2019). *Commercial boat operators in delta state defile safety directives on use of like jacketrs*. https://dailytrust.com/commercial-boat-operators-in-delta-state-defile-safety-directives-on-use-of-life-jackets

[15] Anderson, E. E., & Talley, W. K. (1995). The oil spill size of tanker and barge accidents: determinants and policy implications. *Land economics*, *71*(2), 216-228. https://doi.org/10.2307/3146502

[16] Litman, T. (2001). What's it worth: economic evaluation for transportation decision-making. *TAC symposium on benefit-cost analysis* (pp. 1-23). https://www.vtpi.org/worth.pdf

[17] Nze, I. C. (2013). Analysis of the fatality rates of boat and ferry accident on Inland Waterways in Nigeria. *IOSR journal of business and management (IOSR-JBM)*, *11*(2), 17-20.

[18] Nowakowski, T., Kulczyk, J., Skupień, E., Tubis, A., & Werbińska-Wojciechowska, S. (2015). Inland water transport development possibilities–case study of lower Vistula River. *Archives of transport*, *35*(3), 53-62.

[19] Theophilus C, N., Chukwuebuka Godfrey, O. O., Justice C, M., Lawrence Addah, G., Nwokodi Nwoloziri, Ch., & Arinze Francis, O. (2022). Funding alternatives for speed boat operations in Inland waterways transport sub-sector in rivers state Nigeria: a comparative study. *Himalayan journal of economics and business management*, *3*(2), 116-122.

[20] Bayode, T., & Ipingbemi, O. (2016). Safety and operational characteristics of water based transportation in Lagos state. *SCIREA journal of traffic and transportation engineering*, *1*(1), 13-31.

[21] Atoyebi, O. M. (2022). *A comprehensive analysis of the challenges and prospects in the Nigerian maritime/shipping industry Viz-A-Viz its implications for foreign investment*. https://omaplex.com.ng/the-nigerian-maritime-shipping-industry-its-challenges-and-prospects-and-implications-for-foreign-investment/

[22] Jones, J. A. A. (2014). *Global hydrology: processes, resources and environmental management*. Routledge.

[23] Ford, R. E. (1990). The dynamics of human-environment interactions in the tropical montane agrosystems of Rwanda: implications for economic development and environmental stability. *Mountain research and development*, *10*(1), 43-63.

[24] Ojile, M. O. (2020). Assessing and providing water for small communities in the Niger-Delta, Nigeria–a water supply situational study in Kpite-Tai in Ogoniland, Rivers State. *American journal of water resources*, *8*(1), 12-20.

[25] Sulaiman, O. O., Saharuddin, A. H., & Kader, A. S. A. (2011). Review of potential of Inland waterway hybrid transportation for sustainable transportation capability building terengganu. *Canadian journal on environmental, construction and civil engineering*, 2(5), 73-83.

[26] Dogarawa, L. B. (2012). Marine accidents in Northern Nigeria: causes, prevention and management. *International journal of academic research in business and social sciences*, *2*(11), 378.

[27] Obeta, M.C. (2014). The characteristics of inland water transport in Nigeria. *Journal of humanities and social science (IOSR-JHSS)*, 19(3), 119-126. https://www.iosrjournals.org/iosr-jhss/papers/Vol19-issue3/Version-4/V01934119126.pdf

[28] Efe, S. I. (2010). Spatial variation in acid and some heavy metal composition of rainwater harvesting in the oil-producing region of Nigeria. *Natural hazards*, *55*(2), 307-319.

[29] Celik, M., & Cebi, S. (2009). Analytical HFACS for investigating human errors in shipping accidents. *Accident analysis & prevention*, *41*(1), 66-75.

[30] Tzannatos, E. (2010). Human element and accidents in Greek shipping. *The journal of navigation*, *63*(1), 119-127.

[31] Abiodun, S. (2021). Enforcement of life saving appliances carriage by passenger boats to ensure protection during boat mishaps in Lagos. *International journal of research publication and reviews*, *2*(8), *2582*, 7421. https://www.ijrpr.com/uploads/V2ISSUE8/IJRPR1153.pdf