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# Appraisal of Incidence of Boat Mishaps in South-Western Nigeria

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## Abstract
This study appraises boat mishap incidences involving inland waterways operation in the south-western Nigeria with particular reference to Lagos Metropolitan area. It examines the magnitude of boat mishaps in the area under study using Time Series Analysis. The spatial pattern of boat mishap incidences was examined to underscore the magnitude of the spatial distribution of boat mishaps in the area under consideration. The study was undertaken using GIS Mapping integration systems to ascertain the spatial pattern of the occurrence and distribution of incidences of boat mishaps through satellite imagery. Geographic Information System (GIS) tools were used to ascertain the uniqueness of the spatial content of boat mishaps. Accidents Curve revealed that highest figure of casualties was recorded in 2014 with14 fourteen boat accidents resulting in high fatality rate of 100 casualties; followed by year 2015. The lowest frequency of accident was recorded in 2010. Major proximate cause of boat accidents is attributable to negligence, over speeding and Storms (Act of God), high wave, among others. This can be attributed to increase in traffic and high patronage of water transportation as an alternative to land transport in the study area given the peculiar challenges of road transportation problems and its attendant problems. Others include Overloading, hull problem, and obstacle (environment) respectively. The study recommends that authorities in charge of inland water transport safety management and control as a matter of urgency should pay full attention to safety of life and property on Inland waterways and provide safety apparatus to cater for boat accident victims.

**Keywords: Mishaps, Inland, Waterways, Transport and Casualties**

## 1. Introduction

Transport in its support for human community'slinks continents with continents, countries with countries and localities with localities. It provides access to locations of relative land uses, economic and socio-cultural activities of localities. It boosts social and economic developments of nations that took time to develop it. Water

transportation appears cheaper compared to land transport in terms of funding the operation and construction of road infrastructure except for dredging of water channels when the need arises and also has the advantage of fast movement over short distances as its devoid any form of challenges naturally associated with road transport operation that could vitiate its performance.

Lagos State by virtue of its natural disposition with water bodies commuters have resorted to inland waterways transport as an alternative means of transportation as part of the strategy to reduce time spent on the road, to avoid delay and lateness to other engagements. The government in its efforts of diversifying intracity passenger given the peculiar geographical outlay ofLagos Metropolitan area considering its busy economic activities where lands and important locations are being separated by waters. Balanced and sustainable economic development in Lagos state is becoming pronounced as users are giving testimonies of the advantages derived from water transport services. This can be seen as an achievement; its safety is central means to greater achievement. It is quite unfortunate and disheartening that despite all these advantages, it has social costs in form of accident that leads to loss of lives and properties(Ernest, 2014).

Water transport is serving as veritable alternatives in the actualization of spatial interaction in areas with geographical/environmental possibilities in Nigeria. This to a greater extent has reduced the challenges of the growing wave of urbanization with its attendant mobility problems

Statistics indicates that between 2000 and 2009, a total number of five hundred and fifty-two (552) persons died as a result of boat mishaps in inland waterways of Nigeria(Dogarawa, 2012). Based on this estimate, annual average rate of fatality is found to be 55 persons.

Obviously, Nigeria's inland waterways is not the only area that experiencesthese phenomena;similar cases of watercrafts or vessels accidents at sea have also been documented in nations that utilizes water transportation. It is quite obvious that advancement and sophistication of new transport technology in advanced countries has both increased people's mobility and enriched peoples' lives by widened experience; but it has also increased the price and consequences of transport usage in terms of human lives and sufferings due to accidents(Ogwude, 1993).(Darbra & Casal, 2004)conducted a study on 471 cases of marine accidents that occurred from 1941-2002 in Hong Kong. They observed that 57% of the accidents occurred while vessel was underway at sea and 43% of accident in ports.This statistic shows that boat accident also occurs in advanced countries, despite introduction of new technologies.

## 2. Methods

The research work involved collection of data through secondary sources through acquisition of data based on boat accidents/incidents reports on water transport in the inland waterways of the study area for a period of 16 years (2000-2015). Published and unpublished materials were consulted to support the study. Secondary data were obtained from Nigerian Maritime Safety Agency (NIMASA), Nigeria Inland Waterways Authority (NIWA) and Lagos State Water Authority (LASWA). Data selection took cognizance of variables such as: Environmental characteristics: speed, weather, and condition of water channel (e.g., atmospheric visibility, storm,

and wave height); technological characteristics: boat characteristics, steering; human characteristics- boating education, boating experience, weather forecast pre-check, and life jacket; temporal characteristics- period of day and date, month, and spatial characteristics of accident locations.

The data collected wereanalysed using mapping and other cartographical techniques to establish the spatial characteristics of the distribution of boat mishaps. Scanned maps were geo-referenced, polygonized and digitized using ArcGIS 10.2, Google Earth and AutoCad (Geographic Information Software packages). This was done to generate spatial pattern of boat mishaps in the study area. Hence, the extent of boat mishaps overtime was analysed descriptively using tables, charts, and graphical methods.

## 2.1 Study Area

Lagos State is unique in its geographical location, because of its 3577.28 square kilometre landmass of which about 779.56 (30 percent) is water, only eight of the 20 local government areas in the state are landlocked. Lagos state is located in the southwest geopolitical zone of Nigeria, precisely within latitudes 6° 23'N and 6° 41'N and longitudes 2° 42'E and 4° 00'E.Lagos is one of the African mega cities. Figure below shows the regional location of Lagos state in southwest geopolitical zone of Nigeria. Lagos state is bounded on the western part by Benin republic, on the south is Atlantic Ocean (Bight of Benin) where it has a link to international waters and sea borne trade, to the north is Ogun state while on the east is partly Ondo state.

Lagos state is dominated by two settlement systems which are Metropolitan and Non-metropolitan areas. Lagos Metropolitan Area comprises of 16 local government areas out of 20 local government areas. These are: Agege, Ajeromi/Ifelodun, Amuwo-Odofin, Alimosho, Apapa, Eti-Osa, lfako/ljaye, Ikeja, Kosofe, Lagos Island, Lagos Mainland, Mushin, Oshodi/Isolo, Shomolu, Surulere, and Ojo local government areas. See figure 1.(Urban and Lagos State
Ministry of Economic Planning and Land Matters, 2005).

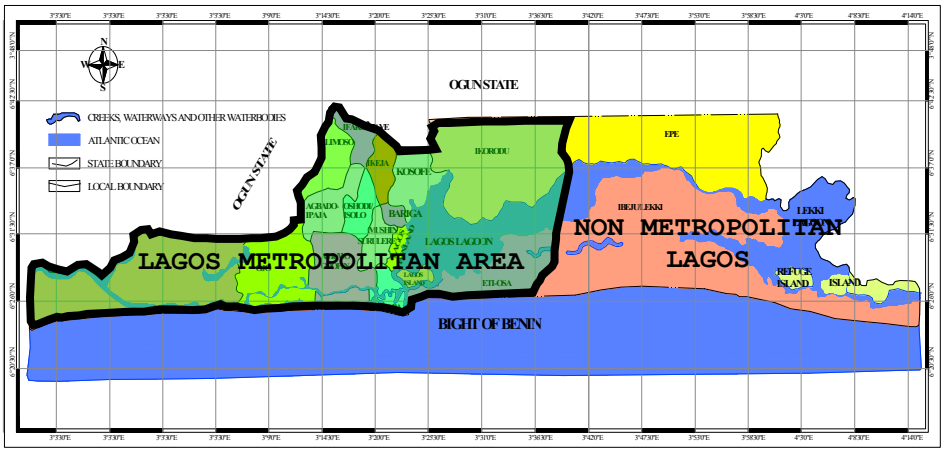


Figure 1: Administrative Map of Lagos State showing Metropolitan Area and Non-Metropolitan Area of Lagos; Source: Digitized map by the author (extract from LAMATA, 2015)

In the advent of Nigerian oil boom in early 1970s, Lagos experienced a sudden increase in population, untamed economic growth, and absolute rural-urban migration. This however caused the neighbouring towns and settlements to experience all-round rapid developments, thus forming the Greater Lagos metropolis that is seen today. Lagos has a total land area of 3,577 square kilometers; 787 square kilometers is made up of lagoons and creeks including: Lagos Lagoon, Five Cowrie Creek, Lagos Harbour, Porto-Novo Creek, New Canal, Badagry Creek, Kuramo Waters, Ebute-Metta Creek, and Lighthouse Creek. (Wikipedia L. , 2015). Most of these water bodies are geographically located within Lagos Metropolitan area. The study area is Lagos Metropolitan Area with particular focus on Lagos Lagoon and the surrounding waterways. Figure 2 shows the Lagos Lagoon, the surrounding settlements, waterways/routes, and jetties in the study area.

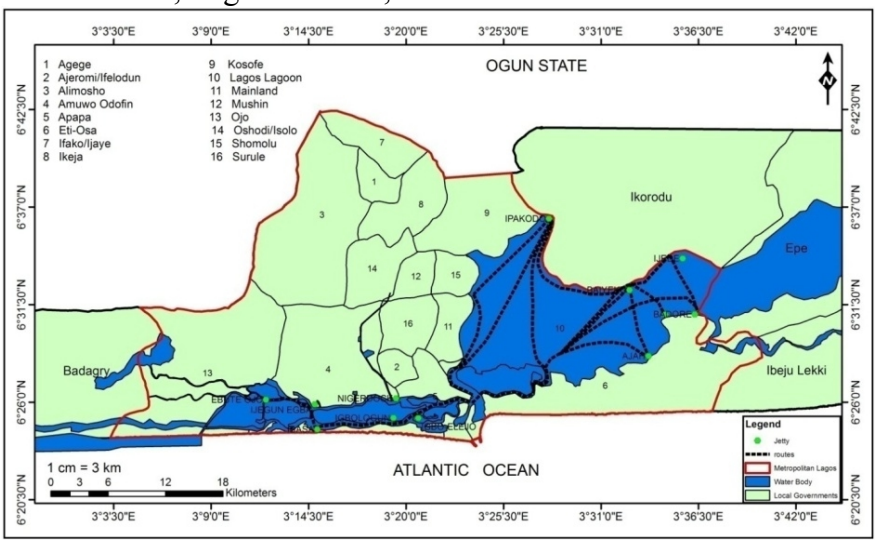


Figure 2: Map showing the area of coverage for the study (Lagos Metropolitan Area)Source: Akinbamijoet al. (2016).

Lagos has been known as one of the industrialized are in Nigeria with concentration of large and medium scale industries. Transportation services in Lagos have grown to be expansive and modernized in order to sustain its population growth and demands. It has suburban trains and some ferry services. (Lawal, Egbejule, & Norbrook, 2016).Lagos State Ferry Services Corporationoperates on and runs some regular routes, for example between Lagos Island and the mainland, Lagos State Ferry Services Corporationoperates on and runs some regular routes.

Studies have shown that there are accidents related to water transportation and they are of varying degrees, magnitude with spatial dimension. The questions of why, what, and how accident cases occurred have been a major research focus of transportation most especially in water sector. Kite-Powell & Talley (2012) investigate the determinants of the vessel damage severity of cargo vessels involved in accidents using the US Coast Guard data covering the period 2001-2008. Four types of cargo vessel (freight barge, freight ship, tank barge and tanker) were considered in the study.

Ozgecan*et al.* (2008) employ simulations to model safety risk factors affecting transit maritime traffic vessels underway the strait of Istanbul. These factors include vessel

arrival rates, scheduling pilotage, overtaking policies, and local traffic conditions. Safety risk analysis was performed by incorporating a probabilistic accident risk model into the simulation model. A mathematical risk model was developed based on probabilistic arguments regarding instigators, situations, accidents, consequences, and historical data as well as subject-matter expert opinions.

Yip (2008) investigates port traffic risk employing historic accidents records involving oceanic ships which visited Hong Kong port. Using negative binomial regression model, it was found that collision accidents are the frequent incidents in heavy port traffic situations. Passenger-type vessels were found to have higher potential for injuries during accidents. Among the variables tested which explain occurrence of accidents; vessel's port of registry, type of vessel, type of waterway was found significant.

**2.2 Conceptual Frameworks**

There are various conceptual terms used in describing accident phenomena as well as analysis tools, for instance approaches, techniques, frameworks, methodologies, methods, and models. The term accident model is frequently used in the literature (Leveson, 2009).

*a.) Accident Models*

An accident model is an abstract conceptual representation of the incidence and development of an accident; it describes the way of viewing and thinking about what, how and why an accident occurs and predicts the phenomenon (Hollnagel, 2002).Accident models can be described as having gone through three major stages, called sequential, epidemiological and systemic models. These stages partly match the developments in the engineering, social, and behavioural sciences.

*b.) Human Factor Concepts*

To estimate boat mishaps or ramming probability, the geometrical accident probability is multiplied by the probability of not making evasive error movements, i.e., the causation probability, which is conditional on the blind navigation assumption. The causation probability thus quantifies the proportion of cases when an accident candidate ends up ramming or colliding with another boat or submerged log due to unawareness or negligence. Not making an evasive movement while being on a collision or ramming course can be a result of a technical and or mechanical failure such as failure of boat steering system or propulsion machinery, human failure, or environmental factors. Sometimes, over-speeding in a bad weather can result to failure of steering system and loss of control. Probability of causation errors is a function of negligence, unawareness, fatigue, and distraction of boat drivers

*c.) The Multiple Causation Theory*

This is the most accepted accident causation theory today. The theory is an outgrowth of the Domino Theory, but it postulates that for a single accident there may be many contributory factors, causes and sub-causes, and that certain combinations of these give rise to accidents. According to this theory, the contributory factors can be grouped into the following two categories: Behavioural category includes factors pertaining to the worker, such as improper

attitude, lack of knowledge, lack of skills, and inadequate physical and mental condition. Environmental category includes degradation of equipment through use and unsafe procedures. The major contribution of this theory is to bring out the fact that rarely, if ever, is an accident the result of a single cause or act.

## 3. Result and Discussion

### 3.1 Presentation of Results

*a) Boat Accidents Frequency: 2000-2015*

Accident frequency refers to the number of occurrences of accident per unit of time (e.g., per year) (WSH, 2013). In Table 1, it is observed that there was no single year that

improper guarding of other hazardous work elements and

boat accident/incident did not occur. Between 2000 and 2015, seventy-seven (73) boat accidents occurred. The highest number of dead casualties was recorded for the year 2014 in fourteen (14) boat accidents. 136 persons were rescued out of 236 accident victims.This is followed by 2015 with 16.4% of total number of boat accidents/incidents for 16 years. Dead casualties recorded were 65 persons.

**Table1: Frequency of Boat Accidents/Incidents: 2000-2015**

| | Frequency of Occurrence | No. of Fatalities (Dead Casualty) | Life rescued (Survived) | Total number of lives Involved |
|---|---|---|---|---|
| **2000** | 5 | 42 | 0 | 42 |
| **2001** | 3 | 15 | 24 | 39 |
| **2002** | 3 | 22 | 32 | 54 |
| **2003** | 2 | 24 | 0 | 24 |
| **2004** | 2 | 23 | 26 | 49 |
| **2005** | 5 | 32 | 18 | 50 |
| **2006** | 3 | 24 | 6 | 30 |
| **2007** | 4 | 8 | 3 | 11 |
| **2008** | 2 | 15 | 14 | 29 |
| **2009** | 4 | 31 | 28 | 59 |
| **2010** | 1 | 15 | 0 | 15 |
| **2011** | 3 | 16 | 36 | 52 |
| **2012** | 6 | 50 | 42 | 92 |
| **2013** | 4 | 48 | 18 | 66 |
| **2014** | 14 | 100 | 136 | 236 |
| **2015** | 12 | 65 | 113 | 178 |
| Total | **73** | **523** | **496** | **1019** |

Source: NIWA, 2016

With reference to the accident data collected, an average of five (5) boat accidents/incidents occurred each year. In 2010, the lowest accident record was observed as only one (1) boat accident occurred.

*b) Nature of Accident/Incident*

Table 2 and figure 3 indicate that, out of all the nature of boat accident highlighted, boat capsize has the largest accident frequency of 50 out of 73 occurrences (the total number of accidents that occurred between year 2000 and 2015). It can be inferred that, in every five (5) boat accidents that occurred each year, 2 (two) are boat capsize cases. Boat sinking has 8.2%, followed by boat collision 5 (6.8%), fire explosion 5 (6.8%).

**Table 2: Nature of Accident/Incident**

| Nature Accident/Incident | Percent | Frequency |
|---|---|---|
| **Boat Capsize** | 68.5 | 50 |
| **Boat Collision** | 6.8 | 5 |
| **Boat Sunk** | 8.2 | 6 |
| **Fire Explosion** | 6.8 | 5 |
| **Boat Piracy/Robbery** | 4.1 | 3 |
| **Adrift** | 1.4 | 1 |
| **Partial Submerge** | 1.4 | 1 |
| **Hull Compressed** | 1.4 | 1 |
| **Jetty Collapse** | 1.4 | 1 |
| Total | **100** | **73** |

Source: NIWA, 2016

*c) Proximate Causes of Boat Accident/Incidents for the period under study (2000-2015)*

In the maritime law a proximate cause is an event sufficiently related to a legally recognizable injury to be held to be the cause of that injury. Figure 3 reveals over speeding of boats as the common cause of boat accidents in Nigeria's inland waterways. An instance of this was a boat accident that occurred on July 1, 2015, when 14 pupils aboard a canoe to their school in Irewe, one of the riverine communities in Ojo Local Government Area of Lagos State, fell into a river after a motorized boat on top speed crashed into their canoe, causing it to capsize. The speedy boat was used for illegal bunkering. While eight of the children were rescued alive, six of them drowned (NIWA, 2015). According to the research statistics, over speeding has a highest record of 9 occurrences with highest percentage of 12.3 among all other proximate causes. Followed are Storms (Act of God), high wave, hull problem with 11.0% respectively.

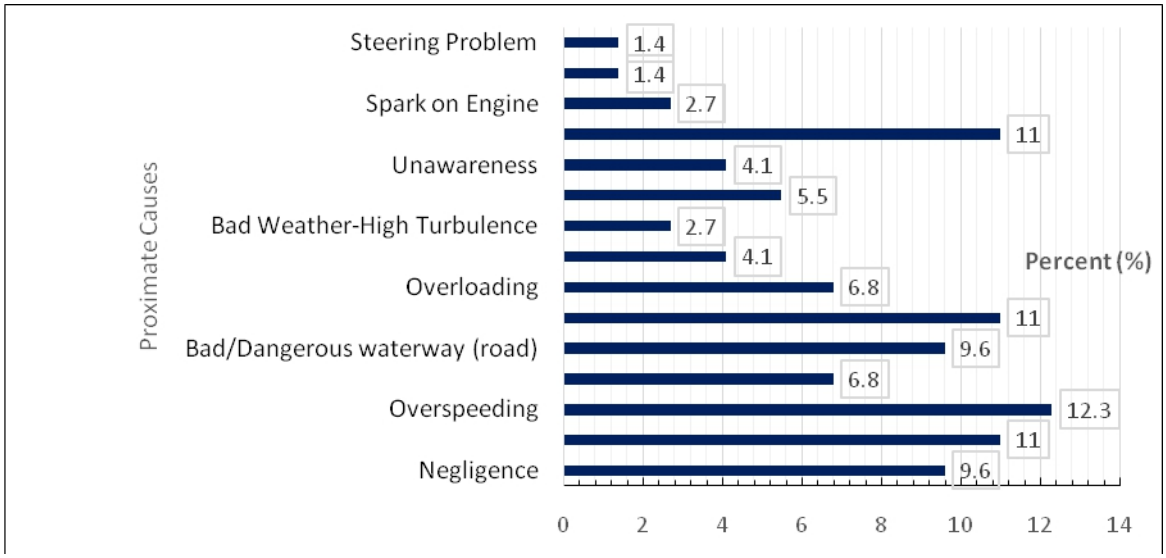


Figure 3: Proximate Causes of Boat Accident/Incident
Source: NIWA, 2016

*d) Frequency and Percentage of Fatalities (Dead Casualties) of Boat Accidents' Proximate causes.*

Figure 4 indicates that Bad and Dangerous waterways contributed to highest number of dead casualties of boat accidents in the study area. This variable is associated with submerged logs, wrecks, and garbage in waterway corridors. Between year 2000 and 2015, 77 (14.7%) fatalities (dead casualties) in 7 related accidents have been attributed to 'ramming' into submerged objects. Hull problem (leakages) is rated second among the contributing proximate causes of high fatalities in the study area as shown in figure 29. Sinking due to hull leakages claimed the lives of 71 people (13.6%) in 8 (eight) boat accidents. Overspeeding caused 9 boat accidents out of which 51 (9.8%) dead casualties were recorded.

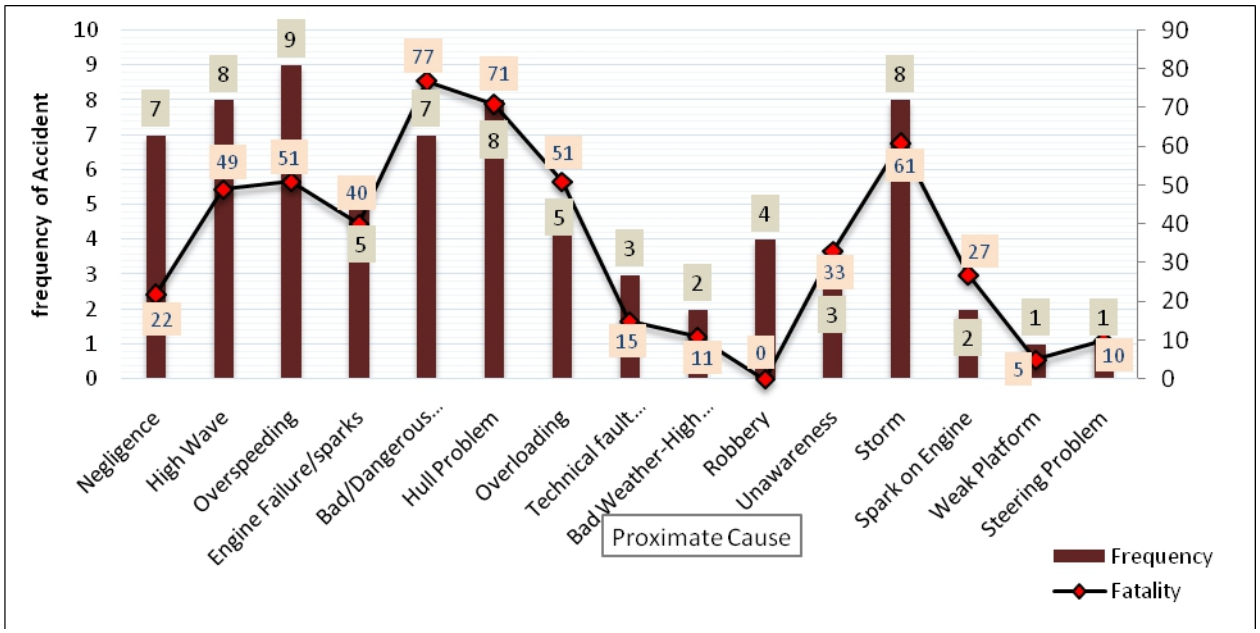


Figure 4: Frequency and Percentage of Fatalities (Dead Casualties) of Boat Accidents' Proximate causes.*(Source: NIWA, 201*

Figure 4 indicates that storm contributed to 61 dead casualties in 8 boat accidents at different locations. Other proximate causes include overloading which contributed to the death of 51 people (dead casualties) in 5 boat accidents, Water tide 'act of God' led to 49 dead causalities in 8 boat accidents and Negligence 'human/behavioural factor' claimed 22 dead casualties in 7 boat accidents between the year 2000 and 2015. This report however revealed that between 2000 and 2015, five hundred and twenty-three (523) people died because of different forms of proximate causes on the waterway corridors in the study area.

*e) Month of Occurrence of Boat Accident/Incident*

Boat Accidents/incidents have become a national debate on issues affecting transportation in Nigeria due to rapid increase in fatalities on waterways. The major causes have been attributed to proximate event or a chain of events leading to injuries and fatalities as well as loss of property. It is however necessary to investigate month of occurrence for probable boat accident/incident.

Table 3: Month of Occurrence of Boat Accident/Incident

| Month of Occurrence | Frequency | Percent |
|---|---|---|
| **January** | 4 | 5.5 |
| **February** | 0 | 0 |
| **March** | 8 | 11 |
| **April** | 8 | 11 |
| **May** | 3 | 4.1 |
| **June** | 7 | 9.6 |
| **July** | 4 | 5.5 |
| **August** | 7 | 9.6 |
| **September** | 13 | 17.8 |
| **October** | 14 | 19.2 |
| **November** | 3 | 4.1 |
| **December** | 2 | 2.7 |
| Total | **73** | **100** |

Source: NIWA, 2016

Table 3 shows that the maximum number of boat accidents between 2000 and 2015 occurred in the month of October, which accounted for 14(19.2%) out of the 73 boat accidents/incidents within period of 16 years. The second highest occurrence of boat accidents/incidents occurred in the month of September as 13 (17.8%) boat accidents/incidents were recorded. In the month of December, only 2 (2.7%) were recorded; this was the lowest number of accidents occurrence for the period of study. Only month in which boat accident/incident did not occur is February.

*f) Time/period of Occurrence*

As shown in Table 4, most of the accident cases recorded between year 2000 and 2015 occurred at Twilight amounting to 23 (31.5%) out of 73 accident cases. This is followed by the accident occurred in the Afternoons with 18 (24.7%); morning accidents/incidents were 16 (21.9%). The highest number of accidents recorded at twilight can be attributable to poor visibility as a result of dark vision, overwork and over speeding due to hurriedness to reach destinations.

Table 4: Time/period of Occurrence

| Time/period of Occurrence | Frequency | Percent |
|---|---|---|
| **Dawn** | 4 | 5.5 |
| **Morning** | 16 | 21.9 |
| **Afternoon** | 18 | 24.7 |
| **Twilight** | 23 | 31.5 |
| **Night** | 12 | 16.4 |
| Total | **73** | **100** |

Source: NIWA, 2016

*g) Spatial Distribution of Boat accidents/Incidents in the Study Area (Lagos Metropolitan Area)*

This report details 73 boat accidents for the period of 16years as shown in Table 1. In total, an estimate of 523 lives was lost in these accidents; an average of 7 deaths has been calculated per accident. Both confirmed deaths and those listed as missing were included in the estimate of dead casualties. Figure 7 indicates that boat accidents and incidents occurred in 28 different locations on waterways in Lagos Metropolitan Area. The spatial distribution of the accidents/incident is however captured in three major axial locations which include Ikorodu, Apapa and Badagry axis. Figure 5 and Figure 7 indicate that accident/incident spots are more concentrated around Ikorodu and Apapa axis than Badagry. Ikorodu has the highest number of boat accidents/incidents of 19 accident cases while Apapa has 17 cases (11accident cases and 6 incidents) followed by Badagry (5 Cases); 3 accident cases occurred each at Ojo, Ikoyi and Victoria Island while Ajah experienced 2boat accident cases within the period under study.

Based on the personal interview with a NIWA officer, the incessant and high frequency of boat accidents in Ikorodu axis has been attributed to frequent wave actions. It is believed that wave actions in Ikorodu axis are much more violent than wave turbulence around Apapa axis despite its distance to the shore of Atlantic Ocean.

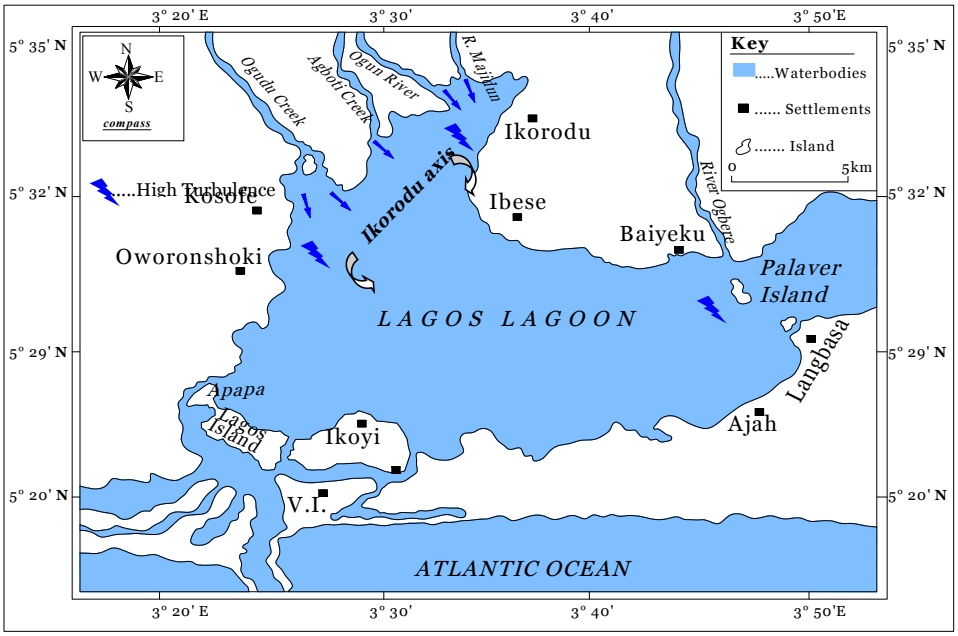


Figure 5: Map showing inflow of rivers into Lagos lagoon at Ikorodu axis.
Source: LASWA (Digitized, 2016)

The study however gathered that there are rivers from different locations in the southwest, Nigeria that flow into the Lagos lagoon at Ikorodu. The lagoon is fed in the north by Ogun River(Solarin, 2003).River Ogun took its source from Igboho, Oyo state with many tributaries and empties its large volume of waters into the lagoon. Other rivers that empty their waters into Lagos lagoon are Ogbere, Majidun, Ogudu and Agboti creek as shown in figure 6. Major contributing factors to high turbulence/water tides on Lagos lagoon at Ikorodu are attributable to the inflow of all these rivers and ocean current from Atlantic Ocean

.


Figure 6: Spatial Pattern of Boat accidents/Incidents in the Study Area (Badagry axis, Lagos Metropolitan Area) between 2000-2015
Source: NIWA, 2016


Figure 7: Spatial Pattern of Boat accidents/Incidents in the Study Area (Apapa and Ikorodu Axis, Lagos Metropolitan Area)
Source: NIWA, 2016

*h) Accident Curve*

Accident curve (FN curve) is the cumulative frequency (F) of an accident versus the number (N) of fatalities. (Starling, 2006). It is used to measure the relationship between the frequency of accidents and the casualty figures resulting there from. This can assist to determine which of the selected years are more fatal than others in terms of casualty rate. Figure 8 and Table 5indicate that highest number of casualties was recorded in 2014 as 100 casualties in fourteen (14) boat accidents/incidents. There was a sharp fall in accident frequency from 2000 to 2001, the casualty and accident figure came down to minimum in 2007 with 8 casualties in 4 boat accidents.

Table 5: Frequency of Occurrence and Dead Casualties in Boat Accidents/Incidents from 2000-2015**.**

| Year | Frequency of Occurrence | No. of Fatalities (Dead Casualty) | Life rescued (Survived) | Total number of lives Involved |
|---|---|---|---|---|
| **2000** | 5 | 42 | 0 | 42 |
| **2001** | 3 | 15 | 24 | 39 |
| **2002** | 3 | 22 | 32 | 54 |
| **2003** | 2 | 24 | 0 | 24 |
| **2004** | 2 | 23 | 26 | 49 |
| **2005** | 5 | 32 | 18 | 50 |
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| **2014** | 14 | 100 | 136 | 236 |
| **2015** | 12 | 65 | 113 | 178 |
| Total | **73** | **523** | **496** | **1019** |

Source: NIWA, 2016

The upsurge in the frequency of boat accidents between 2013 and 2014 is attributable to negligence, over speeding and overloading which are associative results of high traffic and patronage in water transportation as an alternative to land transport. There were 523 fatalities between year 2000 and 2015 as a result of boat mishaps in inland waterways in the study area. Based on this estimate, annual average rate of fatality is found to be Thirty-five (35) persons per year.

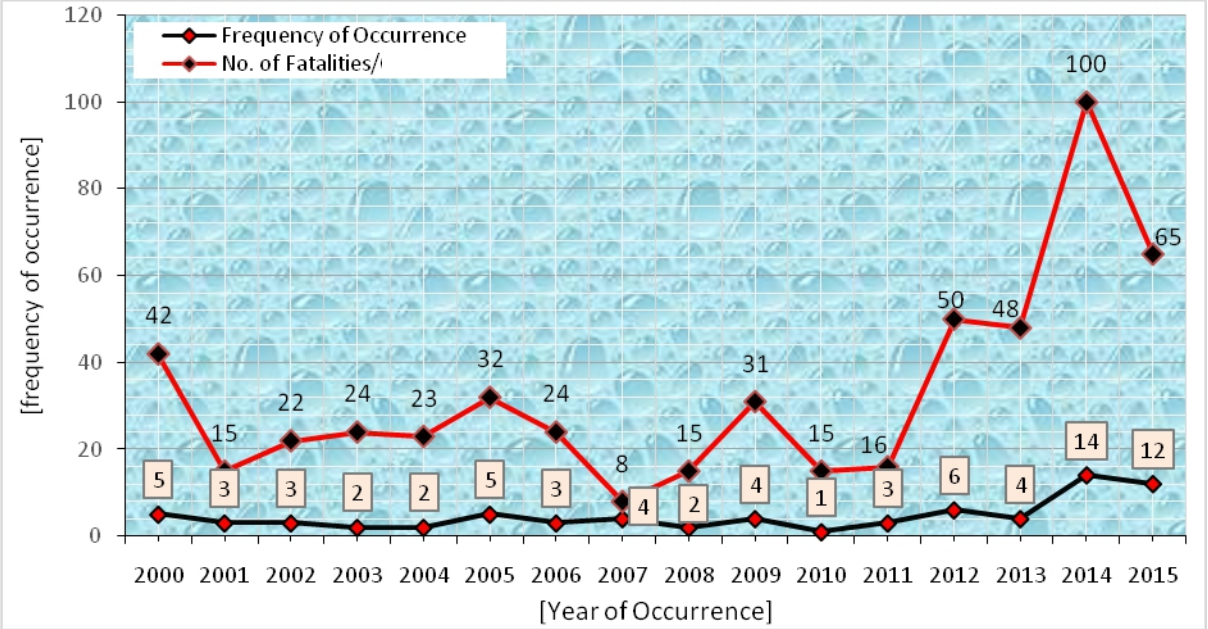


Figure8: Boat Accidents Curve (2000 to 2015)
Source: NIWA, 2016

### 3.2 Results Findings

Rate of recurrence of boat accidents have become a matter of public concern in Lagos state most especially Lagos Metropolitan area; meanwhile, this has been facilitated by the result of an increasing population of Lagos state at large with a corresponding increase in the number of vehicles on roads. In the view of this, Lagos residents' resort to water transportation as alternative means of transportation in anattempt to avoid unnecessary delays from daily the traffic holdup that has become the order of the day in Lagos state the most populated city in Nigeria.The data analysed confirmed that, over speeding caused the largest percentages of accidents/incidents frequency. This was however attributed to lack of stalled speedometer in the watercrafts (boats) and reckless driving and speeding.However, the common accident causalities in Lagos metropolitan area are attributable to over speeding. This is followed by weather effects (storms) and ramming due to submerged derelicts/wreckages. Also, study showed that period of the day that boat mishaps commonly occur is twilight. This is attributed to poor visibility (dark vision) and over speeding due to quickness to get to destinations.Month-wise data study revealed that the highest number of accidents occurred in the months of September and October being the period of peak and heavy downpours/rainfall.

### Conclusion

This has however generated from an increasing population of Lagos state at large with a corresponding increase in the number of vehicles on roads. Hence, Lagos residents resorted to water transportation as alternative means of transportation in anattempt to avoid unnecessary delays from daily the traffic holdup that has become the order of the day in Lagos state the most populated city in Nigeria.Despite these advantages, the country is yet to maximize the opportunity in water transport systems and make it a sustainable and reliable alternative means of transportation to road and air. High frequency in fatalities in boat accidents is taking a negative toll on water transportation in the country. Prospective

passengers are now avoiding this means of transportation and sticking to road transportation in Lagos Metropolitan area thereby further stretching the road infrastructure.

There is no doubt that a perfect well planned transport system is an essential task to determine the quality of life enjoyed by the people and the functioning of trade, economy, and many other essential services. It is therefore necessary that a national policy and statutory institutional framework, effect control on management and direction of funding process and a manpower development strategy be adopted for water transport services

A systematic improvement of the maritime transport system, the adoption of an integrated system of transport and implementation of all that have been recommended will not only go a long way at improving the welfare of coastal residents and their environment but will reduce accident or incident risks with all their negative impacts on humanity and increase the Nation's Gross Domestic Product (GDP).

The recommendations are made based on the researcher's findings, to point out the way forward for Accidents/incidents reduction on Nigeria inland waterways. The way forward is focused on the part of Boat personnel, Boat passengers and Management authorities saddled with safety and management responsibilities pertaining to waterways. The recommendations include:

1. **Provision of effective modern weather station**
   Provision of effective modern weather station ashore will help in weather reports for boat operators to work with while engaging in water transportation. The weather department ashore needs to be well equipped with new sophisticated weather equipment so that correct and accurate weather report can be sent in due time.
2. **Dredging and Channelization of waterways**
   Dredging of Lagoon around where the rivers empty the huge volume of waters will help in minimising turbulence in the accident-prone area in the water. Government should undertake capital and maintenance dredging and channelization of waterways; undertake installation and maintenance of lights, buoys and all navigational aids along water channels and banks of the water ways; clear water hyacinth and other aquatic weeds; and of course, charge and collect toll on water transportation.
3. **Installation of navigation aid devices into commercial watercrafts**
   Majority of boats in operation are not fitted with navigation aid devices. Boats that are not fitted with necessary installations like speedometer, GPS, headlights etc should not be registered to operate on the waterways. Speed limits signpost should plant along the waterways and that all boat operators must obey all posted signs. Besides, NIWA regulations stating that 'All commercial boats must adhere to a speed limit of six knots around jetties and a maximum of 15 knots as service speed'. This regulation may not be effective if speed devices like speedometers are not stalled ontothe watercrafts in operations and services. Acquisition of standard boats with requisite navigation aids and safety accessories like life jackets.
4. **Introduction of Swimming Training Program**
   Users around and within water environment should be equipped with adequate level of water safety. This could be introduced to users at pre-schooler ages to guide against loss of lives of passengers during boat accident/incidents. According to National Occupational Standard,

maintaining health and safety is always of paramount importance when working within port and or water environment.

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